ROUTLEDGE HANDBOOKS



Routledge Handbook of Global Environmental Politics

Edited by Paul G. Harris

Routledge Handbook of Global Environmental Politics

This book offers readers the most comprehensive coverage of global environmental politics yet published in a single volume, including examination of key issues, policies, actors, institutions and theories. It brings together leading international academic experts to:

- Describe the history of global environmental politics as a discipline and explain the various theories and perspectives used by scholars and students to understand it.
- Examine the key actors and institutions in global environmental politics, explaining the role of states, international organizations, regimes, international law, foreign policy institutions, domestic politics, corporations and transnational actors.
- Address the ideas and themes shaping the practice and study of global environmental politics, including sustainability, consumption, expertise, uncertainty, security, diplomacy, North–South relations, globalization, justice, ethics, participation and citizenship.
- Assess the key issues and policies within global environmental politics, including energy, climate change, ozone depletion, air pollution, acid rain, sustainable transport, persistent organic pollutants, hazardous wastes, water, rivers, wetlands, oceans, fisheries, marine mammals, biodiversity, migratory species, natural heritage, forests, desertification, food and agriculture.

This is an invaluable and comprehensive resource for students, scholars, researchers and practitioners of environmental politics and policy, environmental studies, international relations, foreign policy, geography and development studies.

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1

Introduction

Delineating global environmental politics

Paul G. Harris

The natural environment is in decline globally. With too few exceptions, environmental indicators are growing worse. For example, water and air pollution are now so poor in some developing countries, such as China and India, that hundreds of millions of people are forced to drink severely tainted water and breathe toxic air. Regionally, acid rain – which has been reduced in North America and Western Europe in recent decades – is on the increase in East Asia and other developing regions, putting ecosystems and agriculture at great risk. The so-called "Asian brown cloud" of smog is so vast that it spreads across the Pacific to the Americas. Coastal seas have been overfished in most oceans, and this phenomenon has extended to regional seas in both the developed and developing worlds. Marine environments are severely degraded by polluting runoff from continents, with the world's coral reefs shrinking and ocean "dead zones" now extending along the coastlines of all continents. Wildlife around the world is under great threat, with declines and extinctions of species on the rise. These problems are exacerbated by climate change, which is manifested in rising global temperatures, very serious threats to agricultural productivity from droughts and floods, more severe weather events, new threats to species unable to adapt to environmental changes and pollution, declines in marine ecosystems due to warming waters and ocean acidification, and immeasurable dangers posed by sea-level rise, particularly for poor low-lying regions, countries and habitats. These are but a few examples of the environmental challenges that are increasing around the world.

The role that politics plays in these challenges, whether they play out within or among countries, cannot be understated. The continuing decline of the global environment can largely be put down to the failure of governments and other actors to respond in time – or at all. When we do see successes in preventing or responding to adverse environmental changes and pollution, for example in cleaner local environments in many developed countries and a handful of international successes, such as agreements among countries to curb emissions of pollutants that destroy Earth's protective stratospheric ozone layer, they can often be put down to the willingness of governments and other political actors, including nongovernmental organizations and occasionally businesses, to negotiate and implement policies that prioritize environmental protection over short-term economic gain. Understanding and promoting these kinds of successes is crucially important, and in many cases vital, to the future of all societies and to natural ecosystems. This handbook is intended to be part of the process of promoting those successes: first to bolster basic

understanding of environmental changes and the underlying politics that shape them, and second to provide readers with a foundation of knowledge that can help them to promote new, more environmentally sustainable relationships between humankind and the natural world.

Everyone is affected by global environmental politics, often directly through feeling the impacts of the environmental changes caused by government policies, and at least indirectly through having to watch others suffer from those changes. Many people are now affected, in positive ways, by regulations and policies that have reduced environmental pollution. The manner in which human, financial and governmental resources are used to create and hopefully reverse ecological decline, overuse of natural resources and destruction of the natural environment affects the safety of the water that people drink, the air that they breathe and the nature that they enjoy and draw from to meet their individual and community needs. Global environmental politics can and will shape the climate and even the weather of the future. Sadly, for some people, global environmental politics may be a matter of life and death. For example, the failure of governments and other global actors, such as businesses and individuals, to respond robustly to the causes and consequences of climate change means that millions of vulnerable people in the poorest parts of the world will die in the future from drought-induced famine or severe weather events, and many more will die from the diseases that will spread in a warmer and wetter world.

What this means is that global environmental politics should concern everyone. Whether one is a politician, career government official, entrepreneur, activist or student, understanding global environmental politics will help achieve policy or personal goals. Without knowledge of the global nature of environmental changes, policymakers will fail to see many of the causes of those changes, and indeed the remedies for them. Without recognition that the environment permeates other policy areas, ranging from energy supplies and national security to social justice and food production, policy responses are unlikely to succeed, least of all to be cost-effective and equitable. Without realizing that both the causes and consequences of global environmental change are highly political, being influenced by the distribution of power within and among societies, those who seek to limit pollution and destruction of natural resources will not get very far. With this in mind, this handbook brings together a large group of scholars from around the world to examine these connections and to help illuminate the causes of environmental change and especially the ways that the world has and can respond to them. It is intended to be the most comprehensive treatment of the topic yet published. While the field of global environmental politics is much too large to be fully covered by a single volume, we have sought to survey as much of it as possible, thereby giving anyone interested in (or concerned about) it a solid foundation on which to continue with more in-depth analysis or study.

Before the contributors to this volume proceed to examine global environmental politics more widely, this chapter briefly delineates this important topic. It defines the topic and its related field of study by briefly looking at the *global*, the *environment* and the *politics* in global environmental politics. The chapter then distinguishes between the *practice* of global environmental politics and the *study* of it, in the process suggesting how the two do and should overlap. This chapter also introduces the topics that will follow in subsequent chapters, in the process showing how the field is both wide and deep, in many respects reinforcing the importance of global environmental politics for everyone.

Defining global environmental politics

What is, and what are, "global environmental politics"? Global environmental politics is both an area of activity and practice, on one hand, and a field of research and study, on the other. It is

about how governments, diplomats and other actors influence the global environment, which includes local and regional environments, and how what they do is analyzed and understood by scholars, students and activists. Global environmental politics, in a plural sense, can be interpreted as the various ways in which politics are practiced in different places to alter or protect the environment. That is, there are different politics of the environment in different locations and in different issue areas. Importantly, as the term implies, global environmental politics is about the politics of the environment on a global scale.

The "global" in global environmental politics

Environmental changes and associated politics occur at all geographic and social levels. Environmental changes can occur locally and be caused by what happens locally, as when local water supplies are polluted by domestic sewage or industrial effluents. In contrast, environmental problems can be global, as in the case of global warming and associated climate change. These levels of environmental change are routinely connected, sometimes intimately. For example, *global* climate change arising from emissions of carbon dioxide and other greenhouse gases all around the world affects local communities and individuals directly. Global problems can have local causes. In contrast, even apparently localized environmental issues can be global problems. For example, addressing local water and air pollution in poor countries may require financial or technological assistance from affluent countries, often those far away, or from the international community, perhaps in the form of an agency of the United Nations or an international nongovernmental organization.

These varying levels of environmental change, and the various levels of causality, impact and response, highlight the role of politics at all levels. We see different environmental politics depending on the location, scale or issue being addressed. For example, some local environmental problems can be addressed through local action, as occurs when a community implements regulatory measures to curb pollution or to protect local natural resources. Other environmental problems are regional, crossing provincial and national boundaries or entire oceans, requiring and sometimes receiving policy responses from a number of communities or national governments. Examples of this kind of environmental politics include responses by North American and European governments to reduce acid rain, action plans to limit pollution of the Mediterranean Sea, and management of fisheries in regional seas. Environmental problems that are more obviously global, such as stratospheric ozone depletion and global warming, require global political responses: the governments of many countries need to cooperate and collaborate to formulate and implement policy responses, and these in turn require action by many more sub-national governmental bodies as well as non-state actors that operate globally (or nearly so), such as multinational corporations and international nongovernmental organizations.

Thus, in using the term "*global* environmental politics" we mean to encompass all levels of politics (and policy) related to the environment; a global issue is clearly global, but a local one may, by definition, also be encompassed by global politics. Put another way, global environmental politics encompasses local, national, transnational, regional, international *and* geographically global environmental issues and related political activity. As such, in this volume we are interested in environmental issues at all levels and in related political activity at all levels.

The "environment" in global environmental politics

Global environmental politics is the global politics of the environment. More specifically, the environment in global environmental politics is about the human dimensions of the natural

environment: the human causes of environmental change, pollution and resource use, and the human approaches to solving (or trying to solve) or preventing environmental problems and resource scarcities. The "human" here often equates to government policies and the relationships between those policies and the behaviors of individuals and industries. For our purposes, the human also includes international cooperation, often resulting in environmental treaties. This connection between environment and human society, broadly defined, highlights an important point: while global environmental politics is related to the natural environment, how we define "natural" is problematic. A purist might point out that very little of genuine nature still exists; with climate change and the spread of persistent organic pollutants, for example, nearly every part of what was once the natural world has been affected, and often utterly transformed (or destroyed), by humanity. Nevertheless, one expects that for most people "nature" can be defined as the nonhuman world, encompassing the plants, animals, minerals, air, water and ecosystems on which humanity depends for its survival and wellbeing.

Simply put, the "environment" in global environmental politics is roughly equated to "ecology" – natural systems, including humanity and all its influences – but with the important caveat that we are interested in the human–environment relationship, often in the context of governance. This means that the environment of global environmental politics is not about the built environment per se, except insofar as this affects the natural environment. This would be the case with, for example, energy use by buildings (because most of the electricity used by buildings comes from the burning of fossil fuels, which in turn contributes to air pollution and climate change) and transport infrastructure (which can greatly affect air quality and local environmental habitats). In some sense, the environment in global environmental politics is about stewardship of the natural environment. Increasingly this means stewardship of the *global* environment – of the whole planet – implying that truly global cooperation is required to ensure an environmentally sustainable future for all people regardless of where they might live.

The "politics" in global environmental politics

"Politics" can be and is defined in a number of ways. It can refer to the struggle for and distribution of power, and thus resources, within and among national communities. This is routinely associated with the role of governments, notably their policies and actions for regulating behaviors in society, and the manner in which governments are chosen, the institutions from which they obtain their legitimacy, and the way that they rule. Thus global environmental politics is largely about how government policies contribute to environmental problems and about specifically environmental policies (often environmental regulations) and their effects. It is about how environmental resources and pollution are distributed in society, and the role that power and influence play in that distribution. More commonly, the politics in global environmental politics is about international cooperation related to the environment. This might include addressing transboundary, regional and global problems through international conferences of diplomats negotiating environmental treaties, efforts by governments to manage shared resources in natural "commons" areas (such as fish in the open ocean beyond territorial waters), or attempts to formulate and implement international policies on sustainable development that benefit individual countries, reduce local and global pollution, and support environmentally less harmful economic development.

Although global environmental politics routinely involves governments in some way, it is not always about governments relating to one another. It is often about non-state actors trying to influence government policies in ways that affect the environment. It may also involve struggles related to the environment by nongovernmental organizations, businesses and communities

that largely ignore governments, at least directly. At the risk of upsetting purists, one must even acknowledge that the field of global environmental politics goes beyond politics strictly defined. Scholars of global environmental politics thus include those with interest and expertise in economics, sociology and other social sciences, and even the humanities. Ultimately, the politics of global environmental politics is most often the process whereby the constellation of disparate interests – government agencies, corporations, communities and people, and some would add nonhuman species – are represented (or not) in actions that harm the natural environment or in efforts to protect it.

The practice and study of global environmental politics

The field of global environmental politics encompasses both practice (or praxis) and study (and analysis) of politics and policies related to the environment. The former interpretation tends to fit definitions of politics oriented toward activities of governments and traditional political players, although increasingly non-traditional actors, such as civil society groups, often organized via the Internet, have growing importance in environmental politics at all levels. The latter interpretation of global environmental politics is oriented toward research and teaching related to the politics of the environment, although it is important to note the overlap with practice: research about global environmental politics is routinely about, and very importantly can inform, the practice of global environmental politics, and students of global environmental politics might apply what they learn to environmental activism, work in industry or service in government.

The practice of global environmental politics

Global environmental politics is above all about activities – policies, actions, behaviors – that affect the environment, whether negatively (e.g., through pollution or harm to natural resources) or positively (e.g., by reducing or preventing pollution, or using resources sustainably). In its simplest form, the practice of global environmental politics includes those activities of governments that relate to the environment in some way. This might involve the work of environmental ministries, particularly when their work affects what happens in other countries, and it would include the environment-related roles and activities of political executives (presidents, prime ministers) and legislatures, notably the environmental policies, laws and regulations they deliberate, formulate and implement. It follows that the practice of global environmental politics is also about the activities of all those actors trying to influence and shape government policies related to the environment, and the responses of those and other actors to environmental regulation. Thus the practice of global environmental politics within countries includes the activities of special interests, notably corporations and, in many places, environmental advocacy groups, and the processes whereby those interests attempt to shape government policies related to the environment.

The practice of global environmental politics of course includes the actors working across national borders. For example, environmental diplomacy and the complex processes of international environmental negotiations on all manner of issues – such as fishing, whaling, ocean pollution, trade in hazardous wastes, stratospheric ozone depletion and climate change – are most definitely the stuff of global environmental politics. Indeed, some scholars of global environmental politics focus almost entirely on this aspect of the topic – what might be labeled *international* environmental politics – including the roles of important or powerful national actors (such as the United States and China), foreign policy processes (including the roles of influential politicians or diplomats and their relationships with colleagues nationally and internationally),

and the impact of international organizations and regimes (such as the United Nations and the constellation of international agreements and new practices associated with, say, biodiversity and especially climate change). In short, at least for some scholars, global environmental politics is primarily about what governments do at home and abroad to respond to environmental changes or to prevent them from happening.

The study of global environmental politics

As a field of analysis and learning, global environmental politics is about trying to understand and explain the practices of governments and other actors related to the environment, especially insofar as this is associated with international affairs or transboundary environmental issues. For most scholars this involves analyzing the practice of global environmental politics, finding explanations for what happens, and conveying this knowledge to others, often to the practitioners being studied. For many scholars this includes sharing their knowledge via publications of different kinds, sometimes in the form of policy papers intended to shape ("improve") the policies of governments, international organizations and other actors, such as corporations, and to help them arrive at policies more conducive to environmental protection. Most scholars maintain a certain level of disinterestedness in their research: they attempt to find the "truth" behind environmental policies, for example, and to convey what they have learned to the scholarly and policy communities. Other scholars and researchers have more normative objectives: they want to see the environment and natural resources protected, so their research is aimed at finding ways to make that happen, possibly including advocacy work toward that end. A few (sometimes self-styled) scholars, such as the so-called "climate skeptics" and "climate deniers," have just the opposite objective: to use their work to *prevent* governmental regulation for environmental protection.

For many scholars of global environmental politics, their work includes teaching others what they have learned about the practices of global environmental politics, notably in college and university courses (sometimes titled "global environmental politics," "international environmental politics" or something similar). These courses are often geared toward helping students who will join industries to better understand the role of environment in their future work, or to provide training for students who will join government ministries working on environmental and international affairs. Some teachers of global environmental politics no doubt hope that their students will become environmental activists. Regardless of their individual motivations, most of the contributors to this volume both conduct research on global environmental politics and teach about it.

Surveying global environmental politics

This volume brings together a diverse group of scholars from around the world. Their contributions are organized into four parts: (I) explaining and understanding global environmental politics; (II) actors and institutions in global environmental politics; (III) ideas and themes in global environmental politics; and (IV) key issues and policies in global environmental politics. Together the contributors cover most topics in both the practice and study (or research) of global environmental politics, thereby giving readers, whether students, government officials, industry sustainability officers, environmentalists or ordinary concerned citizens, a scope of knowledge that is wider than that found in other books. Chapters describe the topic at hand in enough detail to provide a foundation for policy work and more in-depth reading and study. Most contributors also draw on their experiences to provide some assessment of real-world

events. As such, in the whole the handbook serves as a valuable primer for anyone interested in, or concerned about, humanity's relationship with the global environment.

Explaining and understanding global environmental politics

In Part I, contributors describe the theories and methods used to explain global environmental politics. In Chapter 2, Loren R. Cass provides a historical overview of global environmental politics as a field of study. In a wide-ranging survey of the literature, he shows how the field has advanced from one that was primarily about international environmental cooperation to one that is more inter- and multi-disciplinary, encompassing the full range of political and policy activity related to the environment while still being oriented toward international relations. In Chapters 3 and 4, John Vogler and Hayley Stevenson describe and assess all of the major theoretical approaches, and more than a few of the less common theoretical frameworks, used to analyze and understand global environmental politics. Vogler focuses on mainstream theories of global environmental politics, notably realism and rationalism (which some might say are not always realistic or rational), which have been most commonly used by scholars, and sometimes even by practitioners, to explain the international politics of the environment. In contrast, Stevenson looks at alternative theories, such as constructivism and Marxism, which challenge the mainstream approaches. The alternative perspectives are often about showing that global environmental politics is just as much about ideas as it is about states per se.

The final chapters of Part I turn to questions of how global environmental politics is studied and taught. In Chapter 5 Juliann Emmons Allison draws on a wide literature to craft a framework for doing research and teaching of global environmental politics. She shows how the theories described in the preceding chapters can be brought to bear in explaining global environmental politics to laypersons, and she proposes innovative pedagogies that can be deployed to help students learn about it. In Chapter 6, Peter M. Haas and Ronald B. Mitchell make a strong case for interdisciplinary scholarship that bridges the science–policy interface. Such research is more likely to lead to publications and other outputs that will result in concrete improvements in environmental conditions. Together, the chapters in Part I serve as a theoretical foundation for the rest of the handbook and a guide for further research and study by readers of all kinds.

Actors and institutions in global environmental politics

Global environmental politics is shaped by a variety of major actors and institutions operating at all levels of human activity – from the local to the global. In Part II, contributors describe the most prominent actors and some of the common practices, norms and institutions they often follow in their relations with one another in the context of environmental change. In Chapter 7, Hugh C. Dyer takes a critical look at what are very likely the most important and most powerful actors, if far from the only important ones, in global environmental politics: nation-states. For some scholars and no doubt for many practitioners, especially diplomats, states are *the* chief actors, often receiving all of the attention. As Dyer points out, the international system, and the notion of state sovereignty that serves as its foundation, has the potential both to solve environmental problems and to make them much worse. What may be most interesting and most important, and is certainly germane to other chapters here, is that environmental change, while partly a consequence of the behaviors of sovereign states, is challenging the very idea of sovereignty like nothing else. It may be for this reason that states quite often find it necessary to cooperate at both regional and global levels to seek common approaches to addressing environmental

issues. This cooperation, and especially its manifestation in international (or, more precisely, inter-governmental) environmental organizations, is examined by Kate O'Neill in Chapter 8. She reviews both the functions and operations of regional and global international organizations, in the process examining the extent to which they are autonomous actors, independent of their member states, or more often tools used by their members to promote their own interests in global environmental politics.

One interesting aspect of global environmental politics is that states (and other actors) frequently cooperate informally. This informal cooperation can take on a life of its own. In Chapter 9, Mary E. Pettenger explores this process through an examination of international environmental regimes and some of the underlying theories that are used to explain their formation and effectiveness. While there is some disagreement among scholars about how to define international regimes, they are quite often described as principles, norms and procedures that governments agree to follow in addressing (in this case) international environmental problems. They may have formal international organizations associated with them, and indeed the most influential regimes usually do, but this is not always the case. What is important is that states, at least the most powerful ones, sometimes recognize and accept that only through voluntarily accepting and (mostly) adhering to a common approach can they solve environmental problems.

Another way that the environment-related behavior of and among states is voluntarily regulated, or at least tempered, is through international environmental law, which is described by David B. Hunter in Chapter 10. International environmental law is largely a consequence of formal agreements among states: governments voluntarily agree, through treaties, to be bound to certain behaviors, for example to stop allowing the use of certain pollutants or environmentally harmful practices within their borders that might harm other countries. Having said this, international environmental law can arise in less predictable ways, whether through common practices that evolve over time or as a result of decisions taken by national and international courts. Hunter shows how these formal and informal practices have resulted in an array of commonly accepted standards in global environmental politics.

Global environmental politics is about much more than cooperation among governments at the international level. It is also about what happens within states and what happens at the domestic–international frontier where international and domestic politics and policies interface, as they do in foreign policy processes. In Chapter 11, Mihaela Papa explores the crossovers among different levels of governance by focusing on foreign policy actors. She explores two approaches to environmental foreign policy, namely one that focuses on states and the roles of government officials (such as diplomats and officials in foreign ministries) as primary actors, and another that focuses more on "multi-level governance" and other actors involved in global environmental politics. Moving one further step down from the purely international, in Chapter 12 Stacy D. Vandeveer and Paul F. Steinberg describe the roles of domestic actors and institutions in global environmental politics. They do this by focusing on (and advocating) a comparative approach to analyzing global environmental politics, in the process highlighting the importance of national policies in understanding and explaining the field. It is, after all, quite often policies at this level that have the most impact on the environment.

In Chapters 13 and 14, Kyla Tienhaara and Christian Downie focus on the roles of non-state actors in global environmental politics – although even these actors seldom act entirely independently of states. Tienhaara examines some of the actors that some scholars and observers may argue are more important than most states: corporations. She looks at how corporations wield power, influence and authority in global environmental politics, showing that sometimes businesses have inordinate ability to shape events while at other times their own conflicts leave them unable to have their way. Businesses most often work to limit environmental regulation, but

occasionally they can lead in efforts to move closer to a sustainable balance between environmental and economic priorities. Continuing this survey of non-state entities, in the final chapter of Part II Downie describes a variety of transnational actors in global environmental politics, including for-profit actors (like those examined by Tienhaara) and not-for-profit nongovernmental organizations, as well as other broadly civil society actors, including individuals. He shows when and how these types of actors increasingly have an impact in global environmental politics, and he helps explain why they fail to have the impact that many people might like. Ultimately, it is usually some amalgamation of state and non-state actors and their influences that determines environmental outcomes.

Ideas and themes in global environmental politics

Like many other aspects of world affairs, human relationships with the natural environment are influenced by ideas. Even when not directly influenced by them, global environmental politics can be better understood in terms of relatively discrete ideas. For example, official and unofficial responses to environmental change have in recent decades been influenced by the notion of sustainability, or what we might define simply as the idea that there are ecological limits to economic and other human activities. Indeed, the idea of sustainability now permeates global environmental politics, although the degree to which it is implemented is debatable and certainly uneven. Similarly, a number of key themes help to characterize contemporary global environmental politics. Examples of such themes include security, which is central to other aspects of international affairs, and globalization, the powerful forces of global economic integration and opening of borders that is affecting almost every aspect of life, including as it relates to the environment. Part III is devoted to describing these and other ideas and themes in global environmental politics.

Part III begins in Chapter 15 with an essay on environmental sustainability by Thomas Princen. Princen proposes a number of foundational principles that should guide humanity, in the process tying together the environment, human behavior and politics. Closely related to sustainability – arguably the most important aspect of realizing it – is the question of material consumption, which is taken up by Gabriela Kütting in Chapter 16. She recounts the history of consumption before examining the institutionalization of the idea of "sustainable consumption." Following a theme in other chapters, Kütting shows that the problems of realizing truly sustainable consumption can often be a function of politics.

Understanding sustainability and the underlying ecological and human forces at play when environmental commons suffer decline requires scientific knowledge. As Andrew Karvonen and Ralf Brand show in Chapter 17, scientific expertise feeds into the processes of global environmental politics and policymaking, in the process often becoming a political issue itself. This is especially the case in the United States, where a surprising number of politicians and interest groups have become "anti-science" in their efforts to deny the reality of climate change and the importance of responding to it. Closely related to questions of science is that of uncertainty. As Karen Hussey and Stephen Dovers point out in Chapter 18, the role of risk in political calculations and in technological responses to environmental change are influenced by the level of uncertainty. Uncertainty makes predicting the future more difficult and of course is something that science can help alleviate. It can also play a role in defining how secure people and countries feel in the face of environmental change.

Conceptions of security, whether human, national or international, often describe global environmental politics. But whether environmental issues are considered to be threats to security is open to interpretation, as Sabina W. Lautensach and Alexander K. Lautensach reveal

in Chapter 19. For example, global climate change creates enormous national and human insecurity for poor low-lying communities and coastal countries that suffer its profound direct effects, such as sea-level rise (made much worse during storms), and for those that lack the ability to fully cope with these effects, thus making climate change an immediate threat for them. In contrast, many developed countries, while also experiencing the effects of climate change, are much more able to cope with its impacts and generally have more resilient societies. A threat that is existential to some poor countries is a mostly distant concern to some wealthy ones. At least that is what many people in the latter countries believe. Even such a belief has great significance in global environmental politics.

Another important theme in global environmental politics is, not surprisingly, that of diplomacy, which is examined by Radoslav S. Dimitrov in Chapter 20. The processes of negotiation among diplomats, whether at formal international conferences or in backroom bilateral meetings, can greatly shape outcomes. It is during such meetings that concerns about security and insecurity can be tempered or occasionally exacerbated. This is especially true in forums where diplomats from wealthy developed countries confront diplomats from developing countries. As Shangrila Joshi affirms in Chapter 21, diplomats' conceptions of environmental security and how to ensure it, and more generally how to respond to global environmental problems, can be quite different depending on the countries they represent. For developed-country diplomats, environmental problems may be relatively simple questions of technical responses, but for diplomats from developing countries they are often wrapped up with a strong sense of historical injustice as a consequence of colonialism and empire in past centuries. Closely related to these questions are those of economic globalization, addressed in Chapter 22 by Lada Kochtcheeva. Globalization is arguably one of the most powerful drivers of adverse environmental changes because it has enabled wealthy countries to "export" their pollution by buying products from countries where environmental regulations are relatively low. Related to this is the increased availability of finance, still predominantly originating in developed countries, that can determine whether economic development around the world is more environmentally harmful or less so. Too often it is still the latter.

These themes – of the relative power of rich and poor countries, of how countries' diplomats relate to one another in environmental negotiations, and the extent to which globalization has fostered trade, often to the advantage of some over others while exacerbating environmental decline – raise very serious questions of justice, both internationally and locally. In Chapter 23, Steve Vanderheiden examines international justice in global environmental politics, in the process showing how nation-states have both rights and obligations in the context of environmental change. Questions of environmental justice also obtain locally. As Hollie Nyseth and David N. Pellow show in Chapter 24, pollution harms some people more than others. In particular, marginalized communities and the poor are often saddled with waste and overuse of natural resources on which they may depend for their survival. But questions of what is right and wrong in the context of global environmental politics is not restricted to relations among countries internationally or to interactions among individuals (and other actors) locally; they also raise questions about the roles of nonhuman species. With this in mind, in Chapter 25 Sofia Guedes Vaz and Olivia Bina describe the relationships between ethics and philosophy, on one hand, and ecology and other species, on the other. Together, these chapters on ethics and justice show that questions of global environmental politics can often not be answered by focusing only on traditional conceptions of power and rights.

The final two chapters in Part III look in greater detail at one set of actors that are central to global environmental politics at all levels – or should be, at least – but which sometimes get overlooked: the public. In Chapter 26, Sandra T. Marquart-Pyatt describes the role of public

opinion in global environmental politics and its relationship to how and whether people participate in different forms of environmental action. She describes how public opinion related to the environment is measured and assessed, and addresses the importance of cross-national research to better understand the views of publics. Building on such themes, in Chapter 27 Derek Bell defines and analyzes environmental citizenship. He describes how environmental citizenship has been portrayed and studied in theoretical, philosophical and practical terms. Much as Marquart-Pyatt reveals the difficulties of stimulating strong public commitment to environmental causes, Bell shows that it is a challenge to foster environmental citizenship, even as some scholars question whether doing so is a good idea.

Key issues and policies in global environmental politics

Chapters in Parts I, II and III lay the foundation for understanding global environmental politics and the various actors, institutions and ideas that influence it. In Part IV we turn to specific issues in global environmental politics and many of the policy responses to them, in the process reinforcing and further illustrating the material in preceding parts of the handbook. In Chapters 28 and 29, respectively, Hugh C. Dyer and David Downie look at the truly global environmental issues of climate change and stratospheric ozone depletion. Downie's chapter describes the successful negotiations of quite effective international environmental agreements to curb ozone-destroying chemicals. Indeed, these agreements have served as the framework for addressing climate change. Alas, climate change is a far more complicated problem. Both ozone depletion and climate change are caused by pollution from all around the world. However, climate change is both practically and politically more difficult than ozone depletion because the sources of greenhouse gas pollution are in the billions – that is, everyone contributes to climate change in some way. This may help explain why governments have been able to agree on quite successful measures to curb emissions of pollutants causing ozone depletion – in part because the number of factories making these pollutants is relatively limited – whereas they have failed utterly to come to agreement, let alone act on such agreement, on how to finally start reversing the growing emissions of greenhouse gases. As such, Dyer's chapter appropriately takes a critical look at the problem, showing its intimate connections to energy use, particularly the world's reliance on fossil fuels, thereby revealing how difficult it is to take the kind of action described in Downie's more upbeat chapter.

In the next four chapters, contributors look at pollution that often has widespread geographic impacts. Loren R. Cass describes the causes and politics of transboundary air pollution and acid rain in Chapter 30. While both air pollution and acid rain continue to grow worse in many world regions, such as in East Asia, in other places, for example in Europe, there have been successes in tackling both problems. Cass shows how these experiences can help scholars and practitioners understand the causes of, and solutions to, other adverse changes to the environment. The cause of much of the world's air pollution, and certainly of that which most directly affects people on a day-to-day basis, is addressed by Iain Docherty in Chapter 31. Docherty shows how development policies largely determine the level of air pollution coming from transport infrastructure. These policies are often highly contested by governments, industries and civil society actors. Docherty's analysis shows how questions of environment and sustainability can be highly political. Taking on other forms of pollution, in Chapter 32 David Downie and Jessica Templeton describe how persistent organic pollutants have spread throughout ecosystems, presenting very serious threats to both environmental and human health. They also describe how governments, nongovernmental organizations and other actors have responded to this problem. The result is a mixed bag, with real action occurring, but not always quickly or robustly enough

to keep up with increasing amounts of pollution, notably in the developing world. Henrik Selin expands on this theme in Chapter 33, which is devoted to describing the global politics of hazardous wastes. Selin looks at the science of hazardous waste (and at the politics of the science of hazardous waste), describing how this form of pollution finds its way into oceans in particular. He also shows how hazardous waste is traded around the world, often illicitly. As with other environmental issues, this one has been addressed through international regulation, but this does not yet mean that the problem has been solved.

The final chapters in Part IV look at major concerns related to ecosystems and the species that live within them, and at how governments and other actors have chosen (or not chosen) to address these issues. In Chapter 34, Jens Newig and Edward Challies look at one of the most vital issues in global environmental politics: the governance of water. They show how water has been managed locally and internationally through the collaboration of key actors and stakeholders. Water in lakes and rivers is often polluted, and sadly much of that pollution finds its way to the sea. This and other impacts on the ocean environment are examined in Chapter 35 by Peter J. Jacques as part of his larger analysis of marine politics and what he calls the "world ocean." His chapter describes the myriad threats to the marine environment, ranging from agricultural runoff and dumping at sea to the potentially devastating effects of climate change. Extending this look at Earth's marine environment, in Chapter 36 Elizabeth R. DeSombre describes the international and regional politics of fisheries and marine mammals. As with many other issues examined in this handbook, these have been the subjects of international agreements, sometimes at the global level. Problems persist, but it seems beyond doubt that things would be much worse without such agreements. To some extent the same can be said of international agreements on the protection of biodiversity, migratory species and natural heritage, which are the subjects of Chapter 37 by Volker Mauerhofer and Felister Nyacuru. As they show, environmental agreements can be successful, as demonstrated by some agreements to protect waterfowl that migrate across national borders, but these successes are greatly undermined by the relentless destruction of natural habitats.

Destruction of habitats is starkly revealed by what is happening to the world's forests, which are the subject of David Humphreys's chapter. In Chapter 38 he describes how and why governments have failed to agree on a global forest treaty, in the process tying deforestation back to questions of climate change (and related international and domestic politics). One option for governments in their efforts to limit climate change is to preserve forests, which act as "sinks" for carbon dioxide, the most widespread greenhouse gas. As Humphreys shows, the question of sequestration of carbon in forests is among the most politicized environmental issues. As such, it is the stuff of global environmental politics, revealing how seemingly disconnected issues – in this case, national forest politics and the global politics of climate change – are intimately connected, becoming increasingly complex in both environmental and political terms. The final two chapters of Part IV continue making this link back to climate change. In Chapter 39 Meri Juntti describes the causes of desertification around the world, in the process highlighting the politics of the problem and the roles played by key actors. International agreements have been reached to address desertification. Nevertheless, there is little doubt that the problem will become worse in coming decades. In a closely related and vitally important discussion, in Chapter 40 Jennifer Clapp and Sarah Martin look at food and agriculture. For anyone who might still think that our reliance on the natural environment is not total, or that our connections to it are not political, Clapp and Martin's description of the politics of food should disabuse them of such thinking. Theirs is a classic case study of how the global environment, and specifically our role in shaping it while also being dependent on it, is highly politicized.

The prospects for global environmental politics

What are the prospects for global environmental politics in the future? That is, how likely are scholars and students to garner enough insight into global environmental problems and the world's responses to them to be able (in the case of scholars) to advise policymakers and businesses to be better environmental stewards and (in the case of students) to become sufficiently aware of the environmental crises facing the world to become genuine environmental citizens, and to devote their energies to solving environmental problems – or at the very least to greatly limit their own personal contributions to environmental problems? What are the prospects for the practice of global environmental politics? Will governments and other actors learn from past mistakes and choose to give the natural environment a much higher priority? Will those actors that have failed to do so (meaning most of them) soon realize that the wellbeing of whole societies is intimately linked to environmental sustainability – locally, nationally and globally?

Certainly we cannot predict the future, but in trying to parse these questions we are very likely to arrive at a mixed bag of answers, at best. The world has seen some real progress in addressing environmental problems. In this respect, we might say that global environmental politics has worked. But there is no escaping the stark reality that, broadly and globally speaking, environmental problems continue to grow worse. Climate change is a case in point: despite decades of very serious international negotiations, many resulting treaties, some credible efforts to limit greenhouse gas emissions in some places, and even some progress toward helping those people who are and will be affected by climate change, greenhouse gas pollution continues to increase globally. The problem *will* grow much worse. Developed countries and people living within them have done too little to reduce their use of fossil fuels. Developing countries and their citizens are in the process of becoming addicted to them just as happened in the West. Often this is necessary; the world's poor need inexpensive energy to escape poverty. But this is not the only path to development. The world's affluent people, including the many millions of new middle-class consumers in developing countries, need not make the same mistakes of people in the developed world. The path toward sustainability ought to be followed by all who are capable of doing so. Up to now, too few people around the world have followed this path.

Thus it seems that the work of global environmental politics – the work of government officials, environmental activists and others involved in its practice, as well as the work of scholars who study what those actors do – will be more of the same for the time being. This will involve a growing array of successful efforts by governments around the world to cooperate to address environmental problems and resource scarcities. These agreements will seldom come easily, will require payoffs to vested interests with stakes in continued pollution and overuse of resources, and will no doubt meet with too limited success. But they will be signs of progress in global environmental politics. Similarly, efforts to implement environmental sustainability will spread, thereby reducing the human impact on the environment compared to what it would be without such efforts. But it is likely that coming decades will see increasing environmental pollution at all levels, from the local to the global, as well as the increasing overuse of natural resources and the unsustainable exploitation of environmental commons.

In short, the tide of environmental pollution and decline will not be stemmed anytime soon. Nevertheless, there may still be some room for hope. Scholars and students will continue to observe and learn about what is happening. The tools for doing so will likely improve. Sometimes the work of scholars and analysts, and the understanding of students and future generations, will positively influence policy and the real-world behavior of industries and individuals. At other

times they may understand what is happening but be helpless to do much about it. Insofar as that happens, the scholarship of global environmental politics will be a chronicle of global environmental decline. In the hope that this does not happen, one aim of this handbook is to give those who practice and study global environmental politics some of the information they will need to build the foundations of an environmentally sustainable future.

Part I

Explaining and understanding global environmental politics

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2

The discipline of global environmental politics

A short history

Loren R. Cass

Global environmental politics has emerged as a center of interdisciplinary work that integrates research from a range of fields including international relations, comparative politics, geography, economics, history, law, climatology and biology. This interdisciplinary approach makes it difficult to clearly define the boundaries in this rather immense and diverse field of study. This chapter will briefly review the emergence of global environmental politics as a distinct subfield within the discipline of international relations since the 1980s. Many subfields of international relations have made the environment a subject of study. As early as the mid-eighteenth century scholars were analyzing the roles of natural resources and human population dynamics in the fields of international security and political economy. By the turn of the twentieth century states had begun to address issues related to the protection of fisheries, birds and exotic animals, and to acknowledge problems related to habitat degradation and water pollution. However, environmental policy was generally viewed as a local and perhaps national problem rather than a major issue of international concern.

Global environmental politics emerged relatively recently as a distinct field of study within the larger domain of international relations. The more contemporary focus on the interactions between humans and the natural world emerged in the 1970s and it was not until the 1980s and into the 1990s that global environmental politics became established as a separate subfield with its own dedicated journals and publishers. This is a period in which scholars expanded their focus to more systematically study a range of regional and global environmental problems such as acid rain, ozone depletion, climate change, biodiversity loss, deforestation and desertification.

Global environmental problems present many unique challenges that require a variety of theoretical perspectives and analytical tools to study them. They frequently involve substantial scientific complexity and uncertainty, which has produced a wide-ranging scholarship on the relationships between science and policy. The very long timeframes of both the consequences of environmental problems as well as the efforts to address them create a number of governance challenges. While addressing environmental problems may involve decades of action, politicians and the citizens they serve in democratic systems tend to think in terms of election cycles involving two to six years. In addition, because environmental problems typically do not respect borders, they pose challenges for international cooperation, which has produced a growing literature on environmental negotiation and global environmental governance. The widespread

potential for massive economic, political and ecological dislocation from the consequences of global environmental problems as well as from the potential policies to address those problems have led scholars to study global environmental politics from the perspective of every paradigm within international relations as well as to draw on research from numerous other disciplines. Finally, efforts to address the consequences of environmental problems have produced controversial ethical and distributive justice questions that have generated an important philosophical and normative literature.

Global environmental politics has thus emerged as a very rich and diverse area of scholarship. The sections that follow provide a brief overview of the evolution of global environmental politics scholarship as well as offering entry points to begin exploring the great variety of topics within the field. (In recent years there have been a number of scholars who have presented overviews of the emergence of global environmental politics that complement and expand upon the material presented in this chapter, including Betsill et al. 2006; Dauvergne 2005; Mitchell 2002b; and Stevis 2010.)

The emergence of a distinct field of global environmental politics

The scholarship on global environmental politics emerged alongside the growing international interest in environmental issues, as reflected in the 1972 United Nations Stockholm Conference on the Human Environment. Lynton Caldwell (1972), Richard Falk (1971) and Harold and Margaret Sprout (1971) represent some of the earliest scholars to publish work focused specifically on global environmental politics. Scholarly interest waned somewhat in the late 1970s and 1980s with the resurgence in the Cold War, but international relations journals continued to publish occasional articles and some books were published during this period (Westing 1986; Young 1989). However, global environmental politics achieved much greater interest from scholars as negotiations leading up to the 1992 Earth Summit came to the forefront of international politics in the early 1990s.

Perhaps the strongest indicator of the maturity of a new field of study is the creation of journals dedicated to publishing work in the area. While major international relations journals had published articles on global environmental politics during the 1970s and 1980s (and in prior decades), it was not until the 1990s that journals dedicated to international environmental political research began to emerge. Many of today's environmental politics journals trace their origins to the early 1990s. *Global Environmental Change* (first published in 1990), the *Journal of Environment and Development* (1992) and *Environmental Politics* (1992) represent some of the leading journals dedicated to global and comparative environmental issues. A second wave of journals emerged after 2000 with a specific focus on international environmental relations and international law. *Global Environmental Politics* was established in 2001 and has become a preeminent journal for environmental research within the field of international relations, and *International Environmental Agreements: Politics, Law and Economics* (2001) has established itself as an outlet for a range of research related to global environmental politics, international environmental law and policy, and comparative responses to international environmental problems. There are other more specialized journals, such as *Environmental Values* (1992), *RECIEL: Review of European Community & International Environmental Law* (1992) and the *Journal of International Wildlife Law and Policy* (1998), that were also established during this period. In addition, publishers such as Ashgate, MIT Press, Routledge, State University of New York Press and others have created environmental series to publish wide-ranging scholarship related to global environmental politics.

Another indicator of the establishment of a new field of study is the growth in courses taught on the subject in academia. The emergence of a range of textbooks devoted to global environmental

politics in the 1990s signaled the growing attention that the subject was receiving. Textbooks by Porter and Brown (1991), Choucri (1993), Brenton (1994) and Conca et al. (1995) provided some of the earliest texts to address global environmental politics and they offer insights into the early focus of global environmental politics research. The textbooks typically began with an overview of the history and unique attributes of global environmental politics combined with a discussion of approaches to studying these issues. They then analyzed a set of case studies of international environmental problems and political responses. This approach has been maintained in recent texts including Chasek et al. (2010) and DeSombre (2007). Reflecting the growing sophistication of the global environmental politics literature, several other textbooks, including Lipschutz (2004), O'Neill (2009) and Mitchell (2010), have approached the subject from a more theoretical perspective with less focus on case study analysis, reflecting the growing diversity of scholarship and the momentum toward a more systematic and theory-driven understanding of global environmental politics.

International relations paradigms and global environmental politics

The global environmental politics literature was inevitably shaped by the larger debates within international relations at the time of its emergence as a distinct field and in turn contributed to these larger debates. The 1970s were influenced by debates over the global population explosion, resource scarcity concerns and security. From the 1980s to the early 1990s was a period in which neorealist and neoliberal scholars were debating the potential ability of international institutions and international regimes to mitigate the effects of competition within the international system and to promote cooperation (see Chapter 3). Global environmental politics provided a rich field of study because there was a range of international environmental problems that offered a wealth of case studies to test hypotheses emerging from the neorealist and neoliberal debate. Much of the early scholarship in global environmental politics reflects these debates. This can be seen in works by Haas et al. (1993), Brenton (1994), Paterson (1996) and Seaver (1997). The edited volume by Haas et al. is a classic work that explores the role of international institutions in facilitating more effective international responses to emergent environmental problems (see Chapter 9). Paterson (1996) is one of the best examples from this period of attempts to apply the various international relations paradigms to the study of global environmental politics.

The neorealist paradigm of international relations focuses on the inevitable conflict that occurs among self-interested actors in an anarchic state system (a system lacking any authority above the state). Neorealist approaches to studying global environmental politics have been much less common than the more widely applied neoliberal and constructivist approaches (see Chapter 4). Scholars working within the neorealist tradition have tended to gravitate toward issues of environment and security with a focus on resource scarcity (Westing 1986; Homer-Dixon 1994; Chalecki 2010; see Deudney 1990 for a critique). There has been a growing interest in the security implications of global environmental politics (United States Office of the Director of National Intelligence 2012); thus, there is likely to be an expansion of literature in this area (see Chapter 19). Homer-Dixon's Project on Environmental Change and Acute Conflict was particularly influential in shaping the debate on security and environment. He argues that there are multiple pathways through which environmental scarcities can produce conflict and predicts that environmental conflicts will increase as a result of the growing effects of climate change. Increasingly, the security implications of global environmental problems have become a broader focus of research that bridges the divide between international security studies and global environmental politics.

The neorealist paradigm begins with assumptions that states act in a rational manner to secure the core interests of the state related to national security and prosperity. The most widely cited application of an interest-based approach to broader global environmental politics is Sprinz and Vaahtoranta (1994). They present a model for determining national positions in global environmental negotiations based upon a combination of the abatement costs of addressing the problem and the ecological vulnerability to the environmental threat. They argue that the higher the ecological vulnerability and the lower the abatement costs, the stronger the government's support for international action to address environmental problems will be. Conversely, the lower the ecological vulnerability and the higher the cost of abatement, the more reluctant a state will be to address a global environmental problem. There are a range of other scholars who have utilized an interest-based approach to global environmental politics (Barrett 2006; Grundig 2006; Victor 2006). While an interest-based approach remains an important element of the global environmental politics literature, most scholars have emphasized that a focus on national interests and relative power positions provides at best only a partial explanation for the observed behavior.

Beginning in the 1990s, scholars began to explore the role of international institutions and international regimes (defined as social institutions that shape actor expectations and associated behavior in a given issue area) in influencing environmental negotiations and the emergence of the dense network of international environmental agreements that emerged during this period (see Chapter 9). This neoliberal paradigm has been the most influential in shaping research agendas in global environmental politics. The "international regimes" literature emerged almost simultaneously with the widening focus on global environmental problems in the 1970s and 1980s. Global environmental politics offered case studies to test hypotheses flowing out of the work on international regimes (Young 1977 and Brown et al. 1977). This early research evolved into a broader focus on environmental governance in works such as Young (1994). One of the most influential works of this period was Haas et al. (1993). The book's analytical focus on the importance of building national capacity, improving the contractual environment and elevating governmental concern remains an important organizing focus for the study of global environmental politics.

The early research identified ways in which international organizations and regimes affect environmental politics and the environmental behavior of actors. This then spawned a series of research projects to test the effectiveness of these regimes and the impacts of the growing web of international environmental institutions on global environmental governance.

Global environmental politics continues to be heavily influenced by research on governance and regime effectiveness. Several large-scale research projects have significantly influenced work in this area. Breitmeier et al. (2006) present findings related to regime effectiveness that emerged from the International Regimes Database project. Young et al. (2008) published the findings from the Institutional Dimensions of Global Environmental Change (IDGEC) project that studied relationships among and the effectiveness of global environmental institutions. The Global Governance Project under the direction of Frank Biermann has also produced a range of books and articles related to environmental governance and effectiveness (for example Biermann and Pattberg 2008 and Biermann and Siebenhüner 2009). Park et al. (2008) offer a critique of existing environmental governance structures and argue for alternative strategies based upon the principle of sustainability (see Chapter 15). Busby (2010) provides an overview of the development and current debates in the literature on environmental governance.

More recently, many global environmental politics scholars have turned to constructivist approaches to explain aspects of environmental affairs that cannot be easily explained by a focus on interests and/or international institutions. Constructivism emphasizes the role of ideas in structuring international relations with emphases on the discourses of actors as well as the

identities of the actors and relationships among them (see Chapter 4). The focus is upon the social construction of reality. Constructivists have emerged as critics of the dominant theoretical paradigms that emphasize state power and international institutions as the primary variables shaping international relations. Constructivist approaches have been frequently applied to global environmental politics to try to analyze the role of science in the social construction of knowledge and the use of knowledge in making policy (Haas 2004 and Jasonoff and Martello 2004; see Chapter 17).

Scholars working within the constructivist perspective frequently split between more norm-based approaches, which emphasize social expectations regarding appropriate behavior, and discursive approaches, which focus on the use of language and its relationship to political behavior. Hajer (1995) was among the first scholars to emphasize the importance of discourse in the definition of environmental problems and solutions. Dryzek (2005) offers a more recent introduction to discourse analysis. Epstein (2008) applies discourse analysis to explore the shaping of power and interests in the case of whaling (see Chapter 36). Litfin (1998) presents a variety of scholars with ties to the constructivist tradition that focus on the evolution of sovereignty and changing norms and discourses regarding how sovereignty relates to global environmental politics (see Chapter 7). Within the norms literature, Bernstein (2001) and Cass (2006) analyze the evolution of international norms and the confluence of environmental and liberal economic norms and their effects on international environmental policy. Pettenger (2007) presents the perspectives of a range of constructivist scholars, ranging from those using functionalist, international norm-based analyses to those using a discursive approach to understanding political responses to climate change.

While significantly shaped by the neoliberal paradigm, the global environmental politics literature remains a fertile field for debates among paradigms. Scholars continue to apply a range of theories to the study of global environmental politics.

Bridging the international/domestic divide

While international relations paradigms have been central to exploring the behavior of states, the global environmental politics literature is further complicated by the need to bridge the divide between the disciplines of international relations and comparative politics (which examines domestic political processes; see Chapter 12). Addressing most environmental problems entails major changes to domestic regulations that cover some of the most economically important and politically controversial policy areas. For example, reducing acid rain required expensive changes in electrical power generation, transportation and manufacturing (see Chapter 30). These changes are inevitably contentious and are intimately tied to domestic political norms, processes and histories of the countries involved in the international negotiations.

Scholars of global environmental politics have frequently sought to bridge the international/domestic divide to analyze the forces shaping national positions in international environmental negotiations (see Chapter 11). Harris (2009) systematically surveys the environmental foreign policy literature and its relationship to global environmental politics. He presents a typology of theories that can explain national positions in global environmental negotiations and then offers a series of case studies that illustrate the ability of different theories operating at different levels of analysis to explain national behavior in negotiations. A number of scholars have presented case studies of national responses to global environmental problems. For example, Schreurs and Economy (1997) present a series of case studies evaluating domestic forces shaping national positions across a range of countries on climate change, ozone depletion and biodiversity loss. They argue that the internationalization of environmental protection efforts is altering domestic

policy-making processes, policy outcomes and the effectiveness of policy implementation. There is thus an interactive process in which international and domestic responses to environmental problems are mutually constitutive. Rather than international politics altering domestic politics, DeSombre (2000) argues that national positions in international negotiations are significantly shaped by attempts to internationalize domestic regulations to minimize adjustment costs and improve competitiveness of domestic industry. In other words, the causal arrow points from domestic politics to international negotiations. Harris's Project on Environmental Change and Foreign Policy has produced a series of edited volumes (Harris 2007, 2009, among others) that address domestic forces shaping environmental foreign policy positions. Harrison and Sundstrom (2010) provide a series of articles addressing the comparative politics of climate policy.

Despite these efforts, attempts to systematically link comparative environmental politics and global environmental politics remain relatively underdeveloped. This remains a vital area of research and one that has the potential to contribute greatly to our understanding of global environmental politics.

The role of science in global environmental politics

Environmental problems are frequently characterized by scientific complexity and extensive uncertainty regarding causes and/or solutions (see Chapters 17 and 18). The integration of science into the policy process is thus a critical aspect of efforts to address global environmental politics. Unsurprisingly, scholars have produced an extensive literature to address these issues, with a number of scholars analyzing the conditions under which scientific knowledge is integrated into decision-making processes (Harrison and Bryner 2004; Bocking 2004; Dimitrov 2006; Mitchell et al. 2006).

Analysis of science and policy has a relatively long history. Haas et al. (1977) offer a very early critique of the process through which science is integrated into decision-making processes. During the 1990s the analysis of the role of science was heavily influenced by the concept of epistemic communities or groups of scientists and experts that share a common set of values and a common understanding of an environmental problem and potential solutions (Haas 1990). These groups achieve influence in situations of scientific uncertainty and have the potential to significantly shape both the framing of the environmental problem and potential responses to it. This focus on scientists as active participants in the international environmental policy process is a common theme. Boehmer-Christiansen (1995) argues that scientists must be viewed not as neutral conveyors of policy-relevant information but rather as political actors themselves who seek to shape the availability and interpretation of scientific evidence to further their interests.

International environmental negotiation

As global environmental negotiations increased in their frequency and in the range of issues being addressed, scholars turned their attention to unique attributes of global environmental problems and the difficulties that they posed for achieving effective cooperative solutions (see Chapters 8 and 20). Over 1,000 multilateral environmental agreements and more than 1,500 bilateral environmental agreements have been negotiated to date (Mitchell 2002–11). There is thus a vast dataset of negotiations to draw upon. In analyzing these negotiations, many scholars have argued that the negotiation process itself is an important variable in determining final agreements. Susskind (1994) presented an early attempt to explore the nature of international environmental negotiations and the differences with other types of international issues. Chasek (2001) analyzes thirty years of international environmental negotiations to discern patterns in the

outcomes. She argues that there are six discernible phases and five associated turning points within the process of multilateral environmental negotiation. This complex structure of negotiations affects the types of agreements that can be made and their potential for success. Other scholars such as Kütting (2000), Susskind et al. (2002), Barrett (2006) and Bodansky (2009) have analyzed the relative effectiveness of international environmental negotiations and offer suggestions for improving them.

While international negotiations have traditionally focused almost exclusively on the roles of states and perhaps international institutions, global environmental politics scholarship has increasingly challenged this narrow focus on the state. This is apparent in the sections above that address constructivism, science and subnational forces shaping national negotiating positions. A growing literature on non-state actors further extends the focus to actors such as nongovernmental organizations (NGOs), cities and regional groups, as well as indigenous peoples (see Chapter 14). This literature typically presents non-state actors as independently shaping national positions and increasingly directly influencing international negotiations. Princen and Finger (1994) provide one of the earliest analyses of the roles of environmental NGOs in global environmental politics. They argue that NGOs function both as independent participants in international negotiations as well as serving as agents of social learning to shape the framing of international and subnational understandings of environmental problems and possible policy responses. Betsill and Corell (2008) offer a framework for evaluating the influence of environmental NGOs in global environmental negotiations and evaluate the degree of NGO influence across a variety of case studies. Levy and Newell (2005) analyze the role of business interests in global environmental politics and illustrate the ways business activity shapes and is shaped by global environmental policies.

The international environmental negotiation literature is rich in case studies and nuanced analyses of the negotiating process that highlight the importance of a range of actors and variables. The literature particularly offers insights into how to improve the negotiating environment to increase the prospects of achieving successful agreements.

Methodological approaches to studying global environmental politics

Much of the early scholarship on global environmental politics was heavily influenced by individual case studies. In part this reflected the relative immaturity of the field. The lack of scholarship on global environmental politics meant that many scholars were seeking to apply a range of theories and analytical tools to the emerging field. Mitchell (2010: 7) discusses the problems that emerged during this early period of scholarship:

> Initially, deductive theories generated little follow-up in terms of operationalization and testing while inductive case studies generated useful insights that often were not framed in ways which could facilitate their application and evaluation in other environmental realms. As a result, different terminologies and taxonomies of causal factors often overlapped with, but seemed unaware of, competing or complementary ones.

The choice of case studies also reflected the sequential pattern to the emergence of new environmental problems on the international agenda with scholars producing major works as each new issue arose. Some of the earliest global environmental politics literature focused on acid rain and transboundary air pollution flows (McCormick 1985; see Chapter 30). In the 1990s and into the 2000s scholars produced major works on regional water pollution (Haas 1990; see Chapter 34), ozone depletion (Litfin 1994; Rowlands 1995; Seaver 1997; Benedick 1998; see Chapter 29) and

climate change (Paterson 1996; O'Riordan and Jäger 1996; Luterbacher and Sprinz 2001; see Chapter 28). Each work typically analyzed global environmental politics from a rather unique theoretical perspective, which provided a very diverse and intellectually stimulating range of lenses through which to study global environmental politics, but it was also difficult to determine whether the lessons derived from the individual case studies could be extrapolated to a broader set of cases.

As the scholarship in the field evolved, scholars sought to analyze multiple case studies utilizing a common theoretical approach to begin to test the broader generalizability of findings from earlier case studies. Barkin and Shambaugh (1999) looked at the nature of common pool resource issues and attempts to resolve them across a range of case studies. Haas et al. (1993) and DeSombre (2006) analyzed the role of international institutions in promoting international environmental cooperation.

With over forty years of international environmental negotiations across a wide range of cases, scholars now have a very rich and diverse set of cases to analyze in an attempt to more systematically investigate the nature of global environmental politics. Increasingly, there have been attempts to try to apply quantitative analyses to the study of global environmental politics to empirically test the hypotheses that have emerged from the earlier case study analyses (see Chapter 5). Miles et al. (2002), Mitchell (2002a), Breitmeier et al. (2006), and Young et al. (2008) represent some of the major projects to undertake quantitative analyses of various hypotheses related to global environmental politics. There continues to be a rich diversity of methodological approaches to studying global environmental politics.

Environmental ethics and justice

A vast literature on environmental ethics and justice has emerged over the last several decades (see Chapters 24 and 25). Global environmental problems raise a number of difficult ethical and normative challenges. What obligations do the affluent have to the less affluent in today's world? The rich consume vast quantities of energy and natural resources while the vast majority of the world's people suffer in poverty. Do the wealthy have any obligation to preserve the natural resources of our world today for use by the less affluent? Is there any obligation to use the wealth of the developed world to alleviate the environmental suffering frequently created by the exploitation of resources in developing countries? These questions are frequently discussed in terms of "environmental justice." Schlosberg (2007) provides a particularly interesting exploration of the definition of "justice" as it relates to environmental and ecological justice. He emphasizes differences in the definitions of justice as used by American and global environmental movements and suggests ways in which environmental justice can be built into the practice of environmental policy. Parks and Roberts (2006) and Bryner (2010) present more introductory explorations of the origins and evolution of scholarship related to environmental justice. They provide a good starting point for exploring these issues and extensive bibliographies to pursue additional research in the area. Bryner (2010) presents a useful series of frameworks for defining environmental justice, including civil rights, distributive justice, public participation, social justice and ecological sustainability. Harris (2001) relates international environmental justice back to the dominant paradigms in international relations and critiques US foreign environmental policy in light of his understanding of environmental justice.

While the authors above primarily address questions of environmental justice among the inhabitants of the world today, several scholars have sought to analyze questions of intergenerational justice. What obligation does today's generation have to future generations? Hiskes (2009) builds an argument for preserving the environment as a human right premised upon a notion of

intergenerational justice. Beckerman and Pasek (2001) explore problems related to intergenerational environmental justice and highlight the need to balance the needs of the disadvantaged today with obligations to future generations.

Beyond the broader questions of environmental justice, there have been particularly intense debates surrounding the ethical foundations for addressing the problem of climate change. For example, Adger et al. (2006) address questions related to adaptation to the consequences of climate change and fairness in distributing the costs of adaptation. Page (2006) evaluates the particular problem of intergenerational justice in the case of climate change. Harris (2001) provides a critique of American climate policy, notably its limited accounting for international equity and environmental justice considerations, and Harris (2010) examines the role of global (cosmopolitan) justice in the world's responses to climate change.

The fact that the perpetrators of environmental harm frequently do not face the full costs associated with their actions creates significant ethical problems that must be considered as a part of the international political response. However, both the effects of global environmental problems and the policy responses to those problems have the potential to have significant global redistributive consequences. They will also have important ramifications for quality of life and standards of living. These problems raise difficult equity questions as well as questions related to fairness and equity to the current generation in relationship to future generations. The literature addressing these questions is evolving and it will be important for scholars to continue to highlight these questions in the context of international negotiations to address environmental problems. Many scholars have been highly critical of the failure to adequately incorporate ethical concerns into international decision-making processes.

Conclusion

In providing an overview of the emergence of global environmental politics as a field of study and the growing complexity of the scholarship in this area, it seems appropriate to conclude with perhaps the most important question of global environmental politics, one that relates to nearly all of the scholarship discussed above: Can the existing international political economic system be sustained in the face of growing resource demands and increasing adverse impacts from the release of pollutants? (see Chapters 16 and 22). Clapp and Dauvergne (2005) and Haas (2010) provide overviews of the literature that has evolved around this question. Globalization and the associated growth in international consumption, trade, travel and migration have profound environmental implications. The environment fulfills two critical functions from a political economy perspective. It is the source of the resources that propel the global economy and create wealth and it is a sink to absorb and process much of the waste that is generated as a side effect of global production and consumption (Cass 2012). One of the central questions of global environmental politics is whether the existing international political/economic system is sustainable in light of these increasing demands.

Supporters of the existing system and the central role of the market in allocating resources argue that the path to a sustainable world requires improving the prosperity of the world's people to create the wealth and the political will to address environmental problems (Simon 1998). Other scholars have argued that the system can be made to be compatible with sustainability. Mol (2003) has argued that a normative focus on "ecological modernization" can provide a mechanism to align the existing system with environmental protection and sustainability. He has argued that enlightened self-interest can provide the foundation for sustainability. People can come to understand that consumption patterns must be altered in ways to make the international system sustainable for future generations. Alternatively, institutionalists such as Biermann

and Bauer (2005) argue that the system can be reformed and new global governance structures can be created to achieve sustainability.

While many scholars have argued that the existing system is either sustainable in its present form or can be reformed and saved, there is a radical critique within the global environmental politics scholarship that argues that the existing system is fundamentally flawed and incapable of achieving sustainability. Among the more radical critiques, Daly (1973, 1996) argues that the world must achieve "steady-state equilibrium" where the number of humans and their resource usage are reduced to environmentally sustainable levels. Such a move requires some form of population control and the rejection of the current system's emphasis on constant economic growth and associated rising consumption levels. Lipschutz (2004) argues that the existing global political/economic structures are fundamentally flawed because they create incentives for unsustainable use of resources. He argues for a radical restructuring of the system.

The question of whether the existing international political/economic system is sustainable or can be made to be sustainable is the core foundation for much of the literature within global environmental politics. It is also the question that will continue to motivate future scholarship in global environmental politics.

References

Adger, W.N., Paavola, J., Huq, S. and Mace, M.J. (eds) (2006) *Fairness in Adaptation to Climate Change*, Cambridge, MA: MIT Press.

Barkin, J.S. and Shambaugh, G. E. (eds) (1999) *Anarchy and the Environment: the international relations of common pool resources*, Albany: SUNY Press.

Barrett, S. (2006) *Environment and Statecraft: the strategy of environmental treaty-making*, Oxford: Oxford University Press.

Beckerman, W. and Pasek, J. (2001) *Justice, Posterity and the Environment*, Oxford: Oxford University Press.

Benedick, R.E. (1998) *Ozone Diplomacy: new directions in safeguarding the planet*, Cambridge, MA: Harvard University Press.

Bernstein, S. (2001) *The Compromise of Liberal Environmentalism*, New York: Columbia University Press.

Betsill, M.M. and Corell, E. (eds) (2008) *NGO Diplomacy: the influence of nongovernmental organizations in international environmental negotiations*, Cambridge, MA: MIT Press.

Betsill, M.M., Hochstetler, K. and Stevis, D. (eds) (2006) *Palgrave Advances in International Environmental Politics*, New York: Palgrave.

Biermann, F. and Bauer, S. (eds) (2005) *A World Environment Organization: solution or threat for effective environmental governance?* Burlington, VT: Ashgate.

Biermann, F. and Pattberg, P. (2008) "Global environmental governance: taking stock, moving forward", *Annual Review of Environment and Resources*, 33: 277–94.

Biermann, F. and Siebenhüner, B. (eds) (2009) *Managers of Global Change: the influence of international environmental bureaucracies*, Cambridge, MA: MIT Press.

Bocking, S. (2004) *Nature's Experts: science, politics and the environment*, New Brunswick, NJ: Rutgers University Press.

Bodansky, D. (2009) *The Art and Craft of International Environmental Law*, Cambridge, MA: Harvard University Press.

Boehmer-Christiansen, S. (1995) "Britain and the International Panel on Climate Change: the impacts of scientific advice on global warming part 1: integrated policy analysis and the global dimension", *Environmental Politics*, 4: 1–18.

Breitmeier, H., Young, O. and Zürn, M. (2006) *Analyzing International Environmental Regimes: from case study to database*, Cambridge, MA: MIT Press.

Brenton, T. (1994) *The Greening of Machiavelli: the evolution of international environmental politics*, London: Earthscan Publications.

Brown, S., Cornell, N.W., Fabian, L.L. and Weiss, E.B. (1977) *Regimes for the Ocean, Outer Space and Weather*, Washington, DC: Brookings.

Bryner, G. (2010) "Environmental justice", in R.A. Denemark (ed.) *International Studies Encyclopedia*, London: Blackwell Publishing. Online. Available HTTP: <http://www.isacompendium.com> (accessed 1 March 2012).

Busby, J. (2010) "International organization and environmental governance", in R.A. Denemark (ed.) *International Studies Encyclopedia*, London: Blackwell Publishing. Online. Available HTTP: <http://www.isacompendium.com> (accessed 1 March 2012).

Caldwell, L.K. (1972) *In Defense of the Earth: international protection of the biosphere*, Bloomington: University of Indiana Press.

Cass, L.R. (2006) *The Failures of American and European Climate Policy: international norms, domestic politics and unachievable commitments*, Albany: SUNY Press.

—— (2012). "The global environment: an overview", in R. Pettman (ed.) *Handbook on International Political Economy*, London: World Scientific, 327–42.

Chalecki, E.L. (2010) "Environment and security", in R.A. Denemark (ed.) *International Studies Encyclopedia*, London: Blackwell Publishing. Online. Available HTTP: <http://www.isacompendium.com> (accessed 1 March 2012).

Chasek, P.S. (2001) *Earth Negotiations: analyzing thirty years of environmental diplomacy*, New York: United Nations University Press.

Chasek, P.S., Downie, D.L. and Brown, J.W. (2010) *Global Environmental Politics*, 5th edn, Boulder, CO: Westview Press.

Choucri, N. (ed.) (1993) *Global Accord: environmental challenges and international responses*, Cambridge, MA: MIT Press.

Clapp, J. and Dauvergne, P. (2005) *Paths to a Green World: the political economy of the global environment*, Cambridge, MA: MIT Press.

Conca, K., Alberty, M. and Dabelko, G. (1995) *Green Planet Blues: environmental politics from Stockholm to Rio*, Boulder, CO: Westview Press.

Daly, H. (1973) *Toward a Steady-State Economy*, San Francisco, CA: W.H. Freeman.

—— (1996) *Beyond Growth: the economics of sustainable development*, Boston, MA: Beacon Press.

Dauvergne, P. (ed.) (2005) *Handbook of Global Environmental Politics*, Northampton, MA: Edward Elgar.

DeSombre, E.R. (2000) *Domestic Sources of International Environmental Policy: industry, environmentalists and U.S. power*, Cambridge, MA: MIT Press.

—— (2006) *Global Environmental Institutions*, New York: Routledge.

—— (2007) *The Global Environment and World Politics*, New York: Continuum.

Deudney, D. (1990) "The case against linking environmental degradation and national security", *Millennium: Journal of International Studies*, 19: 461–76.

Dimitrov, R.S. (2006) *Science and International Environmental Policy: regimes and nonregimes in global governance*, Boulder, CO: Rowman and Littlefield.

Dryzek, J. (2005) *The Politics of the Earth: environmental discourses*, 2nd edn, Oxford: Oxford University Press.

Epstein, C. (2008) *The Power of Words in International Relations: birth of an anti-whaling discourse*, Cambridge: Cambridge University Press.

Falk, R. (1971) *This Endangered Planet: prospects and proposals for human survival*, New York: Vintage.

Grundig, F. (2006) "Patterns of international cooperation and the explanatory power of relative gains: an analysis of cooperation on global climate change, ozone depletion and international trade", *International Studies Quarterly*, 50: 781–801.

Haas, E.B., Williams, M.P. and Babai, D. (1977) *Scientists and World Order: the use of technical knowledge in international organizations*, Berkeley: University of California Press.

Haas, P.M. (1990) *Saving the Mediterranean: the politics of international environmental cooperation*, New York: Columbia University Press.

—— (2004) "When does power listen to truth? A constructivist approach to the policy process", *Journal of European Policy*, 11: 569–92.

—— (2010) "Environment in the global political economy", in R.A. Denemark (ed.) *International Studies Encyclopedia*, London: Blackwell Publishing. Online. Available HTTP: <http://www.isacompendium.com> (accessed 1 March 2012).

Haas, P.M., Keohane, R.O. and Levy, M.A. (eds) (1993) *Institutions for the Earth: sources of effective international environmental protection*, Cambridge, MA: MIT Press.

Hajer, M.A. (1995) *The Politics of Environmental Discourse: ecological modernization and the policy process*, Oxford: Clarendon Press.

Harris, P.G. (2001) *International Equity and Global Environmental Politics: power and principles in US foreign policy*, Burlington, VT: Ashgate.
—— (ed.) (2007) *Europe and Global Climate Change: politics, foreign policy and regional cooperation*, Northampton, MA: Edward Elgar.
—— (2009) *Environmental Change and Foreign Policy: theory and practice*, New York: Routledge.
—— (2010) *World Ethics and Climate Change: from international to global justice*, Edinburgh: Edinburgh University Press.
Harrison, K. and Sundstrom, L. M. (eds) (2010) *Global Commons, Domestic Decisions: the comparative politics of climate change*, Cambridge, MA: MIT Press.
Harrison, N.E. and Bryner, G. C. (eds) (2004) *Science and Politics in the International Environment*, Boulder, CO: Rowman and Littlefield.
Hiskes, R.P. (2009) *The Human Right to a Green Future: environmental rights and intergenerational justice*, Cambridge: Cambridge University Press.
Homer-Dixon, T. (1994) "Environmental scarcities and violent conflict: evidence from cases", *International Security*, 19: 5–40.
Jasonoff, S. and Martello, M. L. (eds) (2004) *Earthly Politics: local and global in environmental governance*, Cambridge, MA: MIT Press.
Kütting, G. (2000) *Environment, Society and International Relations: towards more effective international environmental agreements*, London: Routledge.
—— (2004) *Globalization and the Environment: greening global political economy*, Albany: SUNY Press.
Levy, D.L. and Newell, P. J. (eds) (2005) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
Lipschutz, R.D. (2004) *Global Environmental Politics: power, perspectives and practice*, Washington, DC: CQ Press.
Litfin, Karen T. (1994) *Ozone Discourses: science and politics in global environmental cooperation*, New York: Columbia University Press.
—— (ed.) (1998) *The Greening of Sovereignty in World Politics*, Cambridge, MA: MIT Press.
Luterbacher, U. and Sprinz, D. (eds) (2001) *International Relations and Global Climate Change*, Cambridge, MA: MIT Press.
McCormick, J. (1985) *Acid Earth: the global threat of acid pollution*, London: International Institute for Environment and Development.
Miles, E.L., Underdal, A., Andresen, S., Wettestad, J., Skjaerseth, J.B. and Carlin, A.M. (eds) (2002) *Environmental Regime Effectiveness: confronting theory with evidence*, Cambridge, MA: MIT Press.
Mitchell, R.B. (2002a) "A quantitative approach to evaluating international environmental regimes", *Global Environmental Politics*, 2: 58–83.
—— (2002b) "International environment", in W. Carlsnaes, T. Risse-Kappen and B.A. Simmons (eds) *Handbook of International Relations*, London: Sage, 500–16.
—— (2010) *International Politics and the Environment*, Los Angeles, CA: Sage.
—— (2002–11) "International Environmental Agreements Database Project (Version 2010.3)", Online. Available HTTP: < iea.uoregon.edu/> (accessed 5 January 2011).
Mitchell, R.B., Clark, W.C., Cash, D.W. and Dickson, N.M. (eds) (2006) *Global Environmental Assessments: information and influence*, Cambridge, MA: MIT Press.
Mol, A. (2003) *Globalization and Environmental Reform: the ecological modernization of the global economy*, Cambridge, MA: MIT Press.
O'Neill, K. (2009) *The Environment and International Relations*, Cambridge: Cambridge University Press.
O'Riordan, T. and Jäger, J. (eds) (1996) *Politics of Climate Change: a European perspective*, New York: Routledge.
Page, E. (2006) *Climate Change, Justice and Future Generations*, Northampton, MA: Edward Elgar.
Park, J., Conca, K. and Finger, M. (eds) (2008) *The Crisis of Global Environmental Governance: towards a new political economy of sustainability*, New York: Routledge.
Parks, B.C. and Roberts, J. T. (2006) "Environmental and ecological justice", in M.M. Betsill, K. Hochstetler and D. Stevis (eds) *Palgrave Advances in International Environmental Politics*, New York: Palgrave, 329–60.
Paterson, M. (1996) *Global Warming and Global Politics*, New York: Routledge.
Pettenger, M.E. (ed.) (2007) *The Social Construction of Climate Change*, Burlington, VT: Ashgate.
Porter, G. and Brown, J. W. (1991) *Global Environmental Politics*, Boulder, CO: Westview Press.
Princen, T. and Finger, M. (eds) (1994) *Environmental NGOs in World Politics: linking the local and the global*, London: Routledge.

Rowlands, I.H. (1995) *The Politics of Global Atmospheric Change*, Manchester: Manchester University Press.
Schlosberg, D. (2007) *Defining Environmental Justice: theories, movements and nature*, Oxford: Oxford University Press.
Schreurs, M.A. and Economy, E. C. (eds) (1997) *The Internationalization of Environmental Protection*, Cambridge: Cambridge University Press.
Seaver, B. (1997) "Stratospheric ozone protection: IR theory and the Montreal Protocol on Substances that Deplete the Ozone Layer", *Environmental Politics*, 6: 31–67.
Simon, J. (1998) *The Ultimate Resource 2*, Princeton, NJ: Princeton University Press.
Sprinz, D. and Vaahtoranta, T. (1994) "The interest-based explanation of international environmental policy", *International Organization*, 48: 77–105.
Sprout, H.H. and Sprout, M. T. (1971) *Toward a Politics of the Planet Earth*, New York: Van Nostrand Reinhold.
Stevis, D. (2010) "International relations and the study of global environmental politics: past and present", in R.A. Denemark (ed.) *International Studies Encyclopedia*, London: Blackwell Publishing. Online. Available HTTP: <http://www.isacompendium.com> (accessed 1 March 2012).
Susskind, L.E. (1994) *Environmental Diplomacy: negotiating more effective global agreements*, Oxford: Oxford University Press.
Susskind, L.E., Moomaw, W. and Gallagher, K. (eds) (2002) *Transboundary Environmental Negotiation: new approaches to global cooperation*, San Francisco, CA: Jossey-Bass.
United States Office of the Director of National Intelligence (2012) "Global Water Security: intelligence community assessment", Online. Available HTTP: <www.dni.gov/nic/ICA_Global Water Security.pdf> (accessed 15 May 2012).
Victor, D. (2006) "Toward effective international cooperation on climate change: numbers, interests and institutions", *Global Environmental Politics*, 6: 90–103.
Westing, A.H. (1986) *Global Resources and International Conflict: environmental factors in strategic policy and action*, Oxford: Oxford University Press.
Young, O. (1977) *Resource Management at the International Level: the case of the North Pacific*, London: Pinter and Nichols.
—— (1989) *International Cooperation: building regimes for natural resources and the environment*, Ithaca, NY: Cornell University Press.
—— (1994) *International Governance: protecting the environment in a stateless society*, Ithaca, NY: Cornell University Press.
Young, O., King, L. and Schroeder, H. (eds) (2008) *Institutions and Environmental Change: principal findings, applications and research frontiers*, Cambridge, MA: MIT Press.

3

Mainstream theories

Realism, rationalism and revolutionism

John Vogler

International Relations (IR) as a distinct discipline dates from the immediate aftermath of the First World War. Understandably its preoccupation was, and remains, the problem of war and the achievement of security in what is often described as an "anarchic" system of sovereign states (see Chapter 7). Environmental issues, whether seen as transboundary disputes or the international dimension of managing common resources, were a decidedly minority interest (Stevis 2006). The natural environment provided the context, rather than the subject, of international relations. This situation began to change from around the time of the United Nations Conference on the Human Environment, held at Stockholm in 1972. In this issue area, as in others, scholars tended to react to changes in the world of practical politics and policy-making. In developed world societies "green" politics had begun to emerge in response to various environmental disasters and public awareness of the scope of problems, such as air pollution, that were not soluble without international action (see Chapter 30). The probably inevitable response by students of IR was to attempt to frame such novel issues within existing theoretical traditions and to apply the same tools that had been used to analyse cooperation in managing the global economy or negotiating arms limitation in the Cold War (see Chapter 30). It is arguable that this was a mistake, and that something rather more radical would have been more appropriate – something that placed ecology or perhaps green political theory at the centre of theoretical endeavour. Questions might have been asked, for example, about the long-run co-evolution of physical and socio/international systems.

This chapter will review the way in which IR theory engaged with international environmental politics. IR theory may be characterized as a broad, expanding and eclectic church. One way of categorizing its traditions derives from the insight of Martin Wight (1991), a leading exponent of the "English School" of international theory. He made a tripartite division between the three "Rs": *realism, rationalism and revolutionism*. Realism is very well known as the (then) predominant theoretical approach emphasizing power relations between states in an anarchic and inherently war-prone system. Rationalism denoted a reformist and liberal tradition informed by reason. Under this heading one may find liberals, internationalists and "idealists" – a characterization invented by realist antagonists that has proved remarkably resilient. As far as the study of international environmental politics is concerned, liberal institutionalism really does constitute the mainstream and accordingly will receive most attention below. The third category

contains those whose purpose is to provide a theoretical approach critical of the existing international system with a view to its ultimate replacement (see Chapter 4). Prominent amongst them are scholars working within a Marxist tradition who have developed a distinctive alternative to the liberal mainstream. Inevitably, when confronted with actual scholarship there are many ways in which the categories blur and overlap, but there are also key distinctions that will be explored in what follows.

The first concerns the ontological bases of theory – that which is held to exist. Whether, for example, the state or global class relations constitute the fundamental reality for theorists. In tandem with this we may also pose epistemological questions about how the various theoretical traditions claim to be able to know about reality. Here there are important distinctions between those who follow the disciplines of social science seeking to find regularities and explain variations through the objective study of empirical evidence and those, like social constructivists or members of the English School, for whom interpretation rather than "positivistic" explanation is key (see Chapter 5). In discussions of IR theory this distinction is often presented as being between "positivists" or "rationalists" and "reflectivists". Positivistic IR remains the dominant approach, especially in the United States, but even from the 1960s it has been subject to attack from various strands of "reflectivist" thought from diverse positions, including Marxist-inspired structuralism, "critical theory" and "post-structuralism", not to mention the original English School resistance to the behavioural trend in US scholarship.

Finally, there are normative questions that address the purposes of theory. Usually in the study of international relations there is such a purpose beyond a simple commitment to objective scholarship. Students of international environmental politics have frequently aimed to solve or manage problems through international cooperation. For them the ultimate test of effectiveness is whether the institutional or other arrangements devised serve to redress degradation or promote environmental quality (see Chapters 8 and 9). This was the specific intention of many research programmes and of the chairman of the 1992 UN Conference on Environment and Development, who spoke of the "inescapable" need for international cooperation and, in advance of more recent discussions of the topic, called for "a world system of governance" (Maurice Strong cited in Haas et al. 1993: 6). In this way the problematic was devised beyond the academy and translated into the following, frequently referenced, formulation: "Can a fragmented and often highly conflictual political system made up of over 170 sovereign states and numerous other actors achieve the high (and historically unprecedented) levels of cooperation and policy coordination needed to manage environmental problems on a global scale?" (Hurrell and Kingsbury 1992: 1). This is, however, by no means a universal preoccupation amongst IR theorists.

Realism

The realist tradition continues to animate popular and academic study of international relations but it has had only limited impact upon the specialism of international environmental politics. One reason for this is that it tended to define the latter's subject matter out of existence. Environmental issues were for realists matters of "low politics" and the proper subject of IR was constituted by the "high politics" of statecraft, war and peace. Realists assert the primacy of the state which is assumed to pursue its national interest, famously reduced by Hans Morgenthau (1948) to the pursuit of power, but for most writers defined as the protection of its territorial integrity and the achievement of economic security and other central objectives of the state (see Chapter 7). The natural environment is, therefore, significant not in itself, but in terms of resource competition between states. Such competition is conducted within an anarchic

"self-help" system where the resort to force is an ever-present possibility. Thus, the preoccupation of realist thinkers is with the management of power balances and the achievement of some kind of order in a world of conflict. A key realignment of realist thought was inspired by the "structural" theory of Waltz (1979). Neorealism, which shares some important characteristics with neoliberal approaches (discussed below), sought to provide a parsimonious theory of international power politics based upon a rational choice model of the way that any state would behave within an anarchic structure. Realist and neorealist assumptions were often embedded in attempts to provide social scientific and "testable" theories of international relations (Vasquez 1983).

The environment rarely figured as the subject of such analyses, but realism provides one hypothesis that would be relevant to explanations of international environmental cooperation. This is the "hegemonic stability thesis", developed like much of the literature to account for the circumstances under which international economic cooperation could occur. It followed from realist postulates that self-interested states would only subject themselves to international rules if they were enforced by a dominant "hegemon". The occupant of this role for much of the twentieth century was the United States and there was much concern from the 1970s onwards as to the future of world economic regulation, once US dominance began to erode. For students of international environmental politics this did not appear to be a plausible, still less a desirable, thesis because from the late 1980s, through the period of major construction of international environmental accords, the USA was either absent or obstructive – having relinquished its earlier leadership role.

Hegemonic stability does not exhaust the potential of realist theorizing. The emergence of climate change as a central concern has demonstrated, through its inextricable linkage to energy production and issues of economic growth, that it is close to the heart of national interests (see Chapter 28); the designation of environmental politics as "low politics" is no longer tenable – if it ever was. Realist thinking about shifting power constellations is clearly relevant (Rowlands 2001) as are the older traditions of geopolitical analysis which centred on struggles over territorial space and resources. Geopolitics, as outlined by such scholars as Sir Halford Mackinder, was usually located within political geography although it had clear associations with the realist power political analysis. In geopolitical writing the emphasis was always on resource conflict rather than the environment *per se* although prominent political geographers Harold and Margaret Sprout (1971) managed to move on to the consideration of international environmental politics. As Stevis (2006: 20) notes, geopolitics was the predecessor of the contemporary environmental conflict and security research agenda (see Chapter 19).

The study of environmental security has produced an extensive literature in recent years (Barnett 2001; Swatuk 2006; see Chapter 19). When environmental security is defined in terms of the relationship between environmental change and armed conflict – whether war or insurgency – it is of interest to governments and the strategic studies community. Major studies have been funded by, for example, NATO (Lietzmann and Vest 1999), with a view to providing possible future conflict scenarios and climate change, in particular, appears routinely in strategic assessments as a "threat multiplier" (European Council 2008). It is not only the military establishment that has become interested but others, whether governments or activists, who wish to raise the profile of environmental problems by "securitizing" them. (The reference here is to the so-called Copenhagen School whose approach to the study of security involved the way in which political "speech acts" served to increase the salience of a particular policy by associating it with the potent idea of security (Buzan et al. 1998). Hence attempts to focus governmental attention and resources on, say, climate change would describe it as a security threat greater than that posed by terrorists (King 2004; see Chapter 28).) In April 2007, for example, the UK government

introduced a UN Security Council Resolution on climate change. All this is despite the fact that, as Deudney (1990) cogently demonstrates, there are significant disadvantages arising from the attempt to bring environmental and military/strategic concerns together. For one thing the mindsets of soldiers and environmental activists are at variance and the employment of military assets is generally more likely to degrade than enhance environmental quality

A prominent research programme into the actual connections between environmental degradation and conflict has been undertaken by Homer-Dixon (1991, 1999) and his associates who isolate three types of conflict that are likely to be causally connected to environmental changes: struggles over diminishing resources, conflict related to migration and insurrections as fragile states fail to cope with the stresses of environmental change. As evident in cases such as the Darfur conflict in Sudan, there are connections between environmental change (desertification and loss of habitats; see Chapters 39 and 37), the displacement of farmers and ethnically structured conflicts. However, the precise causal mechanisms are notoriously hard to pin down (Barnett 2001; Gleditsch 1998). Much of the writing on environmental security is framed within a set of assumptions about conflict and security that align with realism. For example the Pentagon has commissioned studies of not only the threats but also the strategic opportunities opened up by some of the scenarios for future climate change (Schwartz and Randall 2003). Nonetheless, it must be pointed out that a great deal of work in this field is performed within the competing normative enterprise of peace research (Baechler 1999). There is a similar commitment to social scientific modes of explanation but peace research, with its pacifistic and often radical outlook, is in essential opposition to the realist paradigm.

Rationalism

The use of the term rationalism can cause confusion. It does not in this instance refer to procedural rationality of the sort that is to be found in the rational choice models employed by both realists and their opponents. Rather, the sense is that rationalists have a reasoned approach in contrast to the brutalities of power politics or the excessive idealism of those who would overturn the existing system. At the core of the rationalist tradition in IR are conceptions that can be traced back at least to Grotius, founding father of modern international law (see Chapter 10). States do not exist in a perpetual Hobbesian "war of all against all" but are capable of developing shared norms and practices that can ameliorate their condition and even develop the rights of their citizens. Classical rationalist thinkers were preoccupied by the problems of war, but the general approach does comprehend the mainstream of studies of international environmental politics that endeavours to improve the management of common problems by states, without the expectation that a revolutionary transformation of the international system, to provide a sustainable form of world ecological government is a realistic prospect for the immediate future.

Liberalism and neoliberalism

Liberalism as a political and economic theory has diverse roots in the English constitutional and religious struggles of the seventeenth century and in the European enlightenment of the eighteenth. Its appeal is to the rights of the individual, the limitation of government powers and the importance not only of free association, but of free markets. In IR it has been reflected in a progressive belief in reform of the states system. One version is "democratic peace theory" positing that war and peace depend upon the nature of particular states, while another powerful idea, traceable to the nineteenth-century Manchester School, is that there is an equation between free economic exchange across frontiers, high levels of interdependence and a stable

and pacific international system. In the interwar period liberal internationalist thinkers were in the ascendant as advocates of national self-determination and the encouragement of international law and organization as the antidote to a war-prone international system. Variants of this approach included "functionalism" which proposed that integration across national boundaries can be achieved by low-level socio-economic cooperation that will eventually "spill over" into the transfer of political authority beyond the nation-state. Liberals have been suspicious of the state and receptive to the idea of a more pluralist and transnational world system (see Chapter 14). This, coupled with a strong belief in the efficacy of free trade for the production of both wealth and political stability, has meant that, in the aftermath of the Cold War, liberalism became the dominant ideology that both celebrated and justified the spread of economic globalization. The protection of the natural environment did not figure largely in liberal thinking. Indeed, critics will point out that liberal economics, in its encouragement of the rise of consumer capitalism, bears a major responsibility for the degradation of nature associated with economic growth. The liberal response is that free markets will provide the optimal allocation of resources in terms of efficiency and sustainability if only the environmental costs of human activity (externalities) are properly taken into account in transactions (see Chapter 15).

The fact that this does not occur and that state authorities fail to coordinate their activities in a rational way, beneficial to all in the longer term, provides a key to understanding liberal approaches to international environmental issues. Much of the intellectual inspiration for such thinking in IR derives from a preceding concern with running the international economy in the face of counterproductive "neo-mercantilist" behaviour by governments. In fact proponents of liberal political economy admit that markets in themselves would not operate properly without a framework of rules. Thus governments should be encouraged to cooperate in what was assumed to be their underlying collective interest – as they had at the end of the Second World War with an economic settlement that put in place the Bretton Woods monetary order and the global free trade regime – a critical enabler of globalization. When environmental issues achieved wider salience during the 1980s liberal analysts were able to tap into existing work on the conditions required for international economic cooperation. (There were some exceptions, such as Oran Young, who had already begun to study international environmental cooperation in the preceding decade.) They adopted many of the assumptions of neoclassical economics (Keohane 1984) in the study of what were defined as collective action problems. In fact it is quite difficult to distinguish between work that can be classified as IR and that which presents an essentially economic analysis. Economists have performed extensive research not only on the viability of instruments such as emissions trading, but also into the functions of international agreements and the conditions under which they occur (Barrett 2003). Atmospheric quality was, for example, conceptualized as a global public good and climate change was described as "the greatest example of market failure we have ever seen" (Stern 2007: 1). In economic theory public goods cannot be provided by the operation of the market and this affords a justification for cooperation between governments to ensure their supply. Key assumptions of this type of approach included the notion of rational, utility-maximizing actors who would take strategic decisions to cooperate if the incentives were right. Game theory provided a set of relevant models for such bargaining and in particular the "prisoner's dilemma" game in which actors need to overcome their mutual distrust in order to enjoy the gains available from cooperation.

Associated with this was the need to overcome the "free-rider problem" posed by actors who may profit from agreements without contributing to them. An awareness of this possibility was assumed to be a major disincentive to potential participants in an agreement (Stern 2007). The epistemological stance of these scholars of international cooperation, often referred to as neoliberals, was also closely aligned with mainstream economics. (The neorealist confrontation

with liberal critics is often referred to as the 'neo-neo' controversy. Although the term neoliberal is used to denote scholars who adopted many of the assumptions of their counterparts in economics there are definitional problems. Neoliberalism has a conventional political meaning denoting ideas of a reduced state, privileging the private sector and the individual over the collective interest and inspiring the policies adopted by the Thatcher government in the UK and, at the international level, contained within the Washington Consensus. Some of the intellectual underpinnings of both types of neoliberalism may be similar but many of those who might be defined as neoliberal in the IR literature would not hold with the political and economic programme of neoliberalism.)

Neoliberal scholarship sought, in the main, to explain the pattern of incentives under which cooperation was possible for self-interested actors. In some ways neoliberalism represented a simplification because states became the focus of analysis and other liberal preoccupations, for example with a plurality of international actors and with transnational relations (Mansbach et al. 1976), tended to be forgotten. It was often said that the difference between neorealists and liberals had been narrowed to such an extent that all that divided them was a disagreement over whether the gains of state participants were relative or absolute – in line with the long-standing liberal credo (Lamy 2011: 123–5).

Regimes and liberal institutionalism

It is no exaggeration to say that the mainstream position in the study of international environmental cooperation is liberal institutionalism. While sharing many of the economistic assumptions discussed above, institutionalists understand that economic activity and international cooperation necessarily occur within a framework of rules and understandings (Young 1989). This had long been the province of international law and organization but institutional theorists in IR developed the new concept of an international regime, initially in the study of the regulation of the international economy. Regimes were seen as institutions in the sociological sense of the word. They were defined as sets of norms, principles, rules and decision-making procedures around which actor expectations and behaviour would converge in a given issue area (Ruggie 1975; Krasner 1983; Young 1989). International law and international organizations (often referred to as institutions in established usage) were only constituent parts of this broader concept which was designed to analyse the less formal understandings upon which cooperation was built (see Chapters 8, 9 and 10). In contrast to realist analysis, regimes were seen to have an independent impact upon the calculations of governments. Also, they provided a means whereby "cooperation under anarchy" was possible without the leadership of a hegemonic power. As so often in IR theorizing, there was a real-world issue driving these concerns: the presumed loss of US hegemony following the ending of the dollar standard in 1971 and alarm at the consequent unravelling of the global monetary order. Liberal analysts argued that cooperation and stability could be achieved "after hegemony" (Keohane 1984).

Regime analysis was readily adapted to the study of international environmental cooperation (see Chapter 9); commencing with the Long Range Transboundary Air Pollution Convention 1979 and the Vienna Convention on stratospheric ozone depletion 1985 and its renowned Montreal Protocol 1987 (see Chapter 29), the production of global environmental agreements boomed. Arguably, even though the origins of liberal institutionalist scholarship on regimes lay elsewhere, many of its major developments have been located within the environmental field (Haas et al. 1993). The approach has been social scientific, searching for patterns in the empirical evidence from numerous cases of environmental cooperation (Young and Zurn 2006) and looking to explain variance and to specify independent and dependent variables. The dependent

variables have been: the setting up of environmental regimes, the extent of agreement and levels of compliance and effectiveness – ultimately in the solution or amelioration of environmental problems (see Chapter 9).

At the beginning of the study of environmental regimes the question most frequently posed was the same as that posed by the economists – under what circumstances can cooperation occur (Young 1997)? From the extensive study of cases there were various answers. Perceived mutual vulnerability and a continuing interest in arrangements that safeguarded rights to use the global commons would provide one explanation. The "geometry" of agreements has been a significant theme with the proposition that small "clubs" of interested countries are likely to make most progress (Victor 2011). The continuing success of the Antarctic Treaty regime with its selective membership and the way in which the Montreal Protocol rested upon agreement amongst a relatively small group of chemical manufacturing companies would lend weight to this proposition. The work of Oran Young (1989 and 1994) has been preeminent in establishing the more precise dynamics of the "institutional bargaining" that underlies regime creation when consensus is required. Young presents a series of hypotheses on the conditions of success, including the absence of a specified zone of agreement and the presence of uncertainty. Other factors include the need to find solutions that are regarded as equitable as well as enforceable. External shocks increase the possibility of success and entrepreneurial leadership is a necessary condition (Young 1994: 81–116). This question of effective leadership has been extensively pursued in the literature (Andresen and Agrawala 2002; Wurzel and Connolly 2011). Leadership that can mobilize far-sighted international action is significant because, despite the construction of hundreds of international environmental agreements over the past decades, most of the indicators show a continuing degradation of the Earth's natural systems. The underlying problem that students of international environmental cooperation have to address is, not so much the absence of international agreements, but their tendency to revert to the lowest common denominator – as formulated in Underdal's (1980) "law of the least ambitious programme". A recent joint paper by many leading scholars in the field calls for "a 'constitutional moment' in the history of world politics, akin to the major transformative shift in governance after 1945" (Biermann et al. 2012: 7) The 2012 Rio plus 20 Conference, to which this appeal was addressed, only served to illustrate the unlikelihood of an immediate transformation.

Aside from the question of the determinants of regime formation, an important and problem-focused part of liberal scholarship investigates institutional design. This is also the province of international lawyers and covers such issues as the circumstances under which "soft law" may provide more effective solutions than a comprehensive binding agreement (see Chapter 10). There is much discussion of the future of the climate change regime conducted along these lines. There are related studies of appropriate policy instruments, whether "command and control" or "market based", such as emissions trading. These can be as fine-grained as explanations of variations of approach within a particular regime (Webster 2009). Finally, there is a significant body of work on the question of compliance with international agreements and their effectiveness. This involves both discussions of the meaning and measurement of effectiveness as well as detailed case studies of particular regimes (Haas et al. 1993; Victor et al. 1998).

In recent years the focus upon regimes has broadened out in a number of ways (see Chapter 9). There has been a – perhaps – ambitious rebranding of institutional studies as "earth system governance" or "global environmental governance" (Biermann 2007). Sometimes in official discourse this can mean little more than a reconfiguration of existing international organizations. Witness the long-running debate on whether to raise the status of the United Nations Environment Programme (UNEP) to a specialized agency or to create a UN environment council alongside the Security and Human Rights Councils. However, in the academic world

notions of global governance denote a move away from the state-centric focus of earlier regime analysis and a recognition of the need to consider different levels of appropriate environmental governance and to include transnational actors such as NGOs, which had always received significant attention in the IR literature (Princen and Finger 1994; Keck and Sikkink 1998), and to embrace the possibility that the private sector could provide significant governance alongside or even instead of nation-states (Pattberg 2007). This marks a return to several key themes in liberalism that tended to be crowded out by previous attempts at parsimonious explanation through the assumption of rationally calculating unitary state actors. There is clearly a normative dimension that, in line with classical liberalism, distrusts the state and the possibility that it might be "greened" and seeks more virtuous alternative forms of governance (Vogler 2005). A recent tendency to be found in liberal institutionalist work reflects an understanding that institutions do not stand alone but interact or "interplay" with one another in ways that are significant for their evolution and effectiveness (Oberthür and Gehring 2006). Oran Young has considered not only the fit between institutions but the fit between institutions and their physical setting (Young 2010).

Variations on the rationalist theme: cognitivism and the English School

Mirroring neoclassical economic theory, liberal institutionalist analysts tended not to delve within the state but rather to assume a set of fixed preferences. Recently behavioural economics has questioned this lack of interest in preference formation, but in the study of international environmental politics this has been a long-standing critique. A distinct "cognitivist" approach to the understanding of regimes was evident from around 1990 and the publication of Haas's (1990) work on the Mediterranean pollution regime. Critical enquiry into the supposed linear relationship between authoritative science and policy formulation began to open up the "black box" of national policy positions, pointing out the significance of shifting discourses (Litfin 1994). Cognitive approaches to regime formation betray the influence of "reflectivist" IR and the rising interest in social constructivism (Wendt 1999). In one respect this was a challenge to liberal institutionalist orthodoxy because of its explicit rejection of the rational choice model of human behaviour in favour of alternative "logics of appropriateness". Added to this is a critique of assumptions about objective natural "fact" for science too is seen to be socially constructed (see Chapter 17). Such positions must raise questions about the validity of existing liberal scholarship but can also be incorporated into institutionalism. Regimes are themselves social constructs with a shifting ideational and constitutive character. In some versions of constructivism there is no necessary contradiction with the epistemology of social scientific enquiry and therefore with mainstream liberal institutionalism. Alternatively, a constructivism that seeks understanding of normative evolution rather than strict explanation would seem to align both ontology and epistemology in the study of regimes (Vogler 2003). The extent to which rational choice and reflectivist approaches are commensurable remains one of the most disputed questions in contemporary IR theory (Smith and Owens 2008). (This is sometimes referred to as the "rationalist–reflectivist" debate. Rationalist is a shorthand for rational choice and does not refer to Wight's rationalist category used here in this chapter.)

The English School defines itself in terms of a rationalist approach to international society. Adherents have adopted approaches that are in some ways coincident with more recent constructivist theorists in their concern for the constitution and re-constitution of the institutions, such as sovereignty and diplomacy or, indeed, international society itself (note the distinctive definition of institutions; see Chapters 20 and 9). They early on rejected the epistemological stance of US "behavioural" International Relations scholarship of the 1960s in favour of a more

historically based interpretative approach. English School concerns with the deeper norms of an international society of states would certainly be relevant to global environmental politics but the attention of most of its adherents was elsewhere upon the problems of war, international order and human rights. There are indications that this neglect is now being remedied for, as Falkner (2012: 509) argues, "In contrast to both realism and neoliberal institutionalism, the English School offers a rich account of the institutional phenomena that define the durable patterns of and historically bound character of international society."

Revolutionism

Alongside realism and rationalism, Martin Wight identified a revolutionist tradition in international thought. Some of those in this category, Marxist and socialist writers, did have an explicitly revolutionary purpose, but others had less developed aspirations for the transformation of the interstate system into a more congenial and pacific world system in which both individuals and communities would live in a greater degree of freedom and harmony. The unifying strand that is present in all of this work is a rejection of the status quo and with it the kind of international order that realists accepted as inevitable and rationalists sought to reform and ameliorate (see Chapter 4). Typically, sovereign states are viewed as part of the problem rather than potential promoters of a more cosmopolitan and ecologically sustainable world (see Chapter 23). To use Cox's (1981) terminology, problem-solving theory is the domain of realism and rationalism, while revolutionists are "critical theorists".

During most of the twentieth century the most important revolutionist theorists espoused some form of Marxism. Marxist theorists shared a distinctive historical materialist approach in which the state, far from being the centre of analysis, performed as the agent of a ruling class – "the executive committee of the bourgeoisie". International politics, and in particular the imperialist struggles that characterized the contemporary epoch, were to be understood in terms of the deeper underlying contradictions of the capitalist mode of production. During the Cold War much effort was devoted to the analysis of imperialism and patterns of economic underdevelopment in the global system. As with other contemporary brands of IR theory, very little attention was paid to the natural environment until the final years of the twentieth century when the relationship between capitalist accumulation, globalization and the degradation of the Earth's natural systems began to crystallize (see Chapter 22). Because Marxist analysis seeks explanation through the ways in which an ever-changing system of capital accumulation determines economic activity that is fundamentally responsible for excessive resource use, loss of habitats and rising levels of pollution, it provides a powerful account of the global ecological predicament (Paterson 2001). In particular it directly challenges liberal market-based orthodoxies on solving global environmental problems and achieving justice for the dispossessed (see Chapters 23 and 24). In terms of IR theory, Marxist structural analysis denies that environmental issues can be portrayed as a collective action problem between states. International regimes and schemes of global environmental governance are "epiphenomenal". They may serve a number of functions for the global capitalist system but they are a reflection of it rather than a means to ensuring that it will be less environmentally destructive. Thus, for example, the problem of climate change cannot be dealt with through the elaboration of the UN climate regime but rather through more fundamental alterations in the nature of the capitalist growth model that will provide incentives to de-carbonize the global economy (Newell and Paterson 2011).

Scholarship in the Marxist tradition has often adopted a neo-Gramscian position. Gramsci has been an inspiration because his writings pay attention to the ways in which the material base and the social superstructure combine in a "hegemonic" process to manufacture consent for a

prevailing order even amongst those whose interests would "objectively" be opposed to it (Humphreys 1996; Kütting 2004; Levy and Newell 2005). There is a substantial degree of overlap here with a range of other literature that relocates the ecological problem beyond the structures of the existing international system and examines the implications of incorporating green political thought (Laferrière and Stoett 1999; Saurin 1996; Eckersley 2004).

Conclusion

In the year following the 1992 Rio Earth Summit, Steve Smith (1993) took an outsider's view of the emerging field of international environmental politics. His conclusion was that it remained "at the periphery" dominated by a liberal institutionalist orthodoxy and immune to the theoretical cross-currents so evident elsewhere in IR. In terms of most of the academic research and writing since then, there is still some truth in his observation. The rationalist project is still prominent and is clearly motivated to solve environmental problems through an improvement and extension of international cooperation. The quest is for cumulative, evidence-based scientific knowledge which has policy relevance to the tasks of global environmental governance. A great deal of empirical understanding of the bases and operation of international environmental institutions has been garnered. Such knowledge has been presented within the framework of the International Human Dimensions Programme of the International Social Science Council (Biermann et al. 2012), which forms a small part of a much larger web of international scientific research collaboration. This indicates where the mainstream of liberal institutionalism would wish to position itself.

It is also the case that some participants in this enterprise would not regard themselves as being fully committed to positivistic social science (see Chapter 5). Since the early 1990s the mainstream has expanded to accommodate forms of IR theory that have a more cognitive and reflective character and which reject the rather rigid assumptions of state-centric rational choice analysis. In this respect there has been a major change since Smith's (1993) review of the literature. Critical "revolutionist" writing has remained a significant presence within the study of international political economy and amongst those who view the mainstream concern with international cooperation as fundamentally misplaced. The realist tradition, so important elsewhere in IR theorizing, has had little to say about global environmental change. This state of affairs may be changing, not only on account of the links between degradation and armed conflict, but also as a consequence of the close connections between climate change and a long-term staple of realist analysis: the politics of energy resources (see Chapter 28).

References

Andresen, S. and Agrawala, S. (2002) "Leaders, pushers and laggards in the making of the climate regime", *Global Environmental Change*, 12: 41–51.

Baechler, G. (1999) *Violence through Environmental Discrimination: Causes, Rwanda Arena and Conflict Model*, Dordrecht: Kluwer.

Barnett, J. (2001) *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*, London: Zed Books.

Barrett, S. (2003) *Environment and Statecraft: The Strategy of Environmental Treaty-Making*, Oxford: Oxford University Press.

Biermann, F. (2007) "Earth system governance as a crosscutting theme of global change research", *Global Environmental Change: Human and Policy Dimensions*, 17: 326–37.

Biermann, F. et al. (2012) "Transforming governance and institutions for global sustainability: key insights from the Earth System Governance Project", *Current Opinion in Environmental Sustainability*, 4: 1–10. Available online at www.sciencedirect.com.

Buzan, B., de Wilde, J. and Waever, O. (1998) *Security: a New Framework for Analysis*, Boulder, CO: Lynne Rienner.
Cox, R. (1981) "Social forces, states and world orders: beyond international relations theory", *Millennium: Journal of International Studies*, 10(2): 126–55.
Deudney, D. (1990) "The case against linking environmental degradation and national security", *Millennium: Journal of International Studies*, 19(3): 461–76.
Eckersley, R. (2004) *The Green State: Rethinking Democracy and Sovereignty*, Cambridge, MA: MIT Press.
European Council (2008) *Climate Change and International Security: paper from the High Representative and the European Commission to the European Council*, S113/08, Brussels.
Falkner, R. (2012) "Global environmentalism and the greening of international society", *International Affairs*, 88(3): 503–22.
Gleditsch, N.P. (1998) "Armed conflict and the environment: a critique of the literature", *Journal of Peace Research*, 35(3): 381–400.
Haas, P.M. (1990) "Obtaining environmental protection through epistemic consensus", *Millennium: Journal of International Studies*, 19(3): 347–63.
Haas, P.M., Keohane, R.O. and Levy, M.A. (eds) (1993) *Institutions for the Earth: Sources of Effective International Environmental Protection*, Cambridge, MA: MIT Press.
Homer-Dixon, T. (1991) "On the threshold; environmental changes as causes of acute conflict", *International Security*, 16(2): 76–116.
—— (1999) *The Environment, Scarcity and Violence*, Princeton, NJ: Princeton University Press.
Humphreys, D. (1996) "Hegemonic ideology and the International Tropical Timber Organisation", in J. Vogler and M. Imber (eds) *The Environment and International Relations*, London: Routledge, 197–215.
Hurrell, A. and Kingsbury, B. (eds) (1992) *The International Politics of the Environment: Actors, Interests and Institutions*, Oxford: Clarendon Press.
Keck, M.E and Sikkink, K. (1998) *Activists beyond Borders: Advocacy Networks in International Politics*, Ithaca, NY: Cornell University Press.
Keohane, R. (1984) *After Hegemony: Cooperation and Discord in the World Political Economy*, Princeton, NJ: Princeton University Press.
King, D.A. (2004) "Climate change science: adapt, mitigate or ignore?", *Science*, 303: 176–7.
Krasner, S.D. (ed.) (1983) *International Regimes*, Ithaca, NJ: Cornell University Press.
Kütting, G. (2004) *Globalization and Environment: Greening Global Political Economy*, Albany: SUNY Press.
Laferrière, E. and Stoett, P.J. (1999) *International Relations Theory and Ecological Thought: Towards a Synthesis*, London: Routledge.
Lamy, S. (2011) "Contemporary mainstream approaches: neo-realism and neo-liberalism", in J. Baylis, S. Smith and P. Owens (eds) *The Globalization of World Politics*, 5th edn, Oxford: Oxford University Press, 114–27.
Levy, D. and Newell, P.J. (eds) (2005) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
Lietzmann, K.M. and Vest, G. (eds) (1999) *Environment and Security in an International Context*, Brussels: NATO Committee on the Challenges of Modern Society, no. 232.
Litfin, K. (1994) *Ozone Discourses: Science and Politics in Global Environmental Cooperation*, New York: Columbia University Press.
Mansbach, R., Ferguson, Y. and Lampert, D. (1976) *The Web of World Politics*, Englewood Cliffs, NJ: Prentice-Hall.
Morgenthau, H.J. (1948) *Politics among Nations: The Struggle for Power and Peace*, New York: A.A. Knopf.
Newell, P. and Paterson, M. (2011) *Climate Capitalism: Global Warming and the Transformation of the Global Economy*, Cambridge: Cambridge University Press.
Oberthür, S. and Gehring, T. (eds) (2006) *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*, Cambridge, MA: MIT Press.
O'Neill, K. (2009) *The Environment and International Relations*, Cambridge: Cambridge University Press.
Paterson, M. (2001) *Understanding Global Environmental Politics: Domination, Accumulation, Resistance*, Houndmills: Palgrave.
Pattberg, P.H. (2007) *Private Institutions and Global Governance: The New Politics of Environmental Sustainability*, Cheltenham: Edward Elgar.
Princen, T. and Finger, M. (eds) (1994) *Environmental NGOs in World Politics*, London: Routledge.
Rowlands, I. (2001) "Classical theories of international relations", in U. Luterbacher and D.F. Sprinz (eds) *International Relations and Global Climate Change*, Cambridge, MA: MIT Press, 43–65.

Ruggie, J.G. (1975) "International responses to technology: concepts and trends", *International Organization*, 29(3): 557–83.
Saurin, J. (1996) "International relations, social ecology and the globalisation of environmental change", in J. Vogler and M. Imber (eds) *The Environment and International Relations*, London: Routledge, 77–98.
Schwartz, P. and Randall, D. (2003) *An Abrupt Climate Change Scenario and its Implications for United States National Security*, San Francisco, CA: Global Business Network for the Department of Defense.
Smith, S. (1993) "The environment on the periphery of international relations: an explanation", *Environmental Politics* 2(4): 28–45.
Smith, S. and Owens, P. (2008) "Alternative approaches to international theory", in J. Baylis, S. Smith and P. Owens (eds) *The Globalization of World Politics: An Introduction to International Relations*, 4th edn, Oxford: Oxford University Press, 174–91.
Sprout, H. and Sprout, M. (1971) *Towards a Politics of the Planet Earth*, New York: van Nostrand Rheinhold.
Stern, N. (2007) *The Economics of Climate Change: The Stern Review*, Cambridge: Cambridge University Press.
Stevis, D. (2006) "The trajectory of the study of international environmental politics", in M.M. Betsill, K. Hochstetler and D. Stevis (eds) *Palgrave Advances in International Environmental Politics*, Houndmills: Palgrave Macmillan, 13–54.
Swatuk, L.A. (2006) "Environmental security", in M.M. Betsill, K. Hochstetler and D. Stevis (eds) *Palgrave Advances in International Environmental Politics*, Houndmills: Palgrave Macmillan, 203–36.
Underdal, A. (1980) *The Politics of International Fisheries Management: The Case of the Northeast Atlantic*, New York: Columbia University Press.
Vasquez, J. (1983) *The Power of Power Politics: A Critique*, Newark, NJ: Rutgers University Press.
Victor, D.G. (2011) *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*, Cambridge: Cambridge University Press.
Victor, D.G., Raustiala, K. and Skolnikoff, E. (eds) (1998) *The Implementation and Effectiveness of Environmental Commitments*, Cambridge, MA: MIT Press.
Vogler, J. (2003) "Taking institutions seriously: how regime analysis can be relevant to multilevel environmental governance", *Global Environmental Politics*, 3(2): 25–39.
—— (2005) "In defense of international environmental cooperation", in J. Barry and R. Eckersley (eds) *The State and the Global Ecological Crisis*, Cambridege, MA: MIT Press, 229–54.
Waltz, K. (1979) *Theory of International Politics*, Reading, MA: Addison-Wesley.
Webster, D.G. (2009) *Adaptive Governance: The Dynamics of Atlantic Fisheries Management*, Cambridge, MA: MIT Press.
Wendt, A. (1999) *A Social Theory of International Politics*, Cambridge: Cambridge University Press.
Wight, M. (1991) *International Theory: The Three Traditions*, Leicester: Leicester University Press.
Wurzel, R. and Connolly, J. (eds) (2011) *The European Union as a Leader in International Climate Change Politics*, Abingdon: Routledge.
Young, O.R. (1989) *International Cooperation: Building Regimes for Natural Resources and the Environment*, Ithaca, NY: Cornell University Press.
—— (1994) *International Governance: Protecting the Environment in a Stateless Society*, Ithaca, NY: Cornell University Press.
—— (ed.) (1997) *Global Governance: Drawing Insights from the Environmental Experience*, Cambridge, MA: MIT Press.
—— (2002) *The Institutional Dimensions of Environmental Change: Fit, Interplay and Scale*, Cambridge, MA: MIT Press.
—— (2010) *Institutional Dynamics: Emergent Patterns in International Environmental Governance*, Cambridge, MA: MIT Press.
Young, O.R. and Zurn, M. (2006) "The international regimes database: designing and using a sophisticated tool for institutional analysis", *Global Environmental Politics*, 6(3): 121–41.

4

Alternative theories

Constructivism, Marxism and critical approaches

Hayley Stevenson

This chapter surveys a diverse set of theoretical approaches that scholars draw upon to study global environmental politics. At a basic level, what unites these scholars is their dissatisfaction with the treatment of this subject by traditional theories of international relations (IR) (see Chapter 3). As Hovden (1999) and others have observed, traditional IR has approached environmental problems with the same set of interests, theoretical assumptions and methodological tools that they bring to the study of any other problem in international politics. The possibility that the specific nature of these problems may require a rethinking of these approaches has been overlooked by most within the field of global environmental politics. This chapter provides an overview of efforts to understand global environmental politics by venturing off the beaten track. The source of these scholars' dissatisfaction is meta-theoretical, concerning ontology and epistemology.

For some, the ontological assumptions held by traditional IR scholars are problematic and generate incomplete understandings about why environmental problems occur and how they can be overcome. "Ontology" is the theory of being; it concerns the nature of the world – its essence, boundaries and constitutive units. Traditional IR is based on a rationalist ontology, which assumes that states are unitary rational actors who interact on the basis of strict cost-benefit calculations to maximize their relative or absolute power. Power is understood in a purely material and coercive sense of one actor's ability to get another actor to do something they otherwise would not. The approaches in this chapter rest on different ontologies, which recognize the presence and significance of actors other than states, the socially constructed identities and interests of these actors, other forms of power and domination, and forms of non-instrumental rationality.

For some scholars discussed in this chapter, the epistemological commitments of traditional IR are problematic and counterproductive to the aim of ameliorating environmental degradation. Epistemology is the theory of knowledge; it concerns the potential for acquiring knowledge of the world, as well as the possible validity of this knowledge. Traditional IR is informed by a positivist epistemology, which demands that scholars approach their study of the social world as they would the natural world; namely, with the aim of generating general laws by identifying patterns of relationships across directly observable phenomena. These general laws then provide a basis for making predictions about the social world (Blaikie 1993: 6–7).

The approaches presented in this chapter tend to analyse the power of norms, domination, discourse and patriarchy, which are not only unobservable but also contextual. Given that they do not manifest uniformly across all times and places, it is not possible to produce general laws and predictions. Yet, this does not undermine their significance for our understanding of global environmental politics.

Another assumption of positivism that is problematic for the study of environmental politics is its fact–value separation. The positivist assumption here is that scholars can and should aim for neutrality and objectivity by minimizing the potential for their own values to infiltrate and influence analyses of how the world actually is. Hovden (1999: 59) explains that this separation is problematic because "by insisting on a separation of facts from values, social scientific enquiry… implicitly becomes supportive of the *status quo*, because there is little or no room for social criticism in a positivist social scientific inquiry". The theoretical approaches presented here all engage (if only implicitly) with one of these meta-theoretical critiques, while some depart from traditional global environmental politics on both ontological and epistemological grounds.

Constructivism

Constructivism is essentially a social theory of international relations concerned with the underlying *ideas* that shape the behaviour of states and other actors. (This section draws on Stevenson 2012: ch. 3.) We can best appreciate the distinctiveness of this approach by understanding its ontology, based principally on the mutual constitution of structure and agency. This means that structures constrain and enable the behaviour of actors, but that structures themselves are reproduced and transformed through actors' behaviour. Structures are conceptualized and analysed in ideational terms of norms, culture and identity. The most important defining characteristic of these ideas is their intersubjectivity: they are based on shared knowledge that rests on "collective intentionality" rather than individual belief (Ruggie 1998). Agency is a property of actors that denotes their capacity to act upon situations, and to formulate and implement decisions. Intersubjective meanings constitute structures, which in turn constitute agents.

Think, for example, of the British government: the physical presence of a group of individuals in Whitehall would be inconsequential in the absence of social facts such as the "sovereign state", "national citizens", "voting" and others that constitute these individuals as a single actor. Actors' interests and identities therefore cannot exist prior to their interaction with structures: they are endogenous to this process. Understanding interests and identities therefore requires attention to the social context in which they are formed and transformed. It is also important to note that intersubjective meanings are not universal, but rather specific to certain spatial, temporal and social contexts; neither are they static but rather open to transformation. One of the main concerns of constructivist scholars is to understand and explain processes of change in international relations, including changes within the normative structure of global governance and changes within particular states' responses to these norms.

Norms are typically defined, following Katzenstein (1996: 5), as "collective expectations for the proper behavior of actors with a given identity". There is some agreement among both rationalists and constructivists on the existence of norms; where they depart is in their explanations for compliance with norms. The distinction is captured by March and Olson's (1998) logics of action. Rationalists explain norm conformance as driven by the "logic of consequences" whereby actors engaged in bargaining are understood to calculate the likely consequences of alternative actions and select that which best serves their exogenously given interests (1998: 949). Constructivists, by contrast, invoke the "logic of appropriateness" to explain norm conformance: "(h)uman actors are imagined to follow rules that associate particular identities to

particular situations, approaching individual opportunities for action by assessing similarities between current identities and choice dilemmas and more general concepts of self and situations" (1998: 951).

A number of scholars have analysed global environmental politics in terms of norms that govern states' actions (see Chapter 9). Bernstein (2001) uses a constructivist lens to analyse the evolution of international environmental governance during the three decades following the 1972 United Nations Conference on the Human Environment, held in Stockholm. Specifically, Bernstein sought to understand why a norm-complex of "liberal environmentalism" prevailed over alternative interpretations that attributed environmental degradation to unregulated industrialization and exponential economic growth (see Chapter 22): "Liberal environmentalism accepts the liberalization of trade and finance as consistent with, and even necessary for, international environmental protection. It also promotes market and other economic mechanisms… over 'command-and-control' methods…as the preferred method of environmental management" (Bernstein 2001: 7). Bernstein offers a "socio-evolutionary" explanation for this normative development suggesting that norm selection is a product of "*social* fitness", or the fit between new norms and the existing social structure (2001: 20–1).

Others have examined contestation over the meaning of specific norms defining responsibility and appropriate response measures to climate change (Betsill 2000; Cass 2006; Eckersley 2007; Harris 2000; Hoffmann 2005; Pettenger 2007; Stevenson 2012). The norm of "common but differentiated responsibilities" has received the most attention. This norm is based on the assumptions that states are responsible for the protection of the global environment and that all should participate in its governance, but industrialized countries bear primary responsibility on the basis of their historical contribution to pollution and/or their greater capacity to bear the costs incurred. This norm had earlier been institutionalized in the Conventions on the Law of the Sea (see Chapter 35), the Vienna Convention on the Protection of the Ozone Layer and its Montreal Protocol (see Chapter 29) and the Basel Convention on Control of Transboundary Movements of Hazardous Wastes (Rajamani 2000; see Chapter 33). Nevertheless, its precise prescriptions for allocating responsibility are open to interpretation and have been contested throughout the past two decades. The fact that negotiators are constrained and enabled by this normative understanding arguably only makes sense within a constructivist framework rather than a rationalist one in which states are assumed to act only on the basis of value-free calculations of costs and benefits.

While much constructivist work is state-centric, there are no theoretical restrictions on extending the analysis to other actors in the international system. After all, constructivism is not a *substantive* theory of international relations (as in, say, realism or liberalism) but instead a metatheory. Susan Park (2010) has adopted a constructivist framework to analyse processes of socialization within the World Bank Group. Rather than focus exclusively on states, Park examines the ideational power of transnational environmental advocacy networks and their efforts to bring the World Bank Group's policies into line with environmentalist norms. Park analysed this process of change as one of *socialization*, namely: "a process whereby agents internalise norms that constitute the social structure in which they exist…[this] is not a linear process but one of continuous interaction between agents and structures…[that] can lead to fundamental shifts in an organisation's identity" (Park 2010: 8).

Epistemologically, constructivism rejects positivist assumptions. From a constructivist perspective, our understanding of the social world will always be incomplete and potentially erroneous if it is informed only by phenomena that are directly observable. Moreover, general laws are only plausible in closed systems characterized by stability and consistency. The social world is not such a system. Constructivism is instead compatible with an interpretivist epistemology,

which seeks to interpret the contextual "webs of meaning" that constitute the social world (Neufeld 1993) by "uncover(ing) the beliefs or meanings that make actions and practices possible" (Bevir 2006: 283). However, constructivist scholars do not necessarily challenge the fact–value separation that is central to positivism. Constructivism itself does not entail any normative commitments concerning *how* the world should be constructed.

Constructivist scholars who wish to critique constructions of the world must import normative commitments from political theory. Stevenson (2012) employs a "green constructivist" framework to analyse interactions between state actors and underlying social structures, as well as socially constructed interests and forms of rationality. The integration of green political theory provides a foundation for critiquing existing global climate governance in terms of its institutionalization of ecological irrationality. Others, though, are not directly concerned with critique; Bernstein, for instance, states that his purpose is to "uncover how and why liberal environmentalism became institutionalized…rather than simply offering a critique of the outcome" (Bernstein 2001: 7).

Marxism

Peter Newell (2011: 4) recently observed that capitalism is the "elephant in the room" among global environmental politics scholars. Although capitalism is deeply implicated in global environmental change, and defines the parameters of permissible responses to such change, scholars generally maintain a polite silence about this system. Newell suggests that this silence emerges from a pervasive reluctance to align oneself in opposition to a deeply established and seemingly immutable economic system. This may arise from a desire to pursue policy relevance or to avoid associating oneself with the failed socialist projects of the twentieth century. The former position has some merit, so long as the entire academy does not opt for this route; yet the latter is as illogical as rejecting democracy on the basis of the performance of the Democratic People's Republic of Korea. As Pepper (1993: 59) argues, "[y]ou cannot judge Marxism, socialism, or any other world view solely by the actions of those who profess them", as their practices are frequently the antithesis of the philosophy.

Yet, not all scholars have shunned capitalism in their analyses of global environmental politics. This section reveals a small literature inspired in different ways by Marx's theory and critique of capitalism. Marxism is a broad tradition encompassing a range of philosophical and political positions. Central to this tradition is the idea that humans' experience is fundamentally shaped by the social organization of material production. This mode of organization is understood not as ahistorical and immutable. Instead, any specific mode of organization is produced, reproduced, altered or transformed by actors assuming social identities and performing inherited structural roles. This process is captured by the term "historical materialism" (Rupert 2007: 35–6). Marxism has traditionally critiqued capitalism as a social arrangement for material production. For some, this entails developing an alternative theoretical mode of organizing material production, generally some version of socialism. In the context of global environmental politics, this critique manifests as analyses of capitalism's contribution to environmental degradation and as analyses of corporations' influence on international environmental policy. Here, I outline these two streams in turn (see Chapters 13 and 22).

It has frequently been observed that Karl Marx and his intellectual collaborator, Friedrich Engels, either had little to say about nature or viewed it in purely instrumental terms (e.g., Lipschutz 2004: 78). Several contemporary Marxist scholars have sought to refute the former (see Parsons 1977) and rectify the elements of truth found in the latter (Foster et al. 2010; Kovel 2007; O'Connor 1988; Pepper 1993). Kovel (2007: 9–10) argues: "[s]ince Marx emerged a

century before the ecological crisis matured, we would expect its received form to be both incomplete and flawed when grappling with a society, such as ours, in advanced ecosystemic decay".

Despite the reductionism of historical materialism, Marx and Engels understood ecology as complex interacting processes and objects that could not be understood in isolation from one another (see Merchant 2008: 44). Natural objects were understood to constitute a part of human existence and consciousness, ultimately providing the material conditions for producing subsistence. Yet, the capacity for humans to master and deliberately destroy the environment through labour was also recognized: "Let us not…flatter ourselves overmuch on account of our human conquests over nature", warned Engels, "For each such conquest takes its revenge on us" (quoted in Merchant 2008: 56). Criticism was particularly directed at capitalists for their free appropriation of natural resources, which broke the unity between man (*sic*) and nature (Merchant 2008: 52–4).

Certainly the most sophisticated account of capitalism's impact on environmental degradation that Marx developed was that concerning the soil crisis. Central to this critique was Marx's concept of "social metabolism". Metabolism itself refers to "the complex biochemical process of exchange, through which an organism…draws upon materials and energy from its environment and converts these…into the building blocks of growth" (Foster et al. 2010: 402). *Social* metabolism, then, captures "the complex, dynamic interchange [of matter and energy] between human beings and nature" (Foster 2000: 158). Marx observed that capitalism generated an unavoidable "metabolic rift" in soil nutrients by rupturing the "metabolic interaction" between humans and the earth (Foster et al. 2010: 77). During earlier times when production and consumption occurred within close proximity, crops and natural wastage were returned to the land as fertilizer, thus sustaining its nutrient base and productive capacity. The accumulative imperative of capitalism was seen to concentrate land ownership, depopulate rural areas, increase the density of urban living, and ultimately create an urban–rural divide that saw soil nutrients accumulate as urban waste (Foster et al. 2010: 77).

Contemporary scholars have extended Marx's theory of the "metabolic rift" to analyse the modern global economy, which is far more ecologically damaging than anything witnessed in the nineteenth century (e.g., Foster et al. 2010; Moore 2000; Weis 2010; see Chapter 22). Foster et al. (2010) observe that the "metabolic rift" has been globalized through colonialism, imperialism and market forces that all aim to maximize capital accumulation of the core states at the expense of environmental degradation in the periphery. "Rifts" have been spread throughout the system from the application of "technological fixes", including the intensive use of artificial nitrogen fertilizer to compensate for the loss of organic soil nutrients. Foster and colleagues note that the resulting airborne nitrogen compounds contribute to global warming, while soil run-off increases the concentration of nutrients in waterways causing eutrophication and marine "dead zones" (2010: 81–2). Effectively responding to this situation requires, they argue, a complete rejection of capitalism, which is inherently anti-ecological. Within the specific realm of agriculture, industrial-scale production ought to be replaced with Marx's proposal for "a society of associated producers…[who] can regulate their exchange with nature in accordance with natural limits and laws, while retaining the regenerative properties of natural processes and cycles" (2010: 86). More generally, however, the ecological crisis can only be resolved through a "revolution in the constitution of human society itself…aimed at the creation of a just and sustainable society" (2010: 38, 436).

Fellow Marxist, Tony Weis, similarly argues that "the chronic biophysical contradictions of industrial capitalist agriculture are accelerating" and leading to food price volatility and "ruinous outcomes". These contradictions are generated by the organizing logic of capitalism, which

prescribes ever-greater efficiency for accumulation. Yet this logic will eventually be destabilized by the system's own externalized costs: soil erosion and salinization, depletion of water supplies, biodiversity loss and greenhouse gas emissions, as well as an "intractable dependence" on finite fossilized biomass (Weis 2010: 316–17). Yet Weis sees in this instability the potential for "rebuilding biodiverse food systems and remaking and valorizing agricultural work" (2010: 315).

The second strand of capitalist-centred critique is more explicitly inspired by twentieth-century political theorist Antonio Gramsci's historical materialism. While Gramsci shared many of Marx's assumptions about capitalist processes and relations, he maintained a stronger notion of agency: social transformation would not necessarily emerge from phases of economic development, but rather could be brought about by "historically situated social agents whose actions are enabled by their social self-understandings" (Rupert 2007: 40). The main concept informing Gramsci's work was "hegemony", referring to "the persistence of specific social and economic structures that systematically advantage certain groups" (Levy and Newell 2002: 86). Two different understandings of power emerge from this concept: ideological and strategic. First, power is ideological because the structures that privilege a social group owe their stability to being taken for granted as "common sense". But this also creates an opening for civil society to act strategically and engage capitalists in a "war of position" that exposes the tensions and contradictions of hegemonic projects, thereby de-reifying these and presenting an alternative social order (Rupert 2007: 40; Levy and Newell 2002).

The most influential contributions to global environmental politics from the neo-Gramscian camp emerged in the 1990s and early 2000s (Paterson 1996, 2000; Newell and Paterson 1998; Levy and Newell 2002, 2005; Levy and Egan 2003). Early on, Paterson (1996) argued that the international politics of global warming were best explained using a historical materialist framework comprising three elements. First, recognition of the structural power of capital, which emerges from what Marxists see as a primary function of states: ensuring capital accumulation. This empowers capitalists because they have the capacity to withhold or shift investment, and to construct "hegemonic ideas concerning the conditions for economic growth" (Paterson 1996: 158). The second element is Gramsci's concept of "hegemony", which "denotes the ideological struggles which occur over the projects of the dominant class designed to secure the basic conditions for accumulation. The process of securing those conditions requires that capital engages in continual ideological struggles to create a capacity to keep capitalist societies together" (Paterson 1996: 158). The final element directs attention to inequalities generated (and exploited) by processes of capital accumulation. Paterson argues that the numerous North–South conflicts in international climate negotiations are the product of "structural inequality in the political economy" (1996: 171–2).

Newell and Paterson draw on a "neo-Gramscian" framework to generate further insights about climate negotiations. This overcomes two central fallacies informing regime analyses: first, "the assumption that states can be treated as unitary rational actors", and second, that "states and markets are two separate spheres of human activity" (Newell and Paterson 1998: 679–80). Their framework directs attention to the political–economic dynamics that shape states' positions in climate negotiations. By recognizing that states are positioned within capitalist societies, in which accumulation is driven by fossil fuels, Newell and Paterson are able to appreciate the influence of fossil fuel lobbies; yet, their power is not absolute because capital itself is not a "homogenous bloc". Newell and Paterson observe how the insurance industry was able to challenge the power of the fossil fuel lobbies by establishing "tactical alliances" with environmentalists to advance other interests (1998: 680–1). This potential was limited, however, because the interests of the fossil fuel lobbies also provide most "fractions of capital" with the basic conditions for accumulation because oil and coal are so central to the global economy (1998: 692–3).

Levy and Newell (2002, 2005) employ a neo-Gramscian framework to analyse corporate political strategies more broadly in international environmental governance. These strategies include "technological innovation, partnerships with NGOs, and the development of private standards" (Levy and Newell 2002: 86). A number of contributors to Levy and Newell's (2005) edited volume analyse the "war of position" in contexts including biotechnology, water, toxic waste trade and climate change. These studies undermine assumptions of determinism in global environmental politics and expose the strategies that dominant and marginalized social groups adopt to consolidate or weaken dominant structures.

Critical Theory: from the Frankfurt School to Habermas

Critical Theory has had a small but important impact on the field of global environmental politics. This tradition took shape in the mid-twentieth century through the work of social theorists at Frankfurt's Institute for Social Research, hence the common reference to this tradition as the Frankfurt School. The tradition is typically divided into two "generations": the first generation of Theodor Adorno, Max Horkheimer and Herbert Marcuse, and the second generation led by Jürgen Habermas (Biro 2011). While confronted with the significantly diminished potential of overthrowing the class system, the Frankfurt School theorists maintained Marx's commitment to a critique of domination. Their interpretation of domination has clear affinities with the concerns of green political theorists, and herein lies the (only partially realized) potential contribution to global environmental politics. Andrew Biro (2011: 10), together with William Leiss (2011) and others argue that the Frankfurt School, and especially the concept of domination of nature, can help us understand contemporary environmental crises and paradoxes. Adorno and Horkheimer criticized instrumental reason (or rationality) that was penetrating all areas of life and dominating humans and the non-human world alike. Reason, Horkheimer claimed, is a disease "born from man's urge to dominate nature" (Horkheimer 1947, quoted in Leiss 2011: 23).

From an instrumental perspective, nature has no intrinsic value; it is merely "a stockpile of resources" to be mastered for human ends (Biro 2011: 14). Yet in our attempts at mastering nature "human beings distance themselves from nature" in such a way that ultimately rebounds in the domination of other humans. Leiss explains:

> the enlarged social apparatus that is required to refine, enlarge, and administer control over nature takes its revenge, for "the power of the system over human beings increases with every step they take away from the power of nature". Enlarged, collective domination over nature is matched at every stage by a comparably heightened domination by some people over others.
>
> (Leiss 2011: 24, quoting Adorno and Horkheimer)

The contemporary significance of this has been noted in part by Saurin (1994), who argues that key elements of modernity including "distanciation", "technical–rationalism and bureaucracy", and the displacement of various local *episteme* and *techne* has led to "large-scale and systematic degradation" of ecosystems (1994: 46–9). This is illustrated, again, with the case of agriculture whereby subsistence social relations have been subordinated to "an agricultural episteme which is based on monocultures and mass production".

Dobson notes that the Critical Theorists' critique of instrumental reason resonates with (and provides sophistication to) the environmentalist assumption that the relationship between humans and the non-human world is "troubled" because we treat this as a means to our own

ends (Dobson 1993: 194). Critical Theorists reject the idea that humans can re-capture "a romantic pre-Enlightenment human–nature relationship" and, on the whole, are fairly pessimistic about the prospects for progressive social change (Dobson 1993: 194). Nevertheless, the possibility remains of "domesticating" instrumental reason and supplementing it with substantive reasoning. Substantive reasoning entails value-infused deliberation about the goals pursued by society, not merely a value-free assessment of the means to attain pre-given goals. For Horkheimer, such reasoning was only possible once certain material conditions have been fulfilled for human communities. Yet, environmental degradation has accelerated in step with material development since he was writing in the 1940s. Hence, the precise conditions under which substantive reasoning can occur remains an open question.

One response to this question has come from a second generation of Critical Theorists led by Habermas. Eckersley (1990) expressed scepticism about the value of Habermas for the green movement, especially deep ecologists. The key point of contention was Habermas's revision of the Frankfurt School's critique of instrumental reason. Habermas's concept of the "scientization of politics" rejected the technocratic capture of social problems, which he saw as a source of domination of the citizenry by experts and bureaucrats. Ultimately, for Habermas, science and technology become ideology when directed towards social and political objects because they serve "merely in the end to conceal pre-existing, unreflected social interests and prescientific decisions" (Habermas 1971, quoted in Outhwaite 2009: 20). Yet, unlike the Frankfurt School, Habermas made a clear distinction between inter-human relations and humans' relations with nature. He argued that the only way humans can know and relate to the non-human world is instrumentally through labour and technology. To do otherwise is to jeopardize the survival of the human species (Eckersley 1990: 743, 753). Humans' relations with each other, however, should be governed by "communicative rationality" whereby problems are addressed by seeking a reasoned consensus. Rationality is thus directed to subjecting social norms and goals to open and participatory critique rather than efficiently pursuing pre-given goals.

The arguments presented in such a process ought to be generalizable beyond particular interests and have the potential to be accepted by differently positioned individuals. Such a process may advance human emancipation, but Eckersley pointed out that this process fails to diminish the domination of the non-human world because "a norm is considered 'right' if it is achieved via a consensus of truthful, uncoerced and rational agents. It follows that if a 'speech community' agrees, after free and rational discussion, to direct technology in such a way as to continue to manipulate and subjugate 'external nature,' then Critical Theory can raise no objection" (Eckersley 1990: 757).

Nevertheless, numerous scholars have turned to Habermas, and specifically the theory and practice of "deliberative democracy", to advance ecological concerns. Perhaps the most well-known and comprehensive work in this area is that of Dryzek (e.g., 1987, 1994, 2006). For Dryzek, the green potential of communicative rationality requires accepting an "anthropocentric life-support approach" as a minimum basis for deliberation (1987: 35). If all human beings share an interest in sustaining the "productive, protective, and waste-assimilative value of ecosystems", then this becomes "*the* generalizable interest *par excellence*" (Dryzek 1987: 34, 204). There is thus strong potential for rationally legitimated social norms to be "ecologically rational". Baber and Bartlett also emphasize the importance of broadening knowledge production and decision-making beyond scientists and technocratic elites. Those opposed to an environment-related proposal will not be swayed by the availability of more information "but, rather, public involvement in the production of information through a process of discursive will-formation" (Baber and Bartlett 2005: 97). Moreover, they observe, it is impossible "to protect the environment from human degradation in the absence of a human commitment to do so"; this

commitment will only come about through decentralized and democratic public discourse (2005: 98).

This is a position shared by others including Robert Brulle (2002) and Douglas Torgerson (1999). For Brulle, the aims of human and ecological emancipation will only be realized if a strong public sphere is developed where "ecological politics would take place and meaningful disagreements and debates about our society and the actions necessary to foster ecological sustainability would be carried out" (Brulle 2002: 16). The importance of globalizing deliberation to account for the global nature of many contemporary environmental problems is an issue that some global environmental politics scholars have recently taken up. Dingwerth (2007), for example, has analysed the quality of deliberation in transnational environmental networks and found trade-offs between deliberative quality and other democratic qualities including accountability, transparency and inclusiveness. Dryzek and Stevenson (2011), meanwhile, have analysed global climate governance in deliberative systems terms and proposed a number of ways in which democracy (understood as deliberative capacity building) can be enhanced at this scale (see Chapter 26). They have stressed, for example, the importance of avoiding deliberative enclaves and fostering deliberation across climate discourses (Stevenson and Dryzek 2012a), and enhancing deliberation and legitimacy in multilateral negotiations through a formula of "minilateralism plus discursive representation" (Stevenson and Dryzek 2012b).

Foucauldian approaches

Michel Foucault, a twentieth-century French social theorist, has inspired some scholars of global environmental politics dissatisfied with the offerings of traditional IR theory. Foucauldian-oriented studies start from the assumption that the material world, including "nature", is meaningless until it is interpreted and assigned meaning by humans. There is no deterministic relationship between the material and the meaning; to assign meaning is an act of power. Foucauldians refer to this as "productive power". This power lies in the capacity to define how humans act upon the material world. The power to assign meaning is also the power to marginalize, suppress or delegitimize other potential interpretations. In the field of global environmental politics, Foucauldian-inspired scholars have pursued two main tasks: first, discourse analysis has been employed to uncover potential meanings about the environment, and the processes by which one single interpretation has been imposed and institutionalized; and, second, governmentality analyses have been carried out to expose the dominating effects of this productive power on people's lives.

One of the earliest contributions was Hajer's analysis of environmental policy-making in the United Kingdom and Netherlands. Hajer argued that "policy-making involves much more than merely dreaming up clever ways of creating solutions. It requires first of all the redefinition of a given social phenomenon in such a way that one can also find solutions for them" (Hajer 1995: 2). He thus traces how earlier debates about the radical restructuring demanded by environmental crises were delegitimized as a new manageable way of understanding environmental degradation emerged in the late 1970s. This discourse of "ecological modernisation" established dominance with the idea that "pollution prevention pays": environmental crises do not discredit capitalist development but instead present opportunities for business to innovate and develop new markets. Unlike, say, "limits to growth", ecological modernization is compatible with existing political and economic institutional arrangements. This congruence goes a long way towards explaining its dominance as a policy discourse, at least within Europe.

But discourses do not establish dominance on the basis of rational policy-makers selecting the most convenient framing of any given problem. Litfin analysed how scientific knowledge

influenced international negotiations about the problem of ozone depletion and pointed to the importance of "knowledge brokers" (see Chapter 17). These are individuals who "frame and interpret scientific knowledge" and thereby exercise significant political (and productive) power, especially under conditions of scientific uncertainty (Litfin 1994: 4). In Litfin's analysis, the deployment of "rhetorical devices", such as the metaphors of "ozone layer" and "ozone hole", helped to establish acceptance for a risk-based discourse that promoted precautionary action to phase out ozone-depleting substances.

More recently, Epstein has contributed to Foucauldian environmental politics with an investigation into whaling and the power dynamics that enabled an anti-whaling discourse to supersede an earlier discourse that promoted whaling for economic, military and political ends (Epstein 2008; see Chapter 36). For Epstein, the study of discourse entails denaturalizing "what we assume to be right", thus she does not explicitly treat the anti-whaling discourse as "the truth" that prevailed over a historical "wrong". Instead, she is concerned to reveal how environmentalists "reframed perceptions and understanding by producing a new discourse on whales and whaling" that, in turn, rearticulated state identities from whaling states to anti-whaling states (Epstein 2008: 13, 94–5). The rupture in states' treatment of whales, Epstein argues, cannot be understood through a regime theoretical lens that focuses on narrow cost-benefit calculations because most states did not respond to the issue in ways that only reflected their material interests. Instead, they were "socialised" into the anti-whaling regime in ways that actually redefined their interests and identities.

Several scholars have drawn on Foucault's concept of "governmentality" to advance alternative understandings of global environmental governance (e.g., Death 2010; Epstein 2008; Luke 2011; Methmann 2012; Oels 2005; Paterson and Stripple 2010). This approach has been called "analytics of government" (Dean 2010: 16). Foucault understood the term "government" to mean "conduct of conduct" whereby "conduct" is understood as a verb and a noun. Government is the calculated process of leading, directing or guiding the behaviour and actions of others or of oneself (Death 2010: 18). Governmentality concerns the rationalities of government, or "how we think about governing" (Death 2010: 24). Death draws on this Foucauldian concept to analyse the "rationality of government" built into "sustainable development"; this involves "approaching sustainable development as an assemblage of practices of government which produce their own particular ways of seeing, knowing, acting and being" (Death 2010: 2). This approach allows him to focus on how "the scope, forms and identities of governmental action" were determined in part through "contests between competing rationalities of government" at the Johannesburg Summit (Death 2010: 5, 9). The prevailing rationality was an "advanced liberal rationality of government which relied upon the voluntary and responsible conduct of self-selecting partners operating at a distance from traditional centres of power" (Death 2010: 9). This builds on earlier work by Oels who argued that "climate change has been captured by advanced liberal government, which articulates climate change as an economic issue that requires market-based solutions to facilitate cost-effective technological solutions" (Oels 2005: 185). Oels identified this rationality as weak ecological modernization. By institutionalizing this discourse, climate change has been "rendered governable" by the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC) (Oels 2005: 199; see Chapter 28).

Feminism

There is no single feminist voice in global environmental politics. What different feminist perspectives share is their attention to gender inequalities and the power structures that reinforce them. Some feminist scholars are concerned about the presence and absence of women in global

environmental governance, while others are more concerned about the gendered assumptions embedded in such governance, as well as the implications of governance for gendered relations. Global environmental governance, it seems, has proven resistant to concerns about both women and gender. Back in 1998, Bretherton observed that "attempts to 'put gender on the agenda' of global environmental politics have resulted in, not the incorporation of gender, but the addition of women" (Bretherton 1998: 85). She explains that "(g)ender analysis is not concerned per se with the incorporation of women in environmental decision-making and policy, but with…the broadly accepted, and expected, pattern of relations between men and women". Bringing women into policy-making is insufficient because "masculine values" are privileged over "feminine values" in most contexts; rectifying the sex imbalance does not rectify the enduring patriarchy (Bretherton 1998: 90). The importance of this is underlined by Bretherton's argument that patriarchy is deeply implicated in environmental degradation. Specifically, she argues that the contemporary dominant form of "capitalist patriarchy" is based on "overlapping norms and principles of neoliberalism and Anglo-American hegemonic masculinity" that effectively "authorize conduct directly opposed to that demanded by an ethic of care for the environment" (Bretherton 2003: 103–4).

Similar sentiments have been expressed more recently by MacGregor who argues that environmentalism has been *masculinized* as "[m]en dominate the issue at all levels, as scientific and economic experts, entrepreneurs, policy makers and spokespeople" (MacGregor 2009: 128). Feminist scholars of global environmental politics do not accept that such observations are irrelevant and unproblematic; instead, they are concerned with exposing underlying gendered inequalities. MacGregor explains the masculinization of climate change as an effect of the dominant scientific and security framings of the issue, each of which "work(s) to invisibilise women and their concerns" (MacGregor 2009: 129). Shiva goes as far as claiming that science is based on a "patriarchal mode of knowing (that) is necessarily violent to nature and women" (Shiva 1989: xix). Boyd's (2009) analysis of the Clean Development Mechanism reveals how "the patriarchal underpinnings of the sustainable development and climate-change policy agendas" have undermined the potential of mitigation projects. Her study of the Noel Kempff project in Bolivia found that "practical gender needs" were successfully incorporated, namely, "immediate necessities that women perceive themselves as lacking in a specific context, which would enable them to perform the activities expected of them: for example, a health post, vegetable gardens, or a water pump". However, "strategic gender needs" were neglected; this refers to "that which is necessary for women to change their status in society…: access to and ownership of land or other property, control over one's body, equal wages, or freedom from domestic violence" (Boyd 2009: 102).

Notwithstanding these important insights, MacGregor claims that feminist research into the gender dimensions of climate change remains limited. She identifies a number of priorities for gender research, including the social construction of the problem to examine "the ways in which gendered environmental discourses frame and shape dominant understandings of the issue"; the impacts of climate change on men's and women's everyday lives; "gender differences in perception of climate change-related risks"; and gendered responses to the problem of climate change (MacGregor 2009: 127–33; see Chapter 28).

Conclusion

For decades, the environment was treated by scholars of international politics as an issue of little or no relevance. This trend began to shift in the 1990s as the environment was increasingly recognized as a problem of international political concern and as a focus for global governance.

Nevertheless, since that time the study of global environmental politics has been dominated by rationalist approaches, in particular by neoliberal institutionalism (regime) theory (see Chapter 9). This approach can undoubtedly generate important insights about institutional dynamics and inter-state cooperation over common pools and common sinks. However, this chapter has sought to uncover the fertile theoretical terrain that lies beyond this traditional theoretical foreground. For those who are attracted to the field of global environmental politics by a genuine concern for the social and ecological consequences of global environmental change, these alternative theories provide a valuable set of lenses. By surrendering a commitment to positivist social science, these approaches provide foundations for critiquing global environmental governance by exposing its blind spots and moral shortcomings. These approaches also allow scholars to try to understand the world rather than taking it as the starting point of analysis.

This points to Cox's well-known distinction between problem-solving theory and critical theory (Cox 1981). According to Cox, problem-solving theory

> takes the world as it finds it, with the prevailing social and power relationships and the institutions into which they are organised, as the given framework for action. The general aim… is to make these relationships and institutions work smoothly…Critical theory…does not take institutions and social and power relations for granted but calls them into question by concerning itself with their origins and how and whether they might be in the process of changing. It is directed towards an appraisal of the very framework for action…which problem-solving theory accepts as its parameters.
>
> (Cox 1981: 128–9)

Thus the field of global environmental politics would be best served by a diversity of scholarship that is informed not only by traditional, problem-solving IR theory, but also by the critical theories examined in this chapter.

References

Adorno, T.W. and Horkheimer, M. (1944/1997) *Dialectic of Enlightenment*, London: Verso.

Baber, W.F. and Bartlett, R. V. (2005) *Deliberative Environmental Politics: Democracy and Ecological Rationality*, Cambridge, MA: MIT Press.

Bernstein, S. (2001) *The Compromise of Liberal Environmentalism*, New York: Colombia University Press.

Betsill, M.M. (2000) "The United States and the evolution of international climate change norms", in P.G. Harris (ed.) *Climate Change and American Foreign Policy*, New York: St Martin's Press.

Bevir, M. (2006) "How narratives explain", in D. Yanow and P. Schwartz-Shea (eds) *Interpretation and Method: Empirical Research Methods and the Interpretive Turn*, New York: M.E. Sharpe.

Biro, A. (ed.) (2011) *Critical Ecologies: The Frankfurt School and Contemporary Environmental Crisis*, Toronto: University of Toronto Press.

Blaikie, N. (1993) *Approaches to Social Enquiry*, Cambridge: Polity Press.

Boyd, E. (2009) "The Noel Kempff project in Bolivia: gender, power, and decision-making in climate mitigation", in G. Terry (ed.) *Climate Change and Gender Justice*, Rugby: Practical Action Publishing.

Bretherton, C. (2003) "Movements, networks, hierarchies: a gender perspective on global environmental governance", *Global Environmental Politics*, 3(2): 103–19.

—— (1998) "Global environmental politics: putting gender on the agenda?" *Review of International Studies*, 24: 85–100.

Brulle, R.J. (2002) "Habermas and green political thought: two roads converging", *Environmental Politics*, 11(4): 1–20.

Cass, L. (2006) *The Failures of American and European Climate Policy: International Norms, Domestic Politics, and Unachievable Commitments*, Albany: SUNY Press.

Cox, R. (1981) "Social forces, states and world orders: beyond international relations theory", *Millennium*, 10(2): 126–55.

Dean, M. (2010) *Governmentality: Power and Rule in Modern Society*, 2nd edn, London: Sage.
Death, C. (2010) *Governing Sustainable Development: Partnerships, Protests and Power at the World Summit*, London: Routledge.
Dingwerth, K. (2007) *The New Transnationalism*, Houndmills: Palgrave Macmillan.
Dobson, A. (1993) "Critical Theory and green politics", in A. Dobson and P. Lucardie (eds) *The Politics of Nature: Explorations in Green Political Theory*, London: Routledge.
Dryzek, J.S. (2006) *Deliberative Global Politics*, Cambridge: Polity.
—— (1994) *Discursive Democracy: Politics, Policy, and Political Science*, Cambridge: Cambridge University Press.
—— (1987) *Rational Ecology: Environment and Political Economy*, Oxford: Basil Blackwell.
Dryzek, J.S. and Stevenson, H. (2011) "Global democracy and earth system governance", *Ecological Economics*, 70(1): 1865–74.
Eckersley, R. (2007) "Ambushed: the Kyoto Protocol, the Bush administration's climate policy and the erosion of legitimacy", *International Politics*, 44: 306–24.
—— (1990) "Habermas and green political thought: two roads diverging", *Theory and Society*, 19(6): 739–76.
Epstein, C. (2008) *The Power of Words in International Relations: Birth of an Anti-Whaling Discourse*, Cambridge, MA: MIT Press.
Foster, J.B. (2000) *Marx's Ecology*, New York: Monthly Review Press.
Foster, J.B., Clark, C. and York, R. (2010) *The Ecological Rift: Capitalism's War on the Earth*, New York: Monthly Review Press.
Habermas, J. (1971) *Toward a Rational Society: Student Protest, Science, and Politics*, Toronto: Beacon Press.
Hajer, M.A. (1995) *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*, Oxford: Oxford University Press.
Harris, P.G. (2000) "International norms of responsibility and U.S. climate change policy", in P.G. Harris (ed.) *Climate Change and American Foreign Policy*, New York: St Martin's Press.
Hoffmann, M.J. (2005) *Ozone Depletion and Climate Change*, Albany: SUNY Press.
Hovden, E. (1999) "As if nature doesn't matter: ecology, regime theory and international relations", *Environmental Politics*, 8(2): 50–74.
Katzenstein, P.J. (1996) "Introduction: alternative perspectives on national security", in P.J. Katzenstein (ed.) *The Culture of National Security: Norms and Identity in World Politics*, New York: Columbia University Press.
Kovel, J. (2007) *The Enemy of Nature: The End of Capitalism or the End of the World?* 2nd edn, London: Zed Books.
Leiss, W. (2011) "modern science, enlightenment, and the domination of nature: no exit?", in A. Biro (ed.) *Critical Ecologies: The Frankfurt School and Contemporary Environmental Crisis*, Toronto: University of Toronto Press.
Levy, D.L. and Egan, D. (2003) "A neo-Gramscian approach to corporate political strategy: conflict and accommodation in the climate change negotiations", *Journal of Management Studies*, 40(4): 803–29.
Levy, D.L. and Newell, P. J. (eds) (2005) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
Levy, D.L. and Newell, P. J. (2002) "Business strategy and international environmental governance: toward a neo-Gramscian synthesis", *Global Environmental Politics*, 2(4): 84–101.
Lipschutz, R. (2004) *Global Environmental Politics: Power, Perspectives, and Practice*, Washington, DC: CQ Press.
Litfin, K. (1994) *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, New York: Columbia University Press.
Luke, T. (2011) "Environmentality", in J.S. Dryzek, R.B. Norgaard and D. Schlosberg (eds) *The Oxford Handbook of Climate Change and Society*, Oxford: Oxford University Press, pp. 97–109.
MacGregor, S. (2009) "A stranger silence still: the need for feminist social research on climate change", *Sociological Review*, 57(s2): 124–40.
March, J.G. and Olsen, J. P. (1998) "The institutional dynamics of international political orders", *International Organization*, 52(4): 943–69.
Merchant, C. (ed.) (2008) *Ecology*, 2nd edn, Amherst, NY: Prometheus Books.
Methmann, C.P. (2012) "The sky is the limit: global warming as global governmentality", *European Journal of International Relations*, doi: 10.1177/1354066111415300.

Moore, J.W. (2000) "Environmental crises and the metabolic rift in world-historical perspective", *Organization and Environment*, 13: 123–57.
Neufeld, M. (1993), "Interpretation and the 'science' of international relations", *Review of International Studies*, 19: 39–61.
Newell, P. (2011) "The elephant in the room: capitalism and global environmental change", *Global Environmental Change*, 21: 4–6.
Newell, P. and Paterson, M. (1998) "A climate for business: global warming, the state and capital", *Review of International Political Economy*, 5(4): 679–703.
O'Connor, J. (1988) "Capitalism, nature, socialism: a theoretical introduction", *Capitalism, Nature, Socialism*, 1(1): 11–38.
Oels, A. (2005) "Rendering climate change governable: from biopower to advanced liberal government?" *Journal of Environmental Policy and Planning*, 7(3): 185–207.
Outhwaite, W. (2009) *Habermas: A Critical Introduction*, 2nd edn, Stanford, CA: Stanford University Press.
Park, S. (2010) *World Bank Group Interactions with Environmentalists: Changing International Organisation Identities*, Manchester: Manchester University Press.
Parsons, H.L. (1977) *Marx and Engels on Ecology*, Westport, CT: Greenwood Press.
Paterson, M. (2000) *Understanding Global Environmental Politics: Domination, Accumulation, Resistance*, Houndmills: Palgrave Macmillan.
—— (1996) *Global Warming and Global Politics*, London: Routledge.
Paterson, M. and Stripple, J. (2010) "My space: governing individuals' carbon emissions", *Environment and Planning D: Society and Space*, 28: 341–62.
Pepper, D. (1993) *Eco-socialism*, London: Routledge.
Pettenger, M.E. (ed.) (2007) *The Social Construction of Climate Change*, Ashgate: Aldershot.
Rajamani, L. (2000) "The principle of common but differentiated responsibility and the balance of commitments under the climate regime", *Review of European Community & International Environmental Law*, 9(2): 120–31.
Ruggie, J.G. (1998) *Constructing the World Polity: Essays on International Institutionalization*, London: Routledge.
Rupert, R. (2007) "Marxism", in M. Griffiths (ed.) *International Relations Theory for the Twenty-First Century: An Introduction*, London: Routledge.
Saurin, J. (1994) "Global environmental degradation, modernity and environmental knowledge", in C. Thomas (ed.) *Rio: Unravelling the Consequences*, London: Routledge.
Shiva, V. (1989) *Staying Alive: Women, Ecology, and Development*, London: Zed Books.
Stevenson, H. (2012) *Institutionalizing Unsustainability: The Paradox of Global Climate Governance*, Berkeley: University of California Press.
Stevenson, H. and Dryzek, J. S. (2012a) "The discursive democratisation of global climate governance", *Environmental Politics*, 21(2): 189–210.
Stevenson, H. and Dryzek, J. S. (2012b) "The legitimacy of multilateral climate governance: a deliberative democratic approach", *Critical Policy Studies*, 6(1): 1–18.
Torgerson, D. (1999) *The Promise of Green Politics: Environmentalism and the Public Sphere*, Durham, NC: Duke University Press.
Weis, T. (2010) "The accelerating biophysical contradictions of industrial capitalist agriculture", *Journal of Agrarian Change*, 10(3): 315–41.

5

The study of global environmental politics

Strategies for research and learning

Juliann Emmons Allison

Contemporary research and teaching on global environmental politics (GEP) draw upon many approaches to understanding the ways in which states and societies respond to environmental problems (see Chapter 2). Research that emphasizes the state (Chapter 7) and international organizations (Chapter 8) derives in a more or less straightforward way from scholarly work in international relations (IR), with a marked focus on domestic and international institutions rather than traditional determinants of power as key to understanding states' interests and actions. Alternatively, research that adopts a philosophically critical orientation toward international relations is more inherently interdisciplinary, and draws on theoretical frameworks developed in economics and sociology as well as in the humanities. The latter work examines global environmental politics from the "bottom up," and takes seriously the notion that transnational networks of activist organizations as well as individuals will prove essential to resolving the world's pressing ecological challenges (see Chapter 14).

This chapter describes an analytical framework informed by IR for approaching research and teaching in the GEP subfield. The framework may be adapted for use with any substantive area of interest, as well as used to develop undergraduate and graduate coursework in GEP. Discussion of the framework itself is followed by overview of the ways in which research in the natural and physical sciences interacts with GEP (see also Chapter 17). The section on teaching GEP includes a description of what might be covered in an undergraduate course, including suggestions for the adoption of pedagogies – specifically fieldwork and other outdoor experiences, and contemplative practices – that are particularly well suited to GEP and environmental education more generally.

Approaches to global environmental politics

Although a strict application of IR theory to GEP has fallen out of favor, it is possible to draw on key conceptual categories associated with the study of other international and global issue areas to frame general approaches to the study of environmental concerns of interest to international and transnational bodies. Table 5.1 identifies "power," "institutions," and "ideas" – generally associated with realism, liberal institutionalism, and constructivism, respectively – to characterize distinctions between conventional and mainstream approaches to studying GEP (see Chapter 3)

Table 5.1 Key theoretical influences on generalized approaches to the study of global environmental politics

	Conventional	*Mainstream*	*Radical*
Power	State power, dominance, even hegemony Potential for coercion Maybe regional	Varied determinants of power Power as influence	Discourse paramount Persuasive power Consensus-seeking
Institutions	Largely ineffective Environmental challenges likely to cause conflict	Diffuse Law and organization marginally constitutive of "governance"	Transnationalism rooted in class, cultural, racial, ethnic, gender, and religious differences. Importance and effectiveness of global civil society
Ideas	Self-interest/preservation Expectation of zero-sum outcomes	"Environment and development" Integrative, positive-sum cooperation anticipated	Validity of anarchism, collectivism, and other alternatives to state dominance of environmental behavior

and more radical approaches (see Chapter 4). The shaded cells associated with the most conventional investigations of GEP distinguish historically less useful explanatory variables from the more fruitful mainstream and radical ones.

Beginning with the left column in Table 5.1, conventional approaches to studying GEP generally anticipate that those nations with the greatest geo-strategic, economic, and/or, to some extent, environmental, power will use these political resources to achieve their own most desired outcomes with respect to the terms of multilateral environmental agreements (MEAs; see Haas 1990; Holsti 1964). International environmental treaty regimes and other institutional constraints on state behavior are regarded as suspect if not ineffective. Scientific, ecological, and ethical ideas that are contrary to the policy preferences and negotiating positions of the most dominant nations involved with a given environmental challenge are essentially irrelevant. Insofar as militarized conflict is antithetical to environmental protection, traditional sources of power in world politics have not provided compelling theoretical foundations for the course of GEP. Even limited reliance on power so defined has not proved entirely effective (Barnett 2001; Klare 2009; Matthew et al. 2009). The West's – especially the United States' – involvement in the Middle East may well suggest that the world's most industrialized nations are just as prone as the developing world to conflict over scarce resources (Klare 2002). Yet, it is arguably more likely that acute conflict can be blamed on lack of institutional capacity to resolve conflicts than on scarcity itself (Homer-Dixon 1994).

Mainstream orientations to the study of GEP (see Chapter 3), associated with the center column in Table 5.1, broaden the concept of power to include ecological determinants of national power, including endangered species' habitats and tropical forests (Bonan 2008; Redford and Sanderson 1992; Tilman et al. 1996; see Chapters 37 and 38), and recognize the possibility that even developing nations, if sufficiently ecologically well endowed, may be capable of influencing the negotiation of MEAs (Haas 1990; Schreurs and Economy 1997; Steinberg 2001). States share center stage in GEP with a host of international environmental institutions that are deemed to provide significant limitations on their normative behavior. The individual and collective behavior of states is, ideally, governed by the belief that ecological sustainability will

require the socio-economic and political development of the world's poorest nations (WCED 1987; see Chapter 15).

The phenomenal theoretical and practical success of this analytic is arguably due to the wedding of the environmental and liberal economic norms to institutionalize "liberal environmentalism," which conditions sustainability on preservation of the world's liberal economy (Bernstein 2001; see Ruggie 1982). The economic foundation for this norm incorporates the expectation that nations become better environmental stewards over the long term as a consequence of economic growth. The Environmental Kuznets Curve (Grossman and Krueger 1995), a bell-shaped, "inverted U" curve describing the relationship between a society's economic growth and the problem of environmental degradation, suggests that "at early stages of growth, environmental degradation gets worse, but as citizens get richer, things start to get better" (Leonard 2006). In fact, the relationship between economic growth and environmental protection is tenuous, depending, at least, on the nature of pollutants, national policy prerogatives, access to control technologies, and the progress of globalization (Dasgupta et al. 2002; Leonard 2006; Prieur 2009; Stern 1996, 2001, 2004).

Radical GEP, represented by the right column in Table 5.1 (see Chapter 4), is distinguished from its more mainstream cousin by calling for some long-term redistribution of, at best, modestly increasing resources as the only morally defensible route to global sustainability (see Chapter 15). That is, it seeks an arguably extreme change in the norms that have heretofore guided practical GEP from fairness effectively delimited by preservation of the status quo standard of living for the world's advanced industrialized nations to universally applicable environmental justice (see Chapters 23 and 24). David Schlosberg uses the demands of social activists to argue that global environmental justice "is really threefold: equity in the distribution of environmental risk, recognition of the diversity of the participants and experiences in affected communities, and participation in the political processes which create and manage environmental policy" (Schlosberg 2004: 517). Residing at the most informal end of the institutions continuum, norms, including global environmental justice, are "shared understandings that reflect legitimate social purpose" (Payne 2001: 37). Power in this context derives from the capacity of state representatives to wield communication persuasively in the interest of constructing desirable norms (Guzzini 2005; Hopf 1998; Payne 2001).

Notably, radical approaches to the study of GEP recognize the potential persuasive power of the many non-state actors constitutive of global civil society (see Chapter 4). Specifically, any inequitable distribution of the ill-effects of environmental degradation and responsibility for the costs of redressing them are understood to be rooted in a pervasive lack of recognition of marginalized states, peoples, and cultures (see Chapter 24). Thus their advocates demand "participation for those at the short end of distributional inequity, and participation by those suffering the injustice of cultural recognition" (Schlosberg 2004: 523). Such calls for massively increased participation apply to historically less influential states as well as nongovernmental organizations (NGOs), transnational activist networks (TANs), and subnational activists and other actors – all of which have the potential to respond to the lack of fit between the planet's ecological problems and international governance identified eloquently by Thomas Homer-Dixon (2008) and others (Heinberg 2011; Klare 2012; Meadows et al. 2004). Although the range of responses to this crisis in global environmental governance extends to the local (McKibben 2007), the trend is increasingly toward individual and collective identification with the global (Heise 2008; Lipschutz 2004; Wapner 1995, 2002).

Central areas of research

Research agendas in GEP derive from long-standing IR foci on security, international institutions and domestic politics, and economic growth and development, yet bridge interdisciplinary

studies (primarily with anthropology, international law, political and environmental philosophy, and sociology) to include environmental ethics and activism. The rows in Table 5.1 provide a means for examining how a range of scholars, broadly associated with conventional, mainstream, or radical viewpoints on GEP, might engage this subfield's central areas of research.

Environmental security

Although power does not perfectly determine security with respect to GEP, it is a good conceptual starting point for addressing scholarship on environmental security. Environmental security may be understood, conventionally, in terms of national security (see Chapter 19). Most frequently stated in reference to the United States, this argument identifies environmental degradation as an imminent threat to the nation's territorial integrity, sovereignty, and security. Severe scarcity is posited as highly likely to cause not only civil conflict abroad, which may nonetheless spill over into the United States or its allies, but also international war. As such, national will should be marshaled in the interest of environmental protection. Enthusiasm for this project has waned considerably since its heyday in the immediate post-Cold War era's search for an alternative to the Soviet Union as a patriotic focus. Regardless, it never received overwhelming scholarly support, in part, simply because war is antithetical to environmental protection (Barnett 2001; Deudney 1990; Levy 1995b; Matthew 1999). Furthermore, it is increasingly clear that what the world needs now is globalism, not patriotism (Heise 2008).

Examinations of the foundational relationship among natural resources, power, and conflict have been far more fruitful than any strict identification between national and environmental security. The environmental security problematique can be understood as the threat of conflict over scarce resources (see Chapter 19). This historically compelling relationship has reemerged over the past two decades to account for the United States' incursions in the Middle East and in Central Asia (Klare 2002), as well as the more frequent civil violence over water shortages in China, distribution of land in Mexico, and genocide in Rwanda (Homer-Dixon 2001). Robert Kaplan offers West Africa, specifically, as

> the symbol of worldwide demographic, environmental, and societal stress…Disease, overpopulation, unprovoked crime, scarcity of resources, refugee migrations, the increasing erosion of nation-states and international borders, and the empowerment of private armies, security firms, and international drug cartels are now most tellingly demonstrated through a West African prism.
>
> (Kaplan 1994: 2)

Among GEP scholars, Homer-Dixon (1990, 2001) is most closely associated with arguments linking to violent conflict ecological scarcity due to climate change (Chapter 28), ozone depletion (Chapter 29), loss of forests (Chapter 38) and agricultural lands (Chapter 40), depletion of fisheries (Chapter 36), water pollution or access to fresh water (Chapter 34), and other changes in the quantity or quality of vital resources. Yet he is also chief among many others who recognize that while ecological scarcities do have profound social consequences, including civil and international violence, the effects of scarcity are, at best, more often indirect and highly contingent on nations' varying capacities to respond to social, political, and economic stressors (Gleditsch 1998; Homer-Dixon 1994; Levy 1995b; Matthew 1999). Robert Klare (2002, 2012) ups the ante by charging the United States and the world's other major industrialized nations to engender reduced consumption among their citizens and drastically improve international efforts at collective security (Diamond 2011; Homer-Dixon 2008; see Chapters 16 and 19).

These concluding calls for more effective domestic political institutions and international security institutions would shift attention down a row in Table 5.1. Continuing right, instead, both mainstream and radical views on the role of power in GEP seek to expand the concept of security to incorporate something other than any traditional defense of state interests and territory (Paris 2001; see Chapter 19). Scholars in these analytical traditions recognize, with varying degrees of criticism, that the security contemporary states require does not turn on the unilateral pursuit of generalized national interests (Swatuk 2004). Mainstream scholars typically support broadening security to include economic and ecological elements as well as military strategy, and expanding multilateral options for responding to contemporary security challenges (Haas 1999; Commission on Global Governance 1995). Their radical counterparts go further, and challenge conceptualizations of security defined in terms of (the world's more powerful) nation-states (Barnett 2001; Barnett and Adger 2007; Matthew et al. 2009).

Lloyd Axworthy and Larry Swatuk are among those who embrace the ideal of global – not national – security tied to the well-being of individuals, whether or not they are citizens of relatively self-sufficient advanced industrial nations (Axworthy 2001; Commission on Global Governance 1995; Swatuk 2004). This human security ideal, the brainchild of the United Nations Development Program (UNDP), is a post-Cold War phenomenon designed to reduce human suffering as well as assure security by combining humanitarian, economic, and social issues. In addition to defense against armed conflict and international intervention, human security so defined covers protection from organized crime, criminal violence, and genocide, and provision of good government, including the guaranteed support for human rights, health services, and environmental quality. Axworthy's (2001) support for this reconceptualization of security derives from his recognition that the combined effects of global economic crises and ineffective governance have arguably made it difficult, at best, for many nations to protect their citizens. Despite the accuracy of this situation, human security has been roundly criticized as far too expansive, by definition, to be effective either theoretically or practically (Elkus 2008; Khong 2001; King and Murray 2001; Paris 2001).

International institutions, domestic politics, and transnational activist networks

Moving to the second row in Table 5.1, (liberal) institutionalism easily identifies the most substantial GEP research agenda. Despite conventional disregard for institutions, particularly those statutes, customs, principles, and precedents that are constitutive of international law (see Chapter 10), international environmental regimes have long been the primary stuff of institutional analyses in GEP (see Chapter 9). Given the role of these institutional complexes in mitigating the impacts of human activity on the natural environment, effectiveness has been a long-standing focus of scholarly work. The early development of GEP consisted largely of inductive efforts to draw conclusions about the effectiveness of international environmental institutions from a range of key case studies. Peter Haas, Robert Keohane, and Marc Levy's (Haas et al. 1993) seminal *Institutions for the Earth: Sources of Effective International Environmental Protection* suggests that increasing the capacity of developing nations to implement environmental policy, improving the contractual environment, and elevating governments' ecological concerns are key contributions of effective international environmental institutions. Here "effective" refers to the degree to which the MEAs at the heart of international environmental institutions actually facilitate the domestic implementation necessary to solve identified transboundary and global ecological problems. Assessing the effectiveness of specific international environmental treaties, related institutional arrangements, and regime dynamics continues to be a predominant focus of GEP research (Bernauer 1995; Chayes and Chayes 1991; Haas et al. 1993; Helm and Sprinz 2000;

Levy et al. 1995; Miles 2002; Mitchell 2003, 2006; Victor et al. 1998; Weiss and Jacobson 2000; Young 1999).

Shifting right in Table 5.1 effectively deepens our examination of institutions to include domestic government and political processes, and broadens it to encompass non-state actors, many of which recognize the class, cultural, racial, ethnic, gender, and religious differences that may influence individual and group responses to environmental change. Delving into the domestic sources of nations' positions in the negotiation of MEAs both accounts for their conditions for cooperation, and provides a foundation for comparative analysis of domestic environmental policy (see Chapter 12). Interactions between domestic politics and international environmental negotiations are amenable to analysis as a site for two-level and bargaining games (Putnam 1988). In addition, scholars have developed more specific models for analyzing these interactions in specific cases. For example, Detlef Sprinz (Sprinz and Vaahtoranta 1994; Sprinz and Weiβ 2001; Luterbacher and Sprinz 2001) focuses on nations' vulnerabilities to air pollution, broadly defined, and corresponding abatement costs to explain their negotiating positions; Kate O'Neill (2009) instead studies nations' regulatory structures and hazardous waste industries to determine why nations choose to import/export hazardous waste (see Chapter 33). Their conclusions notably suggest that perceived vulnerability is more significant than actual vulnerability, and a nation's mitigation costs are practically determined by their access to control technologies. Though fruitful, such analyses do not yet suggest that there is sufficient variation among nations' most preferred MEA outcomes to facilitate successful international environmental agreements (Susskind 1994).

The recent proliferation of research on NGOs, social movements, and TANs in GEP, represented in the right column of Table 5.1, has arguably eclipsed attention previously devoted to domestic politics. Collectively, these constituents of global civil society counterbalance government and provide a social space within which individuals and collectivities might challenge extant political and economic powers (Falk 1991; Keane 2003; Lipschutz 1992). With respect to GEP, Paul Wapner explains (and see Chapter 14) that

> Activist organizations are not simply transnational pressure groups, but rather are political actors in their own right…When transnational activists direct their efforts beyond the state, they are politicizing global civil society…that slice of associational life which exists above the individual and below the state, but also across national boundaries.
>
> (Paul Wapner 1995: 312–13).

Early scholarship on global civil society and environmental protection coincided with the unprecedented inclusion of representatives of more than 2,000 NGOs and 45,000 independent environmental and other activists – 17,000 of whom were granted consultative status to participate in the meetings – at the 1992 Earth Summit in Rio de Janeiro.

Contributors to Matthias Finger and Thomas Princen's (1994) volume on environmental NGOs and world politics collectively describe increased activism around ecological issues as a response to the combined effects of the end of the Cold War and rapid economic globalization on natural systems (see Chapter 22). Margaret Keck and Kathryn Sikkink's (1998) work on TANs, which arguably seek to facilitate the political and social change necessary to increase justice and improve human rights, explains the success of NGO campaigns and the informal movements that surround and support them in terms of the networks that connect these actors to key individuals situated both within states and at some distance from them (DeMars 2005; O'Neill 2004; Risse-Kappen 1995; Tarrow 2005; Wapner 2002). Current research on global civil society as the most democratic foundation for a sustainable future decidedly emphasizes

environmental TANs (Betsill and Corell 2001; Gehring and Oberthür 2009; Miller 2007; Pattberg 2007; Wapner 2002). Interestingly, it also explicitly interprets global civil society in terms of regimes as a means of governance without government (Biermann and Pattberg 2008; Buchanan and Keohane 2006; Mitchell et al. 2006; Ward 2006).

Beyond "environment and development"

The bottom row in Table 5.1 traces the ideational bases for the approaches to studying GEP discussed in this chapter from a conventional focus on the self-interested state with sovereign authority over environmental resources within its borders, to the contemporary mainstream acceptance of the identity between environmental protection and economic development, to a range of radical ideas for global governance. While mainstream ideals acknowledge calls for global environmental justice that would permit growth sufficient to afford a sustainable redistribution of resources, they are undermined by a concomitant nearly blind acceptance of the world's liberal market economy. An obvious way around this conundrum, then, would be to move from the global economy in favor of a more manageable, local alternative.

The oxymoronic notion of "sustainable development" in its usual, international context prompts a reconsideration of sustainability at lower – and, importantly, smaller – levels of human organization (see Chapter 15). Activist and author Bill McKibben (2007) argues that we need to dissociate "growth" and "prosperity," and move intentionally toward a future where food and energy, in particular, are consumed in close proximity to where they are produced (see Chapter 15). More generally, he urges more ethical consumption in the interest of responding directly and effectively to individual and community concerns about the natural environment and social justice (Carrier and Luetchford 2012; see Chapters 16 and 24). Attending to the impacts of our choices as consumers is at the heart of new work in GEP that seeks to illuminate the environmental and social toll of Western patterns of consumption (Dauvergne 2010; Princen et al. 2002; see Chapter 16). David Hess's (2009) research on "localist" movements like those advocated by McKibben (2007) suggests that trends toward conscious support of locally owned and operated sources of food, consumer goods, energy, transportation, and media bode well for achieving national and regional sustainability and environmental justice (see Chapter 12). Global environmental governance effectively embraces this idea of intentional localization of sustainability as a means toward democratic transformation of world politics and markets (Falk 1991; Lipschutz 1997, 2004; Wapner 2011; see Chapter 15).

Scientific information and technological innovation

Regardless of the analytical approach one adopts, studying the environmental impacts associated with human activity ultimately depends on the advancement of scientific knowledge and technological innovation (see Chapter 17). Carl Sagan went so far as to claim that we are "absolutely dependent" on science and technology (Head 2006). That is, advanced industrial societies come to understand their experience of the natural environment through the scientific lens, characterized by the process of hypothesis testing. In keeping with Winnie the Pooh's impromptu analysis of the relationship between fir cone size and the speed at which these plant organs move in water (Nordmoe 2004), we learn from an early age to make educated guesses about the causes of changes in the natural environment, and test these working hypotheses. Some of those who ultimately opt for careers in the natural sciences will devote their professional lives to testing relationships between human activity and degradation of the natural environment – repeatedly and with increasing stringency. As scientific certainty about human complicity in environmental

degradation increases, so does the propensity for political intervention to better manage, if not reverse, it. Hence the practice of scientific discovery is central to the politics of environmental protection. GEP concerns these politics to the extent that they address transboundary or global environments, or ecological issues that are ubiquitous across nations or sufficiently egregious to attract international or transnational attention.

Trends in GEP research currently favor analyses of the institutions that govern nations' and organizations' efforts to reduce pollution or conserve resources; yet the field actually covers the gamut of theoretical orientations and ecological issue areas (Speth and Haas 2006). GEP is easily identified with the intractable problem of global warming – the rise in average temperature associated with the emission of carbon dioxide and other greenhouse gases; however, the impetus for the natural environment's entrance on to the global political stage was long-range transboundary air pollution, or acid rain (see Chapter 30), which was chief among the regional environmental concerns that prompted the 1972 Stockholm Conference. Likewise, GEP is often associated with major, global conferences, such as Stockholm and the 1992 Earth Summit – more formally, the United Nations Conference on Environment Development (UNCED) – but many more scholars devote their attention to international environmental incidents, events, and treaties involving smaller numbers of states concerned about relatively more manageable problems, such as reducing a specific air pollutant or conserving a single animal species (DeSombre 2007; Mitchell 2009; Steinberg and VanDeveer 2012).

Whatever the substantive issue of interest, GEP research requires mastery of the defining scientific information and development of a better than average understanding of any technologies available to address the problem. Such specific knowledge informs the investigator's theoretical orientation toward the interaction of science, technology, and politics and contributes to her choice and justification of methodological approach (see Chapters 17 and 18). For example, successful analysis of the regional politics of acid rain demands research on the history of the phenomenon, including review of the underlying atmospheric chemistry and timeline of relevant scientific discoveries and technological developments (see Chapter 30). Although acid rain and dry deposition can occur naturally, it is more likely the result of sulfur dioxide and nitrogen oxide emissions during fossil fuel combustion. These gases react with water, oxygen and other gases to form sulfuric acid, ammonium nitrate, and nitric acid that can be carried long distances by wind before falling back to earth in rain or dust.

This phenomenon affects nations worldwide, especially in Europe, the Americas, and Asia; yet it is best understood as a "transboundary" regional problem, as opposed to a global one. Hence, while there is a broad international support for the framework Convention on Long Range Transboundary Air Pollution (LRTAP), cooperative regulatory action includes bilateral and multilateral accords, states' independent regulation of acid rain precursors, and transnational efforts to develop effective normative support for acid rain control (Levy 1995a). The well-developed science of acid rain, availability of acid rain control technologies, and the number of nations impacted by acid deposition has made this particular long-standing environmental problem amenable to qualitative and quantitative analysis, formal modeling, and political economic inquiry (Allison 1999; Boehmer-Christiansen and Skea 1991; Levy 1995a; Levy et al. 1995; Sprinz and Vaahtoranta 1994).

Scientific consensus and epistemic communities

The role of scientific inquiry in the negotiation of MEAs itself represents a significant area of research within GEP. Emphasizing scientific ideas as "reflective" institutions (see Young 2002), and so arguably best associated with mainstream approaches to GEP, analysis of the development

of scientific consensus and its contribution to the emergence of effective international environmental regimes has proved particularly fruitful (see Chapter 9). Most importantly, Peter Haas (1990, 1992a, 1992b), Karen Litfin (1994), and M.J. Peterson (1992) have examined the epistemic communities, or networks of predominantly scientific and technical experts with policy-relevant knowledge in a specific issue area, in international environmental negotiations. These analyses examine how highly technical knowledge influences decision-making among the international and transnational actors tasked with responding to transboundary and global environmental problems (Sundstrom 2000; see Krasner 1983; see Chapter 14). For example, Haas (1992b) argues persuasively that scientific consensus on the causal relationship between chlorofluorocarbons (CFCs) and stratospheric ozone depletion was critical to the success of the Montreal Protocol (see Chapter 29). Richard Benedick (1998), the United States' chief negotiator in this case, substantiates Haas's argument in his personal account of ozone negotiations.

Scientific skepticism and GEP research

Scientific consensus, or the position agreed upon by the vast majority of scientists and other relevant specialists concerned with a given issue, represents the best possible foundation for environmental policy-making (Barash 2012; Mandia 2011; Pike 2009; see Chapter 17). Although the self-correcting process of science must remain open to alternative, yet still theoretically valid, viewpoints and the accumulation of new information, David Barash explains that it is blessedly "not so open-minded as to let our brains fall out, or our planet overheat" (Barash 2012: 1). Perhaps not; unfortunately, issue-specific experts are not the only sources of influence on GEP. Broaching the contest between scientific and ideological world views perhaps best suited to some radical analysis, Daniel Sarewitz explains that "scientific inquiry is inherently and unavoidably subject to becoming politicized in environmental controversies"(Sarewitz 2004: 385) because facts may be manipulated to suit special interests and the ubiquity of scientific uncertainty fuels claims of scientific dissensus by skeptics and deniers (Block 2008; Jacques et al. 2008; Sarewitz 2004).

Consequently, analysis of the politics of environmental skepticism, especially as it relates to climate change, has recently emerged as another science-based area of research within GEP (see Chapters 28 and 17). Catalyzed by the publication of Bjørn Lomborg's (2001) *Skeptical Environmentalist: Measuring the Real State of the World*, scholarship on climate change skepticism has generated a wealth of information on the conservative bias in skeptics' climate science, the increasing divergence between popular "belief" in global warming and scientists' consensual knowledge about the facts of this critical phenomenon, and the social reasons for these developments in GEP (Jacques 2009, 2006; Jacques et al. 2008; Kysar 2003; Mandia 2011; Schmidt 2010). According to Peter Jacques et al. (2008), "92 percent of the skeptical authors were in some way affiliated to conservative think tanks" (Block 2008). Doran and Zimmerman (2009) report that while Americans tend to believe that most climate scientists do not think that the Earth is warming, and do not agree that human activities are a major cause of that warming, 96 percent of climatologists who are active in climate research actually agree that mean global temperatures have risen compared with pre-1800s levels, and more than 97 percent of them blame human activity for rising temperatures! Jacques et al. (Jacques 2006; Jacques et al. 2008) attribute this effective success of the skeptics' countermovement to a conservative backlash in response to the success of the environmental movement fueled by a reliance on distorted scientific evidence (Diamond 2011; Fagan 2004; Flannery 2006; Kolbert 2006).

Teaching global environmental politics

Even the most cursory review of GEP course syllabi would reveal that in addition to facilitating students' development of a comprehensive and critical understanding of the subfield, instructors also expect them to achieve some level of competency with respect to using knowledge and skills acquired in class to make more ecologically conscious future life decisions. In other words, many GEP scholars practice environmental activism in the classroom (Milton 2002). Hence teaching GEP demands more than simply transmitting a body of knowledge concerning how state and non-state actors interact to solve transboundary and global environmental problems produced as a consequence of human behavior (Mitchell 2009). In light of the dual – ecological and pedagogical – demands of the GEP classroom, this section provides suggestions for incorporating environmentally conscious practices into coursework, in addition to an overview of how the substance of the field tends to be taught on North American college and university campuses.

Course description and topics covered

The typical GEP course is designed for upper division undergraduates and seeks to introduce students to the study of GEP as well as the subfield's major substantive foci. To an extent, then, teaching GEP can consist of a categorical review of literature. Most college undergraduates arrive on campus with little, if any, awareness of "the environment" in the context of IR or comparative politics outside of, maybe, passing knowledge of the science of global warming and its relevance for the Kyoto Protocol or process. Consequently, in addition to covering some subset of themes and issues in the field, courses on GEP tend to incorporate a brief history of the substance of GEP, as well as include details on the politics of scientific discovery, and the international treaty-making process. Comprehensive GEP textbooks conform to instructors' demands for this body of material and feature sections on the history or emergence of GEP (see Chapter 2), international environmental conflict and cooperation (see Chapter 19), environmental treaty-making and/or regime formation (see Chapters 8 and 9), science and scientific uncertainty (see Chapters 17 and 18), non-state actors and their roles in GEP (see Chapter 14), environment and development (or sustainability; see Chapter 15), and selected case studies (see Chasek et al. 2010; DeSombre 2007; O'Neill 2009; Vaughn 2011).

Alternative texts, often developed for advanced undergraduate or graduate students, build much of this necessary content into a favored conceptual or philosophical framework. Ronald Mitchell's (2009) methodologically rigorous *International Politics and the Environment*, for instance, emphasizes analysis of global environmental problems and substantive cases. This decidedly mainstream, institutional text, or one that would be situated at the center of Table 5.1, follows an overview of the GEP subfield and review of theory-building in IR with a definition of international environmental problems conceptually – i.e., as commons or upstream/downstream issues. It then explains theoretical perspectives in terms of how population, affluence, and available technologies interact to impact the natural environment (the IPAT identity), before turning to the negotiation of international treaties to address these impacts, and methods for assessing their effectiveness.

Ronnie Lipschutz's normative *Global Environmental Politics* instead incites readers to act because "only politics can save the environment" (Lipschutz 2004: xi). His critical text – "radical" with reference to the right column in Table 5.1 – defines global environmental problems in terms of our consumption choices (see Chapter 16), then deconstructs "global environment" by way of revealing the relationship between the economic globalization and environmental degradation

occurring outside our own front doors (see Chapter 22). Lipschutz's illustrative analysis calls the reader to local action premised on the expectation that solutions to global environmental problems will require behavioral changes on the part of individuals.

Place-based education and contemplation

Place-based education refers to the provision of "meaningful contextual experiences intended to complement and expand classroom" (Knapp 1996: 1). Insofar as GEP instructors would like their courses to engender students to make more ecologically conscious decisions, incorporating opportunities to "go outside" might be considered essential. Literatures in the natural and social sciences alike indicate that our experiences in nature influence our relationship with nonhuman life and consequent behavior (Milton 2002; Warren 1997; Wilson 1984). Milton (2002), in particular, argues that positive experiences in nature, from idolizing a favorite tree to frequent backcountry excursions, provide the foundation for environmental activism. Echoing biologist Edward O. Wilson's (1984) biophilia hypothesis, or the existence of a genetic basis for humans' interconnection with their natural environment, McKibben (2006) goes further, arguing that we can only experience ourselves as fully human in relationship to the natural world. Incorporating a place-based educational opportunity need not be complicated or administratively difficult. So supplementing a GEP course can be as easy as requiring "field" work in the community in connection with a term paper or presentation, or offering extra credit for community service related to the natural environment.

Enabling students to be fully present in the classroom is as important to their exposure to GEP as getting them outside. Mindfulness is regarded as key to stress reduction to improve psychological and physical health and well-being, for instance. It has also become more familiar in the classroom, where teaching students to "quiet the mind" increases their focus, self- and collective awareness, and overall learning potential (Brown 2007; Odahowski 2004; Zajonc 2006). The introduction of mindfulness and other contemplative practices intended "to cultivate a personal capacity for deep concentration and insight" (Zajonc 2006) is characteristic of contemplative pedagogy (Apffel-Marglin and Bush 2004; Brady 2007). The simple addition of a period of silent meditation at the beginning of class supports students' efforts to become present in and attentive to lecture and class discussion. In addition, the Center for Contemplative Mind in Society identifies contemplative reading, mindful walking and other forms of locomotion, focused experiences in nature, yoga, and a number of other contemporary physical and artistic practices as likewise contemplative. Incorporating these practices may require more preparation – even training, if appropriate specialists are unavailable.

Conclusion

This chapter's approach to research in GEP, the role of scientific inquiry in the subfield, and teaching in GEP provides a framework informed by IR for approaching studies in the field that may be adapted for use with any substantive area of interest, as well as used to develop undergraduate and graduate coursework in GEP. Although the chapter reflects the subfield's emphasis on international environmental negotiations and institutional analyses, it recognizes the ongoing shift to the left associated with novel research on the potentially enhanced role for global civil society in global environmental governance. This emerging focus in GEP research is particularly well suited to encouraging greater use of alternative pedagogies in college courses on GEP and related topics. Outdoor experiences and contemplative practices are among these alternatives for consideration by those who teach global environmental politics.

References

Allison, Juliann Emmons. 1999. "Fortuitous Consequence: The Domestic Politics of the 1991 Canada–United States Agreement on Air Quality." *Policy Studies Journal* 27(2): 347–59. doi:10.1111/j.1541–0072.1999.tb01972.x.

Apffel-Marglin, F., and M. Bush. 2004. "Healing the Breach of Faith toward Everything that Is: Integration in Academia." www.contemplativemind.org/programs/.../Apffel-Marglin_Bush.pdf

Axworthy, Lloyd. 2001. "Human Security and Global Governance: Putting People First." *Global Governance* 7: 19.

Barash, David. 2012. "On Scientific Consensus". *Chronicle of Higher Education. Brainstorm*. Available HTTP: <http://chronicle.com/blogs/brainstorm/on-scientific-consensus/49895>.

Barnett, Jon. 2001. *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*. London: Zed Books.

Barnett, Jon, and W. Neil Adger. 2007. "Climate Change, Human Security and Violent Conflict." *Political Geography* 26(6): 639–55. doi:10.1016/j.polgeo.2007.03.003.

Benedick, Richard Elliot. 1998. *Ozone Diplomacy: New Directions in Safeguarding the Planet, Enlarged Edition*. 2nd ed. Cambridge, MA: Harvard University Press.

Bernauer, Thomas. 1995. "The Effect of International Environmental Institutions: How We Might Learn More." *International Organization* 49(02): 351–77. doi:10.1017/S0020818300028423.

Bernstein, Steven. 2001. *The Compromise of Liberal Environmentalism*. New York: Columbia University Press.

Betsill, Michele M., and Elisabeth Corell. 2001. "NGO Influence in International Environmental Negotiations: A Framework for Analysis." *Global Environmental Politics* 1(4): 65–85. doi:10.{1162/152638001317146372}.

Biermann, Frank, and Philipp Pattberg. 2008. "Global Environmental Governance: Taking Stock, Moving Forward." *Annual Review of Environment and Resources* 33(1): 277–94. doi:10.1146/annurev.environ.33.050707.085733.

Block, Ben. 2008. "Environmental Skeptics are Overwhelmingly Politicized, Study Says." *Worldwatch Institute: Vision for a Sustainable World*. Available HTTP: <http://www.worldwatch.org/node/5782>.

Boehmer-Christiansen, Sonja, and Jim Skea. 1991. *Acid Politics*. London: John Wiley.

Bonan, Gordon B. 2008. "Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests." *Science* 320: 1444–9.

Brady, Richard. 2007. "Learning to Stop, Stopping to Learn: Discovering the Contemplative Dimension in Education." *Journal of Transformative Education* 5(4): 372–94. doi:10.{1177/1541344607313250}.

Brown, Patricia Leigh. 2007. "In the Classroom, a New Focus on Quieting the Mind." *New York Times*, June 16, sec. National. Available HTTP: <http://www.nytimes.com/2007/06/16/us/16mindful.html>.

Buchanan, Allen, and Robert O. Keohane. 2006. "The Legitimacy of Global Governance Institutions." *Ethics & International Affairs* 20(4): 405–37. doi:10.1111/j.1747–7093.2006.00043.x.

Carrier, James, and Peter Luetchford, eds. 2012. *Ethical Consumption: Social Value and Economic Practice*. New York: Berghahn Books.

Chasek, Pamela S., David Leonard Downie, and Janet Welsh Brown. 2010. *Global Environmental Politics*. Boulder, CO: Westview Press.

Chayes, Abram, and Antonia Chayes. 1991. "Adjustment and Compliance Processes in International Regulatory Regimes." In *Preserving the Global Environment*, ed. Jessica Tuchman Mathews, 280–308. New York: W.W. Norton.

Commission on Global Governance. 1995. *Our Global Neighborhood: The Report of the Commission on Global Governance*. New York: Oxford University Press.

Dasgupta, Susmita, Benoit Laplante, Hua Wang, and David Wheeler. 2002. "Confronting the Environmental Kuznets Curve." *Journal of Economic Perspective* 16(1): 147–68.

Dauvergne, Peter. 2010. *The Shadows of Consumption: Consequences for the Global Environment*. Cambridge, MA: MIT Press.

DeMars, William. 2005. *NGOs and Transnational Networks: Wild Cards in World Politics*. London: Pluto Press.

DeSombre, Elizabeth R. 2007. *Global Environment and World Politics*. 2nd ed. New York: Continuum.

Deudney, Daniel. 1990. "The Case against Linking Environmental Degradation and National Security." *Millennium: Journal of International Studies* 19(3): 461–76.

Diamond, Jared. 2011. *Collapse: How Societies Choose to Fail or Succeed*. Revised ed. London: Penguin Books.

Doran, Peter T., and Maggie Kendall Zimmerman. 2009. "Examining the Scientific Consensus on Climate Change." *EOS* 90 (23) (January 20): 1–2.

Elkus, Adam. 2008. "Human Security, Environmental Security, and National Security." *Rethinking Security*. Available HTTP: <http://rethinkingsecurity.typepad.com/rethinkingsecurity/2008/12/human-security-environmental-security-and-national-security.html>.
Fagan, Brian. 2004. *The Long Summer: How Climate Changed Civilization*. Cambridge, MA: Basic Books.
Falk, Richard. 1991. *Explorations on the Edge of Time: The Prospects for World Order*. Philadelphia, PA: Temple University Press.
Finger, Matthias, and Thomas Princen. 1994. *Environmental NGOs in World Politics: Linking the Local and the Global*. 1st ed. London: Routledge.
Flannery, Tim. 2006. *The Weather Makers: The History and Future Impact of Climate Change*. Melbourne: Text Publishing.
Gehring, Thomas, and Sebastian Oberthür. 2009. "The Causal Mechanisms of Interaction between International Institutions." *European Journal of International Relations* 15(1): 125–56. doi:10.{1177/1354066108100055}.
Gleditsch, Nils Petter. 1998. "Armed Conflict and the Environment: A Critique of the Literature." *Journal of Peace Research* 35(3): 381–400. doi:10.{1177/0022343398035003007}.
Grossman, G., and A. Krueger. 1995. "Economic Growth and the Environment." *Quarterly Journal of Economics* 110: 353–77.
Guzzini, Stefano. 2005. "The Concept of Power: A Constructivist Analysis." *Millennium: Journal of International Studies* 33: 495–522.
Haas, Peter M. 1990. *Saving the Mediterranean: The Politics of International Environmental Cooperation*. New York: Columbia University Press.
—— 1992a. "Introduction: Epistemic Communities and International Policy Coordination." *International Organization* 46(1): 1–35.
—— 1992b. "Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone." *International Organization* 46(1): 187–224. doi:10.1017/S002081830000148X.
—— 1999. "Social Constructivism and the Evolution of Multilateral Environmental Governance." In Aseem Prakash and Jeffrey A. Hart, eds., *Globalization and Governance*. London: Routledge.
Haas, Peter M., Robert O. Keohane, and Marc A. Levy. 1993. *Institutions for the Earth: Sources of Effective International Environmental Protection*. Cambridge, MA: MIT Press.
Head, Tom. 2006. *Conversations with Carl Sagan*. Jackson: University Press of Mississippi.
Heinberg, Richard. 2011. *The End of Growth: Adapting to Our New Economic Reality*. Gabriola Island, BC: New Society Publishers.
Heise, Ursula K. 2008. *Sense of Place and Sense of Planet: The Environmental Imagination of the Global*. New York: Oxford University Press.
Helm, Carsten, and Detlef Sprinz. 2000. "Measuring the Effectiveness of International Environmental Regimes." *Journal of Conflict Resolution* 44(5): 630–52. doi:10.{1177/0022002700044005004}.
Hess, David J. 2009. *Localist Movements in a Global Economy: Sustainability, Justice, and Urban Development in the United States*. Cambridge, MA: MIT Press.
Holsti, K.J. 1964. "The Concept of Power in the Study of International Relations." *Background* 7(4): 179–94. doi:10.{2307/3013644}.
Homer-Dixon, Thomas F. 1990. "On the Threshold: Environmental Changes as Causes of Acute Conflict." *International Security* 116(2): 76–115.
—— 1994. "Environmental Scarcities and Violent Conflict: Evidence from Case." *International Security* 19(1): 5–40.
—— 2001. *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press.
—— 2008. *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*. Washington, DC: Island Press.
Hopf, Ted. 1998. "The Promise of Constructivism in International Relations Theory." *International Security* 23(1): 171–200. doi:10.{2307/2539267}.
Jacques, Peter. 2006. "The Rearguard of Modernity: Environmental Skepticism as a Struggle of Citizenship." *Global Environmental Politics* 6(1): 76–101. doi:10.1162/glep.2006.6.1.76.
Jacques, Peter J. 2009. *Environmental Skepticism*. Burlington, VT: Ashgate.
Jacques, Peter J., Riley E. Dunlap, and Mark Freeman. 2008. "The Organisation of Denial: Conservative Think Tanks and Environmental Scepticism." *Environmental Politics* 17(3): 349–85. doi:10.1080/09644010802055576.
Kaplan, Robert D. 1994. "The Coming Anarchy." *The Atlantic*, February. Available HTTP: <http://www.theatlantic.com/magazine/archive/1994/02/the-coming-anarchy/304670/>.

Keane, John. 2003. *Global Civil Society?* Cambridge: Cambridge University Press.
Keck, Margaret E., and Kathryn Sikkink. 1998. *Activists beyond Borders: Advocacy Networks in International Politics*. Ithaca, NY: Cornell University Press.
Khong, Yuen Foong. 2001. "Human Security: A Shotgun Approach to Alleviating Human Misery?" *Global Governance* 7(3): 231–6.
King, Gary, and Christopher J.L. Murray. 2001. "Rethinking Human Security." *Political Science Quarterly* 116(4): 585–610. doi:10.{2307/798222}.
Klare, Michael T. 2002. *Resource Wars: The New Landscape of Global Conflict*. With a New Introduction by the Author. New York: Holt.
—— 2009. *Rising Powers, Shrinking Planet: The New Geopolitics of Energy*. New York: Holt.
—— 2012. *The Race for What's Left: The Global Scramble for the World's Last Resources*. New York: Metropolitan Books.
Knapp, C.E. 1996. *Just beyond the Classroom: Community Adventures for Interdisciplinary Learning*. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools.
Kolbert, Elizabeth. 2006. *Field Notes from a Catastrophe: Man, Nature, and Climate Change*. New York: Bloomsbury.
Krasner, Stephen D., ed. 1983. *International Regimes*. Ithaca, NY: Cornell University Press.
Kysar, Douglas A. 2003. "Some Realism about Environmental Skepticism: The Implications of Bjørn Lomborg's *The Skeptical Environmentalist* for Environmental Law and Policy." *Ecology Law Quarterly* 30: 223.
Leonard, Andrew. 2006. "About that Environmental Kuznets Curve." *Economist's View*. Available HTTP: <http://economistsview.typepad.com/economistsview/2006/08/about_that_envi.html>
Levy, Marc. 1995a. "International Co-operation to Combat Acid Rain." In *Green Globe Yearbook of International Co-operation on Environment and Development*, 59–68. New York: Oxford University Press.
—— 1995b. "Is the Environment a National Security Issue?" *International Security* 20(2): 35–62. doi:10.{2307/2539228}.
Levy, Marc A., Oran R. Young, and Michael Zürn. 1995. "The Study of International Regimes." *European Journal of International Relations* 1(3): 267–330. doi:10.{1177/1354066195001003001}.
Lipschutz, Ronnie D. 1992. "Reconstructing World Politics: The Emergence of Global Civil Society." *Millennium: Journal of International Studies* 21(3): 389–420.
—— 1997. "From Place to Planet: Local Knowledge and Global Environmental Governance." *Global Governance* 3(1): 83–102.
—— 2004. *Global Environmental Politics: Power, Perspectives, and Practice*. Washington, DC: CQ Press.
Litfin, Karen. 1994. *Ozone Discourses: Science and Politics in Global Environmental Cooperation*. New York: Columbia University Press.
Lomborg, Bjørn. 2001. *The Skeptical Environmentalist: Measuring the Real State of the World*. Cambridge: Cambridge University Press.
Luterbacher, Urs, and Detlef F. Sprinz. 2001. *International Relations and Global Climate Change*. Cambridge, MA: MIT Press.
McKibben, Bill. 2006. *The End of Nature*. New York: Random House.
—— 2007. *Deep Economy: The Wealth of Communities and the Durable Future*. New York: Times Books.
Mandia, Scott A. 2011. "Global Warming: Man or Myth." Available HTTP: <http://www2.sunysuffolk.edu/mandias/global_warming/global_warming_scientific_consensus.html>.
Matthew, Richard A. 1999. *Contested Grounds: Security and Conflict in the New Environmental Politics*. Ed. Daniel H. Deudney. Albany: SUNY Press.
Matthew, Richard A., Jon Barnett, Bryan McDonald, and Karen L. O'Brien, eds. 2009. *Global Environmental Change and Human Security*. Cambridge, MA: MIT Press.
Meadows, Donella H., Jorgen Randers, and Dennis L. Meadows. 2004. *Limits to Growth: The 30-Year Update*. 3rd ed. Post Mills, VT: Chelsea Green.
Miles, Edward L. 2002. *Environmental Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press.
Miller, Clark A. 2007. "Democratization, International Knowledge Institutions, and Global Governance." *Governance* 20(2): 325–57. doi:10.1111/j.1468–0491.2007.00359.x.
Milton, Kay. 2002. *Loving Nature: Towards an Ecology of Emotion*. New York: Routledge.
Mitchell, Ronald B. 2003. "International Environmental Agreements: A Survey of their Features, Formation, and Effects." *Annual Review of Environment and Resources* 28(1): 429–61. doi:10.1146/annurev.energy.28.050302.105603.

Mitchell, Ronald B. 2006. "Problem Structure, Institutional Design, and the Relative Effectiveness of International Environmental Agreements." *Global Environmental Politics* 6(3): 72–89. doi:10.1162/glep.2006.6.3.72.

—— 2009. *International Politics and the Environment*. Thousand Oaks, CA: Sage.

Mitchell, Ronald B., William C. Clark, David W. Cash, and Nancy M. Dickson, eds. 2006. *Global Environmental Assessments: Information and Influence*. Cambridge, MA: MIT Press.

Nordmoe, Eric D. 2004. "Of Poohsticks and p-Values: Hypothesis Testing in the Hundred Acre Wood." *Teaching Statistics* 26(2): 56–8. doi:10.1111/j.1467–9639.2004.00163.x.

Odahowski, Marga. 2004. "Mindfulness in Higher Education." faculty.virginia.edu/odahowski/moddocs/MindfulnessinHigherEd.pdf.

O'Neill, Kate. 2004. "Transnational Protest: States, Circuses, and Conflict at the Frontline of Global Politics 1." *International Studies Review* 6(2): 233–52. doi:10.1111/j.1521–9488.2004.00397.x.

—— 2009. *The Environment and International Relations*. Cambridge: Cambridge University Press.

Paris, Roland. 2001. "Human Security: Paradigm Shift or Hot Air?" *International Security* 26(2): 87–102. doi:10.{1162/016228801753191141}.

Pattberg, Philipp H. 2007. *Private Institutions and Global Governance: The New Politics of Environmental Sustainability*. Cheltenham: Edward Elgar.

Payne, Roger A. 2001. "Persuasion, Frames, and Norm Construction." *European Journal of International Relations* 7(1): 37–61.

Peterson, M.J. 1992. "Whalers, Cetologists, Environmentalists, and the International Management of Whaling." *International Organization* 46 (1): 147–86.

Pike, Rachel. 2009. "Rachel Pike: The Science behind a Climate Headline." Video on TED.com. Available HTTP: <http://www.ted.com/talks/rachel_pike_the_science_behind_a_climate_headline.html>.

Prieur, Fabien. 2009. "The Environmental Kuznets Curve in a World of Irreversibility." *Economic Theory* 40: 57–90.

Princen, Thomas, Michael Maniates, and Ken Conca, eds. 2002. *Confronting Consumption*. Cambridge, MA: MIT Press.

Putnam, Robert D. 1988. "Diplomacy and Domestic Politics: The Logic of Two-Level Games." *International Organization* 42(3): 427–60.

Redford, Kent H., and Steven E. Sanderson. 1992. "The Brief, Barren Marriage of Biodiversity and Sustainability?" *Bulletin of the Ecological Society of America* 73(1): 36–9.

Risse-Kappen, Thomas. 1995. *Bringing Transnational Relations Back In: Non-State Actors, Domestic Structures and International Institutions*. New York: Cambridge University Press.

Ruggie, John Gerard. 1982. "International Regimes, Transactions, and Change: Embedded Liberalism in the Postwar Economic Order." *International Organization* 36(2): 379–415.

Sarewitz, Daniel. 2004. "How Science Makes Environmental Controversies Worse." *Environmental Science & Policy* 7: 385–403.

Schlosberg, David. 2004. "Reconceiving Environmental Justice: Global Movements and Political Theories." *Environmental Politics* 13(3): 517–40.

Schmidt, Charles W. 2010. "A Closer Look at Climate Change Skepticism." *Environmental Health Perspectives* 118(12): A536–A540.

Schreurs, Miranda A., and Elizabeth Economy, eds. 1997. *The Internationalization of Environmental Protection*. Cambridge: Cambridge University Press.

Speth, James Gustave, and Peter Haas. 2006. *Global Environmental Governance: Foundations of Contemporary Environmental Studies*. Washington, DC: Island Press.

Sprinz, Detlef F., and Tapani Vaahtoranta. 1994. "The Interest Based Explanation of International Environmental Policy." *International Organization* 48(1): 77–105.

Sprinz, Detlef F., and Martin Weiβ. 2001. "Domestic Politics and Global Climate Policy." In U. Luterbacher and D.F. Sprinz, eds., *International Relations and Global Climate Change*, 67–94. Cambridge, MA: MIT Press.

Steinberg, Paul F. 2001. *Environmental Leadership in Developing Countries: Transnational Relations and Biodiversity Policy in Costa Rica and Bolivia*. Cambridge, MA: MIT Press.

Steinberg, Paul F., and Stacy D. VanDeveer, eds. 2012. *Comparative Environmental Politics: Theory, Practice, and Prospects*. Cambridge, MA: MIT Press.

Stern, David. 1996. "Economic Growth and Environmental Degradation: The Environmental Kuznets Curve and Sustainable Development." *World Development* 24(7): 1151–60.

—— 2001. "Is there an Environmental Kuznets Curve for Sulfur?" *Journal of Environmental Economics and Management* 41(2): 162–78.
—— 2004. "The Rise and Fall of the Environmental Kuznets Curve." *World Development* 32(8): 1419–39.
Sundstrom, Mikael. 2000. "A Brief Introduction: What is an Epistemic Community?" pp. 1–9. Print.
Susskind, Lawrence E. 1994. *Environmental Diplomacy: Negotiating More Effective Global Agreements*. New York: Oxford University Press.
Swatuk, Larry A. 2004. "Environmental Security in Practice: Transboundary Natural Resource Management in Southern Africa". Conference Paper. The Hague.
Tarrow, Sidney. 2005. *The New Transnational Activism*. Cambridge: Cambridge University Press.
Tilman, David, David Wedin, and Johannes Knops. 1996. "Productivity and Sustainabiilty Influenced by Biodiversity in Grassland Ecosystems." *Nature* 379 (February): 718–20.
Vaughn, Jacqueline. 2011. *Environmental Politics: Domestic and Global Dimensions*. 6th ed. Belmont, CA: Wadsworth Publishing.
Victor, David, Kal Raustiala, and Eugene B. Skolnikoff, eds. 1998. *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*. Cambridge, MA: MIT Press.
Wapner, Paul. 1995. *Environmental Activism and World Civic Politics*. Albany: SUNY Press.
—— 2002. "Horizontal Politics: Transnational Environmental Activism and Global Cultural Change." *Global Environmental Politics* 2(2): 37–62. doi:10.{1162/15263800260047826}.
—— 2011. "Civil Society and the Emergent Green Economy." *Review of Policy Research* 28(5): 525–30. doi:10.1111/j.1541–1338.2011.00520.x.
Ward, Hugh. 2006. "International Linkages and Environmental Sustainability: The Effectiveness of the Regime Network." *Journal of Peace Research* 43(2): 149–66. doi:10.{1177/0022343306061545}.
Warren, Karen J., ed. 1997. *Ecofeminism: Women, Culture, Nature*. Bloomington: Indiana University Press.
WCED (World Commission on Environment and Development) 1987. *Our Common Future*. Oxford: Oxford University Press.
Weiss, Edith Brown, and Harold K. Jacobson. 2000. *Engaging Countries: Strengthening Compliance with International Environmental Accords*. Cambridge, MA: MIT Press.
Wilson, Edward O. 1984. *Biophilia*. Cambridge, MA: Harvard University Press.
Young, Oran R., ed. 1999. *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Cambridge, MA: MIT Press.
—— 2002. "Are Institutions Intervening Variables or Basic Causal Forces? Causal Clusters Versus Causal Chains in International Society." In *Realism and Institutionalism in International Studies*, ed. Michael Brecher and Frank P. Harvey. Ann Arbor: University of Michigan Press.
Zajonc, Arthur. 2006. "Contemplative and Transformative Pedagogy." *Kosmos Journal* 5(1): 1–6.

6

Advanced scholarship

Interdisciplinary research at the science–policy interface

Peter M. Haas and Ronald B. Mitchell

Introduction

How can we better organize and publish meaningful research to help us better understand and respond to the global environment problems we face? This chapter provides suggestions for successful interdisciplinary research on international environmental politics, based on a review of published and unpublished works in the field. Usable science and knowledge is essential for devising effective environmental policies to address major global environmental threats, including climate change (see Chapter 28). Most policy analysts believe that better public discourse and elite deliberations require reliable knowledge that is accurate and socially legitimate (Haas 2004; Mitchell et al. 2006). Accurate knowledge in the environmental domain must be interdisciplinary in order to capture the complex array of interactions between social and physical activities that give rise to global environmental threats. Legitimate knowledge must enjoy a social pedigree, which in practice is often the peer-review process. For example, the Intergovernmental Panel on Climate Change (IPCC) requires that all information that it presents be published or accepted in peer-reviewed journals and books. While this requirement leads to a lag in the dissemination of scientific knowledge to policy making, it does enforce the legitimacy of the knowledge that is being presented. Consequently, despite efforts by "climate denialists" to delegitimize climate change science over the last several years in the United States and the United Kingdom, the integrity of the climate change science was ultimately upheld by the courts and high-level oversight panels in each country.

Many scientists are frustrated that their work is not readily recognized in the policy community (Hulme 2009; Schneider 2009; Bradley 2011). One recent approach to science communication focuses on the rhetorical presentation of science and the psychological factors that influence its reception (Boykoff and Boykoff 2004; Leiserowitz et al. 2006; Boykoff 2011). Others look at the political constraints operating on governments that impede the reception of new information which may require costly new measures (Hulme 2009), or from entrenched domestic interests in the United States (Oreskes 2007; Schneider 2009; Oreskes and Conway 2010; Bradley 2011). In this chapter we focus on the instrumental means by which usable knowledge is generated and circulated (see also Chapter 17). Elsewhere Haas has argued that credible science is provided by epistemic communities (Haas 2001, 2004, 2004, 2007). Here we

focus on the published medium by which epistemic communities may better make their voices heard in the public discourse. We draw largely on experiences from published and unpublished manuscripts from the MIT Press series on Science, Politics and the Environment, which has published 18 edited and multiauthored interdisciplinary volumes on climate change.

The need for interdisciplinary knowledge about global environmental threats

Although the causes and effects of global environmental problems tend to be multidisciplinary and interdisciplinary, modern scholars too often are disciplinary. The complexity of environmental issues – in terms of the number of and interactions among variables, the length of causal chains, and the extent of interactions across time, space, and scale – requires insights from multiple disciplines to capture accurately the extensive and multiple understandings of their causes, causal mechanisms, and effects (Price 1992; Jacobson and Price 1990; Wiman 1991; Consortium for International Earth Science Information Network (CIESIN) 1992; National Research Council 1999a; Brewer and Stern 2005; Biermann 2007). Despite this, most scholars are trained – and often continue to think – in ways that are strongly disciplinary. As Gary Brewer cleverly quipped, "the world has problems, but universities have departments" (Snow 1962; Brewer 1999: 328). Addressing this disconnect between the problems we face and the solutions we offer is akin to reconciling different "epistemic cultures," i.e., the habits and beliefs associated with different academic disciplines (Knorr-Cetina 1999). Given this, how can we better organize and publish meaningful research to help us better understand and respond to the global environmental problems we face? (See also Chapter 5.)

Since environmental problems emerged on the scholarly agenda in the 1970s, academics have debated the proper way to analyze their causes and effects. Alvin Weinberg, in 1972, called for "transdisciplinary" work that went beyond single discipline studies of environmental issues (Weinberg 1972). Others promoted the virtues of multidisciplinary work that drew on various disciplines. Tribe and colleagues noted that variation in analyses of a given environmental problem was likely to reflect, in large measure, the disciplinary values and perspectives of the analysts rather than real variation in the problem unless an interdisciplinary approach was used to help those from different disciplines converge on common values and methods (Tribe et al. 1976). Integrated assessment modelers, particularly in Europe in the 1990s, frustrated by their lack of influence on policy-makers, argued for interdisciplinary work that included policy-makers and stakeholders at the outset. Indeed, some have argued that environmental complexity exceeds the limits of traditional policy analysis and can only be meaningfully addressed through dialogues among such diverse groups (Ravetz 1986; Funtowicz and Ravetz 1991, 2001; Kasemir et al. 2003)

Training environmental scholars

Views about the proper training of environmental scholars have changed significantly over time, with corresponding changes in terminology from "generalists" to "multidisciplinary," "interdisciplinary," "transdisciplinary," and "sustainability" scientists. During the 1960s and 1970s, people sought to help graduate students become *generalists* by training them in several aspects of the multiple fields needed to meaningfully contribute to our understanding of a problem. This approach ran into two problems. First, were institutional incentives: universities lacked tenure track jobs for such individuals, either failing to hire them or placing them in programs (rather than departments) in which they trained few if any graduate students who could reproduce, develop, and refine their ideas. Second, were individual capacities: as the number, magnitude, and technical

nature of environmental problems grew over time, it soon became clear that few individuals could master the array of tools and scope of knowledge to conduct environmental research.

By the 1980s, *multidisciplinary* had become the professional mantra, largely in response to the institutional incentive and individual capacity problems mention above. This approach saw the answer as building teams of scholars from diverse *social science* disciplines who individually could receive tenure and promotions within existing university structures but who collectively could shed better light on the complex environmental problems in question(Keohane and Ostrom 1995; Young 1997, 1999; Miles et al. 2002; Young et al. 2008). It was hoped that teams composed of individuals well versed in their own disciplines but interested in working with those from other disciplines could generate better insights by creating analytic synergies and identifying and removing disciplinary blind spots.

During the 1990s, this multidisciplinary perspective transitioned into an *interdisciplinary* one that sought to bridge the disciplinarian chasm that traditionally divides the social sciences from the natural sciences and engineering (Social Learning Group 2001a, 2001b; Miller and Edwards 2001; Schellnhuber et al. 2003; Jasanoff and Martello 2004) This shift urged greater collaboration across this chasm in an effort to progressively remedy the problem that social scientists often got the natural science wrong and natural scientists and engineers often got the social science wrong, with either error posing the risk that the science would be wrong and/or irrelevant to policymakers.

Throughout this period and into the 2000s, policymakers demonstrated an increasing desire for "usable" science that was not only ecologically sound but was also politically, economically, and sociologically informed while scholars demonstrated an increasing desire to contribute to policy debates and a frustration that their work so rarely did so. Both as a reflection of, and contributor to, these trends, increasing attention was paid to those who were calling for *transdisciplinary* work. Such work sought to generate new theoretical frameworks for understanding social–ecological relationships rather than, as earlier work was accused of doing, simply trying to better understand the causes and effects of particular social–ecological problems (Jasanoff 2003, 2004; Kasemir et al. 2003; Brewer and Stern 2005). Such an approach aspires to forging a new theoretical framework for understanding environmental complexity that is drawn from a hands-on dialogue between practitioners, civil society advocates, and active scientists across the full spectrum of natural and social sciences and humanities. It also cautions against the hubris of a physics-based nomothetic approach to knowledge cumulation, rather focusing on deeper understandings of specific important problems through participatory learning.

Some recent scholars have called for interdisciplinary, international research teams that encompass not only academic researchers but also policymakers under an umbrella of Sustainability Science (Gallopin 2006; Kates et al. 2001; see Chapter 15). In this view, for interdisciplinary research to be successful, it must involve individuals from a range of disciplines, each of whom is well trained in their own discipline; has some familiarity with the core concepts of other relevant disciplines; and is skilled in making the core concepts of their discipline accessible to other scholars, policy-makers, and stakeholders. Assembling teams of such scholars is thought to promote progressive research that generates new knowledge and new frameworks of understanding that could not, or would be unlikely to, emerge from a single discipline's perspective.

The US National Academy of Sciences, in a series of reports initiated in the early 1990s, proposed a division of labor for socio-ecological research. In the National Academy's rubric, the social sciences can help explain the causes (or driving forces) of human behaviors that lead to global environmental change. The social sciences can also help explain the process by which societies and decision-makers respond to identified threats and thus help better understand the likelihood, means, and conditions that foster or inhibit alternative collective responses. The

natural sciences can help explain how problems unfold and identify goals for sustainable responses. In turn, different disciplines can contribute in ways that relate to their core concepts: power and institutions from political science, markets and price signals from economics, public opinion and social attitudes from sociology and political science, local knowledge and organization from anthropology, issues of law and enforcement from legal scholars, and the like. Similarly distinct fields of natural science can contribute insights into the behavior of different types of ecosystems (Rayner and Malone 1998; National Research Council 1999b; Biermann 2007).

Such calls for interdisciplinarity, of whatever sort, complement rather than replace more traditional disciplinary efforts. A full understanding of socio-ecological systems will always require the deep disciplinary research that stays within more traditional disciplinary boundaries. For instance, in political science, *Institutions for the Earth* (Haas et al. 1993), a team-based project undertaken by political scientists, looked at the question of how international institutional design can improve the management of shared ecosystems, as well as some international public goods (see Chapters 8 and 9). It found that institutions that enhance cooperation, concern, and capacity were more likely to yield beneficial results than those without. Other groups of political scientists have confirmed that regimes with organized scientific involvement (epistemic communities) yield more comprehensive regulatory commitments and also better environmental outcomes than those without (Andresen et al. 2000; Miles et al. 2002; Haas 2007; Biermann and Pattberg 2012; see Chapter 17).

Conducting effective environmental policy research

How can effective research on global environmental issues be conducted? A key conclusion from this review of the philosophy of science for socio-ecological research suggests at the very least that meaningful work is best performed by teams of scholars. Several recent books have also tried to develop some heuristics for effective environmental policy research (Benda et al. 2002; Bergmann et al. 2005). Our judgments are based on our experiences as authors, as participants in interdisciplinary research projects, as editors of journals and book series, and as peer reviewers for journals, publishers, and foundations.

For present purposes, we consider research as effective when it provides new insights into the causes or consequences of global environmental problems in ways that foster, in the short or long term, human society's ability to mitigate or adapt to those problems. Achievements in this realm can be observed (if not measured) by reference to the degree that research:

- is published in peer-reviewed journals or with university presses,
- trains new scholars,
- leads policy-makers and stakeholders to accept new understandings of a problem and respond in more effective ways to mitigate or adapt to those problems.

The results of most past collective research projects in the global environmental politics arena, usually published as edited volumes, have tended to involve multiple chapters written by different, often multiple, scholars from various disciplines and countries. Such volumes often include authors at different career stages, from graduate students to senior professors. Building on our distinctions above, we distinguish two classes of research: interdisciplinary projects involving scholars from distinctly different disciplines including both social and natural scientists; and multidisciplinary projects involving scholars from a single discipline or a narrow range of cognate disciplines within the social (or natural sciences), such as political science, sociology, law, and economics (Choucri 1993; Winter 2006).

To date, most published work has been multidisciplinary. Interdisciplinary work is more difficult to achieve, as discussed below, because of the difficulties in spanning disciplinary cultures and vocabularies. In general, while these efforts highlight insights from individual disciplines about a problem they fail more generally to integrate them into a more coherent picture or even clearly to articulate the compatibility or tensions between different approaches (Cebon et al. 1998; Social Learning Group 2001a, 2001b). In short, truly interdisciplinary work remains in its infancy with considerable room for improvement. To foster progress in that venture, the following section reflects our thoughts for improving, and publishing, both multidisciplinary and interdisciplinary work on global environmental problems. While successful multidisciplinary and interdisciplinary work may generate new integrated wisdom, it may also reveal uncertainties and fundamental differences in understanding between actors and disciplines.

Applications of interdisciplinarity

Here we provide two exemplars of interdisciplinary books whose findings exceed the conventional views of single disciplines. *Changing the Atmosphere* (Miller and Edwards 2001) has ten chapters written by nine authors, ranging from PhD candidates to full professors. The authors come from information sciences, philosophy, social studies of science, biology and climate science. The research was well supported by a variety of grants. This collection was one of the earlier social science investigations of the production and use of climate science for policy. Thus it had a comprehensive introduction providing an overview of the critical social studies of science literature, but lacked a concluding chapter. The empirical chapters demonstrate the greater role of interpretation and uncertainty associated with scientific advice and the IPCC than was generally recognized by hard scientists and policy analysts (see Chapters 17 and 18). It developed the finding that science and science policy does not directly mirror the natural world, but rather that it interprets the world for policy and political consumers in ways that are socially and politically shaped. Thus the effective provision of scientific information requires political and social inquiry about the frames and context with which policy-makers solicit and understand scientific advice. Policy studies need to better understand the degree of distortion involved in the knowledge being delivered, and to focus on the political processes by which choices about knowledge claims are made and the knowledge is itself interpreted by less technically trained policy-makers.

More recently, *Reflexive Governance for Global Public Goods* (Brousseau et al. 2012) provides an interdisciplinary investigation of global public goods; an analytic category that includes climate change. *Reflexive Governance* has 15 chapters as well as an introduction and conclusion, written by 21 international contributors, drawn from research fellows, assistant professors to full professors, and one government official. Substantively, they range from economics, ecological economics, philosophy, politics, and interdisciplinary training in environment change. The interdisciplinary approach to global public goods complements conventional studies of international public goods that seek to internalize the costs of environmental degradation through hierarchical controls, market arrangements to internalize costs, or institutional arrangements to concentrate the environmental consequences. By studying a number of public goods occurring at different scales and with different participants, the authors find that the provision of organized scientific knowledge is capable of educating political actors to change their behavior and take account of environmental externalities which remain economically low cost. In this regard the volume is "reflexive" in documenting knowledge about how knowledge may be usefully integrated by national-level decision-makers to learn about climate change, and to embark on new policies that are more sustainable. Such collective reflection requires democratic participation,

scientific information, and a lengthy social process of deliberation (Dedeurwaerdere et al. 2012: 316–17; see Chapter 26).

Improving interdisciplinary and multidisciplinary research

In our view, conducting and publishing effective research requires that the scholars design the research in ways that meet the three criteria delineated.

Selecting participants

The first step in developing successful interdisciplinary research is the selection of the research team. Individuals should be chosen on the basis of their depth of disciplinary expertise and their ability to communicate clearly about their discipline with those from other disciplines. Individuals also should be chosen to create an "expert team" rather than a "team of experts." An expert team consists of a set of scholars who have individual skills but also, collectively, represent the range of disciplines necessary to accurately evaluate and analyze the environmental problem in question and who also have the interpersonal skills that help a team run well. These include the ability and willingness to provide honest yet constructive feedback to others, to listen and respond quickly and well to such feedback from others, and to contribute to the project's overall goals, especially when that means altering individual research approaches and processes to foster those goals.

In addition, several benefits arise from having multiple ranks represented within a team. Junior scholars benefit from the explicit and implicit training and mentoring from more senior scholars with more extensive and varied experience who can demonstrate various solutions to the inevitable problems that arise in collective research. Senior scholars benefit from the intense exposure to and interaction with those trained in the most current research and methodological developments and by being challenged to respond to, rather than merely read about, alternative perspectives on various issues. Such interactions may help overcome the theoretical myopia that can develop in senior researchers who have worked within their own traditionally defined boundaries for most of their careers (see Chapters 3 and 4).

There are several obstacles to building such a team. One is that most networks of scholars are built within rather than across disciplines. Most scholars' networks include those who went to graduate school together and those who meet by going to the annual conventions of their own discipline. Institutional incentives reinforce the need to write papers that will be published in one's own discipline's journals and to "build a reputation" in that discipline and discourage the time "wasted" going to conferences, engaging in collaborations, and networking with those from other disciplines. The challenge is to identify and recruit people who either have found ways to achieve traditional measures of disciplinary success while retaining both the time and inclination to engage in interdisciplinary work or have found less traditional research trajectories in places such as the Santa Fe Institute.

We believe that policy-makers and stakeholders can make significant contributions to interdisciplinary research teams. One useful model involves having policy-makers and stakeholders involved in initial research project meetings to ensure that the research questions are framed in ways that promote salient research results that stand some chance of contributing to upcoming policy decisions in ways that are sensitive to existing political, financial, and social constraints and perspectives (Mitchell et al. 2006). Briefing these policy-makers and stakeholders at regular intervals during the research process also allows for "course corrections" that can improve the "uptake" of the ultimate conclusions without making them susceptible to the influence of these

groups. An obstacle that may need to be overcome exists in the relatively brief job tenure and demanding time schedule of individual policy-makers and civil society members. Thus involving individuals in such an enterprise runs the risk of discontinuities as members drop off and replacements bring in new agendas. Having briefing sessions with a broader community at the beginning and end of the research process, rather than relying directly on a cadre of individuals, offers an alternative solution.

Finally, we believe there is a "Goldilocks" problem in terms of team size. Interdisciplinary teams, to be successful, must contain sufficient expertise to address the array of perspectives and disciplines that can contribute to analyzing the problem in truly interdisciplinary ways. At the same time, teams that exceed 10 to 15 individuals can present a range of cost and logistical problems that can prove challenging for the organizers and can undermine team members' sense that their contributions are crucial to the team goals.

Building a team

Once participants have been selected, the next step in effective interdisciplinary research is building a team. Perhaps most important to doing so is the need to develop effective communication among team members, taking time to understand both the terminology and perspectives of the other scholars involved. Different disciplines can use the same word or phrase to mean completely different things and, at times, can use different words or phrases to mean the same thing (consider the difference in what a "climate regime" means to an atmospheric scientist and a political scientist). Equally important, but often harder to get at, are the more subterranean assumptions, methodologies, and "ways of thinking" that are deeply embedded in each discipline. Without intending to stereotype, economists may be more comfortable monetizing certain human values, physicists may see the world in more mechanistic terms; anthropologists may be less comfortable generalizing across different cultures, etc. Mutual understanding of and, equally important, respect for, these "cultural differences" requires an ongoing process that tends to require considerable in-person interaction and may take a year or more. Open and explicit discussions of disciplinary semantics and methodologies can help identify often broad and deep divergences in outlooks and approaches. Such efforts are crucial to development of a common but integrated understanding of the environmental problem that the scholars seek to understand.

The success of "team-building" also requires explicitly and directly addressing the task of designing an internally consistent framework that accurately and usefully integrates the different disciplines and perspectives of the scholars involved. When such efforts are undertaken and succeed, truly interdisciplinary work can emerge that creates synergies from the contributing scholars. When such efforts fail, edited volumes whose chapters nominally address the same problem may prove quite non-cumulative, with insights from many chapters being ignored, misunderstood, or not taken advantage of with the result that meaningful communication across disciplines fails to emerge.

Overcoming these problems often benefits from strong editorial leadership that develops support for, and if necessary imposes, a common framework for analyzing the problem, either with all contributing scholars applying the same framework or each scholar accurately using their own disciplinary tools to contribute to the overall framework. Procedurally, this often requires frequent face-to-face meetings throughout the course of the research project – and often more meetings than seem necessary – to develop a coherent common framework, to ensure collective understanding of that framework, to foster consistent application of that framework within individual chapters, and to develop careful cross-chapter insights as the project moves toward conclusion.

Developing coherent and collective findings

To ensure a project generates strong interdisciplinary insights and presents them in a coherent manuscript requires iterative interactions among those contributors analyzing the individual cases and the editors developing the collective conclusions. Reinforcing the need for "strong leadership" noted above, the need for a strong leader or team of leaders becomes particularly important as a project moves to completion. These individuals must, from the outset, clarify both the standards and deadlines they will use for including or excluding chapters in any final published manuscript. Projects are too often delayed by one or two scholars who deliver their manuscripts late or provide manuscripts of demonstrably lower quality than others planned for inclusion. Although telling a team member that their contribution will not be included is unlikely to be pleasant for either party, they are easier when the criteria for such a decision have been delineated and understood at the outset. Letting a project be held hostage by those who miss deadlines or fall short of the group's agreed-upon standards does a disservice to all the other team members. In case honoraria are involved, payments should be staggered to ensure successful iterated editing of drafts.

Beyond these logistical points, the editors of collective volumes owe an obligation to their contributors to engage in the careful cross-case comparisons that are necessary to identifying common patterns and themes and to deriving both backward-looking conclusions and forward-looking conjectures. Editors should plan on blocking out the requisite three to six months of time needed to carefully read the contributed analyses, identify and write up interesting patterns, analyze the comparisons carefully, have their findings reviewed by all contributing authors, and revise the conclusions and introduction so that they simultaneously meet the goals of abstracting from the individual cases without doing injustices to the empirical evidence from those cases.

Training scholars

Beyond their intellectual benefits, interdisciplinary research projects that contain both senior and junior scholars provide excellent opportunities for mentoring. In-person interactions as well as those by phone or email, provide excellent opportunities for senior scholars to advise junior scholars on "threading the needle" of conducting research that is publishable in disciplinary journals and fosters professional advancement, that contributes to interdisciplinary understanding of important environmental problems, and that helps stakeholders and policy-makers improve human responses to the environmental problems being studied. Equally important, relationships that develop over the two- to ten-year timelines common to such projects provide the basis for respected senior scholars to write compelling letters of recommendation for interdisciplinary junior scholars seeking jobs or promotion in a world that remains, unfortunately, highly disciplinary.

These training and mentoring benefits can be fostered, especially for junior scholars, by developing a common team identity. This can be promoted by having a central institutional home for the research team, with a critical mass of PhD candidates, post-docs, and faculty that can interact regularly over the course of two or three years. Where such intensive interactions are not possible, ensuring that dedicated research team meetings are combined with more ad hoc meetings involving those team members that happen to be at annual conventions, particularly when team findings are presented at those meetings, can help considerably. Annual "retreats" at relatively isolated locations can also improve team esprit de corps and promote possibilities for following up themes more carefully than can occur in briefer more structured settings and can also facilitate more serendipitous interactions with benefits in terms of concept formation, analytic insights, and development of future collaborations.

Crossing the academic–policy divide

A crucial aspiration of many scholars involved in studying socio-ecological systems is to have their scholarship contribute to the mitigation and resolution of specific environmental problems and, more generally, to the improvement of the relationship humans have with the natural world. Yet understanding the conditions under which and processes by which good scholarship becomes usable and used knowledge remains a poorly understood element of socio-ecological work (Mitchell et al. 2006). Indeed, the current popularity of Sustainability Science reflects, at least in part, an effort to improve the ways socio-ecological scholarship is produced and presented to make it more usable and thereby overcome existing political disinterest and resistance that fail to lead to usable knowledge actually being used.

In the short term and at an initial level, scholars can increase the contribution they make to policy by self-consciously attempting to understand, and conduct their research in ways that reflect and respond to, the political and policy opportunities and constraints that often are the cause of scholarly irrelevance. Research often fails to be "salient," in the sense of being relevant to current policy decisions – it comes in before the policy recommendations being offered have any chance of success or after the policy "window of opportunity" has closed (Kingdon 2003; Mitchell et al. 2006). Equally important, scholars often confuse what "should be" the constraints and opportunities with what are those constraints and opportunities. In this vein of "small changes," it certainly also makes sense for scholars to carefully develop "summaries for policy-makers," to provide policy briefings to those working on the issue, and to entertain the wide range of other opportunities to communicate with and provide inputs to policy-makers and decision-makers. Dual conclusions, aimed at academic researchers and policy-makers, also seems like an imaginative technique (Miles et al. 2002).

Conclusion

The ability for scholars to have a larger and more long-lasting influence with policy-makers and stakeholders requires a deeper change in how research is conducted. Notions of "co-production" of knowledge and of "adaptive management" involve ongoing interactions among scholars (both natural and social scientists), policy-makers, stakeholders, and resource managers (Jasanoff 2004). In this model, the sequestered generation of knowledge by scholars that is published and handed off to policy-makers and others in policy briefings is replaced by efforts to build social institutions that involve relatively frequent interactions over several years in which trust and understanding can develop in ways that are designed to avoid political pressures influencing scientific findings while, at the same time, ensuring that political constraints are recognized as creating important boundaries within which policy recommendations must fall (even if, over the longer term, those boundaries themselves may be subject to change). Such co-production institutions allow policy-makers and stakeholders to realize the value of, and better understand natural and social science insights; provides managers with better insights into novel techniques for addressing their day-to-day problems; and helps scholars have a better sense of existing policy constraints and opportunities and why they exist.

These approaches are likely to be more challenging, more time-consuming, and slower to "bear fruit" than more traditional strategies of publishing scholarship and hoping it has influence. But they offer the promise of allowing scholars to have significantly more influence than they would otherwise. Such strategies also require scholars to think carefully about how they maintain their scientific impartiality and credibility while improving their policy-relevance, what Stephen Schneider has called the "double ethical bind" of being politically effective while being scientifically accurate and honest (Russill 2010).

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References

Andresen, S., T. Skodvin, A. Underdal, and J. Wettestad (2000). *Science and Politics in International Environmental Regimes*. Manchester: Manchester University Press.

Benda, L. E., N. L. Poff, C. Tague, M. A. Palmer, J. Pizzuto, S. D. Cooper et al. (2002). "How to avoid train wrecks when using science in environmental problem solving." *BioScience* 52(12): 1127–36.

Bergmann, M., B. Brohmann, E. Hoffmann, M. C. Loibl, R. Rehaag, E. Schramm et al., Eds. (2005). *Quality Criteria of Transdisciplinary Research*. Frankfurt am Main, Germany: Institute for Social–Ecological Research (ISOE).

Biermann, F. (2007). " 'Earth System Governance' as a cross-cutting theme of global change research." *Global Environmental Change* 17: 326–37.

Biermann, F. and P. Pattberg, Eds. (2012). *Global Environmental Governance Reconsidered*. Cambridge, MA: MIT Press.

Boykoff, M. T. (2011). *Who Speaks for the Climate?* Cambridge: Cambridge University Press.

Boykoff, M. T. and J. M. Boykoff (2004). "Balance as bias: global warming and the US prestige press." *Global Environmental Change* 14(2): 125–36.

Bradley, R. S. (2011). *Global Warming and Political Intimidation*. Amherst: University of Massachusetts Press.

Brewer, G. and P. C. Stern, Eds. (2005). *Decision Making for the Environment*. Washington, DC: National Academies Press.

Brewer, G. D. (1999). "The challenges of interdisciplinarity." *Policy Sciences* 32: 327–37.

Brousseau, E., T. Dedeurwaerdere, and B. Siebenhüner, Eds. (2012). *Reflexive Governance for Global Public Goods*. Cambridge, MA: MIT Press.

Cebon, P., U. Dahinden, H. Davies, D. Imboden, and C. C. Jaeger, Eds. (1998). *Views from the Alps: Regional Perspectives on Climate Change*. Cambridge, MA: MIT Press.

Choucri, N. (1993). *Global Accord*. Cambridge, MA: MIT Press.

Consortium for International Earth Science Information Network (CIESIN) (1992). *Pathways of Understanding*. University Center, MI: CIESIN.

Dedeurwaerdere, T., E. Brousseau, and B. Siebenhüner (2012). Conclusion. In E. Brousseau, T. Dedeurwaerdere, and B. Siebenhüner, Eds., *Reflexive Governance and Global Public Goods*. Cambridge, MA: MIT Press.

Funtowicz, S. O. and J. R. Ravetz (1991). "A new scientific methodology for global environmental issues." In R. Costanza, Ed., *Ecological Economics*. New York: Columbia University Press, 137–52.

Funtowicz, S. O. and J. R. Ravetz (2001). "Global risk, uncertainty, and ignorance." In J. X. Kasperson and R. Kasperson, Eds., *Global Environmental Risk*. London: Earthscan.

Gallopin, G. C. (2006). "Linkages between vulnerability, resilience and adaptive capacity." *Global Environmental Change* 16(3): 293–303.

Haas, P. M. (2001). "Epistemic communities and policy knowledge." In N. J. Smelser and P. B. Baltes, Eds., *International Encyclopedia of Social and Behavioral Sciences*. Oxford: Elsevier Science, 11578–86.

—— (2004a). "Science policy for multilateral environmental governance." In N. Kanie and P. Haas, Eds., *Emerging Forces in Environmental Governance*. Tokyo: UNU Press, 115–36.

—— (2004b). "When does power listen to truth? A constructivist approach to the policy process." *Journal of European Public Policy* 11(4): 569–92.

—— (2007). "Epistemic communities." In D. Bodansky, J. Brunnee, and E. Hey, Eds., *Oxford Handbook of International Environmental Law*. New York: Oxford University Press, 791–806.

Haas, P. M., R. O. Keohane, and M. A. Levy, Eds. (1993). *Institutions for the Earth*. Cambridge, MA: MIT Press.

Hulme, M. (2009). *Why We Disagree about Climate Change*. Cambridge: Cambridge University Press.

Jacobson, H. K. and M. F. Price (1990). *A Framework for Research on the Human Dimensions of Global Environmental Change*. Paris: International Social Science Council.

Jasanoff, S. (2003). "Technologies of humility: citizen participation in governing science." *Minerva* 41: 223–44.

—— Ed. (2004). *States of Knowledge: The Co-Production of Science and Social Order*. New York: Routledge.

Jasanoff, S. and M. B. Martello, Eds. (2004). *Localizing and Globalizing: Knowledge Cultures of Environment and Development*. Cambridge, MA: MIT Press.
Kasemir, B. J., J. Jäger, C. C. Jaeger, and M. T. Gardner, Eds. (2003). *Public Participation in Sustainability Science*. Cambridge: Cambridge University Press.
Kates, R. W., W. C. Clark, R. Corell, J. M. Hall, C. C. Jaeger, I. Lowe et al. (2001). "Sustainability science." *Science* 292(5517): 641–2.
Keohane, R. O. and E. Ostrom, Eds. (1995). *Local Commons and Global Interdependence*. Thousand Oaks, CA: Sage Publications.
Kingdon, J. W. (2003). *Agendas, Alternatives, and Public Policies*. New York: Longman.
Knorr-Cetina, K. (1999). *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.
Leiserowitz, A. A., R. W. Kates and T. Parris (2006). "Sustainability values, attitutudes, and behaviors: a review of multinational and global trends." *Annual Review of Environmental Resources* 31: 413–44.
Miles, E. L., S. Andresen, E. M. Carlin, J. B. Skjærseth, A. Underdal, and J. Wettestad, Eds. (2002). *Environmental Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press.
Miller, C. A. and P. N. Edwards (2001). *Changing the Atmosphere*. Cambridge, MA: MIT Press.
Mitchell, R. B., W. C. Clark, D. W. Cash and N. M. Dickson, Eds. (2006). *Global Environmental Assessments: Information and Influence*. Cambridge, MA: MIT Press.
National Research Council (1999a). *Our Common Journey: A Transition toward Sustainability*. Washington, DC: National Academy Press.
National Research Council (1999b). *Human Dimensions of Global Environmental Change*. By Committee on the Human Dimensions of Global Change and Committee on Global Change Research, National Research Council. Washington, DC: National Academy Press.
Oreskes, N. (2007). "The scientific consensus on climate change." In J. F. C. DiMention and P. Doughman, Eds., *Climate Change*. Cambridge, MA: MIT Press.
Oreskes, N. and E. M. Conway (2010). *Merchants of Doubt*. New York: Bloomsbury Press.
Price, M. F. (1992) "The evolution of global environmental change." *Impact of Science on Society* 166: 171–82.
Ravetz, J. R. (1986). "Usable knowledge, usable ignorance: incomplete science with policy implications." In W. C. Clark and R. E. Munn. Eds., *Sustainable Development of the Biosphere*. New York: Cambridge University Press, 415–32.
Rayner, S. and E. L. Malone, Eds. (1998). *Human Choice and Climate Change*. Colombus, OH: Batelle Press.
Russill, C. (2010). "Stephen Schneider and the 'double ethical bind' of climate change communication." *Bulletin of Science, Technology and Society* 30: 60–9.
Schellnhuber, H. J., P. J. Crutzen, W. C. Clark, M. Claussen, and H. Held, Eds. (2003). *Earth System Analysis for Sustainability*. Cambridge, MA: MIT Press.
Schneider, S. H. (2009). *Science as a Contact Sport*. Washington, DC: National Geographic.
Snow, C. P. (1962). *The Two Cultures and the Scientific Revolution*. New York: Cambridge Univeristy Press.
Social Learning Group, Ed. (2001a). *Learning to Manage Global Environmental Risks, Volume 1: A Comparative History of Social Responses to Climate Change, Ozone Depletion and Acid Rain*. Cambridge, MA: MIT Press.
—— (2001b). *Learning to Manage Global Environmental Risks, Volume 2: A Functional Analysis of Social Responses to Climate Change, Ozone Depletion and Acid Rain*. Cambridge, MA: MIT Press.
Tribe, L. T., C. Schelling, and J. Voss, Eds. (1976). *When Values Conflict*. Cambridge, MA: Ballinger.
Weinberg, A. (1972). "Science and trans-science." *Minerva* 10: 2009–222.
Wiman, B. L. B. (1991). "Implications of environmental complexity for science and policy." *Global Environmental Change* 1: 235–47.
Winter, G., Ed. (2006). *Multilevel Governance of Global Environmental Change*. Cambridge: Cambridge University Press.
Young, O. R., Ed. (1997). *Global Governance: Drawing Insights from the Environmental Experience*. Cambridge, MA: MIT Press.
Young, O. R. (1999). *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Cambridge, MA: MIT Press.
Young, O. R., L. A. King, and H. Schroeder., Eds. (2008). *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*. Cambridge, MA: MIT Press.

Part II

Actors and institutions in global environmental politics

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7

States

Nations, sovereignty and the international system

Hugh C. Dyer

The politics of the environment have transformed the practices of nations and our understanding of state sovereignty and the international system. However, the question remains whether states, nations and the international system can support the practices of environmental politics. At the heart of the matter are the limitations of the state as a mechanism for delivering environmental policy. It is difficult for national governments to respond to global environmental change because their political obligations are defined by pre-existing perceptions and expectations of the state and assumed national priorities, particularly economic ones. Furthermore, established administrative structures of the state engage with the relatively novel politics of the environment with some difficulty, such that policies based on efficiency may actually increase overall consumption and ecological degradation. To some extent this has been addressed by bureaucratic reorganization (or just rebranding) around environmental issues with energy and climate appearing together in the titles of governmental departments, agencies and programmes.

However, there is also a deeper underpinning that makes the environment a difficult subject for the state, its outlook being not just economistic but anthropocentric – meeting human needs and aspirations as judged in isolation from their ecological context. We may have to extend our concern for the "other" beyond other nations of humans to include nonhuman nature (Wapner 2002; see Chapter 25). In *Environment and the Nation State*, Lieferrink argues that increased ecological interdependence challenges states' ability to control "not actually the borders but rather the quality or what may be called the 'ecological sustenance base' or 'eco-capacity' of their territories" (Liefferink 1996: 26). It is this ecological perspective that raises difficulties for the economistic and anthropocentric habits of nations, states and the international system, and their political and economic practices.

The idea of a "nation" suggests a degree of unity among a defined group of people. Like other "ideal types", the term is used for simplicity or clarity, but of course the idea of nationhood disguises the complexity of social history. There are few if any groups of people so homogeneous in their origins and identities as to be accurately summarized as belonging to one nation. Indeed nationalism has an unfortunate history because of its use by powerful political actors to impose a unitary identity, including some people and excluding others, in order to achieve a political goal. This has sometimes been in aid of developing peaceful solidarity among diverse peoples, but it has also been used to justify and support inter-national political violence.

The idea of the "state" is likewise a somewhat arbitrary term to describe a political–legal entity, and though often traced back to ancient city-states as models of civic order, its international significance is usually associated with seventeenth-century European political settlements designed to attach ultimate political authority ("sovereignty") to particular rulers within defined territories. Such authority over a territory is easier to justify if those people being ruled are seen (and see themselves) as a unitary group somehow naturally belonging to the state. Thus a hybrid notion of a sovereign territorial nation-state emerges, and is in due course exported globally, either by agreement, or more often by conquest and imposition – particularly in areas of European colonization – as the standard model of political association. Since relations between states, or international relations, are based on mutual recognition of their sovereign territorial status (however they may be governed internally), this gives rise to a particular kind of international system of equally sovereign entities without an overarching higher authority – at least in principle.

Because the central concepts of "nation", "sovereignty" and "international system" are abstract ideal types and historically contingent, they do not accurately reflect or describe reality. To begin with, both nation and state are concepts imposed on people, even if accepted or adopted by them. There are few if any examples of an ethnically, culturally, linguistically, religiously homogeneous "nation" that matches the territorial boundaries of a "state", and indeed few if any genuinely unitary states in terms of political authority. The state itself is a legal abstraction, and takes many forms internally and only stands up to claims of sovereign equality as a convenient fiction. Political authority expressed as sovereignty is in fact fragmented or absent – various internal actors may exercise political influence, while the fiction of equality in relation to external actors belies the huge variations in the resources and capabilities of states. In relation to global environmental issues, the idea that nations could exercise sovereign command authority over the eco-sphere is absurd, but in a globalized world there are ample opportunities for political cooperation and even the prospect of global governance. Certainly the impact of human activities and the manner in which they are organized in the international system is a major environmental factor, perhaps the determining factor in the "anthropocene" period of human-dominated global ecology.

The limits of the nation-state

The division of the planet into sovereign states does not reflect the interdependencies of ecosystems crossing state borders. This is important in respect of transnational relations between multiple actors. The state, as a legal entity, is responsible for its own jurisdiction, but it can also be held responsible for pollution beyond its borders (see Chapter 10). State policies adjust to pressure from lobbying groups, but they are also subject to other domestic and international pressures. It is widely expected that environmental problems will be managed by governments and "that states are willing and able to assume this managerial role" (Lipschutz and Conca 1993: 19). Is this a reasonable or realistic expectation? Given the "very prevalent suspicion of the state on the part of many ecologists" (Hurrell 2006: 166), is it even desirable? It may be difficult for states to reconcile the different aspects of their responsibilities, creating an unmanageable situation which drives global environmental politics, even so far as precipitating a "constitutional moment" and fundamental revisions in governance (UNEP 2012: 6).

There is a growing web of economic, cultural, social and political relations between states and between states and other actors. While this is clearly a changing political context, the nation-state is not likely to disappear. (Indeed, there are more states now than ever before as a consequence of demands for independence.) This leaves us to conclude that, for the time being

at least, non-environmental considerations and domestic political interests will often override commitments to environmental cooperation, and as long as the key environmental agreements are negotiated by states, national interest will play a significant part in decisions that are made. However, this still allows some consideration of what political interests, or "national interests", really are, not least because environmental issues have challenged many of the social and political assumptions of national life.

Barry and Eckersley (2005: 261–3) point to the tension between the accumulation and legitimation functions of the state in relation to ecological modernization (that is, updating policy and practice in relation to ecological goals). The former function is supported by weaker win–win versions of ecological modernization (those aimed at both economic and ecological objectives) that support the globally competitive position of the state and supply-side concern with efficient production, while increasing pressure on the latter function arising from expectations of higher environmental standards (and demand-side concern with consumption) points to a stronger version of ecological modernization, implying a need for more clearly transnational political and economic practices. There may also be more fundamental doubts about whether and which interests are served by the technological optimism, reformism and "statism" of ecological modernization (Mol 2001; Fisher and Freudenburg 2001; York and Rose 2003). The state will remain, but its context and position may change.

The traditional political goals of society that the state purports to serve, such as health, wealth and security, are likely to be viewed differently in an environmental light, requiring development of sustainability policies, albeit within the constraints of existing social and political systems in the first instance. However, achieving any measure of success in environmental policy is likely to require substantial change in habitual political practices of decision-making and agenda-setting, and the means of wealth creation and protection of national interests. Equally, or in parallel, there are challenges to existing social practices, such as uneven distribution of resources, the character of the capitalist economic system in respect of profit motive and pressures to increase productivity, and the corollary of such economic growth – increased consumption. In many respects, therefore, both state and society may be wrestling with a set of conflicting goals, though this might yet be addressed if there remains scope for reframing identities and interests.

To exacerbate this situation, there are various constraints on social and political change, at individual, institutional and international levels. Constraints at the level of people exist in the embedded assumptions and habits of individuals and in the attitudes of the general public to environmental issues. These may change, but perhaps not very quickly. The existing version of the capitalist system serves and supplies individual "needs", and so reinforces and is reinforced by individual and public attitudes about the appropriateness of economic growth, individualism, competition and self-interest. At the institutional level there are constraints in that the attitudes of individuals are rooted in political, social and economic institutions that are not designed or developed to implement sustainable goals. At the international level, the constraints relate to the authority of the state in decision-making processes, economic competition between states, and the relative weakness of international regimes that establish shared expectations (see Chapter 9).

In *The Green State* Eckersley (2004) points to three core challenges for the prospect of a "green" state: anarchy in the states system, promotion of capitalist accumulation and democratic deficits in the liberal state. She argues that the key to transformation is increased accountability to both global civil society (citizens and others; see Chapter 14) and international society (state-based organizations and institutions; see Chapter 8). The logic of this structure is challenged by the emerging environmental multilateralism, sustainable development strategies and environmental advocacy, though crucially the success of such a challenge is dependent on a distinctly green conception of state governance (Eckersley 2004: 14–15). We can see some evidence of this

tension between accountability and the pursuit of capital accumulation in recent attempts to establish more ambitious carbon reduction targets coinciding with liberalization of transatlantic air travel (with increased competition likely leading to increased flights). Kostić et al. (2012: 41) argue that "this type of liberal state- and nation-building" does not bring societal integration nor take account of post-conflict environmental problems. Finally, in the context of climate change, time is not on our side and the importance of longer-term transformation may be displaced by the urgency of shorter-term action – such is the difficulty of escaping the immediate logic of established political and economic practices in order to adopt a more ecological perspective.

The existing structure of both the international legal and political systems rests heavily on independence and autonomy of states. Collective environmental management poses politically sensitive challenges involving the creation of rules and institutions that reflect the rather different idea of shared responsibilities. There may also be a range of apparently reasonable grounds for resistance by states to an environmental supranational authority: the state remains a source of human identity, and it is a significant means of political expression, which gives claims to national sovereignty their moral credibility. The significance of environmental challenges, though important, may not be sufficient reason to abolish sovereignty when it is anyway not clear that supranational authority would lead to efficient environmental management.

Litfin has indicated that experience of environmental regimes "warrants a healthy scepticism about whether the nation-state system can smoothly adapt to ecological interdependence via traditional forms of multilateral, state-centric institutions" (Litfin 1993: 111). However, there may be other reasons to abandon strict versions of sovereignty, including the absence of any choice about the matter. Under the heading "Sovereignty and the inadequate state", Elliott argues that it is "not simply that the unilateral state cannot meet the challenges of global environmental change through self-help when the causes of that change lie outside its borders. It is that the state itself – its autonomy, capacity and legitimacy – is being eroded, or at least challenged, by the very nature of environmental problems which do not respect territorial borders" (Elliott 2004: 109).

Even so, the international system per se is only one factor in the management of the global environment, and there are signs of change in states in terms of policies on pollution and waste management (via taxation or regulation) and increased environmental awareness, at least in the limited terms of managing environmental risk. Individuals have undergone changes to attitudes and practices, with consumer activism in the "North" and producer activism in the "South", and they are increasing their political leverage through public demand for increased transparency and involvement in policy formulation (Princen 2010; see Chapter 14). Even those aspects of the international system that are able to escape a purely state-centred perspective may influence the behaviour of states and other actors, and international engagement can both help to promote domestic policy goals as well as underwrite international law (see Chapters 12 and 10).

If the changing position of the state can be attributed to public demand rather than governmental initiative, then we should perhaps consider the importance of public opinion in the creation and formulation of state policies for the environment, and equally how public pressure plays a similar role at the global level (see Chapter 26). Of course, public opinion is difficult to assess, and there is also a question as to what constitutes a relevant "public" (if we cannot assume that this is already constituted by the state in terms of citizenship and electoral registers, or indeed by the idea of a "nation"). It would be problematic to assume that "the public" is constituted by unelected elites or unrepresentative activists, whatever their environmental credentials.

Nevertheless, there is plenty of evidence for public opinion carrying weight on environmental issues even if it is often difficult to distinguish from the influence of organized non-state actors. A good example is the change led by influential nongovernmental organizations mobilizing

world public opinion behind the rights of whales (see Chapters 14 and 36). Other familiar examples include seal culling, disposal of the Brent Spar oil storage container, French nuclear testing in the South Pacific and so forth. In such cases, governments are required to balance "national interests" with the need for public support. Such cases of public opinion driven by environmental activism have normative significance and reflect "universalistic moral concern and a conception of collective human interest" (Vogler 1995: 201). Vogler suggests that it is easy to be cynical about moral positions in politics, but public support for such positions cannot be discounted. We could even consider extending the moral community, and indeed some form of representation, to the nonhuman realm in an ecocentric approach, notwithstanding the challenges of integrating such positions into current practice (Eckersley 1992).

There is further evidence of this trend in non-state politics in the emergence and relative significance of environmental social movements. Dryzek et al.'s volume on *Green States and Social Movements* (2003) suggests that social movements are influenced by the kind of state they relate to, and conversely that states may be transformed by incorporation of, or resistance to, social movements. This has implications for the choice of political strategies for environmental movements (Dryzek et al. 2003). If the environmental situation is a cause of political behaviour, and if it is not improving, then the drive towards environmentalism is one that states may not be able to resist.

National identities and the environment

There are good ethical and political reasons for privileging people over the state or any other form of political authority. This could begin with individuals, on the simple premise that each "has an overriding obligation to be morally autonomous" such that a "legitimate state is a logical impossibility" (Wolff 1998: vii). Individuals may well hold the secret to dealing with the environmental crisis, either as challengers of technocratic society (Roszak 1979) or as a source of ethical and political meaning (Peterson 2001). However, if individuals are fundamental in ethical and political terms, they typically are so in a wider national context. It may be that the conventional political location of individuals within the defining purview of the state is inadequate for the purposes of environmental politics, and as Beitz (1979: 180), for example, notes, "the critique of the idea of state autonomy clear[s] the way for the formulation of a more satisfactory normative international political theory". However, he elsewhere notes that political theory should guide rather than replace practical judgement (Beitz 1989: 227), and we may feel that people are practical in ways that political institutions are often not.

Nations, even in the context of world environmental politics, are a significant political fact. What is more, the nations have a convincing claim to be both source and content of value, and so it is only by finding a place for the individuals and their nations in world environmental politics that we can determine the source and content of the relevant political values. While a more holistic ecocentric perspective would certainly challenge fragmented individualism and nationalism, ecocentric values will need to be held politically. Individuals and nations may still be the political home for such values. Out of this emerges perhaps only a story about world environmental politics in which national identity is the source or locus of political values. It remains a weakly anthropocentric story because politics is an anthropocentric exercise in which such story telling is important. Peterson identifies humans (in the context of a socially created ecocrisis) as "storytelling culture dwellers", in contrast to rational self-interested agents (Peterson 2001: 8).

A focus on the individual actor and national identity has implications for theorizing world environmental politics and reorients our understanding of global politics more generally.

The political implications of this perspective may be rather more trans-social than interstate, more global–local than international, while allowing that the individual retains moral and political standing in ecological politics. This still leaves us with some room for considering the social influences of environmental politics, and hence its impact on national identities and the international system. Kütting (2000) connects environmental degradation to social origins, and shows that the failure to recognize the centrality and complexity of this connection has resulted in its externalization through concentration on the study of international institutional developments. To the extent that the literature tends to reflect scientific rational analysis, which largely ignores underlying social issues, the implications for the study of international relations are quite broad, and in particular point less to the "international" and more to the "social".

If we cannot evade the political, we can nevertheless see that the institutional and the social are implicated in our understanding of global politics. Elliott's admirable survey of *The Global Politics of the Environment* (2004) begins by noting two "simple aphorisms" – that "global environmental problems…require global solutions", and that there are "no simple solutions" – and puzzles about "how we should understand the 'global' as an organising principle" (Elliott 2004: 3–4). We are perhaps most concerned about the direction of political causation (such positivist social science pursuits die hard) for good practical and ethical reasons. In this lies both potential for change and potential dangers. The case of "global governance" is a useful test, describing something short of government in its state-centric sense and indicating formal and informal structures and processes, all in aid of (potentially global) political order; but it remains a form of "politics from above" (Maiguashca 2003: 5). In its global manifestation this may well amount to hegemony or imperialism if global environmental governance is understood as a device for protecting existing power structures rather than changing them – a "globalisation from above" (Elliott 2004: 111–12). Such global governance initiatives have encountered some resistance from individual activists, social movements, non-state actors and weak-state actors, representing a form of "politics from below" (Maiguashca 2003: 5). This hierarchical "above" or "below" seems typically political, but governance issues may be better understood as social. In any case the environmental crisis adds a particular additional consideration to ethical, social, political and economic (anthropocentric) tests we might apply to any scheme – that of ecological integrity.

Schemes to improve the human condition do not always work out according to plan, even if it is possible to point to progress in some respects. There is no reason to think that we will cope much better with environmental problems than we have with problems of inequality, not least because they are linked. However, there may yet be some progress over the long term. In years to come, there may be a call for expressions of regret for contemporary environmental practice in much the same way as there have been some belated apologies for historical injustices. The comparison is useful, not because expressions of regret will right a wrong (or that there is moral equivalence between cases), but because it illustrates how behaviours that were once widely accepted can become unthinkable. It also illustrates changes in authoritative values and practices. The nature of struggles to change practices and values are seldom linear, uniform or complete. It further illustrates the tensions between economic forces and the proper exercise of political (or moral) authority, even if there is consensus on the issues.

Thus environment politics may follow a pattern of social change, in the context of its own times, such that what may be viewed as unrealistically burdensome constraints on behaviour are in the future seen to be clear moral requirements and become both commonplace and common sense. What is more, facing the environmental challenge need not be seen in negative terms of constraint; it can be readily understood in positive terms of opportunity. Princen has convincingly shown that sufficiency, rather than "efficiency", is an entirely practical goal that results not in merely surviving but in actually thriving (Princen 2005: 3; see Chapter 15). The challenge for

people and politics is to underwrite such opportunities as being legitimate. The nature of illegitimacy (or political distance) is illustrated by Perkins (2000): if the political scale of decision-making (at the level of the nation or state) is at odds with the ecological scale of environmental impacts, the result is a democratic deficit. Thus the consequence of the environmental crisis for the state and international politics is that it "calls into question both the practical viability and the moral adequacy of this pluralist conception of a state-based global order", and this has already elicited a partial response in that it has "pushed states towards new forms of international law and global governance" (Hurrell 2006: 167), even if it has not yet brought about fundamental change in the world's social structure (see Chapter 10).

The sovereign state and the environment

The state remains at the centre of debate. Dauvergne (2005) discusses the possibility of a "secure world of states, institutions and regimes" with circumspection, noting arguments that global institutions and regimes cannot constrain the self-interested behaviour of states (which damage common resources), and other arguments supporting global governance on the basis of complex drivers and constraints on states, and the rational choice of states to cooperate through management regimes and institutions (Dauvergne 2005: 13–16). Consequently, the critique of the discipline of International Relations (IR) is its conventional preoccupation with the state as a constitutive central actor in the practice of international relations. In particular the traditional attribute of the state – sovereignty – is seen as a constitutive concept of international relations. Karen Litfin's edited volume, *The Greening of Sovereignty in World Politics* (1998), engages this issue with a collection of essays that examine the less than obvious relationship between sovereignty and ecology, countering the commonplace assumption that the two are irreconcilable by pointing to ways in which sovereignty is revisioned, reoriented and problematized in respect of the relevant socio-political boundaries and concepts. Specifically, she argues that "conceiving of sovereignty in terms of autonomy, control, and authority usefully decenters the state", and that sovereignty "can be an attribute of various political entities, not just the state" (Litfin 1998: 9).

In his study of the relationship between the extremes of interstate regimes and global civil society, Conca (2005) sets out two challenging observations on the role of the state while acknowledging that the state does have some role to play (see Chapters 9 and 14). The first challenge is a poor track record of centralization and of industrialization at the expense of the environment. The second challenge is that globalization has cost the state some potential ability to respond to environmental issues, even if states have been complicit in the deregulation and liberalization of a transnationalized world economy (Conca 2005: 181–2; see Chapter 22). Globalization is uneven and hierarchical, and the competitive aspects of international relations remain, supported by notions of relative gain in a zero-sum situation of scarcity (see Chapter 3). However, in the context of global environmental change absolute gains are more likely in the long term even if immediate costs imply relative gains in the short term. So in this respect the stakes are high for those state actors considering political and economic integration. For those inclined to protect their borders and economies from the effects of globalization (and environmental change), this approach to protecting sovereignty may come at a high price.

If environmental governance is tethered to broader processes of globalization and associated forms of global governance, and if these can draw attention away from state-centric concerns towards the global–local, then the question is whether globalization can be good for the environment. If it could be, could it also be good for people? This may still be an open question; but even if the anti-globalization movement provides an obvious case of resistance, this is focused on exploitation and inequality rather than constructive global cooperation. Clearly, if there is any

emerging consensus on a new global environmental order, then one or more alternative existing orders would be displaced by it. Perhaps the existing orders are "development" (which means different things to different peoples) and "sovereignty" (which has always been elusive), and there are those who would be happy to see the end of some versions of either or both of these.

Keuhls (1996) argues that it is conceptually questionable to create a sovereign object out of land, to create "sovereign territory" with all its political implications. For example, "environment and development" has become an established (if unclear) agenda of international relations for the twenty-first century. That this agenda reflects earlier agendas of colonization, decolonization and uneven development, all long-standing "North–South" issues, perhaps reduces its novelty, but it adds environmental concern even if also disguising the political interests of the North (see Chapter 21). This agenda points to the complexity of environmental issues and their interdependence with other functional issue-areas, all set against the economic and political challenges of countries pursuing industrial growth. It also raises again the question of what (and if) global institutional arrangements might ameliorate the situation. Young argues for a common research agenda and a unified theory of environmental governance for localized common-property systems in small-scale settings (Young 2005: 176), and for "conditions under which environmental regimes will produce outcomes that fulfil various criteria of sustainability, efficiency or equity" (Young 2005: 178). This suggests that subtle, complex and systemic solutions may be needed to square environment and development. This also suggests a case for humility in the face of such political challenges.

With any global political scheme comes the danger of substituting one overarching discourse for another. In the current political imagination, global environmental governance is constrained by, or aligned with, the desire for deregulation and liberalization such that win–win solutions (which may have merit if winning is ecological) are promoted under the banner of economic efficiency. Perhaps eco-capitalism is the appropriate charge against current global environmental governance, rather than eco-imperialism. Even so, assuming the hegemonic aspects of "primitive accumulation" remains problematic in a world where social transformation is so varied (Shilliam 2004). Lipschutz argues that "it is the relationships between ruler and ruled, and the mechanisms of rule, that are important", and he cites two models of empire: "neo-liberal institutionalism" and "new sovereignty" (Lipschutz 2004: 21). Here again we may ask if global environmental policy represents a new form of imperial governance to be resisted or a gradual transformation in the mechanisms of authority and legitimacy of states – that is, something that might be welcomed.

Conca argues that there remains some exercise of state authority even as states are displaced in some degree by transnational civil society (Conca 2005: 183; see Chapter 14). However, this occurs in a rather different context of institutionalized politics in which the state is not irrelevant but its authority is contested (Conca 2005: 194–6). He concludes that governance is increasingly transnational, institutions are more complex, and exercise of authority is more fluid (Conca 2005: 202–3). Weiss and Jacobson (1998) point out aspects of relationships between individual and collective actors in the international system which should tell us something about the way international relations is changing – and how this might change our thinking about it. Perhaps, not surprisingly, implementation of environmental agreements turns out to be the greatest challenge. In order to judge the success of environmental diplomacy it may be necessary to know how and why implementation and compliance with such agreements varies. Interestingly, the international political environment remains a dominant factor. While states are obviously central to implementation and compliance, none can or will act in a vacuum. The term "engagement" goes some way to capturing the political dynamic and prescription for achieving compliance (Weiss and Jacobson 1998). Compliance is typically both a legal and technical issue, but ultimately

behaviour modification is what counts, and in this respect nongovernmental actors and communities of technical experts make considerable contributions to what may be seen as both transnational and transgovernmental activity (Vogler 2000). Stiles takes a pluralist view of the relationship between civil society actors and states (and their intergovernmental institutions), and he argues that "the interests and identities of major players tend not to change over time, only their strategies and tactics depending on the general distribution of power and resources" (Stiles 1998).

This pluralist perspective on the state system, and its relation to other actors, may be both accurate and politically appealing: "it is important to note the normative claims made for this kind of [classical] pluralism" (Hurrell 2006: 166). Yet the pluralist view, and its practice, may be fundamentally (if unintentionally) reactionary: "Indeed, green arguments that economies should be brought back under firm national control and that 'excessive' immigration should be resisted attest to the continued power of the pluralist impulse" (Hurrell 2006: 167). This seems to make sense in terms of contemporary practices, but Smith (1993) warned against an unchallenged pluralist consensus and absence of more critical engagement as being a cause of the environment's marginal place in the academic discipline of International Relations – which may say more about the academic discipline than about environmental politics (see Chapters 4 and 5).

Brenton (1994), in considering the role of the state, suggests some caution in regard to supranational rather than sub-national, local, individual approaches to environmental problems. He suggests that the collective and integrative perspective of environmentalism has made it too easy to accept regulations and grand schemes, sometimes at the expense of liberty. Clearly some goals can only be achieved by international cooperation given the global environmental and political–economic context, but the modes and consequences of such cooperation remain an issue. Reflecting widely held concern about the nature of political authority and accountability in the supranational context, Brenton goes on to note that "replacement of the judgement of the individual by that of the state raises problems of its own", and he notes that this is compounded by transfer of authority to the international level, "placing it still further from the people it is intended to serve" (Brenton 1994: 268). A deeper critique attacks claims of sovereignty over the natural world, as this resource-based orientation is the source of our environmental problems (Smith 2011). This growing challenge to the notion of sovereignty supports "post-sovereign" forms of global environmental governance (Karkkainen 2004; see Chapter 4).

Conclusion

The "state" and the "international" represent a set of political structures with roots in self-determination and independence, rather than in environmental concerns. If concern with the role of the state and international relations becomes less relevant, concern with human practices and the role of political economy and transnational civil society becomes more so. It may be felt that escaping state-centric structures is merely creating a new difficulty: if we did not have such administrative structures we would have to invent something similar. Nevertheless, this may allow us to acknowledge the emergence of "an epoch defined primarily by globalization and de-territorialization" (Lawson 2006: 415–16).

The complexity and ubiquity of environmental issues provide environmental concern with a potential new avenue of expression and application, and with environmental values running through modern political discourse there is the possibility for constructively subversive developments (Dyer 1996). One illustration is Tim Hayward's *Political Theory and Ecological Values* (1998), which argues that environmental values can be supported by enlightened human interests, that this link must exist if ecological goods are to be promoted, and that there are profound implications

of fully integrating environmental issues into our disciplinary concerns (Hayward 1998). If political analysis is concerned with the transformation of political community (Linklater 1998) rather than the preservation of the environment, once environmental issues are introduced the fundamental problematic becomes the transformation of the human relationship to the environment.

As Biermann and Dingwerth (2004) argue, understanding global environmental governance requires reconsidering key concepts such as sovereignty. A consequence of engaging with the environment is that international politics is less about conflict and cooperation as solutions to state interests, and more about coping with competing values and the practical means of dealing with them (Dyer 2000). In this sense we are already concerned more with "global politics" than with "international politics", and if this amounts to a transformation, emerging patterns of global governance suggest a somewhat different model of world politics driven in part by environmental concerns (Sonnenfeld 2008). The prospects for global governance in issue areas like climate change may illustrate the boundaries and possibilities of our inherited political designs (Haas 2008; see Chapter 28). Plans for climate governance collapsed dramatically in a diplomatic failure at the Copenhagen climate conference in 2009, with subsequent meetings suggesting little improvement. More generally, states do not have a very good record of achieving sustainability over the decades since the 1992 Earth Summit in Rio de Janeiro. However, the legacy of Rio goes beyond the formal agreements because it encouraged a wider range of political actors and spaces that have challenged conventional notions of national sovereignty (Andonova and Hoffman 2012).

As Hobson and Hobden put it, we are obliged "to rethink the origins of international systems, states and international institutions as well as to denaturalize such historical forms, and to consider the potential and actual processes which are reconstituting, if not transforming, the present into possible and desirable futures" (Hobson and Hobden 2002: 283). Bigo and Walker observe that a sociological approach to politics and international relations offers the benefit of "emphasis on the study of practices", including discourses, rather than lapsing into engagement "with systems, states, sovereignties and so on as more or less disembodied structures, even abstractions" (Bigo and Walker 2007: 5). Environmental change exacerbates the situation of states by creating different contexts which are not state-centric, but for which states are responsible. Demands for state action on the environment create tensions between established institutional practices and environmental responsibility (Falkner 2012). Nevertheless, with the increasing significance of non-state contexts and civil society actors, the environment may be the determining factor in the end.

Nations, states, sovereignty and the international system should be viewed differently in the ecological context of world environmental politics. With processes of global environmental governance cutting across political, social and economic boundaries at different levels and scales of politics, the resilience of nation-states as a political form will be thoroughly tested.

References

Andonova, L.B. and Hoffman, M.J. (2012) "From Rio to Rio and beyond: innovation in global environmental governance", *Journal of Environment Development*, 21: 57–61. Online. Available HTTP: <http://jed.sagepub.com/content/21/1/57.full.pdf+html> (accessed 17 May 2012).

Barry, J. and Eckersley, R. (2005) "W(h)ither the green state?", in J. Barry and R. Eckersley (eds) *The State and the Global Ecological Crisis*, Cambridge, MA: MIT Press.

Beitz, C. (1979) *Political Theory and International Relations*, Princeton, NJ: Princeton University Press.

—— (1989) *Political Equality: An Essay in Democratic Theory*, Princeton, NJ: Princeton University Press.

Biermann, F. and Dingwerth, K. (2004) "Global environmental change and the nation state", *Global Environmental Politics*, 4: 1–22.

Bigo, D. and Walker, R.B.J. (2007) "Editorial", *International Political Sociology*, 1: 5.
Brenton, T. (1994) *The Greening of Machiavelli*, London: Earthscan.
Conca, K. (2005) "Old states in new bottles? The hybridization of authority in global environmental governance", in J. Barry and R. Eckersley (eds) *The State and the Global Ecological Crisis*, Cambridge, MA: MIT Press.
Dauvergne, P. (ed.) (2005) *Handbook of Global Environmental Politics*, Cheltenham: Edward Elgar.
Dryzek, J., Downes, D., Hunold, C., Schlosberg, D. and Hernes, H.K. (2003) *Green States and Social Movements*, Oxford: Oxford University Press.
Dyer, H.C. (1996) "Environmental security as a universal value: implications for international theory", in J. Vogler and M.F. Imber (eds) *The Environment and International Relations*, London: Routledge.
—— (2000) "Coping and conformity in International Relations: environmental values in the post-Cold War world", *Journal of International Relations and Development*, 3(1): 6–23.
Eckersley, R. (1992) *Environmentalism and Political Theory: Towards an Ecocentric Approach*, London: UCL Press.
—— (2004) *The Green State: Rethinking Democracy and Sovereignty*, Cambridge, MA: MIT Press.
Elliott, L.M. (2004) *The Global Politics of the Environment*, Houndmills: Palgrave.
Falkner, R. (2012) "Global environmentalism and the greening of international society", *International Affairs*, 88: 503–22.
Fisher, D.R. and Freudenburg, W.R. (2001) "Ecological modernization and its critics: assessing the past and looking toward the future", *Society and Natural Resources*, 14: 701–9.
Haas, P. M. (2008) "Climate change governance after Bali", *Global Environmental Politics*, 8(3): 1–7.
Hayward, T. (1998) *Political Theory and Ecological Values*, Cambridge: Polity Press.
Hobson, J.M. and Hobden, S. (2002) "On the road towards an historicised world sociology", in S. Hobden and J.M. Hobson (eds) *Historical Sociology of International Relations*, Cambridge: Cambridge University Press.
Hurrell, A. (2006) "The state", in A. Dobson and R. Eckersley (eds) *Political Theory and the Ecological Challenge*, Cambridge: Cambridge University Press.
"International Environmental Agreements" (2010) A special issue of the journal. Online. Available HTTP <http://www.earthsystemgovernance.org/news/2010-11-16-special-issue-international-environmental-agreements> (accessed 15 May 2012).
"International Environmental Agreements (IEA) Database Project" (2012) A useful database project, with links and lists of relevant literature. Online. Available HTTP <http://iea.uoregon.edu> (accessed 15 May 2012).
Karkkainen, B.C. (2004) "Post-sovereign environmental governance", *Global Environmental Politics*, 4: 72–96.
Keuhls, T. (1996) *Beyond Sovereign Territory: The Space of Ecopolitics*, Minneapolis: University of Minnesota Press.
Kostić, R., Krampe, F. and Swain, A. (2012) "Liberal state-building and environmental security: the international community between trade-off and carelessness", in R. Amer, A. Swain and J. Öjendal (eds) *The Security–Development Nexus: Peace, Conflict and Development*, London: Anthem Press.
Kütting, G. (2000) *Environment, Society and International Relations: Towards More Effective International Environmental Agreements*, London: Routledge.
Lawson, G. (2006) "The promise of historical sociology in International Relations", *International Studies Review* 8(3): 397–423.
Liefferink, D. (1996) *Environment and the Nation State*, Manchester: Manchester University Press.
Linklater, A. (1998) *The Transformation of Political Community*, Cambridge: Polity Press.
Lipschutz, R.D. (2004) "Imitations of empire", *Global Environmental Politics* 4(2): 20–3.
Lipschutz, R.D. and Conca, K. (1993) "Act I: the state and global ecological interdependence", in R.D. Lipschutz and K. Conca (eds) *The State and Social Power in Global Environmental Politics*, New York: Columbia University Press.
Litfin, K. (1993) "Ecoregimes: playing tug of war with the nation-state", in R.D. Lipschutz and K. Conca (eds) *The State and Social Power in Global Environmental Politics*, New York: Columbia University Press.
—— (1998) "The greening of sovereignty: an introduction", in K. Litfin (ed.) *The Greening of Sovereignty in World Politics*, Cambridge, MA: MIT Press.
Maiguashca, B. (2003) "Governance and resistance in world politics: introduction", *Review of International Studies*, 29(1): 3–28.
Mol, A.P.J. (2001) *Globalization and Environmental Reform: The Ecological Modernization of the Global Economy*, Cambridge, MA: MIT Press.

Perkins, E. (2000) "Equity, economic scale, and the role of exchange in a sustainable economy", in R.M. M'Gonigle and F.P. Gale (eds) *Nature, Production, Power*, Cheltenham: Edward Elgar.

Peterson, A.L. (2001) *Being Human: Ethics, Environment and Our Place in the World*, Berkeley: University of California Press.

Princen, T. (2005) *The Logic of Sufficiency*, Cambridge, MA: MIT Press.

—— (2010) "Consumer sovereignty, heroic sacrifice: two insidious concepts in an endlessly expansionist economy", in M. Maniates and J.M. Meyer (eds) *The Environmental Politics of Sacrifice*, Boston, MA: MIT Press.

Roszak, T. (1979) *Person/Planet: The Creative Disintegration of Industrial Society*, London: Gollancz.

Shilliam, R. (2004) "Hegemony and the unfashionable problematic of 'primitive accumulation'", *Millennium: Journal of International Studies*, 33(1): 59–88.

Smith, M. (2011) *Against Ecological Sovereignty: Ethics, Biopolitics and Saving the Natural Environment*, Minneapolis: University of Minnesota Press.

Smith, S. (1993) "The environment on the periphery of International Relations: an explanation", *Environmental Politics*, 2: 28–45.

Sonnenfeld, D.A. (ed.) (2008) Special issue on "Globalisation and environmental governance", *Global Environmental Change: Human and Policy Dimensions*, 18(3).

Stiles, K. (1998) "A rational choice model of grassroots empowerment", International Studies Association paper. Online. Available HTTP: <http://www.ciaonet.org/conf/stk01/> (accessed 15 May 2012).

UNEP (2012) *21 Issues for the 21st Century: Result of the UNEP Foresight Process on Emerging Environmental Issues*, Nairobi: United Nations Environment Programme. Online. Available HTTP: <http://www.unep.org/publications/ebooks/foresightreport/> (accessed 15 May 2012).

Vogler, J. (1995) *The Global Commons: A Regime Analysis*, Chichester: John Wiley.

—— (2000) *The Global Commons: Environmental and Technological Governance*, Chichester: John Wiley.

Wapner, P. (2002) "The sovereignty of nature? Environmental protection in a postmodern age", *International Studies Quarterly*, 46: 167–87.

Weiss, E.B. and Jacobson, H.K. (eds) (1998) *Engaging Countries: Strengthening Compliance with International Environmental Accords*, Cambridge, MA: MIT Press.

Wolff, R. (1998) *In Defence of Anarchy*, Berkeley: University of California Press.

York, R. and Rose, E.A. (2003) "Key challenges to ecological modernization theory", *Organization and Environment* 16(3): 273–88.

Young, O.R. (2005) "Why is there no unified theory of environmental governance?", in P. Dauvergne (ed.) *Handbook of Global Environmental Politics*, Cheltenham: Edward Elgar.

8

International organizations

Global and regional environmental cooperation

Kate O'Neill

Global environmental cooperation does not occur in a vacuum. It is initiated, encouraged, coordinated, strengthened and monitored by a series of intergovernmental organizations (IGOs), with exclusive or partial environmental mandates. The environment as an issue for global governance organizations appeared on the international agenda in the late 1960s. Despite its relatively recent entry, the intersection between environment and development has gone on to become a central focus of global governance ever since, and IGOs have played a critical role in this process.

This chapter reviews the functions and operation of existing global and regional IGOs as they pertain to global environmental governance. It examines some of the more interesting lines of inquiry into their role in the international political system, both individually and as a collective whole, and how they have been applied in research on environmental IGOs to further our understanding of this set of actors. These include the extent to which IGOs are autonomous actors, how to assess their performance and impacts, how to manage links and overlap between them, and the emergence of regional IGOs, adding a new dimension to this field. Finally, this chapter outlines possible future trajectories and reforms for this complex institutional terrain.

International organizations and global governance

Intergovernmental organizations have long played a critical role in coordinating and steering inter-state cooperation and global governance. They also play a role in creating and enforcing international law and principles (see Chapter 10). In other words, nation-states delegate the business of managing and implementing global political processes to IGOs. Most simply, IGOs are "organizations that include at least three states among their membership, that have activities in several states, and that are created through a formal intergovernmental agreement such as a treaty, charter or statute" (Karns and Mingst 2010: 5). The terms "international organization" and "international institution" are not synonymous. Institutions more broadly are the "rules of the game that serve to define social practices, assign roles and guide interactions among the occupants of those roles" at the global level (Young 1994: 15), and may or may not take on formal shape. This chapter focuses on "concrete" environmental IGOs whose role and actions in the international system are shaped, at least in part, by these social institutions, as well as by their member states, including those members' internal cultures and leadership (see Chapters 4 and 7).

As we shall see, these intergovernmental organizations also play a role shaping the social institutions themselves.

Intergovernmental organizations may be global in membership, in the sense that any country may join, such as the United Nations (UN) or the World Trade Organization (WTO). They may also be limited in membership or in mandate. The Organization for Economic Cooperation and Development (OECD) requires countries to meet certain conditions before joining. Many smaller IGOs are tied to a specific issue, as with the secretariats of different international environmental regimes. At a broader level, so is the main "anchor organization" for global environmental governance, the UN Environment Program (UNEP). Intergovernmental organizations may be regional, covering a (usually) contiguous group of states, such as the European Union (EU), the North American Free Trade Agreement (NAFTA) or the Association of Southeast Asian Nations (ASEAN). They are engaged in many different spheres of global governance, from peace and security to trade, world health, development financing and the environment (see Chapters 19 and 22). Intergovernmental organizations have existed in recognizable form since the nineteenth century, but most current IGOs came into existence after the Second World War. Citing the 2008–9 *International Yearbook of International Organizations*, Karns and Mingst put the total of IGOs at that time at 240 (Karns and Mingst 2010: 5).

Many IGOs share structural similarities. They are managed by (often tiny) secretariats, often with the assistance of standing or ad hoc committees. They have a particular mandate, or purpose, as documented in their founding charter or constitution. They have a budget, funded by governments, either directly or through the UN, and mechanisms whereby member state representatives meet and make policy decisions or organizational changes. This may be through permanent representation, or via regular conferences of the parties that bring national representatives together, or some combination. In most IGOs, day-to-day affairs are run by a permanent secretariat staffed by full-time employees, while major decisions are (officially) made by state representatives. Voting rules differ across organizations: some are "one member, one vote" (e.g., the UN General Assembly), others, particularly financial institutions, are weighted according to states' financial contributions (e.g., the World Bank, where donor states collectively hold the bulk of decision-making authority). There are few easily available comparisons of IGO size, in terms of budget and number of employees. Blackhurst (1998: 40, table 1) supplies data from 1996 that places the World Bank at the top of the ranks of IGOs in terms of budget and staff, followed by the UN Food and Agriculture Organization (FAO) and the UN Development Program (UNDP), while UNEP and (perhaps surprisingly) the WTO rank closer to the bottom of the 17 organizations listed.

Theoretical perspectives on intergovernmental organizations

The proliferation of IGOs in general since the end of the Second World War and of environmental IGOs since the early 1970s has given rise to a variety of theoretical perspectives and debates about their identity, functions and impacts (see, for example, Barnett and Finnemore 1999, 2004; Diehl 2005; Hurd 2011; Karns and Mingst 2010; and for an earlier overview, Kratochwil and Ruggie 1986; see also *International Organization* and *Global Governance* journals). More recently, studies of environmental issue and regime linkages across IGOs, and the management of those linkages, have helped to revive and refresh a bureaucratic politics literature on IGOs (Biermann and Siebenhüner 2009; Jinnah 2010, 2012).

The earliest post-Second World War scholarship saw IGOs through a (neo)-functionalist lens: created by states in a process of integration, in order to fulfill particular tasks that they could not accomplish on their own (Haas 1964; Schmitter 1969; see Chapter 3). This perspective

flowed relatively easily into the neoliberal institutionalist perspective on international relations, which put states back at the center of analysis but still saw important functions for IGOs in easing inter-state cooperation and managing interdependence (see, for example, Abbott and Snidal 1998; Baldwin 1993; Keohane 1984; see Chapter 7). According to neoliberal institutionalists, IGOs are created by states in order to reduce the transaction costs of international cooperation, by coordinating meetings, collecting information, running day-to-day operations, and creating mechanisms to ensure transparency and accountability (see Chapter 3). These activities help counteract the possibility that states will cheat or free-ride on the efforts of other states, which reduces the likelihood of effective or lasting cooperation.

Institutionalist theories, unlike their realist counterparts, accord IGOs some "life of their own," in that they outlast the constellation of national interests that created them (Keohane 1984), but often ascribe that longevity to inertia (Krasner 1988) or to state actors continuing to value their functions (see Chapters 3 and 4). In terms of environmental IGOs, the neoliberal institutionalist approach has a great deal of applicability. Addressing global environmental problems, certainly at the outset, seemed more a question of coordination among nation-states, and creating rules and norms that made them take into account global and transboundary environmental degradation. This degree of interdependence clearly (in a semi-functionalist sense) demanded some form of international organization in charge.

More recent scholarship has examined the extent to which IGOs are more than forums for collective decision-making by nation-states, instead acknowledging that IGOs – or actors within IGOs – can act as autonomous agents, often exceeding their existing mandate (Barnett and Finnemore 1999, 2004). As with other sorts of bureaucracies, including at the domestic level, it became important to address the way that IGOs develop their own autonomy, their own goals – their own continued existence being one – and begin, indeed, to take on agency and power in a political realm thought to be dominated by nation-states (see Chapter 7). To an extent, these approaches are compatible with constructivist approaches within IR theory (see Chapter 4), in that they examine the co-constitution of organizations, issues and identities in the international system. Research in this vein also examines how IGOs aid in the diffusion of not only international rules, but also international norms, such as sustainable development (Bernstein 2000, 2002; see also Finnemore and Sikkink 1998). Some have also examined the conditions under which the actions of IGOs become dysfunctional – or pathological, as when, for example, they fail in their mission. Such failures can be explained, for instance, by the development of a stagnant or perhaps too insular bureaucratic culture (Barnett and Finnemore 2004).

The IGO-as-Actor approach is clearly reflected and extended in the study of environmental IGOs, most particularly in works that examine overlap, or interplay, management across international regime boundaries, where critical personnel within the organizations often take on an entrepreneurial or leadership role in governing this process (Biermann and Siebenhüner 2009; Jinnah 2010, 2011). In this sphere, IGO power and authority clearly and at least in part derives from the expertise provided by secretariats and associated regime bodies (outlined below). Such expertise – scientific and otherwise – is critical for effective governance of environmental problems (see Chapter 17), but is hard to acquire and build on without an IGO willing to coordinate transnational scientific efforts, for example. Further, in a world populated by a large number of small agencies often sharing space in the same city, collaboration across units is both effective and likely. Finally, we have seen instances of creative and effective leadership by individuals, which have helped bolster global environmental governance, as well as instances where less effective leadership has contributed to less effective governance (see Chapter 14). Ivanova (2010) discusses this with respect to UNEP.

Recent research has also turned to studying the factors influencing IGO performance and impacts, how their performance is assessed, and how they evolve over time (Barnett and Finnemore 2004; Ivanova 2010). In particular, many are interested in how, or whether, IGOs can learn over time, from assessments, or from each other, and under what conditions (Greene 1998; Haas 1990; Siebenhüner 2006). Again, given the emphasis in the global environmental politics literature on the effectiveness and impacts of environmental regimes (see Chapter 9), work in this field has yielded important insights into issues of environmental IGO performance and learning that have broader applicability to IGOs in general. Finally, researchers are starting to examine IGOs as a collective whole, asking the perhaps inevitable question: are environmental IGOs greater or less than the sum of their parts? Is the system too fragmented, with duplicative or conflicting mandates and activities across IGOs? Are actors within the system working to forge linkages across IGOs, as in, for example, regime complexes (Keohane and Victor 2011)? Or does the system require some sort of reform, perhaps centralization into a World Environment Organization (Biermann 2001; Biermann and Bauer 2005; Najam 2003)?

These perspectives are complicated by the emergence of regional organizations as nodes of environmental governance, through, for example, the EU's environmental governance structures, or through regional organizations and agreements connected with international environmental regimes (see Chapter 9). Interest in multilevel and/or cross-scale governance is growing (Balsiger and VanDeveer 2012), especially given the perceived failure of, or deadlock within, global environmental governance processes (Conca 2012). Therefore, the conditions under which regional governance (or the devolution of governance capabilities across levels) is appropriate and effective for addressing transboundary or global environmental problems has become a new focal point of research for scholars of IGOs.

Mapping environmental intergovernmental organizations: functions, nesting and linkages

Many different international organizations and agencies have full or partial mandates to address global environmental problems. This creates a complex terrain and sets of interactions for the researcher to delineate, despite the fact that most are nested in some way within the UN system, or work closely with it. This section maps the major international environmental organizations, and their functions, from UNEP to individual secretariats and other regime bodies, to IGOs with or that have developed environmental governance functions. It also identifies some of the regional IGOs that have an environmental mandate within and across their member states. It demonstrates the linkages – horizontal and vertical – and interrelationships across environmental IGOs, as well as some of the insights and perspectives on their work, goals and influence analyzed by the leading researchers in this field.

The United Nations Environment Program

The UN Environment Program is the intended anchor organization for global environmental governance (Ivanova 2007). The organization was created in 1972 at the United Nations Conference for Humans and the Environment, held in Stockholm, Sweden. The UN convened this conference to bring states together to discuss and implement a coordinated legal framework to address global and transboundary environmental problems, the extent of which had only recently become clear. Despite some calls at the time for a form of "International Environment Organization" (Kennan 1970) that would be more centralized and have more enforcement powers, UNEP was established as a UN program under the auspices of the UN General Assembly

and Economic and Social Council (Biermann 2001: 46–7), reflecting a certain amount of pragmatism on the part of its architects. As a program, UNEP is designed to be nimble and responsive (Ivanova 2010), but it lacks the authority and autonomy to make binding decisions on its members (Bauer 2009), as a specialized UN agency such as the World Health Organization can. It cannot make funding allocations, compared with the World Bank, nor enforce treaty provisions when violated or settle disputes, compared with the UN Security Council and the WTO.

UNEP is the first UN agency to be based in a developing country, with headquarters in Nairobi, Kenya, although many of its offices are based in Geneva and other European cities, and its associated secretariats and offices are distributed worldwide. Its functions are to serve as a focal point for and coordinator of international environmental organizations, to engage in monitoring, assessment and early warning, to foster compliance with international agreements, and engage in long-term, capacity-building efforts. UNEP is also tasked with fostering linkages across the UN system, and is largely funded through voluntary, not assessed, contributions by member states (Ivanova 2010: 33–4). In 2010, its funding requirements across its work programs added up to around $218 million (UNEP 2010).

Many have questioned UNEP's performance, given its financial and political constraints, and assessments are decidedly mixed (as pointed out in Bauer 2009; Ivanova 2010: 36–7; and Najam 2003). In her assessment of UNEP's performance across the different areas and goals of its mandate, Ivanova also finds its performance to be mixed (Ivanova 2010; see also Ivanova 2007). Although in many ways its activities reflect the pragmatic nature of its design, it has not been able to push much beyond its original mandate, and has been excluded from some critical global governance processes. While it has failed to become *the* main single international environmental organization, it has been more successful in monitoring and assessing the state of the global environment and in establishing and managing many different international environmental regimes and negotiating processes (Ivanova 2010: 46). Najam (2003) finds that, despite some deserved criticism, UNEP has functioned well in the light of its budgetary constraints and overwhelming mandate, and by comparison with similar international agencies.

A number of factors help explain this performance record. For example, leadership has been important for UNEP. Its key achievements correlate with the terms of office of particular executive directors – such as Maurice Strong or Mostafa Tolba – who were often lauded (or criticized) for pushing the global environmental agenda (Benedick 2007). Not all directors have been considered as effective. On the other hand, others have seen the reliance on charismatic leadership as a weakness, not a strength – an important insight from broader institutional literatures (Downie and Levy 2000; Ivanova 2007, 2010). Ivanova (2010) builds on the Barnett and Finnemore (2004) framework outlined above to identify features that determine UNEP's performance. She examines elements of UNEP's design and operation (as established by member states), its internal leadership and organizational culture – and adds its distant location in order to understand the challenges it faces, and why it has not been able to go above and beyond its mandate. In the next section, however, we move on to examine how some of UNEP's subsidiary bodies have made more progress in pushing global environmental governance beyond its initial bounds.

Treaty secretariats and other regime bodies

Other important international environmental organizations are nested within international environmental regimes (see Chapter 9). Each treaty-based regime, from ozone depletion (Chapter 29) to biodiversity (Chapter 37) to toxins to climate (Chapter 32), is managed by its own secretariat, which in turn reports to the regime's Conference of the Parties (COP), and has

its own permanent staff. Many of these are nested within UNEP. The UN manages some, such as the secretariat of the UN Framework Convention on Climate Change (UNFCCC), while others, such as the Ramsar Convention Secretariat, exist entirely outside the UN system (Jinnah 2012; see Chapters 28 and 37). The functions and operations of treaty secretariats have received increased attention in recent years (Biermann and Siebenhüner 2009; Jinnah 2010, 2012; Muñoz et al. 2009; Sandford 1994). Long dismissed as merely functional agencies, which coordinate treaty-related paperwork and run Conferences of the Parties, it has become clear that in many cases, they wield considerable power behind the scenes, but that power, or, more accurately, influence, varies across environmental regimes. For example, they have been able in many cases to exercise considerable (but not explicit) leeway in terms of steering their member states towards particular outcomes (for example, by supplying draft text).

Both Jinnah (2010, 2011) and the authors of the essays in Biermann and Siebenhüner (2009) are particularly interested in how secretariats are directly engaged in overlap or interplay management – where the sphere of action of one regime cuts across another. This may be across environmental regimes (in the same issue area or different), or between environmental and other international governance arenas, in particular the trade regime (see Chapter 22). The reason secretariats are especially important here is that international law and politics have little provision for what happens when regime processes overlap – despite the potential for conflict – or for mutual advantage in such cases. Thus they have been able to exert agency in shaping a whole new area of global governance activity, albeit often through informal means. Jinnah (2012) examines, for example, how the secretariat of the 1992 Convention on Biological Diversity has worked with secretariats of other biodiversity-related regimes to strengthen joint activity on overlapping goals (see Chapter 37). She also points out how the secretariats of the various chemicals treaties have cooperated to create an ad hoc joint working group to look for ways to make them work more closely together (see also Selin 2011; and Chapter 33).

One of the particular concerns of recent work on secretariats again taps into the new theoretical perspectives on IGOs as autonomous actors. Jinnah (2010) in particular provides a framework for identifying sources of secretariat authority, over and above the authority delegated to them by member states. In terms of authority, she points out that they can draw on their expertise, their "moral authority" as representing the global community on a particular issue (see also Barnett and Finnemore 2004), their role as holders of institutional memory, and the ability of individuals within secretariats to build professional networks over time across a number of institutional entities. The extent to which this authority translates into influence is an empirical question (which Jinnah tests with respect to environmental overlap management activities of the WTO secretariat), but this recent work notes the importance of these "unsung" actors in global environmental governance. It also flags important avenues for future research, into, for example, the legitimacy of such actors in global governance.

Many treaty-based environmental regimes also contain subsidiary bodies, often for scientific and technical advice (Kohler et al. 2012; see Chapter 17). Many of these bodies are permanent, some are ad hoc. The UN Framework Convention on Climate Change and the Kyoto Protocol have a particularly complex combined administrative structure (UNFCCC 2012). Permanent and ad hoc committees serve each agreement under the overall authority of the UNFCCC secretariat, reporting to the Conference of the Parties (UNFCCC) and the Meeting of the Parties (Kyoto). Two subsidiary bodies – for Scientific and Technical Advice, and for Implementation – are permanent bodies, along with other committees on compliance, funding mechanisms and so on. However, ad hoc working groups have played a very important role, too, in steering the progress of the UNFCCC and the Kyoto Protocol. The most prominent international scientific body associated with the climate regime, the Intergovernmental Panel on

Climate Change (IPCC) operates outside the UNFCCC. Co-established by UNEP and the World Meteorological Organization (WMO) in 1988, it collects, summarizes and assesses global scientific research on climate change (Hulme and Mahony 2010).

Other regimes have similar, if perhaps not quite so complex, structures. The Convention on Biological Diversity has, for example, its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), and the Article 8j Working Group, whose mandate is to integrate local knowledge and knowledge holders into the regime. Even in regimes that are not anchored by a multilateral agreement, more informal international bodies – such as the UN Forum on Forests – provide venues and assistance for multilateral dialogue and advice.

Understanding these subsidiary bodies is not only important for drawing an accurate map of this institutional landscape. First, they provide important information and advice to treaty secretariats, UNEP (and other IGOs), and Conferences of the Parties that is used as the basis for new measures within regimes. Certain of these bodies are explicitly delegated assessment tasks. The 1987 Montreal Protocol set up three assessment panels and a system of implementation review that engages a variety of stakeholders and interested actors to create quite an effective learning environment (Greene 1998). Second, and speaking to the macro perspective on environmental IGOs, they have attracted the interest of researchers working on the fragmentation of global environmental governance. These analysts are interested in the extent to which this system serves a collective interest, and whether it would be advantageous to cluster or merge these diverse actors into, for example, a global scientific panel that could work across environmental issues, or into issue-based clusters (Biermann 2001; von Moltke 2001).

Finally, a small number of environmental IGOs have been set up to work across environmental regimes. The Global Environment Faculty (GEF) coordinates funding and capacity-building projects across several regimes and issue areas: climate change (Chapter 28), ozone depletion (Chapter 29), biodiversity (Chapter 37), oceans (Chapter 35), persistent organic pollutants (Chapter 32), and desertification or land degradation (Chapter 39). GEF is administered by UNEP and UNDP, with funding coordinated by the World Bank, although it has its own council and decision-making body. As a capacity-building organization, it has also been assessed (and found wanting) on its performance – but has been lauded as a moderately successful experiment in terms of cooperation between three different agencies (Clémençon 2006; Lattanzio 2010). On a far smaller scale, the Green Customs Initiative works to train customs officials in developing countries to be able to identify and prevent smuggling of various goods and substances prohibited across different environmental regimes, from ozone-depleting substances to hazardous wastes to wildlife and genetically modified organisms. Managed through partnering of a variety of international agencies, including regime secretariats, Interpol, the World Customs Organization and others, it is a small but potentially innovative agency within this landscape, albeit under-studied. Finally, although by no means exclusively environmental, the UN Institute for Training and Research (UNITAR) has an important function in building capacity at local and national levels to address a variety of environmental problems – from climate change to chemicals management.

Other intergovernmental organizations with environmental links and functions

Issues of global environmental protection, politics and sustainable development have spilled over into the mandates and activities of many other IGOs. Some have a long association with global environmental issues, and indeed have been instrumental in helping get environmental problems on to the international policy agenda. The World Meteorological Organization, for example, worked with UNEP on early meetings around developing a regime to combat ozone

layer depletion (see Chapter 29), and with the UN to establish the IPCC. The UN Economic and Social Council (UNESCO) oversees the 1972 World Heritage Convention, an early conservation agreement that protects sites of natural and cultural importance worldwide. The UN Food and Agriculture Organization (FAO) monitors the world's forests, and is increasingly engaged in sustainability debates around world agricultural production (see Chapters 38 and 40). Finally, the International Maritime Organization (IMO), among other important functions to do with maritime security and safety, oversees the International Convention for the Prevention of Pollution by Ships (MARPOL 1973/78). The Organization for Economic Cooperation and Development (OECD), while not a law-making organization, issues guidelines and data on environmental practices and performance, primarily but not wholly for and on its member states.

Other IGOs have taken on environmental responsibilities far more reluctantly, often in the wake of extensive criticism of the environmental and social impacts of their previous work. Perhaps most famously, the World Bank was forced to address, starting in the late 1980s and continuing through the 1990s, the environmental degradation and social dislocation that had followed many of the large-scale infrastructure projects it had funded. Nongovernmental organizations (NGOs), both local to the affected communities and transnational, were able to apply pressure to politicians in donor countries to get the Bank to start integrating environmental assessment into its funding process (Fox and Brown 1998). While it has made progress in these tasks, it still faces criticism on a variety of fronts, including its technocratic approach to environmental management (Goldman 2005) and its continued funding of "brown" development projects (see Clapp and Dauvergne 2011 for an overview).

The WTO and its predecessor, the General Agreement on Tariffs and Trade, faced particular criticism in the 1990s for high-profile rulings against US regulatory actions to restrict imports of tuna (from Mexico) and shrimp (from South East Asia) on environmental grounds (see Chapters 22 and 36). These cases generated fears that any environment-related trade restriction, including those under multilateral environmental agreements, might be struck down in the interests of fostering global trade liberalization (see Chapter 22). In fact, these rulings were either never enforced or overturned on appeal (O'Neill and Burns 2005). Furthermore, the secretariats of both UNEP and the WTO have started working together in recent years to minimize conflicts and manage overlap between their respective jurisdictions (Gehring 2011; Jinnah 2010). The WTO was a significant presence both at the 2002 World Summit on Sustainable Development and the 2012 "Rio+20" summit. From an organizational perspective, these activities both demonstrate active, and relatively autonomous, work by regime secretariats over and above their individual mandates. The results of the cases reflect how the GATT/WTO dispute settlement process can be contingent as well as how it has changed over time, as in the creation of appellate panels under the 1995 WTO agreements.

Therefore, in the cases of the World Bank and the GATT/WTO, we see some progress in incorporating sustainable development goals into their initial mandates – economic development for the former, and trade liberalization for the latter – albeit in ways that fit with rather than depart radically from their overall economic ideologies (see Chapter 22). These developments stand, for instance, in stark contrast to the other main international financial organization, the International Monetary Fund (IMF), which has remained relatively resistant to societal pressures. However, developments in this arena speak to two of the theoretical debates brought up at the start of this chapter. First, they reflect the way norms have diffused across international organizations and policy arenas – in this case with respect to sustainable development (see Chapter 15). Second, they speak to overall debates about fragmentation of global environmental governance, as international economic organizations become new governance sites (O'Neill 2009), as well as to efforts to overcome such fragmentation and potential conflict.

Regional intergovernmental organizations and global environmental governance

Regional environmental governance – governance arrangements across several (usually contiguous) states, terrestrial ecosystems (such as mountain ranges) or shared bodies of water – and the role of regional governmental organizations in environmental governance have of late garnered more attention from analysts and policy-makers (Balsiger and VanDeveer 2012). This is perhaps an unsurprising development, given the ways global governance processes have stalled in recent years and the perception that global and transboundary environmental problems might be addressed more effectively by smaller groups of actors who share common characteristics, thus ameliorating collective action problems (Conca 2012). Proponents of multilevel governance, and of integrating the work of local, regional and global organizations and actors are also interested in the role of regional governance organizations in reaching across scales. This renewed interest is both generating and bringing together a rich set of research studies, which can be only briefly surveyed here.

While regional environmental governance arrangements have a long history (e.g., Rhine River management arrangements in the nineteenth century; see Chapter 34), regional organizations have recently started to take on more, and more diverse, environmental governance functions. Most generally, regional agreements are "those bilateral or multilateral agreements which are signed by at least two countries that share territorial or maritime borders, or that govern a contiguous, transnational region" (Balsiger and VanDeveer 2012: 5, citing Balsiger et al. 2012). Their organizational components vary widely in size and capacity, from a huge institutional apparatus with strong enforcement powers (e.g., the EU) to very tiny units with few employees and resources. Based on an Internet search by the author, some regional fisheries management organizations (RFMOs), for example, are lucky to have even three permanent employees.

As Balsiger and VanDeveer (2012) point out, some of these initiatives are part of autonomous organizations, such as environmental policies within the EU, the Arctic Council, ASEAN, or environmental bodies within free trade associations such as NAFTA. Others are part of multilevel governance arrangements, such as regional centers established under chemicals treaties (see Selin 2012) or regional treaties formed under the umbrella of a broader global regime. Examples of the latter include various sub-regimes associated with the 1975 Convention on Migratory Species (see Chapter 37), such as Eurobats (which monitors the European bat population and engages in educational activities and came into force in 1994) or ACCOBAMS (the Agreements for the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Areas, created in 1996). Others still are autonomous regional governance arrangements, although they may be networked with similar groups, such as RFMOs. Another example of regional governance arrangements around specific environmental issue areas is the 1979 Convention on Long Range Transboundary Air Pollution, whose activities are largely based in Europe, but with another North American sub-regional organization (Levy 1993; see Chapter 30).

In many cases of regional environmental governance, issue-area based regional organizations often cover (or are extended to cover) a cluster of concerns, including environmental, but also those related to sustainable development, border control, regional security and others (see Chapter 19). Examples include transboundary mountain regions, such as the Himalayas or the Swiss Alps (Matthew 2012; Balsiger 2012) and regional seas (Chapter 35), such as the Barents Sea and the Mediterranean (Stokke et al. 1999; P. Haas 1990).

In terms of analyzing regional environmental IGOs, many of the same themes that occur in the broader literature apply to them, but perhaps play out in different ways. Some research examines how regional organizations reflect and/or shape identities across borders or within

certain eco-regions (Balsiger 2012, on the European Alps). Others examine how well existing organizations are able to build environmental concerns into their existing governance activities and structures (see Aggarwal and Chow 2010 on the ASEAN Agreement on Transboundary Haze Pollution, which entered into force in 2003, and Elliott 2012). Yet others analyze the impacts and effectiveness of regional agreements and organizations. Specifically, there is quite a lot of literature on RFMOs in this context (e.g., Cullis-Suzuki and Pauly 2010; Schiffman 2009). A 2006 study published by the World Wildlife Fund and the wildlife NGO TRAFFIC (Wilcock and Lack 2006) recommends in particular the development of some coordinated management of RFMOs, at least in terms of monitoring and compliance, or providing scientific input, and notes high level discussions about creating some sort of global fisheries agency (see Chapter 36). Although this has not happened, nor does it seem likely, in this case of regional governance effectiveness appears low, to at least some extent because of its regional level.

The possibility of adding a regional dimension to the environmental IGO landscape raises some more questions specific to this issue. First, where, and under what conditions, is regional governance more effective or more appropriate than global governance? What sorts of relationships exist between global and regional organizations? Across regional organizations? Are they more vertical (hierarchical), or horizontal (networked)? Can regional organizations in similar areas learn from each other and adapt more easily than global IGOs can? Stokke et al. (1999), in their study of the bilateral regime managing the Barents Sea, suggest that while learning is possible, careful attention needs to be paid to the contextual characteristics of specific regional arrangements, which may make policy or institutional diffusion much harder. Either way, these questions about regional IGOs deserve further exploration.

Conclusion

In practice and in theory, environmental IGOs have recently been experiencing a moment in the sun – even if that sunlight has sometimes shown up their flaws. This chapter has described the complex landscape, at global and regional levels, of IGOs with environmental governance responsibilities. It has also described some of the linkages, formal and informal, that exist between them, for example the nested nature of the major UN-related agencies, from UNEP to the secretariats and other regime bodies, or their growing interrelationship across regime lines with the WTO. The emergence of multilevel governance as a very visible phenomenon has also raised questions of linkages across scales of global governance – between global and regional.

Factors and themes that have been important to understanding individual IGOs have to do with their performance and impacts, and their role in reducing the transaction costs of inter-state cooperation. In terms of performance, the evidence, as discussed above, is mixed, though several studies find that performance is better than expected, given the various constraints IGOs face, and have made progress in identifying what factors are important in determining performance. Recent research also addresses the (often growing) extent to which IGOs are able to exert agency, over and above the functions delegated to them by member states. In the environmental arena, while research shows that UNEP is more constrained, a more recent set of studies are showing how bureaucracies at a lower level – such as treaty secretariats – are able to push environmental governance agendas in particular directions. Quite often this is through informal means – such as the development of shared norms and understandings in the management of overlap between regimes.

Collectively, environmental IGOs face a number of challenges. The main one is quite simply the complexity of this landscape, which makes for potential overlaps and conflicts between organizations and across jurisdictions, as well as unnecessary fragmentation of governance activities.

Adding regional IGOs to this mix raises the possibility for conflicts across scales too. Debates have turned to the possible future trajectories for this institutional system or complex. This demonstrates the extent to which environmental IGOs are now entrenched in the global political system. One of the possible trajectories for this system is towards deliberate centralization, building, for example, an overarching authority to coordinate global environmental governance such as a World Environment Organization (Biermann 2001). Others point out problems with this model (e.g., Najam 2003), and there is some doubt that such deliberate reform, even if the political will existed, would lead to the desired results (O'Neill 2012). Conversely, some (e.g., Conca 2012) have identified forces for decentralization given the perceived failings of traditional state-led global environmental governance, in this case, pursuing governance solutions at a regional level. One possible shift has to date been under-represented: the incorporation of NGOs and other non-state actors directly into IGO decision-making processes (see Chapter 14). While some studies – with respect to partnerships (Joyner 2005), multi-stakeholder commissions such as the World Commission on Dams (Ottaway 2001), and specific global institutions, such as the World Bank (Park 2010) – address the possibilities of a more hybrid form of international organization (international "governance" organizations, perhaps), this possibility needs more exploration.

In sum the role of IGOs in global and regional environmental cooperation has been shown to be significant, and, largely, positive. Their impacts and activities go well beyond realist or neoliberal institutionalist formulations of their role and activities (see Chapter 3). Many challenges to – and critiques of – their activities do exist. Practical constraints are, of course, important, and, ultimately, without member states on board, they cannot fulfill their mission. Finally, if we are to assume they will take on more autonomy as time goes on, we will have, sooner or later, to address their legitimacy, or lack thereof, in this role as global policy-makers, and whose interests they are going to represent (Jinnah 2010).

References

Abbott, Kenneth W., and Duncan Snidal. "Why States Act through Formal International Organizations." *Journal of Conflict Resolution* 42.1 (1998): 3–32.

Aggarwal, Vinod K., and Jonathan T. Chow. "The Perils of Consensus: How ASEAN's Meta-Regime Undermines Economic and Environmental Cooperation." *Review of International Political Economy* 17.2 (2010): 262–90.

Baldwin, David A., ed. *Neorealism and Neoliberalism: The Contemporary Debate*. New York: Columbia University Press, 1993.

Balsiger, Jörg. "New Environmental Regionalism and Sustainable Development in the European Alps." *Global Environmental Politics* 12.3 (2012): 58–78.

Balsiger, Jörg, and Stacy VanDeveer. "Navigating Regional Environmental Governance." *Global Environmental Politics* 12.3 (2012): 1–17.

Balsiger, Jörg, Miriam Prys, and Niko Steinhoff. "The Nature and Role of Regional Agreements in International Environmental Politics." *GIGA Working Paper*, no. 208, Hamburg: German Institute of Global and Area Studies, 2012.

Barnett, Michael N., and Martha Finnemore. "The Politics, Power, and Pathologies of International Organizations." *International Organization* 53.4 (1999): 699–732.

Barnett, Michael, and Martha Finnemore. *Rules for the World: International Organizations in World Politics*. Ithaca, NY: Cornell University Press, 2004.

Bauer, Steffen. "The Secretariat of the United Nations Environment Programme: Tangled up in Blue." *Managers of Global Change: The Influence of International Environmental Bureaucracies*. Eds. Biermann, Frank and Bernd Siebenhüner. Cambridge, MA: MIT Press, 2009.

Benedick, Richard E. "Science, Diplomacy and the Montreal Protocol." *Encyclopedia of Earth*. Ed. Cleveland, Cutler J. Washington, DC: Environmental Information Coalition, National Council for Science and the Environment, 2007.

Bernstein, Steven. "Ideas, Social Structure and the Compromise of Liberal Environmentalism." *European Journal of International Relations* 6.4 (2000): 464–512.
—— *The Compromise of Liberal Environmentalism*. New York: Columbia University Press, 2002.
Biermann, Frank. "The Emerging Debate on the Need for a World Environment Organization: A Commentary." *Global Environmental Politics* 1.1 (2001): 45–55.
Biermann, Frank, and Steffen Bauer, eds. *A World Environment Organization: Solution or Threat for Effective International Environmental Governance?* London: Ashgate Publishing, 2005.
Biermann, Frank, and Bernd Siebenhüner, eds. *Managers of Global Change: The Influence of International Environmental Bureaucracies*. Cambridge, MA: MIT Press, 2009.
Blackhurst, Richard. "The Capacity of the WTO to Fulfill Its Mandate." *The WTO as an International Organization*. Ed. Krueger, Anne O. Chicago, IL: University of Chicago Press, 1998.
Clapp, Jennifer, and Peter Dauvergne. *Paths to a Green World: The Political Economy of the Global Environment*. Cambridge, MA: MIT Press, 2011.
Clémençon, Raymond. "What Future for the Global Environment Facility?" *Journal of Environment and Development* 15.1 (2006): 50–74.
Conca, Ken. "The Rise of the Region in Global Environmental Governance." *Global Environmental Politics* 12.3 (2012): 127–33.
Cullis-Suzuki, Sairka, and Daniel Pauly. "Failing the High Seas: A Global Evaluation of Regional Fisheries Management Organizations." *Marine Policy* 34 (2010): 1036–42.
Diehl, Paul, ed. *The Politics of Global Governance: International Organizations in an Interdependent World*, 3rd ed. Boulder, CO: Lynne Rienner Press, 2005.
Downie, David, and Marc A. Levy. "The UN Environment Programme at a Turning Point: Options for Change." *The Global Environment in the Twenty-First Century: Prospects for International Cooperation*. Ed. Chasek, Pamela S. Tokyo: UN University Press, 2000.
Elliott, Lorraine. "ASEAN and Environmental Governance: Strategies of Regionalism in Southeast Asia." *Global Environmental Politics* 12.3 (2012): 38–57.
Finnemore, Martha, and Kathryn Sikkink. "International Norm Dynamics and Political Change." *International Organization* 52.4 (1998): 887–917.
Fox, Jonathan A., and L. David Brown, eds. *The Struggle for Accountability: The World Bank, NGOs and Grassroots Movements*. Cambridge, MA: MIT Press, 1998.
Gehring, Thomas. "The Institutional Complex of Trade and Environment: Toward an Interlocking Governance Structure and a Division of Labor." *Managing Institutional Complexity: Regime Interplay and Global Environmental Change*. Eds. Oberthür, Sebastian and Olav Schram Stokke. Cambridge, MA: MIT Press, 2011.
Goldman, Michael. *Imperial Nature: The World Bank and Struggles for Social Justice in the Age of Globalization*. New Haven, CT: Yale University Press, 2005.
Greene, Owen. "The System for Implementation Review in the Ozone Regime." *The Implementation and Effectiveness of International Environmental Commitments: Theory and Practice*. Eds. Victor, David G., Kal Raustiala, and Eugene B. Skolnikoff. Cambridge, MA: MIT Press, 1998.
Haas, Ernst B. *Beyond the Nation State: Functionalism and International Organizations*. Stanford, CA: Stanford University Press, 1964.
—— *When Knowledge Is Power: Three Models of Change in International Organizations*. Berkeley: University of California Press, 1990.
Haas, Peter M. *Saving the Mediterranean: The Politics of International Environmental Cooperation*. New York: Columbia University Press, 1990.
Hulme, Mike, and Martin Mahony. "Climate Change: What Do We Know about the IPCC?" *Progress in Physical Geography* 34.5 (2010): 705–18.
Hurd, Ian. *International Organizations: Politics, Law, Practice*. Cambridge: Cambridge University Press, 2011.
Ivanova, Maria. "Designing the United Nations Environment Programme: A Story of Compromise and Confrontation." *International Environmental Agreements* 7 (2007): 337–61.
—— "UNEP in Global Environmental Governance: Design, Leadership, Location." *Global Environmental Politics* 10.1 (2010): 30–59.
Jinnah, Sikina. "Overlap Management in the World Trade Organization: Secretariat Influence on Trade-Environment Politics." *Global Environmental Politics* 10.2 (2010): 54–79.
—— "Marketing Linkages: Secretariat Governance of the Climate–Biodiversity Interface." *Global Environmental Politics* 11.3 (2011): 23–43.

—— "Singing the Unsung: Secretariats in Global Environmental Politics." *The Roads from Rio: Lessons Learned from Twenty Years of Multilateral Environmental Negotiations*. Eds. Chasek, Pamela S. and Lynn M. Wagner. New York: Routledge, 2012.

Joyner, Christopher C. "Rethinking International Environmental Regimes: What Role for Partnership Coalitions?" *Journal of International Law & International Relations* 1.1–2 (2005): 89–119.

Karns, Margaret P., and Karen A. Mingst. *International Organizations: The Politics and Processes of Global Governance*, 2nd ed. Boulder, CO: Lynne Rienner, 2010.

Kennan, George F. "To Prevent a World Wasteland: A Proposal." *Foreign Affairs* 48 (1970): 401–13.

Keohane, Robert O. *After Hegemony: Cooperation and Discord in the World Economy*. Princeton, NJ: Princeton University Press, 1984.

Keohane, Robert O., and David G. Victor. "The Regime Complex for Climate Change." *Perspectives on Politics* 9.1 (2011): 7–23.

Kohler, Pia M., Alexandra Conliffe, Stefan Jungcurt, Maria Gutierrez, and Yulia Yamineva. "Informing Policy: Science and Knowledge in Global Environmental Agreements." *The Roads from Rio: Lessons Learned from Twenty Years of Multilateral Environmental Negotiations*. Eds. Chasek, Pamela S. and Lynn M. Wagner. New York: Routledge, 2012.

Krasner, Stephen D. "Sovereignty: An Institutional Perspective." *Comparative Political Studies* 21.1 (1988): 66–94.

Kratochwil, Friedrich, and John G. Ruggie. "International Organization: A State of the Art on an Art of the State." *International Organization* 40.4 (1986): 753–75.

Lattanzio, Richard K. *Global Environment Facility (GEF): An Overview*. Washington, DC: Congressional Research Service, 2010.

Levy, Marc A. "European Acid Rain: The Power of Tote-Board Diplomacy." *Institutions for the Earth: Sources of Effective International Environmental Protection*. Eds. Haas, Peter M., Robert O. Keohane and Marc A. Levy. Cambridge, MA: MIT Press, 1993.

Matthew, Richard A. "Environmental Change, Human Security, and Regional Governance: The Case of the Hindu Kush/Himalaya Region." *Global Environmental Politics* 12.3 (2012): 100–18.

Muñoz, Miquel, Rachel Thrasher, and Adil Najam. "Measuring the Negotiation Burden of Multilateral Environmental Agreements." *Global Environmental Politics* 9.4 (2009): 1–13.

Najam, Adil. "The Case against a New International Environmental Organization." *Global Governance* 9 (2003): 367–84.

O'Neill, Kate. *The Environment and International Relations*. Cambridge: Cambridge University Press, 2009.

—— "From Stockholm to Copenhagen: The Evolving Meta-Regime of Global Environmental Governance." Paper presented at the Annual Meeting of the International Studies Association, San Diego, April 2012.

O'Neill, Kate, and William C. G. Burns. "Trade Liberalization and Global Environmental Governance: The Potential for Conflict." *Handbook of Global Environmental Governance*. Ed. Dauvergne, Peter. Cheltenham: Edward Elgar, 2005.

Ottaway, Marina. "Corporatism Goes Global: International Organizations, Nongovernmental Organization Networks, and Transnational Business." *Global Governance* 7 (2001): 265–92.

Park, Susan. *World Bank Group Interactions with Environmentalists: Changing International Organization Identities*. Manchester: Manchester University Press, 2010.

Sandford, Rosemary. "International Treaty Secretariats: Stage-Hands or Actors?" *Green Globe Yearbook of International Cooperation on Environment and Development 1994*. Eds. Bergesen, Helge Ole and Georg Parmann. Oxford: Oxford University Press, 1994.

Schiffman, Howard S. "CCAMLR Fisheries: Challenges to Effective Conservation and Management." *Journal of International Wildlife Law and Policy* 12 (2009): 180–9.

Schmitter, Philippe C. "Three Neo-Functional Hypotheses about International Integration." *International Organization* 23 (1969): 161–6.

Selin, Henrik. "Global Politics and Policy of Hazardous Chemicals." *The Global Environment: Institutions, Law and Policy*, 3rd ed. Eds. Axelrod, Regina, Stacy VanDeveer, and David L. Downie. Washington, DC: CQ Press, 2011.

—— "Global Environmental Governance and Regional Centers." *Global Environmental Politics* 12.3 (2012): 18–37.

Siebenhüner, Bernd. "Can Assessments Learn, and If So, How? A Study of the IPCC." *Assessments of Regional and Global Environmental Risks: Designing Processes for the Effective Use of Science in Decision-making*. Eds. Farrell, Alexander E. and Jill Jäger. Cambridge, MA: MIT Press, 2006.

Stokke, Olav Schram, Lee G. Anderson, and Natalia Mirovitskaya. "The Barents Sea Fisheries." *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Ed. Young, Oran. Cambridge, MA: MIT Press, 1999.

United Nations Environment Programme (UNEP). *UNEP Annual Report, 2010*. 2010. Available at http://www.unep.org/annualreport/2010/ (accessed September 19, 2012).

United Nations Framework Convention on Climate Change (UNFCCC). *Bodies*. Available at http://unfccc.int/bodies/items/6241.php (accessed September 19, 2012).

von Moltke, Konrad. "The Organization of the Impossible." *Global Environmental Politics* 1.1 (2001): 23–8.

Wilcock, A., and M. Lack. *Follow the Leader: Learning from Experience and Best Practice in Regional Fisheries Management Organizations*. WWF International and TRAFFIC International, 2006.

Young, Oran R. *International Governance: Protecting the Environment in a Stateless Society*. Ithaca, NY: Cornell University Press, 1994.

9

International environmental regimes

Formation, effectiveness and trends

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Human activity over the last century has significantly damaged the Earth's atmosphere, water, land, and biodiversity. Environmental problems such as stratopsheric ozone depletion (see Chapter 29), acid rain (see Chapter 30), climate change (see Chapter 28), collapse of fish stocks (see Chapter 36), water pollution (see Chapter 34), and deforestation (see Chapter 38) represent challenges from local to global levels. A central focus of this Handbook is explaining and understanding human behavior that has led to environment problems, and the methods and tools to alter this behavior. This chapter focuses on international environmental regimes, which have evolved since the 1970s, as important actors in international environmental politics and as an influential research topic.

International regime theory (IRT) emerged in the field of international relations during a period of theoretical debate. It was influenced by liberalism's rejuvenation, reflected in Keohane and Nye's (1977) representation of complex interdependence, and it was influenced by significant challenges within the international system, such as the decline of US hegemony and rising awareness of transboundary pollution. Early IRT followed in the steps of neoliberal institutionalism, neofunctionalism, social constructivism and global governance (see Chapters 3 and 4). To date, IRT maintains a primary focus on state-based behavior, and international regimes have been studied in numerous issues including, among others, the environment, human rights, refugees, trade, monetary policy, nuclear non-proliferation, food security, space, telecommunications and intellectual property rights.

The bellwether event of the 1972 United Nations Conference on the Human Environment is arguably the stimulus of many subsequent multi- and bilateral environmental agreements, and numerous international environmental regimes. International regimes are no longer perceived as a passing fad (Strange 1983), with over 30 years of articles and books, and the presence of international regimes as a theme within numerous textbooks on international relations, international organizations and environmental politics. However, while international regimes seem omnipresent in the field, at times the application of the concept "international regime" seems to denote any form of state cooperation or institutionalized behavior that is not a formal international organization.

This chapter provides an overview of international environmental regimes and will shift between theory and environmental issues as it lays out international environmental regime

theory's (IERT) key scholars, foundations, transformation, successes, criticisms, current applications and future challenges. IERT has been applied to numerous environmental issues, including deforestation, ozone depletion, the Arctic, whales, marine pollution, climate change, air pollution and space, among others. This chapter focuses on the application of IERT rather than on individual environmental issues, which are covered in detail in other chapters of this Handbook (see especially chapters in Part IV).

Much of the IERT literature serves to answer important questions. For example, are regimes effective (e.g., can they change state behavior)? What makes them more or less effective (e.g., what improves compliance and legitimacy, how are they formed, what is the influence of different states participating)? Associated with this is the investigation of how regimes challenge and overcome state sovereignty; many environmental problems extend over state borders and require international (if not global) responses. For some, environmental regimes may even assume independence from states and gain significant influence over environmental problems.

Thus a central theme of the IERT literature is whether regimes matter, that is, whether they are effective in increasing cooperation and improving the environment. This is the unifying strand that runs throughout this chapter. Clearly environmental damage continues. Is this a failure of international regimes or are international regime scholars coming close to identifying how regimes can and will solve environmental problems? The first section of the chapter elaborates on the beginnings of IERT scholarship. Section two discusses a reorientation, beginning in the 1990s, on regime effectiveness and expansion of research foci. Section three elucidates current research, and section four presents the future directions of IERT in response to contemporary environmental problems, theoretical challenges, and a shift beyond the state to analyzing multilevel actors.

Phase One: definitions, theory and focus

The binding characteristic of the early phase of IRT is disagreement, typified by debates regarding definitions, theory and research questions. These tensions continue today, but as will be discussed below, they have largely been set aside. Early efforts focused on three areas: (a) definition/conceptualization of international regimes, (b) theoretical orientation, and (3) regime function, formation and persistence. The definitional divide is emblematic of one of the fundamental controversies in the IRT field. Different researchers, while conceptualizing international regimes, have adapted countervailing theories and proposed definitions that include or exclude significant terms (for a detailed accounting see Hasenclever et al. 1997: 8–22). In short, without agreement on the concept, it has been difficult to design rigorous studies that can identify if, how and why environmental regimes can be effective.

Discussion of international regimes began in earnest in the 1970s (Ruggie 1975; E. Haas 1975). However, a 1982 special issue of *International Organization* journal, subsequently published as a book titled *International Regimes* (Krasner 1983), propelled the research topic to prominence. The journal and book served to introduce Stephen Krasner's oft-quoted definition: "Regimes can be defined as sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations" (Krasner 1983: 2). In contrast, Oran Young's early definition focuses more directly on the social and ideational aspect of regimes: "Regimes are social institutions governing the actions of those interested in specifiable activities (or accepted sets of activities)" (Young 1983: 93). Even more broadly, Kratochwil and Ruggie (1986: 759) define regimes as "governing arrangements constructed by states to coordinate their expectations and organize aspects of international behavior in various issue-areas." Thus, for some scholars regimes are socially constructed

institutions that promote greater cooperation, or collective action, between states in issues of shared concern. For others they are rule-based structures, formed by states in the anarchical international system, which alter state interests (Keohane 1989).

International regimes are human constructs and are not corporeal phenomena such as a table or a tree. Therefore, in order to "see" a regime, one has to look for signs of its impact or influence. Regimes are a form of institution because routinized behavior and social practices, based on mutual expectations of state behavior (rules, norms and principles for many regime theorists), can be observed. However, they exist between the formal (physical) institutions of international organizations, such as the North Atlantic Treaty Organization that has a staff and buildings and so forth, and the informal (nonphysical) institutions of conventions, such as everyone driving on the left (or the right) side of the road. Kratochwil and Ruggie may be right when they say that "regimes are conceptual creations not concrete entities" and as such will remain a "contestable concept" (Kratochwil and Ruggie 1986: 763–4).

Much of the early literature on regimes can be found in the journal *International Organization* as well as in legal journals, such as the *American Journal of International Law* and *Yale Law Journal*. For the purposes of this chapter, it is important to note that many environmental regulatory regimes have formed out of multilateral legal agreements, for example the Montreal Protocol and the ozone regime (see Chapter 29) or the Law of the Sea Convention (see Chapter 35) and the fisheries regime (see Chapter 36). Thus, a significant focus of the approach has been on the legal aspects of these agreements, for example parties to the agreement and their interests, and soft/hard law components, such as compliance, enforcement and regulations.

Those planning to study international regimes should acquaint themselves with the ontological and epistemological differences within the field (Kratochwil and Ruggie 1986; Haggard and Simmons 1987; Hasenclever et al. 1997; Zürn 1998; Mitchell 2002a; Young 2011). The scope of this chapter prevents explicit details; however, important debates to note follow briefly. First, disagreement is found concerning the function of regimes as intervening variables between "causal variables" and "behaviors and outcomes" (Krasner 1983: 1–9). That is, are regimes independent actors or "autonomous variables" that can overcome state interests (Krasner 1983: viii and 355–68; Haggard and Simmons 1987: 492)? Or are they dependent on state-based power structures (Puchala and Hopkins 1983) and thus never independent (Rittberger et al. 2012: 5)? In other words, can they overcome state sovereignty and, if so, under what conditions can they be a useful means of solving environmental problems?

Second, united with this debate is a deeper question of the theoretical foundation for examining regimes. The field has been defined as having interest-based theories: neoliberalism, power-based theories (neorealism) and knowledge-based (cognitive) theories (Hasenclever et al. 1997; Rittberger 1995; see Chapters 3 and 4). Haggard and Simmons (1987) designate four theoretical approaches: "Structuralism: the theory of hegemonic stability," "Strategic and game-theoretic approaches," "Functional theories," and "Cognitive theories: Knowledge, ideology, and regimes." In short, the epistemological and ontological differences between these theoretical approaches could leave the field unable to move toward a common framework and understanding of the effectiveness of regimes. Zürn (1998) encourages side-stepping this issue and moving to a more significant focus on effectiveness (see below). After all, do we not know a regime when we see one? The answer will be left to those reading this chapter.

A third focus was on the function and purpose of regimes, and regime formation, persistence, implementation and compliance (List and Rittberger 1992; Rittberger 1995). Such studies concentrated on establishing the means by which regimes "collectively manage conflicts" over environmental issues, for example vis-à-vis principles, norms, rules, expectations, "guided behavior" and so forth (Young 1989: 89). Regimes have been examined for their regulatory

functions, as well as their ability to promote norms against certain behaviors, for example regimes prohibiting the killing of whales and elephants (Nadelman 1990; see Chapters 36 and 37). Numerous functions of regimes have been analyzed including reducing transaction costs and providing information (Axelrod and Keohane 1986: 250), and reducing uncertainty and risk (Keohane 1983: 161–2). Regime functions can nurture and strengthen the continuance of a regime, such as "providing high-quality information to policy makers" (Keohane 1983: 165).

Another example of regime formation and persistence is found in research on epistemic communities as forerunners of successful environmental regimes (see Chapter 17). As Peter Haas (1989) discusses in relation to Mediterranean pollution, regime perseverance is enabled by an effective scientific epistemic community which takes knowledge to the domestic political systems of the individual states: "If a group with a common perspective is able to acquire and sustain control over a substantive [domestic] policy domain, the associated regime will become stronger and countries will comply with it" (Haas 1989: 380). The role of epistemic communities is further delineated in a special issue of *International Organization*, including articles by Haas (1992) on the ozone regime (see Chapter 29) and Peterson (1992) on the whaling regime (see Chapter 36). As will be discussed below and in Chapter 17, the influence of science on environmental politics is integral to examining the effectiveness of environmental regimes.

A fourth focus concerns the assumption that international regimes will create greater cooperation between states and lead to improvement in environmental problems, what some call "fairy tales" (Paterson 1999: 793). Keeley notes in his call to "develop a nonliberal alternative" that "Liberal approaches assume, rather than establish, regimes as benevolent, voluntary, cooperative and legitimate" (Keeley 1990: 90). There appears to be an even deeper assumption that regimes can be created to confront environmental degradation. Young notes that the "naïve hopes concerning the efficacy of social engineering in the realm of international regimes constitute a common and serious failing among policy makers and students of international relations alike" (Young 1982: 281).

During the growing pains of this early phrase several useful studies began to apply IRT to environmental issues. IERT is exemplified by issue-specific studies examining the formation, implementation and effectiveness of specific environmental regimes. According to early definitions, regimes are limited in their purpose to one issue area, but recent studies have examined the interplay between regimes.

Oran Young has been extremely prolific in documenting and theorizing about international environmental regimes, as well as inspiring several generations of researchers. His early work *Resource Regimes* (1982) was one of the first large-scale studies to position regimes as important variables between state sovereignty and natural resources (specifically marine fisheries; see Chapter 36). His research continued (Young 1989) with an exploration of regimes "in theory" and "in practice," expanding upon the theoretical foundations of IERT as well as examining additional cases (marine fisheries, deep-seabed mining, nuclear accidents, and Arctic shipping; see Chapters 36, 35 and 33). Preceding today's studies of global governance, his study continued with an analysis of international governance that examines the climate regime and resource regimes in the Arctic (Young 1998).

In conclusion, the first phase served to identify many of the tensions and theoretical differences among approaches to international environmental regimes. By the end of the 1980s calls were made for more rigorous applications of the approach. For example, Haggard and Simmons call for "Large-n studies" and concluded that "current theories of international regimes have ignored domestic political processes" (Haggard and Simmons 1987: 513–15). Such calls have been heard, as discussed in the next two sections.

Phase Two: effectiveness, expansion and empiricism

The end of the Cold War had a significant impact on the field of environmental politics and as such on IERT. Environmental crises were elevated in importance, perhaps even becoming "high" political issues for policymakers and researchers. As the available scope of topics ballooned, so too did the identification of potential benefits of regimes, multilevel actors, and cooperation beyond the sovereign state. Articles examining environmental regimes began to appear outside *International Organization* and within issue-specific journals, such as the *Journal of Environmental Management, International Security, International Studies Quarterly*, *International Environmental Affairs* and later *Global Environmental Politics*. Additionally, concentrated efforts were made to unite European–US IRT research approaches and agendas (Rittberger 1995; Miles et al. 2002).

The primary focus of this second phase of international environmental regime research is a reorientation away from the definitional and theoretical debates toward regime effectiveness and research that identifies and documents push/pull factors with rigorous case studies and empirical analysis (Mitchell 2002a). Additionally, during this phase, IERT became much more closely linked with policy studies and solutions. Zürn (1998) contrasts the second generation of environmental politics research, which "broadened both the scope of the issues and the empirical observations of the field," with the first generation, which "identified the preeminence of the environment for the analysis of international relations" (Zürn 1998: 618).

Germane to this phase is Zürn's contrast between early studies of regime formation, categorizing the study that "significantly contributes to an ongoing research program but does not constitute one of its own," and a second generation focus on regime consequences and effectiveness that "has the most potential for producing an enduring research program" (Zürn 1998: 620). The question that rose in the beginning, and took on greater prominence in the 1990s, persists today: "Do regimes matter?" (Zürn 1998: 632). If regimes are designed to solve environmental problems, do they solve them? What does a solution look like? How are regime consequences different from regime effectiveness? Zürn defines regime effectiveness as "those intended and issue-area-specific outcomes of the regime," implying a more narrow action with intent. Regime consequences "refer mainly to the more general impacts of the regime, whether intended or unintended, issue-area specific or general" (Zürn 1998: 632). Setting a high standard for international environmental regimes, he states that "Institutional effectiveness occurs when the quality of the environment is improved because of the institution" (Zürn 1998: 637).

The shift to effectiveness is clear when Rittberger posits refining Krasner's definition:

> we stipulate that the injunctions of regime be *effective* and *durable*. Effectiveness means that the behavior of actors is actually guided by the norms and rules of the regime, that is, that the pre- and proscriptions of the regime are implemented and that the compliance with the rules as the most concrete injunctions can be verified. Durability…refers to the persistence, over time, of patterns of behavior which reflect the routinized compliance with the rules of the regime. Taken together, these two additional elements of the definition raise the threshold for a cooperative mode of conflict management to be called a regime.
>
> (Rittberger 1990: 3)

In short, a regime is not a regime if it does not change the behavior of actors. Numerous variables have been proposed and examined in the efforts by scholars to operationalize environmental regime effectiveness (for an extensive introduction see Wettestad 2006 and Mitchell 2002b: 507–12; see below).

Wettestad (2001) notes that IERT needs to move beyond "do regimes matter" to "more specifically to what extent and how regimes possibly matter. In other words, are we able to say anything more specific about types of regimes and their specific regime features that are likely to make more impact and to contribute to higher effectiveness than others" (Wettestad 2001: 317). For many scholars, regime effectiveness revolves around the regime's ability to "problem solve," that is, to create international cooperation or collective action to overcome an environmental problem. In order to define "effectiveness" one also has to identify both ends of the causal equation, the independent variable, such as the characteristics of an environmental problem that needs to be solved (Hisschemöller and Gupta 1999) or sources of influence, such as science and knowledge, and the dependent variable, for example the measurable signs of effectiveness, such as compliance or providing information (Mitchell 2002b). Some even dispute using effectiveness as a dependent variable (see discussion of the Oslo–Potsdam debate below).

The operationalization of "effectiveness" has been an exhaustive and controversial issue for IERT. List (1990) presents an early case on the Baltic Sea regime to demonstrate the difficulties, "Effectiveness in the sense of compliance with existing prescriptions is best verified on the level of rules, for they contain the most concrete injunctions." However,

> In the absence of either an evaluation of national implementation reports or figures about the prosecution of breaches of environmental law, one has to rely on indirect indications of rule effectiveness…[such as] the absence of mutual accusations of rule-breaking…the adaptation of national standards of environmental law to those agreed upon internationally…[and] implementation of at least some of the rules, notably in the field of scientific cooperation.
>
> (List 1990: 100–1)

Sprinz (2001) discusses capturing effectiveness by including decision-making, reporting and compliance, funding mechanisms and development components (developed versus developing state goals). Luterbacher and Sprinz propose science, international actors and bargaining power, equity, institutional setup, side payments and regime linkages (interplay) (Luterbacher and Sprinz 2001: 300). For example, they discuss how the US refusal to join the Kyoto Protocol affected the climate change regime: "The fact that the most powerful country on Earth and also the largest emitter of greenhouse gases [in 2001] does not seem to be close to ratifying the Kyoto Protocol keeps others from taking major initiatives" (Luterbacher and Sprinz 2001: 298).

Several authors carefully examine the influence of science and knowledge on environmental regime effectiveness (Andresen et al. 2000; see Chapter 17). Dimitrov's (2003) provocative study compared the ozone regime (see Chapter 29) to the non-regime of deforestation (see Chapter 38) to demonstrate the role of specific types of knowledge and science in enabling regime formation. He concludes, "Reliable information about the shared consequences of a problem appears to be particularly important in efforts to introduce regimes" (Dimitrov 2003: 145).

In conclusion, Phase Two of scholarship on international environmental regimes witnessed an increased emphasis on the question of "to what extent and how regimes matter." As noted, "effectiveness" emerged as a contested concept, and greater emphasis was placed on developing more rigorous qualitative and quantitative studies of environmental regimes.

Phase Three: databases and operationalizing effectiveness

Consensus on the maturity of IERT is left to the reader to determine, but clearly the field has progressed significantly since the 1970s. The most important contributions of its latest phase are the operationalization of regime effectiveness and the advent of large empirical studies.

Several teams have assembled extensive databases with which to identify the factors contributing to regime effectiveness. These include the Institutional Dimensions of Global Environmental Change project (Young et al. 2008), the Oslo–Seattle Project Database (Miles et al. 2002) and the International Regimes Database (IRD) (Breitmeier et al. 2006).

As IERT advances, the need to operationalize regime effectiveness has become more urgent (see Young 2011 for a concise synopsis). For example, why did the ozone regime succeed (see Chapter 29) while the climate change regime has failed (see Chapter 28)? Why has a deforestation regime not emerged (Dimitrov 2003; see Chapter 38)? Answering these questions are important not only for the researchers but for policymakers. Yet, the assumption persists that regimes are the tools with which to advance positive change.

Not only are the IERT researchers attempting to describe and explain the world, they are also seeking to prescribe future actions. Heated but productive debate has emerged on the proper means to empirically examine regime effectiveness. One example is the "dialogue, or what is called 'good trouble,'" between Young (2003) and Hovi et al. (2003) regarding the "Oslo–Potsdam solution to measuring regime effectiveness." Hovi et al. propose a "formula" premised on game theory to measure regime effectiveness based on the variables of "a no-regime counterfactual," a "measure of actual performance" and a determination of what they call a "collective optimum" (Hovi et al. 2003: 75). Young praises the steps forward to devising measures that can be easily quantified and "allow comparison," but critiques their variables and the focus on regime effectiveness as the dependent variable with causal implications (Young 2003).

Miles et al. present detailed case studies that focus on the independent variables of "type of problem," "problem-solving capacity" and "political context" (Miles et al. 2002: 63–5) to assess regime effectiveness, and then categorize these variables along a spectrum of "benign" to "malign" based on the ease or difficulty of the problem to be solved (Underdal 2002: 55–6). Young argues that such a spectrum is in itself conceptually problematic (Young 2010: 44–5). While the debate continues on the variables to study, data continue to be accumulated and the effects are being implemented in the policy world, such as the Environmental Regulatory Regime Index used as a matrix of environmental performance in Europe (European Commission 2008).

A second focus of current IERT effectiveness research is on the interplay (or linkages) between environmental regimes and other types of regimes, such as the relationship between the World Trade Organization (see Chapter 22) and marine mammal regimes (see Chapter 36). Numerous studies began comparing the effectiveness of different international regimes, such as those on climate change (Chapter 28), stratospheric ozone depletion (Chapter 29), biodiversity (Chapter 37), deforestation (Chapter 38), desertification (Chapter 39) and persistent organic pollutants (Chapter 32) (Sprinz 2001). IERT researchers also began to examine more carefully the interplay or linkages among international environmental regimes (Young et al. 1996; Stokke 2001; Andersen 2002; Ward 2006). According to Stokke (2001: 2), "regime inter-play refers to situations when the contents, operation or consequences of one institution (the recipient regime) are significantly affected by another (the tributary regime)." These studies highlight the types of interplay, such as embedded, nested, clustered and overlapping regimes (Young et al. 1996), utilitarian, normative and ideational factors (Stokke 2001: 10–11) and "time dimensions" (Andersen 2002). The purpose is to examine "whether such interplay will be supportive or obstructive to problem-solving efforts under international regimes" (Stokke 2001: 23). Young identifies one such negative linkage: if "the center of attention shifts to efforts on the part of major actors to exploit interactive decision making to promote their own ends regardless of the consequences in terms of the common [environmental] problem" (Young 2002: 133).

Oberthür and Stokke's (2011) edited volume provides another clear example of the directions the field is taking regarding interplay. Their book offers a thoughtful connection of empirical

data from the Institutional Dimensions of Global Environmental Change project, numerous environmental case studies (e.g., climate change, Arctic resources and biodiversity) and analysis of the interplay management of regimes (e.g., trade and environmental regimes). Raustiala and Victor (2004) examine the influence of regime "density" in the issue area of plant genetic resources. They present the concept of "a *regime complex*: an array of partially overlapping and nonhierarchical institutions governing a particular issue area" (Raustiala and Victor 2004: 279) that led to "legal inconsistencies" (2004: 306) and lack of effective action. Likewise, a 2011 *Global Environmental Politics* special issue was devoted to linkages between numerous environmental regimes and the climate change regime (e.g., biodiversity, fisheries and desertification). The journal examines "how regime overlap is managed by political actors through the creation of strategic linkages between international regimes" (Jinnah 2011: 4).

A third focus is on the questions of why regimes were formed in some issue areas, why they were not in others (non-regimes) and why some regimes have failed. Why was it relatively easy to form a regime for ozone depletion, but has been hard to form a climate regime or biodiversity regime? Several researchers in this area employ counterfactuals to assess the impact of the appearance or absence of a regime, that is, they ask what would happen if the regime did not exist (Helm and Sprinz 2000: 633–5). Others seek to identify the factors that led to the lack of a regime (Dimitrov et al. 2007; Wilkening 2011) or regime failure (Harris 2007).

In conclusion, regime effectiveness has remained an important focus as well as goal of current IERT. Yet dialogue (or controversy) over the conceptualization of effectiveness continues to dominate the field, and may do so into the foreseeable future.

The future: trends, roadblocks and opportunities

Recently, international environmental regime theory has been challenged by constructivist and critical theories (see Chapter 4), and may be subsumed under a much broader global environmental research agenda that has expanded beyond the state to global governance (see Chapter 7). For example, Paterson (2009) raises an interesting criticism of "institutionalist conclusions" directed specifically at environmental regime literature. While the number of international environmental institutions has grown over the last few decades, so too has the level of environmental damage. Does this signify a weakness of IERT to capture the means by which to bring positive change? Or, rather, is the world changing so that new patterns of behavior, such as global governance, and more importantly "global environmental governance," are changing environmental politics, and regimes themselves (Paterson 2009: 264–6)? Will and can IERT adapt to this new theoretical and substantive world?

Constructivists have recently begun to examine international environmental regimes. For example, Eckersley (2004: 28–52) discusses the theoretical limits of regime theory in relation to "critical constructivism." Because regimes by definition incorporate shared rules, norms and principles, and affect behavior, the process by which shared (intersubjective) meaning is formed fits clearly within the cognitive/social learning IERT approach, as well as that of social constructivism. Another example is Walsh's (2004) investigation of epistemic communities as one mechanism (among several others described) that can provide the information or knowledge "necessary to improve cooperation" (Walsh 2004: 7). In her examination of the cases of the fisheries regime and tuna, Walsh embeds regimes as one form of institution promoting cooperation. It must be noted as well that she views institutionalism as a form of "weak constructivism."

Paterson (1999) critiques regime theory's inability or unwillingness to include additional levels, such as nongovernmental organizations, in its analysis (see Chapter 14). Regime theory may ultimately fail in its quest to explain and alter human behavior because it focuses solely on

cooperation between states. This myopia means IERT may miss shifting "power structures" that are beyond state sovereignty, for example resistance to capitalism and its detrimental effects on the environment (Paterson 1999: 798–800; see Chapter 22). Nevertheless, much of the IERT literature adopts a positivist approach, namely neo-institutionalism or neo-functionalism, and for some critical theorists the theoretical differences "are incommensurable (making empirical comparisons unhelpful, if not impossible)" (Walsh 2004: 12) (see Chapter 5). In addition, it seems (to this author) that it is counterproductive for IERT to transform its epistemological and ontological foundations to absorb a post-structuralist or post-modernist perspective. Such an effort could return the field back to the morass of its first phase.

Future directions of regime theory point as well to a connection of regime theory with the study of global governance (Young et al. 1996; Vogler 2003; Young 2008). Biermann goes as far as to say that the early debates of international regime theory served as a "relevant precursor of the concept of global governance…including the discussions on the creation of environmental regimes, on their maintenance, and on their eventual effectiveness" (Biermann 2006: 238). Betsill and Bulkeley critique regime theory and transnational networks for their limited ability "to adequately engage the concept of governance, especially the increasingly complex interactions between supranational and subnational state and nonstate actors" (Betsill and Bulkeley 2006: 142). In other words, with its focus on states as the primary actors, IERT cannot "adequately" capture the causes of environmental problems found in a broader "multilevel governance perspective" (Betsill and Bulkeley 2006: 153) and, as such, will never find solutions.

Others have begun to encourage IERT to embrace additional levels of governance. For example, echoing earlier calls to bring a domestic focus to the study of regimes (see Haggard and Simmons 1987; Zürn 1998), Nilsson et al.'s (2009) introduction to a special issue of *International Environmental Agreements* connects the national level to the international level: "environmental policy integration" in international regimes. This is emphasized as well in Betsill and Bulkeley's (2006) study of the influence of cities on climate change policy, and Fisher's examination of "national governance" as "the base of global environmental policy making" (Fisher 2004b: 4) for the climate regime. Fisher provides an in-depth study of an inside-out approach and argues that "it is through the implementation and enforcement of these domestic laws [produced by international treaties] that success or failure of the regime will ultimately be judged" (Fisher 2004b: 4).

However, to date the movement to redefine international regimes within the realm of governance seems problematic. It is unclear if this movement is a recognition that IERT is deficient because it focuses too narrowly on states that are declining in influence, or if particular regimes themselves are ineffective and need to be redesigned to include actors beyond states in their formation and implementation. For example, Okereke et al. state:

> There has been an explosion of parallel initiatives by NNSAs [non-nation-state actors] aimed at reducing emissions of greenhouse gases. These activities, which are broadening climate governance "*beyond*" *the realms of the international climate regimes*, have crucial implications for climate governance.…The recent proliferation of a body of work on global governance can be seen as an attempt *to address the lapses in the regime approach* and hence to conceptualize governance "beyond" the regime.
>
> (Okereke et al. 2009: 60, italics added)

Regimes seem to have become another variable or level of global governance for some. Have they become part of the network or web that will bind state behavior and subjugate sovereignty? If so, how far will this process go? Global governance has moved beyond the nation-state.

Conversely, IERT has focused more closely on the roles of states and their behavior, and seems to be moving more toward a positivist and empiricist world.

Future research may follow in Fisher's (2004a) footsteps and her study of the influence of regimes on civil society protests. She examines how "multilateral environmental governance regimes [note the language she uses] should engage with civil society actors in an effective way" (Fisher 2004a: 194). Clearly, regimes have moved a great distance from their early stages when researchers fought over definitions of the concept, to a stage where regimes are actors that influence other actors. Likewise, Young (2008) and the Institutional Dimensions of Global Environmental Change research team seems to push for IERT to expand itself to see "governance systems" of regimes at multilevels, not just those that are state-based "governmental or intergovernmental in nature" but to expand to

> a broader category of environmental regimes that include private governance systems (e.g., the Chicago Climate Exchange in the United States), systems in which actors located in civil society play prominent roles (e.g., codes of conduct), and hybrid arrangements in which several distinct types of actors emerge as prominent actors (e.g., the Forest Stewardship Council and the Marine Stewardship Council).
>
> (Young 2008: 17)

Perhaps based on his cognitive/knowledge focus on the social relations fomented by regimes, Young seems to be comfortable with expanding the definition of regimes themselves to be global governance itself.

Conclusion

International environmental regime theory is thriving. The field has demonstrated longevity, and theoretical rigor, endurance and flexibility. This chapter concludes by asking important questions for the future. Should we continue to study international environmental regimes? Have we proven that regimes matter, and now can we focus on how and why? Will global governance transcend international environmental regimes? And most important, will environmental regimes be sufficient to protect our environment? Oran Young may have already moved to new answers to these questions. He argues that "the next phase of research" (Young 2010: 185) will be the "the study of institutional dynamics" (Young 2010: 192). While he has not abandoned regime effectiveness and empirical studies, his latest book examines the patterns of institutional change. He argues that regimes are "complex and dynamic systems" that are always changing, and seeks to identify the "determinants" of these changes.

We are at the point of governance in that regimes seem to be adapting to a world of multilevel/global governance. Perhaps in the end we are just returning to the original questions now illuminated by a changed world: what are regimes, how are they formed, are they effective, and do they matter?

References

Andersen, R. (2002) "The time dimension in international regime interplay," *Global Environmental Politics*, 2: 98–117.

Andresen, S., Skodvin, T., Underdal, A., and Wettestad, J. (2000) *Science and Politics in International Environmental Regimes: Between Integrity and Involvement*, New York: Manchester University Press.

Axelrod, R. and Keohane, R. O. (1986) "Achieving cooperation under anarchy: strategies and institutions," in K.A. Oye (ed.) *Cooperation Under Anarchy*, Princeton, NJ: Princeton University Press.

Betsill, M. and Bulkeley, H. (2006) "Cities and the multilevel governance of global climate change," *Global Governance*, 12: 141–59.
Biermann, F. (2006) "Global governance and the environment," in M. Betsill, K. Hochstetler and D. Stevis (eds) *International Environmental Politics*, New York: Palgrave Macmillan.
Breitmeier, H., Young, O.R., and Zürn, M. (2006) *Analyzing International Environmental Regimes: From Case Study to Database*, Cambridge, MA: MIT Press.
Dimitrov, R. (2003) "Knowledge, power, and interests in environmental regime formation," *International Studies Quarterly*, 47: 123–50.
Dimitrov, R.S., Sprinz, D.F., DiGiusto, G.M., and Kelle, A. (2007). "International nonregimes: a research agenda," *International Studies Review*, 9: 230–58.
Eckersley, R. (2004) *The Green State: Rethinking Democracy and Sovereignty*, Cambridge, MA: MIT Press.
European Commission (2008) "Science for environment policy" SCU, University of the West of England, Bristol, ed., European Commission DG Environmental News Alert Service, Online. Available HTTP: <http://ec.europa.eu/environment/integration/research/newsalert/pdf/94na6.pdf> (accessed May 20, 2012).
Fisher, D. (2004a) "Civil society protest and participation: civic engagement within the multilateral governance regime," in N. Kanie and P.M. Haas (eds) *Emerging Forces in Environmental Governance*, New York: United Nations University Press.
—— (2004b) *National Governance and the Global Climate Change Regime*, Lanham, MD: Rowman & Littlefield.
Haas, E.B. (1975) "Is there a hole in the whole? Knowledge, technology, interdependence and the construction of international regimes," *International Organization*, 29: 827–76.
Haas, P. (1989) "do regimes matter? Epistemic communities and Mediterranean pollution control," *International Organization*, 43: 377–403.
—— (1992) "Banning chlorofluorocarbons: epistemic community efforts to protect stratospheric ozone," *International Organization*, 46: 187–224.
Haggard, S. and Simmons, B. A. (1987) "Theories of international regimes," *International Organization*, 41: 491–517.
Harris, P.G. (2007) "Collective action on climate change: the logic of regime failure," *Natural Resources Journal*, 47: 195–224.
Hasenclever, A., Mayer, P., and Rittberger, V. (1997) *Theories of International Regimes*, Cambridge: Cambridge University Press.
Helm, C. and Sprinz, D. (2000) "Measuring the effectiveness of international environmental regimes," *Journal of Conflict Resolution*, 44: 630–52.
Hisschemöller, M. and Gupta, J. (1999) "Problem-solving through international environmental agreements: the issue of regime effectiveness," *International Political Science Review/Revue internationale de science politique*, 20: 151–73.
Hovi, J., Sprinz, D., and Underdal, A. (2003) "The Oslo–Potsdam solution to measuring regime effectiveness: critique, response and the road ahead," *Global Environmental Politics*, 3: 74–96.
Jinnah, S. (2011) "Climate change bandwagoning: the impacts of strategic linkages on regime design, maintenance, and death," *Global Environmental Politics*, 11: 1–9.
Keeley, J.F. (1990) "Toward a Foucauldian analysis of international regimes," *International Organization*, 44: 83–105.
Keohane, R.O. (1983) "The demand for international regimes," in S. Krasner (ed.) *International Regimes*, Ithaca, NY: Cornell University Press.
—— (1984) *After Hegemony: Cooperation and Discord in the World Political Economy*, Princeton, NJ: Princeton University Press.
—— (1989) *International Institutions and State Power: Essays in International Relations Theory*, Boulder, CO: Westview Press.
Keohane, R.O. and Nye, J. S. (1977) *Power and Interdependence: World Politics in Transition*, Boston, MA: Little, Brown.
Krasner, S. (ed.) (1983) *International Regimes*, Ithaca, NY: Cornell University Press.
Kratochwil, F. and Ruggie, J. G. (1986) "International organization: a state of the art on an art of the state," *International Organization*, 40: 753–75.
List, M. (1990) "Cleaning up the Baltic: a case study in East–West environmental cooperation," in V. Rittberger (ed.) *International Regimes in East–West Politics*, London: Pinter Publishers.
List, M. and Rittberger, V. (1992) "Regime theory and international environmental management," in A. Hurrell and B. Kingsbury (eds) *The International Politics of the Environment*, Oxford: Clarendon Press.

Luterbacher, U. and Sprinz, D. (eds) (2001) *International Relations and Global Climate Change*, Cambridge, MA: MIT Press.
Miles, E., Andresen, S., Carlin, E.M., Skjærseth, J.B., Underdal, A. and Wettestad, J. (2002) *Environmental Regime Effectiveness: Confronting Theory with Evidence*, Cambridge, MA: MIT Press.
Mitchell, R.B. (2002a) "International environment," in W. Carlsnaes, T. Risse, and B. Simmonds (eds) *Handbook of International Relations*, Thousand Oaks, CA: Sage Publications.
—— (2002b) "A quantitative approach to evaluating international environmental regimes," *Global Environmental Politics*, 2: 58–83.
Nadelman, E. (1990) "Global prohibition regimes: the evolution of norms in international society," *International Organization*, 44: 479–526.
Nilsson, M., Pallemaerts, M., and von Homeyer, I. (2009) "International regimes and environmental policy integration: introducing the special issue," *International Environmental Agreements: Politics, Law and Economics*, 9: 337–50.
Oberthür, S. and Stokke, O.S. (eds) (2011) *Managing Institutional Complexity: Regime Interplay and Global Environmental Change*, Cambridge, MA: MIT Press.
Okereke, C., Bulkeley, H., and Schroeder, H. (2009) "Conceptualizing climate governance beyond the international regime," *Global Environmental Politics*, 9: 58–78.
Paterson, M. (1999) "Overview: interpreting trends in global environmental governance," *International Affairs*, 75: 793–802.
—— (2009) "Green politics," in S. Burchill, A. Linklater, R. Devetak et al. (eds) *Theories of International Relations*, 4th edn, New York: Palgrave Macmillan.
Peterson, M.J. (1992) "Whalers, cetologists, environmentalists and the international management of whaling," *International Organization*, 46: 147–86.
Puchala, D.J. and Hopkins, R. F. (1983) "International regimes: lessons from inductive analysis," in S. Krasner (ed.) *International Regimes*, Ithaca, NY: Cornell University Press.
Raustiala, K. and Victor, D. (2004) "The regimes complex for plant genetics resources," *International Organization*, 58: 277–309.
Rittberger, V. (ed.) (1990) *International Regimes in East–West Politics*, London: Pinter Publishers.
—— (1995) *Regime Theory and International Relations*, Oxford: Clarendon Press.
Rittberger, V., Zangl, B., and Kruck, A. (2012) *International Organization*, 2nd edn, New York: Palgrave Macmillan.
Ruggie, J.G. (1975) "International responses to technology: concepts and trends," *International Organization*, 29: 557–83.
Sprinz, D. (2001) "Comparing the global climate regime with other global environmental accords," in U. Luterbacher and D. Sprinz (eds) *International Relations and Global Climate Change*, Cambridge, MA: MIT Press.
Stokke, O.S. (2001) "The interplay of international regimes: putting effectiveness theory to work," *Fridtjof Nansens Institute (FNI Report)*, 14: 1–29.
Strange, S. (1983) "*Cave! hic dragones*: a critique of regime analysis," in S. Krasner (ed.) *International Regimes*, Ithaca, NY: Cornell University Press.
Underdal, A. (2002) "Methods of analysis," in E. Miles, S. Andresen, E.M. Carlin et al. (eds) *Environmental Regime Effectiveness: Confronting Theory with Evidence*, Cambridge, MA: MIT Press.
Vogler, J. (2003) "Taking institutions seriously: how regime analysis can be relevant to multilevel environmental governance," *Global Environmental Politics*, 3: 25–39.
Walsh, V. (2004) *Global Institutions and Social Knowledge: Generating Research at the Scripps Institution and the Inter-American Tropical Tuna Commission, 1900s–1990s*, Cambridge MA: MIT Press.
Ward, H. (2006) "International linkages and environmental sustainability: the effectiveness of the regime," *Journal of Peace Research*, 43: 149–66.
Wettestad, J. (2001) "Designing effective environmental regimes: the conditional keys," *Global Governance*, 7: 317–41.
—— (2006) "The effectiveness of environmental politics" in M. Betsill, K. Hochstetler, and D. Stevis (eds) *International Environmental Politics*, New York: Palgrave Macmillan.
Wilkening, K. (2011) "Science and international environmental non-regimes: the case of Arctic haze," *Review of Policy Research*, 28: 125–48.
Young, O.R. (1982) *Resource Regimes*, Los Angeles: University of California Press.
—— (1983) "Regime dynamics: the rise and fall of international regimes," in S. Krasner (ed.) *International Regimes*, Ithaca, NY: Cornell University Press.

—— (1989) *International Cooperation: Building Regimes for Natural Resources and the Environment*, Ithaca, NY: Cornell University Press.
—— (1998) *Creating Regimes: Arctic Accords and International Governance*, Ithaca, NY: Cornell University Press.
—— (2002) *The Institutional Dimensions of Environmental Change: Fit, Interplay and Scale*, Cambridge, MA: MIT Press.
—— (2003) "Determining regime effectiveness: a commentary on the Oslo–Potsdam solution," *Global Environmental Politics*, 3: 97–104.
—— (2008) "Institutions and environmental change: the scientific legacy of a decade of IDGEC research," in O.R. Young L.A. King, and H. Schroeder (eds) *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, Cambridge, MA: MIT Press.
—— (2010) *Institutional Dynamics: Emergent Patterns in International Environmental Governance*, Cambridge, MA: MIT Press.
—— (2011) "Effectiveness of international environmental regimes: existing knowledge, cutting-edge themes, and research strategies," *Proceedings of the National Academy of Sciences*, 108: 19853–60.
Young, O.R., Demko, G.J., and Ramakrishna, K. (eds) (1996) *Global Environmental Change and International Governance*, Hanover, NH: University Press of New England.
Young, O.R., King, L.A., and Schroeder, H. (2008) *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, Cambridge, MA: MIT Press.
Zürn, M. (1998) "The rise of international environmental politics: a review of current research," *World Politics*, 50: 617–49.

10

International environmental law

Sources, principles, and innovations

David B. Hunter

International environmental law is composed most prominently of bilateral, regional and global environmental treaties that have been negotiated and ratified by the States that choose to be parties. These treaties address a wide range of issues, including for example the protection of the global atmosphere and oceans (see Chapters 28, 29 and 35), management of transboundary rivers or other shared natural resources (see Chapters 34 and 36), conservation of migratory wildlife or biodiversity (see Chapter 37), and international trade in hazardous substances (see Chapter 32). In addition to this substantial array of international treaties, certain principles of environmental law are emerging as customary or general principles of international law. These principles have formed the basis for a small but growing number of environmental judgments in international tribunals. Together these treaties, principles, and judicial opinions form the body of international environmental law.

International environmental law is a subset of the broader field of international law; international law is bound by centuries-old traditions and relies fundamentally on the consent of sovereign nation States. The international lawmaking system is far less developed than the more familiar national system. Under traditional principles of international law, each State is independent and sovereign. No centralized legislative or lawmaking body exists, except arguably the United Nations Security Council, which rarely addresses environment-related issues. The subjects of international law are limited primarily to States, rather than firms or individuals. States are thus both the international lawmakers and the subjects of the law they make, and they must consent to limits on their sovereignty. While consent can sometimes be inferred, States that do not explicitly agree to be bound generally are not. And even when they initially agree to be bound, they can in most cases withdraw their consent later if their governments choose to do so.

The limitations of international law have left it open to criticism by those who aspire for international law to be more effective in protecting the environment. Although critical in some contexts, international law is formalistic and slow in responding to new challenges. The state-centered focus of international law limits its effectiveness, particularly given the critical role of the private sector and civil society organizations in the pursuit of environmental protection (see Chapters 13 and 14). The cumbersome processes of international law have led environmentalists to look for new ways of shaping international environmental law. These new international lawmaking processes are part of a broader new governance model, in which multi-stakeholder and

flexible processes allow new forms of norm creation and broader conceptions of law and compliance.

This chapter initially reviews the traditional sources of international environmental law, such as treaties and custom, and their importance to environmental protection. It then discusses emerging principles of international environmental law and concludes with a section describing the newer forms of environmental norm creation that allow multiple stakeholders to participate, and result in a diversity of "soft" law approaches.

Traditional sources of international law

The primary judicial organ of the United Nations system is the International Court of Justice (ICJ), also known as the World Court. The ICJ acts as both a legal advisory body and a court for the settlement of disputes between States. Its 15 judges are chosen to represent geographic regions and types of legal system. Article 38(1) of the Statute establishing the ICJ identifies four sources of international law that the Court employs to resolve specific international disputes:

> The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:
> (a) international conventions, whether general or particular, establishing rules expressly recognized by the contesting states;
> (b) international custom, as evidence of a general practice accepted as law;
> (c) the general principles of law recognized by civilized nations; and
> (d) …judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.
>
> (ICJ 1945: Art. 38(1))

The first three sources – treaty, custom, and general principles of international law – create binding legal obligations for States. Judicial decisions and the writings of publicists are subsidiary means for understanding what the law is, and do not create generally binding obligations for States. We next examine each of these sources of law and their role in international environmental law.

Treaties

Treaties create specific legal obligations between those States that have consented to become treaty parties. Treaties are the principal method for creating binding rules of international law in the environmental field. By most estimates more than 500 treaties relate to environmental protection. Although most environmental treaties are bilateral or regional, more than a dozen significant multilateral environmental agreements (MEAs) have been negotiated in the past few decades, most of which enjoy nearly universal acceptance by countries around the world. See Table 10.1.

The Vienna Convention on the Law of Treaties is the primary source of rules governing the major aspects of treaties, including negotiation, interpretation, amendment, and termination. It defines a treaty as "an international agreement concluded between States in written form and governed by international law, whether embodied in a single instrument or in two or more related instruments and whatever its particular designation" (United Nations 1969: Art. 2.1(a)). The instrument need not be called a treaty; it can be called an agreement, convention, pact, covenant, or by virtually any other name. Four basic steps are inherent in the development of

Table 10.1 Parties to global environmental agreements

Treaty	*Number of parties*	*Opened for signature*	*Entered into force*
Convention on Biological Diversity	193	1992	1993
Convention on International Trade in Endangered Species	175	1973	1987
Basel Convention on the Transboundary Movement of Hazardous Wastes	173	1989	1992
Montreal Protocol for the Protection of the Ozone Layer	196	1985	1988
UN Framework Convention on Climate Change (UNFCCC)	194	1992	1994
Kyoto Protocol to the UNFCCC	190	1997	2005
Desertification Convention	193	1994	1996
Ramsar Convention on Wetlands of International Importance	160	1971	1975
UNESCO World Heritage Convention	186	1972	1975
Law of the Sea Convention	160	1982	1994
Stockholm Convention on Persistent Organic Pollutants	170	2001	2004
Rotterdam Convention on Prior Informed Consent	134	1998	2004

Source: The information in this table was drawn from the websites of each of the conventions listed above, available and accessed online in July 2012.

any international treaty: (1) identification of needs and goals; (2) negotiation; (3) adoption and signature; and (4) ratification. Even after these steps are completed, treaties must be implemented through national law, monitored for compliance, enforced, and, if necessary, modified or amended. A treaty is interpreted primarily in light of the intent of the parties in negotiating and signing the agreement.

A State is bound by the terms of a treaty only if it takes affirmative steps to demonstrate its consent to be bound. For multilateral agreements, consent is typically demonstrated by ratification, which is usually done by depositing an "instrument of ratification" with the United Nations or another designated depositary organization. In many States, a treaty must be approved through domestic political processes before the treaty is ratified. In the United States, for example, Senate ratification requires a two-thirds vote. As a result, the United States has failed to ratify several major environmental treaties, including the Kyoto Protocol, the Convention on Biological Diversity, and the UN Convention on the Law of the Sea. Thus, a State's signature on a treaty is only part of the battle. Until the treaty is ratified and has entered into force, the State is not obligated to comply with it.

Many contemporary environmental agreements have been designed within the highly flexible system known as a framework/protocol approach, used for agreements on ozone depletion, climate change, the conservation of biological diversity, and persistent organic pollutants. This approach allows States, like the Parties to the Vienna Ozone Convention and Montreal Protocol (see Chapter 29), to first adopt a broad framework convention that can promote more thorough understanding of the underlying environmental problem and possible solutions, while steadily building political support and capacity for taking stronger actions. Ultimately, the parties may subsequently adopt a protocol, amendment, or other instrument that imposes tighter controls with more specific obligations.

Note that treaties do not include agreements between State and non-State actors. Agreements between States and private individuals, organizations, or corporations are generally governed not by public international law, but instead by the law of contracts – either as applied in the territory

of the contracting State or as otherwise specified in the contract itself. Although States are the predominant actors in the treaty-making process, international governmental organizations (IGOs), civil society organizations, and other non-State actors are playing an increasingly significant role, particularly in identifying environmental issues appropriate for international cooperation and in building the political will for countries to negotiate treaties.

Custom

In addition to treaties, international law can also be created through the customary practice of States, where such practice is done under the belief that it is required by law. Custom is in many ways harder than treaty law for practitioners, as it requires that one both articulate the rule of law and then prove that the rule is accepted by States as law. To prove that a customary norm exists, a court must establish general acceptance of the rule: first, by demonstrating that State practice is consistent with the rule; and, second, by demonstrating that States act in accordance with the rule from a sense of legal obligation to do so. This sense of legal obligation is known as *opinio juris*. Both State practice and *opinio juris* are required to prove the existence of a customary rule of international law.

While there is no precise definition of what constitutes State practice, the ICJ has required that practice be both extensive and virtually uniform and include those States that are particularly affected by the proposed norm. It is not necessary that State practice continue over a long period of time. Nor must State practice rigorously and consistently conform to the rule at issue. However, it must be clear that State conduct that is inconsistent with the customary practice has generally been treated as a breach of a rule.

For State practice to be recognized as a rule of customary international law, it must further be shown that the State practice follows from a sense of legal obligation rather than from a sense of moral obligation or political expediency. The existence of such *opinio juris* is a factual matter that can be determined by consideration of a wide range of evidence, including diplomatic correspondence, government policy statements and press releases, opinions of official legal advisors, national legislation, national judicial decisions, legal briefs endorsed by the State, a pattern of treaties in the same form, and resolutions and declarations by the United Nations. Once custom is established it becomes binding on all States, regardless of whether those States contributed to the formation of the custom. However, under the traditional view a State may exclude itself from the obligations of a particular customary rule by persistent conduct exhibiting an unwillingness to be bound by the rule or a refusal to recognize it as law (American Law Institute 1987: § 102, cmt. B).

As the number of international treaties, declarations, and resolutions announcing principles of environmental protection has increased over time, scholars as well as States have begun to debate whether customary rules of international environmental law have emerged. Frequently mentioned candidates for customary status include the principle that a State should not use its territory in a way that causes environmental harm outside that territory, sustainable development, the precautionary principle, and the obligation to conduct an environmental impact assessment. (These and other environmental law principles are discussed further below.) These prospective customary environmental norms face a particular difficulty when subjected to the standard test of customary law (i.e., consistent State practice and the existence of *opinio juris*). Although their frequent reiteration in international documents of every kind provides evidence of possible *opinio juris*, practice in the environment may be too new and insufficiently uniform to satisfy the consistent State practice requirement. Nevertheless, these principles are increasingly being recognized in judicial opinions and elsewhere as customary law, perhaps reflecting

changing notions of how customary law is made. Some emerging environmental principles have also been considered general principles.

General principles

General principles of law "recognized by civilized nations" are another source of international law recognized by the ICJ, although what is included within those principles is not always clear (ICJ 1945: Art. 38(1)(c)). Ian Brownlie, a leading international law scholar, states that general principles may refer to "rules accepted in the domestic law of all civilized states," or alternatively, to the general principles of private law used within all or most States (Brownlie 2008: 16). General principles are primarily used to fill in the gaps in international law that have not already been filled by treaty or custom. Some environmental scholars argue that multilateral forums or diplomatic conferences can also create general principles of international law, in a way that prioritizes multilateral consensus rather than State practice and *opinio juris*. Charney, for example, argues that this new approach leads to "general international law" or "universal international law" that can bind non-parties even without their consent (Charney 1993: 543). Bodansky similarly refers to this in the environmental context as "declarative law" (Bodansky 2010: 200).

Judicial decisions and the writings of eminent publicists

The final sources of international law are "judicial decisions and the writings of eminent publicists," which are subsidiary means for determining international law (ICJ 1945: Art.38(1)(d)). The writings of publicists may help States and courts discern what the law is, and they may help policy-makers decide what the law should be, but they have no independent force. Similarly, international jurists may take guidance from the principles and reasoning employed by judges in national courts, even though those decisions are not, themselves, international law. In addition to the writings of publicists, the ICJ may also look for guidance to its prior decisions or those of other international tribunals. But the decisions of such tribunals, even of the ICJ itself, are binding only on the States whose dispute the court has decided. For other States, such decisions may provide evidence of what the law is, but the decisions do not, themselves, create law. Having said this, ICJ opinions are cited as authority so frequently that the distinction between simply identifying the law and actually making it has been blurred.

Although judicial decisions have been relatively uncommon in the environmental field, they have been important for the development of international environmental law and for shaping the responsibilities of States that share transboundary resources. A number of international courts have addressed environmental issues, including the ICJ, which has general jurisdiction over international disputes (when both parties agree to jurisdiction). Other courts with jurisdictions limited by region or subject matter, such as the International Law of the Sea Tribunal, the World Trade Organization Appellate Body, or the European Court of Justice, are also playing an increasingly important role in addressing environment-related issues and furthering the development of international environmental law. The following are brief examples of two of the best-known international environmental disputes.

The Trail Smelter Arbitration (1941). The Trail Smelter Arbitration, the most famous international environmental adjudication, involved transboundary sulfur dioxide emissions from a smelter located in Trail, British Columbia, just a few miles north of the US–Canada border. During the 1930s, the Trail Smelter emitted approximately 250,000 tons of sulfur dioxide per year into the air. This plume traveled across the border and damaged the property of apple

growers in Washington State. For a variety of jurisdictional reasons, Washington State residents could not bring a lawsuit either in Washington State or in British Colombia, so they asked the US government to intervene on their behalf in 1927. Ultimately, the Tribunal would side with the United States, ruling that "under the principles of international law… no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence"(Trail Smelter Case 1941: 1965). The Tribunal accordingly held Canada responsible under international law for damages caused by the air pollution. Canada was forced to pay compensation and to take measures to reduce the pollution. The obligation not to cause environmental harm to a neighboring State would later be recognized as part of customary law by the ICJ.

The Pulp Mill Case (Argentina v. *Uruguay)* (2010). In 2010, the ICJ ruled on an international water dispute involving the anticipated pollution from two pulp mills proposed in Uruguay near the River Uruguay, which forms the boundary between Uruguay and Argentina. Argentina alleged a series of violations of a 1975 treaty between Argentina and Uruguay that set forth the regime for the shared use of the river. The 1975 treaty established a bilateral river commission (CARU), which provided the institutional framework for mutually achieving the rational use and development of the river. In a comprehensive decision, the Court ruled that Uruguay had breached procedural, but not substantive, obligations owed to Argentina in planning and constructing the pulp mills. The Court found that the obligation to inform CARU of planned developments was the first step in the whole procedural mechanism established by the treaty and could not be replaced by some alternative form of notification. The ICJ ultimately found that Uruguay had violated its procedural obligations to notify and consult with Argentina under the 1975 treaty, but that no substantive environmental obligations were breached. It further ruled that Argentina should receive no remedy beyond the finding of a violation. The pulp mills could still operate without any restitution.

Notwithstanding these two examples, international environmental disputes are only rarely brought to courts or other formal tribunals. Several factors account for this. First, the jurisdictional and enforcement authority of formal tribunals may be inadequate to ensure a meaningful remedy. Formal dispute mechanisms can be slow and costly, and simply may be inappropriate for reaching effective and practical solutions to the technical and difficult issues frequently posed by environmental issues. It may be more efficient to resolve such disputes through informal negotiations between the parties, through the good offices of regional institutions, or at periodic conferences of treaty parties. The overriding reason, though, likely resides in a simple truism of international law – States are generally unwilling to cede their sovereignty by submitting to the jurisdiction of third-party arbitration or judicial settlement. Moreover, the substantive rules of international environmental law are not yet totally clear, so predicting which State will prevail is difficult and may deter some States from bringing judicial cases. For these reasons, recent treaties have focused as much on mechanisms to *avoid* disputes (e.g., through facilitating compliance) as on the procedures for litigating them.

Key principles of international environmental law

As already noted, international environmental law is relatively new and consists of a relatively large number of treaties, declarations, or resolutions – but relatively little State practice. The result is that many emerging principles of international environmental law may not yet have been

accepted either as custom or as general principles of law. International environmental scholars have described these principles in many ways, including calling them "soft law," "universal law," "declarative law," or "global law". Regardless of the name, the reality is that only a few international environmental law principles have been recognized by the ICJ or other courts as binding rules of international law, while others are still emerging.

Principles and concepts do not have to be binding, however, to have a significant impact on international environmental policy. Some principles, such as the obligations for notification, consultation, and not to harm the environment of neighboring States, provide customary legal principles for resolving transboundary environmental conflicts. Regardless of their legal status, other principles contribute to the framework for negotiating and implementing new and existing environmental treaties, the development and convergence of national and subnational environmental laws, and the integration of international environmental law with other fields, such as international trade or human rights (Hunter et al. 2010). Following are some of the most prominent international environmental legal principles.

State sovereignty

State sovereignty in the legal sense signifies independence – that is, the right to exercise, within a portion of the globe and to the exclusion of other States, the functions of a State, such as the exercise of jurisdiction and enforcement of laws over persons therein (see Chapter 7). A bedrock principle of international environmental law is that countries have the sovereign right to exploit their natural resources pursuant to their own environmental and developmental policies. Territorial sovereignty extends to the geographic borders of the country and to the underlying subsoil as well as the airspace overhead. States have sovereignty over inland waters, including groundwater, wholly within their boundaries, and they have substantial sovereign rights with respect to shared watercourses. Sovereignty over resources also extends outward through the Exclusive Economic Zone (EEZ), the area within 200 nautical miles of the State's coast. International environmental law reflects the fundamental tension between a State's interest in protecting its independence (i.e., its sovereignty) and the recognition that certain problems, in this case regional and global environmental problems, require international cooperation. In this respect, most international environmental treaties by their very nature constrain a State's sovereignty.

Common heritage of humankind

State sovereignty and the principles and rights that derive from it have historically been applied to the natural resources within a State. Yet, over half of the world's surface area lies outside the national borders of any one State. Those areas beyond the limits of national jurisdiction – the high seas, the seabed, Antarctica, outer space, and sometimes the outer atmosphere, including the ozone layer – are frequently referred to as the "global commons." Resources in the global commons are outside the territorial reach of States, and the concept of sovereignty does not readily apply. For many global commons resources, most notably the high seas fisheries, the general rule has been the right of capture – that is, whoever captures a fish or other resource has the right to it. Concerned that this right of capture penalizes developing and landlocked States, participants in the Law of the Sea Convention and other negotiations perceived a need for a new conceptual framework to address resources in the global commons (see Chapter 35). This framework became known as the "common heritage of mankind" (or, more accurately, humankind). Areas governed by the principle of common heritage cannot be appropriated by any State and

must be used only for peaceful purposes and for the shared benefit of all States. The application of this principle today is limited primarily to Antarctica, outer space and the moon, certain cultural landmarks, and possibly certain plant genetic resources (see Chapter 37).

Common concern

The global environment is increasingly viewed as a common concern of humanity. This principle reflects the growing consensus that the planet is ecologically interdependent, and therefore humanity may have a collective interest in certain activities that take place within, or resources that are located within, State boundaries. Thus, for example, the recognition that nations have a common concern in the global environment has provided a critical conceptual framework for treaties addressing climate change and biological diversity (see Chapters 28 and 37). Common concern has limited legal content for resolving disputes or clarifying State obligations, but it does provide an important counterweight to State sovereignty for justifying international cooperation for environmental protection

Duty not to cause environmental harm

A central principle in international environmental law is the obligation of States to ensure that activities within their jurisdiction or control do not cause damage to the environment of other countries or of areas beyond the limits of national jurisdiction. This obligation not to cause environmental harm has been elaborated in the Trail Smelter decision (as noted above), in Article 21 of the 1972 *Stockholm Declaration* and Article 2 of the 1992 *Rio Declaration*, and in the ICJ's advisory opinion regarding the legality of nuclear weapons. The principle is generally considered a part of customary international law, but little has been clarified about how it will apply in specific cases. In the future, the contours of this principle, probably more than any other, will determine the legal rights and responsibilities in most disputes regarding transboundary environmental damage.

State responsibility

Under the principle of State responsibility, States are generally responsible for breaches of their obligations under international law. Under the International Law Commission's Draft Articles, States responsible for an internationally wrongful act are under an obligation to make restitution (i.e., to re-establish the situation which existed before the wrongful act was committed), to compensate for any damage caused, and to give satisfaction (for example, to acknowledge the breach, express regret, or formally apologize). Thus, State responsibility comes into play as a complementary rule that explains the remedies one State has against another that has violated international legal obligations.

Common but differentiated responsibilities

According to the principle of common but differentiated responsibilities, all States have common responsibilities to protect the environment and promote sustainable development, but because of different social, economic, and ecological situations, countries must shoulder different responsibilities. The principle reflects core elements of equity, placing more responsibility on wealthier countries and those that are more responsible for causing specific global environmental problems (see Chapter 23). Differentiated responsibility also allows for ecological differences in countries –

for example, the particular vulnerability of small-island States to the flooding that may result from global warming. Common but differentiated responsibilities is not a principle for resolving specific disputes. Instead it presents a conceptual framework for compromise and cooperation in negotiations to meet complex environmental challenges. It allows countries that are in different positions with respect to specific environmental issues to be treated differently.

The polluter-pays principle

As reflected in the *Rio Declaration*, national authorities should promote the internalization of environmental costs by taking those actions necessary to ensure that polluters and users of natural resources bear the full environmental and social costs of their activities. The principle integrates environmental protection and economic activities, by ensuring that the full environmental and social "external" costs (including costs associated with pollution, resource degradation, and environmental harm) are reflected in the ultimate market price for a good or service. Environmentally harmful or unsustainable goods will tend to cost more, and consumers will switch to less-polluting substitutes. In addition, if all States require their industries to pay for pollution and other impacts, then no State will have a significant competitive trade advantage by allowing their companies to pollute freely. This principle is thus not a formula for resolving environmental disputes between two States, but rather serves to integrate the goals of trade liberalization and environmental protection (see Chapter 22).

Intergenerational equity

The principle of intergenerational equity requires that we take into consideration the impact of our activities on future generations, giving them a "seat at the table" when making current decisions. At a minimum, implementing this principle requires using natural resources sustainably and avoiding irreversible environmental damage (see Chapters 23 and 24). It may also lead to expanding our concepts of judicial standing to future generations. Although primarily a principle of fairness, several national courts have relied on the principle to uphold legal standing on behalf of future generations in environmental cases.

Environmental impact assessment

The ICJ has appeared to recognize that States are under an obligation to conduct an environmental impact assessment (EIA), at least where there are potentially significant impacts on transboundary resources (Argentina *v.* Uruguay, 2010). Although international law provides few mandatory requirements in how to implement an EIA, international best practice suggests that the EIA process should ensure that *before* granting approval for a project that might harm the environment, the appropriate government authorities have fully identified and considered the environmental effects of proposed activities under their jurisdiction and control, and affected citizens have an opportunity to understand the proposed project or policy and to express their views to decision makers.

The precautionary principle

The precautionary principle states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations 1992: Principle 15). The precautionary

principle addresses how environmental decisions should be made in the face of scientific uncertainty. It provides a framework for governments to set preventative policies where existing science is incomplete or where no consensus exists regarding a particular threat (see Chapter 17). The principle is often viewed as conflicting with science-based decision making, but the principle operates where there is a lack of scientific knowledge or where there is significant uncertainty; decision makers are not excused from considering what science does exist. In most instances, the precautionary principle has been used to *allow* or *authorize*, but not to *require*, policy measures. Outside of the United States, the precautionary principle is widely viewed as a binding rule of customary law.

Public participation, access to information, and access to justice

Beginning with Principle 10 of the *Rio Declaration*, governments began to recognize three pillars of environmental democracy: the right to access environmental information, the right to participate in environmental decisions that affect their lives, and the right to access justice in environmental cases. More than 40 mostly European countries endorsed these rights in the Aarhus Convention, and the rights have been upheld in domestic legislation and judicial decisions in many other countries. Rooted in both concepts of human rights and sustainable development, these obligations are emerging as a requirement of international environmental law.

Notification and consultation

States should provide prior and timely notification to, and consult with, potentially affected States regarding activities that may have a significant adverse transboundary environmental effect. The principle of prior notification obliges States planning a potentially damaging activity to transmit to affected States all necessary information sufficiently in advance so that the latter can prevent damage to their respective territory. The principle of consultation requires States to allow potentially affected States an opportunity to review and discuss a planned activity that may have potentially damaging effects. The acting State is not necessarily obliged to conform to the interests of affected States, but it should take them into account.

Sustainable development

Sustainable development is generally viewed as the general goal of international environmental policy, guiding the integration of environment and development at the international and national levels (see Chapter 15). In recent years, the concept has also taken on a legal nature, requiring the integration of environmental concerns into treaties that were negotiated prior to the emergence of environmental consciousness. Thus, for example, Belgium was allowed to develop a transboundary railroad across the Netherlands under a decades-old treaty, but only if it considered and mitigated the environmental impacts of the project (Permanent Court of Arbitration 2005). Environmental issues, which were not explicitly included in the treaty, were implicitly required due to the application of sustainable development as a legal principle.

New governance and innovations in international environmental law

To many observers, the formalistic, non-participatory, consensus-based nature of the international law system has hindered efforts to formulate an effective international response to our global environmental crisis (Speth 2005). The law is not sufficiently developed to hold States

accountable for environmental damage. International law ascribes "hardness" to treaties and custom that meet certain forms, but it leaves little room for normative development outside those strict categories. Moreover, the primary behavioral changes needed to address global environmental challenges are frequently those of corporations, consumers, and other private actors – not necessarily governments (see Chapters 13 and 14). Private actors are only indirectly the subject of traditional international environmental law and thus escape direct accountability. The inherent limitations of international law for addressing global environmental challenges have left room for innovation and more flexible "new governance" models of norm creation. These new approaches are inclusive, frequently relying on multi-stakeholder processes that may include governments, international organizations, private sector companies, civil society organizations, and community groups (Mattli and Woods 2009; Dupuy 1991).

Environmental standards now come in many forms, targeting specific projects, corporations, industry sectors, or general behaviors. Some of these international standards may be wholly voluntary, require public reporting, or be part of elaborate certification systems that include third-party monitoring. Others may be issued as standards or rules by international organizations and be implemented and enforced through their operations. The following examples illustrate the diversity of these new governance environmental measures:

The OECD Guidelines for Multinational Enterprises

The Organization of Economic Cooperation and Development (OECD) Council of Ministers first adopted a set of voluntary rules of conduct for multinational corporations that included environmental concerns in 1991. Known as the OECD Guidelines, these standards are aimed at ensuring that multinational corporations operate in a way that is compatible with the expectations of host countries by establishing a baseline of standards (OECD 2011). An environmental chapter was added in 1991 with further amendment in 2000 and 2010. Implementation of the Guidelines is voluntary, but a series of National Contact Points (NCP), typically housed within government agencies, receive complaints from interested parties who believe the Guidelines have been violated. Each NCP has its own rules for responding to such requests, but in general they provide a forum for the parties to negotiate or discuss the application of the principles. If the discussions at this level do not resolve the issue between the parties, it can be passed to the OECD's Investment Committee, which is ultimately responsible for adjudication and development of the Guidelines. In response to disputes passed up by the NCP, the OECD's Investment Committee provides clarifications of the scope and meaning of the Guidelines in specific instances. The Committee's judgments do not "enforce the Guidelines" against either of the parties. Instead it uses its findings in specific cases to clarify the meaning of how a provision in the Guidelines should be applied in the future.

IFC environmental and social guidelines

The International Finance Corporation (IFC) is the private sector lending arm of the World Bank Group. The IFC provides loans to private companies conducting projects in developing countries. With a clear development objective, the IFC provides a bridge between public development assistance and private sector activities. Because many of its projects have potentially negative development impacts, the IFC was forced to adopt a set of environmental and social performance standards for its borrowers. These standards, which were adopted in 2006 and revised in 2012, have become the most important set of standards for international project finance. The IFC's approach includes a "Policy on Social and Environmental Sustainability" and

eight "Performance Standards" covering environment, labor, resettlement, indigenous peoples, and community health issues (IFC 2012). The policy applies to the IFC's review and due diligence of the project, and the performance standards apply to the borrowers. The heart of the performance standards is a requirement that all borrowers must have an environmental and social management system, including in most cases a project-specific action plan that is negotiated with each borrower to ensure that the project meets the other performance standards over time. The environmental and social action plans and annual monitoring reports must be released to the public. In 1999, the IFC created the Compliance Advisor and Ombudsman (CAO), which allows people affected by IFC projects to raise concerns, including whether the IFC has complied with its environmental and social policy (CAO 2010).

The Equator Principles

More than 65 of the world's largest private financial institutions have signed on to the Equator Principles – a common set of policies for financial institutions to determine, assess, and manage environmental and social risks in project finance. Based closely on the IFC's environmental and social performance standards, the Equator Principles set out an overall framework for banks to review and mitigate environmental and social impacts and risks. For projects with significant environmental and social risks, the borrower must, in consultation with the public, prepare an Environmental Management Plan (EMP) that addresses mitigation and monitoring of environmental and social impacts. The terms of the EMP will be covenanted, and the bank will work with the borrower to ensure compliance. Signatories to the Equator Principles are also expected to adopt their own internal policies, procedures, and management systems for implementing the environmental and social policy framework (see Durbin et al. 2006).

The CERES Principles

The Coalition for Environmentally Responsible Economies (CERES), comprising environmental organizations, labor groups, and pension funds, established a voluntary code of conduct following the 1989 *Exxon Valdez* oil spill. Now known as the CERES Principles, they set broad standards for evaluating corporate activity and are intended both to improve the environmental performance of signatory companies and to enable investors to make informed decisions on a company's environmental performance. A company adopting the CERES Principles pledges to monitor and improve the environmental impacts resulting from its use of natural resources, reduce and dispose of wastes, conserve energy, reduce risk, create safe products and services, restore any environmental damage, and improve environmental management through audits, reports, and public communication. Companies that endorse the CERES Principles must also annually publish a CERES Report that provides information related to the company's commitment to the Principles. Over 80 companies have endorsed the CERES Principles, including major corporations such as Ford Motor Company, Nike, American Airlines, and British Petroleum.

Forest Stewardship Council certification

The Forest Stewardship Council (FSC) is a non-profit association established in 1993 to promote environmentally responsible, socially beneficial, and economically viable management of the world's forests by establishing a worldwide standard of recognized and respected Principles of Forest Stewardship. The FSC accredits certification organizations in order to guarantee their

independence and capability. In turn these organizations certify timber operations and products. The FSC's principles and criteria serve as broad guidelines for the development of forest management standards. The FSC Principles and Criteria apply to forest management on the national level, not directly to a forest unit, because local forest conditions can differ significantly. Standards for certification of specific forests units are to be developed by multi-stakeholder working groups within the country or region, which are then submitted to the FSC Board of Directors for approval. By July 2012, more than 155 million hectares in over 80 countries had been certified according to the FSC standards, and products carrying the FSC trademark had an estimated value of more than $20 billion (Forest Stewardship Council 2012).

International environmental standards like these now number in the hundreds. They apply in a variety of ways to a wide range of actors in many industries and resource sectors. Although, strictly speaking, these new forms of environmental norms are not international law, they may nonetheless be prescriptive and enforceable. The binding/non-binding or hard/soft divides of international law are eroding. Whether an environmental provision is found in a treaty, for example, may be relevant to whether it is binding international law – but other factors may be more important for whether it effectively helps to address an environmental problem. For example, the IFC environmental and performance standards are clearly not a treaty, nor do they fall into any other category of binding law identified in Article 38 of the ICJ statute. On the other hand, they are standards issued by an international organization that, when required as conditions of project finance loans, are enforceable through the provisions of the loan contract. Similarly, retail stores may contractually require that all forest products in their supply chains be FSC certified. In this way, such standards blur the sharp lines between public and private law, and between binding and non-binding norms. In the future, more relevant than the form of the underlying instrument to the "hardness" of an environmental provision may be whether it is written in clearly enforceable terms, whether a reporting or monitoring process is attached to the provision, and whether sanctions are available.

Conclusion

Although the past two decades have seen significant political commitment to international environmental law, as evidenced by a variety of international environmental treaties and other instruments, the period has also witnessed a marked decline in virtually every important global environmental indicator (UNEP 2007). This has given rise to significant criticism that international environmental law's reliance on treaty making and slow development of customary law may be ineffective when evaluated against the goal of environmental protection (Speth 2005). Moving beyond a focus on formal lawmaking provides new opportunities for creativity, innovation, and flexibility in crafting a more effective response to increasingly complex international and global environmental challenges.

References

American Law Institute (ALI) (1987) *Restatement (Third) of Foreign Relations Law of the United States, § 102, cmt, b*. Online. Available HTTP: <http://www.taiwankey.net/dc/ReinstateSr.pdf> (accessed 17 July 2012).

Bodansky, D. (2010) *The Art and Craft of International Environmental Law*, London: Harvard Press.

Brownlie, I. (2008) *Principles of Public International Law*, 7th edn, New York: Oxford University Press.

Charney, J. (1993) "Universal international law," *American Journal of International Law* 87: 529.

Compliance Advisor Ombudsman (CAO) (2010) *The CAO at 10: Annual Report FY 2010 and Review FY 2000–10*.

Durbin, A., Herz, S., Hunter, D., and Peck, J. (2006) "Shaping the future of sustainable finance," *WWF-Banktrack Report*.

Dupuy, P.M. (1991) "Soft law and the international law of the environment," *Michigan Journal of International Law* 12: 420.

Forest Stewardship Council (FSC) (2012) "Global FSC certificates: type and distribution." Online. Available HTTP: <http://www.fsc.org/facts-figures.19.htm>.

Hunter, D., Salzman, J., and Zaelke, D. (2010) *International Environmental Law and Policy*, 4th edn, New York: Foundation Press.

International Court of Justice (ICJ) (1945) *Statute of the International Court of Justice (1945)*. Online. Available HTTP: <http://www.icj-cij.org/documents/index.php?p1=4&p2=2&p3=0> (accessed 17 July 2012).

International Finance Corporation (IFC) (2012) *Performance Standards on Environmental and Social Sustainability*. Online. Available HTTP: <http://www1.ifc.org/wps/wcm/connect/115482804a0255db96fbffd1a5d13d27/PS_English_2012_Full-Document.pdf?MOD = AJPERES> (accessed 17 July 2012).

Mattli, M. and Woods, N. (2009) *The Politics of Global Regulation*, Princeton, NJ: Princeton University Press.

Organization of Economic Cooperation and Development (OECD) (2011) *Guidelines for Multinational Enterprises*. Online. Available HTTP: <http://www.oecd.org/dataoecd/43/29/48004323.pdf> (accessed 17 July 2012).

Permanent Court of Arbitration (PCA) (2005) *Belgium v. Netherlands*, Arbitral Award. Online. Available HTTP: <http://www.pca-cpa.org>.

Speth, J.G. (2005) *Red Sky at Morning: America and the Crisis of the Global Environment*, 2nd edn, New Haven, CT: Yale University Press.

Trail Smelter Case (U.S. *v.* Can.) (1941) *Reports of International Arbitral Awards*. Online. Available HTTP: <http://untreaty.un.org/cod/riaa/cases/vol_III/1905–82.pdf>.

United Nations (1969) *Vienna Convention on the Law of Treaties*. Online. Available HTTP: <http://untreaty.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf>.

—— (1992) *UN Declaration on Environment and Development* (the "Rio Declaration"), United Nations.

United Nations Environment Programme (UNEP) (2007) *Global Environmental Outlook 4*. Online. Available HTTP: <http://www.unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf> (accessed 17 July 2012).

11

Environmental foreign policy

Crossovers among levels of governance

Mihaela Papa

In a seminal article, Robert Putnam (1988) used the metaphor of "two-level games" to describe how government officials conduct foreign policy by simultaneously engaging in negotiations at two levels: domestic and international. This idea of foreign policy decision-makers as brokers along the domestic–foreign (or international) frontier has since gained significant ground in the academic literature. It has provided new avenues to explore the links between foreign policy analysis and international relations. Studies looking more closely at both the domestic and the international level subsequently acknowledged that these levels are themselves made up of different levels (Piattoni 2010; Woolcock 2011; Cottier and Hertig 2003). Domestically, there are a number of governmental (national and subnational) and nongovernmental actors that interact among themselves (see Chapter 14). Internationally, negotiations take place at bilateral, regional, multilateral and other levels (see Chapter 20). Not only do these actors operate at multiple levels at the same time, they also use one level to influence the other(s).

The increasing complexity of world politics – the growth of actors, issues and cooperative arrangements – puts officials of environmental foreign policy at the crossovers among multiple negotiation processes. It also stretches the concept of foreign policy officials as brokers and gives rise to a number of ambiguities concerning their roles, choices and impact. These ambiguities persist in literature; studies of foreign policy generally develop separately from the literature on governance and its complexity.

This chapter looks at several issues and processes that are at the core of the debate on environmental foreign policy as it operates at the crossovers. Environmental foreign policy-making is a particularly timely topic, given, on the one hand, growing pressures of environmental degradation and increasing awareness of human dependence on ecosystems, and, on the other hand, the need to understand the changing nature of foreign policy as an important mechanism of political agency in global environmental politics. The chapter begins by introducing environmental foreign policy and the two main approaches used to describe, analyze and explain its operation across multiple levels. The first approach is a state-centered analysis. It considers the state as the primary arena of political power, and explains how environmental foreign policy officials seek to take advantage of the different levels of cooperation. The second approach, focused on multilevel governance, takes shared competencies as a point of departure, and environmental

foreign policy officials are one group of actors, but not necessarily the leading ones, that assume policy responsibilities in this realm.

Following the analysis of these two approaches, the chapter discusses the changing politics of foreign policy in light of greater complexity of the international system. It points out several foreign policy challenges at the crossovers between the domestic and the international, such as defining environmental problems, strategizing about institutional choice, dealing with transscalar civil society, and responding to equity concerns arising from the system's growth. The chapter concludes by discussion implications for future research on environmental foreign policy.

Theoretical debates: environmental foreign policy and multiple levels of governance

Environmental foreign policy primarily refers to state policy directed to matters beyond state borders as it aims to protect, preserve and improve the environment (extensively discussed in Papa 2009; Harris 2008, 2009). From an environmental perspective, the very concept of the state is artificial because the environment and environmental problems disregard political borders. Politically, the notion of the state traditionally reflected the centralization of authority, and foreign policy officials were the sole brokers between the national and the international realm. The changing nature of state authority has become visible as corporations, international bodies and a proliferating universe of citizen groups have gained more influence on policy (see Chapters 13, 8 and 14), and as different functional departments of the government became increasingly active and engaged with their counterparts abroad (Matthews 1997; Slaughter 1997; see Chapter 12). The notion of governance was introduced to describe these shifting patterns in the style of governing and the multiplicity of actors engaged both domestically and internationally. Governance refers to new ways of achieving social objectives in which states participate and may, but do not necessarily have to, play a leading role (Rhodes 1996; Stoker 1998; Rosenau and Czempiel 1992). When these objectives relate to addressing environmental challenges or resolving environmental conflicts by creating, changing or reaffirming institutional arrangements, scholars talk about environmental governance (Davidson and Frickel 2004; Paavola 2007).

This section first uses a state-centric perspective to examine how foreign policy officials engage at multiple levels of cooperation. It introduces the concept of multilevel governance, which uses shared competences between foreign policy officials and other actors as an entry point for analyzing environmental foreign policy.

Policy engagement at multiple levels: states as points of departure

In environmental diplomacy, governments seek to take advantage of the different levels of cooperation in various ways, and they find some ways more suitable for certain issues than others. The first choice governments face is whether to engage in cooperation and, if they engage, whether they want to engage on a one-time basis or pursue institutional cooperation. For example, they may choose from among different cooperation options:

Unilateralism. Unilateral actions are one-sided or undertaken by a single state. They are used as an expression of a commitment toward a policy. A case in point is Russia's effort to prevent the extinction of fur seals in 1893: Russia issued a decree prohibiting the taking of fur seals just outside its territorial waters in reaction to British and North American fishing in that area. Unilateral measures can also be used as a way to spearhead policy change in multilateral

forums and to act when effective multilateral cooperation is impossible (Bodansky 2000). For example, parties to the Convention on International Trade in Endangered Species are allowed to unilaterally impose restrictions on wildlife trade that may be considerably stricter than those imposed by the Convention as a result of their own concerns about contributing to the decline of species that are consumed within their territory (see Chapter 37). When a critical mass of countries adopts unilateral measures, multilateral response becomes more likely.

Bilateralism. Bilateral actions are two-sided or undertaken by two governments. Environmental foreign policy officials often take advantage of this form of cooperation to manage shared resources together with their neighbors; for example, they negotiate treaties on joint river development (e.g., Dinar et al. 2011; see Chapter 34). Sometimes neighboring countries that do not share common interests have a common aversion to environmental harms, so environmental cooperation may be a way to improve their relations (Ali 2007). For example, in 1999 Botswana and a newly democratic South Africa signed a historic bilateral treaty to form Southern Africa's first peace park, the Kgalagadi Transfrontier Park. The countries undertook to manage their adjacent national parks as a single ecological unit: there are no physical barriers between the two parks and animals can move freely. Bilateral environmental cooperation also occurs between non-neighboring states: environmental assistance arrangements or joint development of clean energy technologies are cases in point.

Regionalism. Environmental foreign policy officials engage in regional cooperation by entering issue-specific regional agreements or by developing environmental aspects of broader regional integration processes. For example, the transboundary nature of acid rain in Europe required regional cooperation to ensure that all countries causing the problem and the countries that suffer from it jointly address the issue (see Chapter 30). The resulting 1979 Convention on Long-Range Transboundary Pollution used the United Nations Economic Commission for Europe as its secretariat. Environment can also be a significant aspect of regional integration processes: countries joining the European Union (EU) were required to harmonize their environmental policies with EU standards, resulting in regional norm diffusion and greater regulatory harmonization (see Chapter 8). Members of other regional cooperation agreements and associations, such as the North American Free Trade Agreement and the Association of Southeast Asian Nations, have also engaged in cooperation on environmental matters.

Multilateralism. Foreign policy officials take advantage of multilateral cooperation when the involvement of a number of countries is necessary. Environmental problems like climate change are global in scope: greenhouse gas emissions from anywhere in the world contribute to rising global mean temperature, which then entails differential but substantive risks for all countries (see Chapter 28). Multilateralism is thus relevant for both understanding the nature of the problem and its management. More generally, large-scale multilateralism involving more than 170 countries has been a common feature of environmental diplomacy. It has been used to create agreements ranging from addressing transboundary movement of chemicals (see Chapter 32) to defining the rights and responsibilities of nations in their use of the world's oceans (Chapter 35). United Nations mega-conferences dedicated to the environment and development are some of the largest events in world politics: the 1992 UN Conference on Environment and Development in Rio de Janeiro and the 2012 "Rio+20" UN Conference on Sustainable Development each gathered nearly 200 countries to strategize the direction and implementation of the global transition to sustainability (see Chapter 20).

Environmental foreign policy officials in every country simultaneously engage in a large number of issues at multiple levels. They may use different mixes of unilateralism, bilateralism, regionalism

and multilateralism at different stages of the cooperation process. At any point in time, however, the foreign policy of a state can be conceived of as a portfolio of policies implemented at different levels and designed to achieve foreign policy outcomes that the state wants (Palmer and Morgan 2006). Over time, states have generated a large number of environmental agreements: the International Environmental Agreements Database lists 1,520 bilateral and 1,131 multilateral environmental agreements, and 197 bilateral and 211 multilateral non-binding instruments, including declarations and memoranda of understanding (Mitchell 2012). States' foreign policy portfolios and activities at multiple levels have expanded accordingly.

How can we explain the engagement of states in environmental cooperation at multiple levels? International relations theory draws on three categories of thought to explain the emergence and stability of international cooperation: power-based theories, interest-based theories and knowledge-based theories (Hasenclever et al. 1997; Barrett 2003; see Chapters 3 and 4). From the most simplified perspective, power-based theories argue that power differences shape the level of cooperation, its rules and payoffs. Foreign policy officials' focus on the importance of relative gains and security concerns common to power-based theories is often illustrated in studies of powerful riparian states sustaining their privileged shares of transboundary waters (see Chapter 34). Interest-based theories find foreign policy officials as rational utility maximizers acting to overcome collective action problems – situations where they engage in cooperation to avoid suboptimal outcomes. Well-designed institutions (e.g., for the protection of the ozone layer; see Chapter 29) can produce mutual gains for countries and change their incentives to exploit the environment. Choosing between different levels of cooperation is a function of the trade-off between each instrument's relative flaw: multilateralism can be a solution to high transaction costs, and bilateralism or regionalism can help avoid free-riding or exclusion in the case of a public good (Thompson and Verdier 2010). Finally, knowledge-based theories focus on the way in which knowledge shapes environmental foreign policy-makers' behavior and identities. For example, it was found that powerful anti-whaling discourses have structured the positions that foreign policy-makers took on the need to save whales and helped recast whales into an issue of global concern (Epstein 2008; see Chapter 36).

Besides power-, interest- and knowledge-based explanations for states' engagement in various forms of cooperation, the rich literature on international environmental regimes has extensively relied on foreign policy analysis and international negotiation (see Chapter 9). These approaches allow for the integration of material and ideational determinants of state behavior and help explain how foreign policy officials make decisions and negotiate at the domestic–foreign frontier. Conceptualizations of the role of bargaining power and the effectiveness of lead vs. veto coalitions in determining the level of cooperation are cases in point (Young 1997; Chasek et al. 2010). Regime compliance studies have further investigated the interplay between domestic and international levels by examining both the intentions and capacities of governments as they decide whether and to what extent they will implement international commitments at the domestic level (Brown Weiss and Jacobson 1998; Chayes and Chayes 1995). Overall, environmental regime literature acknowledges that regimes may assume a degree of control over states, but they are seen to be created by and for states, thereby reaffirming the centrality of the state-centered system in its operation at multiple levels (see also Bulkeley 2005: 878).

The concept of multilevel governance: shared competencies as points of departure

A second analytical approach to environmental foreign policy is that of multilevel governance. In this approach, the point of departure is the existence of overlapping competencies amongst multiple levels of government (see Marks et al. 1996: 41). Multilevel governance describes

decision-making processes that involve the simultaneous mobilization of public authorities at different jurisdictional levels as well as that of nongovernmental organizations and social movements (Piattoni 2010). While it is a contested concept, its broad appeal reflects a shared concern with increased complexity, proliferating jurisdictions, the rise of non-state actors, and the related challenges to state power (Bache and Flinders 2004: 4–5). Environmental foreign policy decision-makers are one of the actors sharing policy responsibilities. (Hooghe and Marks [2003] and Zürn et al. [2010] argue that multilevel governance vocabulary has spread to many subfields of political science, including European Union studies, international relations, federalism and public policy, comparative politics, political economy and normative political theory.)

The operation of multilevel governance can be illustrated in Baltic Sea fisheries, a case of commons governance that involves multiple regulatory processes operating at different scales (Burns and Stöhr 2011). This governance system is under the EU Common Fisheries Policy framework, and decisions about regulations for the Baltic Sea are negotiated among the ministers of EU members. The European Commission (i.e., the Directorate-General for Maritime Affairs and Fisheries) prepares and proposes regulations for the EU Council of Ministers, which is the highest decision-making body determining broad policy measures that are to be implemented by the member-state fishing ministries. EU member states play an important role in the allocation of the annual total allowable catches, but they are faced with the substantial power of the Commission in setting up and managing institutional arrangements, and the powers of a multilevel system of member states (including non-coastal states), as well as powers at the grassroots level.

Similarly, other issues that work across multiple spatial scales in their ecological dimensions, like water and climate, have been analyzed from a multilevel perspective (Moss and Newig 2010). For example, Schreurs (2010) argued that national, regional and local governments have both distinct and complementary roles in developing climate mitigation and adaptation strategies and explained how cities and provinces in China, Japan and South Korea initiate their own climate action plans and join local, national and international networks for climate change, and Finger and his colleagues (2006) described the politics of transnational water resource management through case studies of the Aral Sea basin and the Danube, Euphrates and Mekong river basins as a multi-governance effort to collectively solve public problems by involving a variety of relevant actors, from the local to the global level, including institutions, states, civil society and businesses.

Multilevel governance approaches have also been used to analyze regulatory processes at different levels in order to obtain a comprehensive picture of human responses to environmental problems and to help analyze their effectiveness. Studies using such approaches have given rise to a number of analytical debates about the "right" scale for addressing a problem, the centralization of decision-making across levels, the interplay among various elements of governance, and the shift from institution-focused to institutional complex-focused thinking. These debates are briefly outlined below:

Scales and subsidiarity. One of the central questions of multilevel governance is what tasks should be "scaled" to which level of jurisdiction. The EU has experimented for decades with the idea of regulating authority through the principle of subsidiarity, which says that action should be taken at the lowest effective level of governance: tasks should rest at the lower levels unless relocating them to a higher level would ensure greater comparative effectiveness (Jordan 2000). In the international arena generally there is no one-size-fits-all approach to matching tasks and levels, but the match between political–administrative characteristics of institutions for collective action and the characteristics of the biogeophysical systems

with which they interact is considered relevant to their effectiveness (Young 2002). However, while there might exist an optimal level for addressing a problem from a functional perspective, environmental issues are continuously created, constructed, regulated and contested between, across and among scales (Bulkeley 2005: 876; Delaney and Leitner 1997; Gupta 2008). The resulting governance arrangement is the outcome of negotiations about the right definition: Is regulating the number of children people have a household issue or a global environmental concern? Is the Amazon a global resource – the lungs of the world – or a local resource? Is whaling a regional issue for whaling countries or an issue of global concern where non-whaling countries have a say in managing whales? Is the funding for adaptation to climate change a global responsibility of the key historical emitters or a local responsibility of affected communities?

Monocentric vs. polycentric governance. The difference between monocentric and polycentric governance has been used in discussions of local governance and has become more recently adopted in the context of global governance (Ostrom et al. 1961; Ostrom 2009). Monocentric hierarchy is characterized by governmental units at higher levels making all decisions, with units at lower levels following them. The existence of a central government at the domestic level makes the application of such a command-based approach possible, but internationally there is no world government, so monocentricity in this context refers to top-level rule-making through global regimes, where international negotiators find global solutions through multilateral negotiations (e.g., how to protect the ozone layer) and the lower levels of government carry out mandates. Polycentric governance connotes many centers of decision-making that are formally independent of each other, compete and cooperate, and interact and learn from one another. It is frequently discussed in areas where multilateral rule-making is either nonexistent, so the focus is on other levels (e.g., forest governance), or where it is deadlocked, so participants tend to seek other terrains for political intervention (e.g., climate change). The resulting debate is about the scale of the needed interventions and ways to bring top-down and bottom-up approaches together (Howlett and Rayner 2011; Tal and Cohen 2007).

Interplay and institutional/regime complexity. Going beyond concerns with the center of decision-making, scholars studying multilevel governance have engaged in a broader investigation of the interplay among governance arrangements, distinguishing between horizontal and vertical interplay in order to denote the horizontal linkages among distinct institutional arrangements at the same level of social organization and the vertical linkages across levels (see Young 2002). With the proliferation of institutions, however, the number of linkages has proliferated, and the governance activities of individual institutional arrangements overlap in a conflicting way (e.g., ozone vs. climate regime) or a complementary way (e.g., biodiversity and climate regime), raising questions about their impact on governance (see also Najam et al. 2006; Kanie and Haas 2004). Recent scholarship examines the causal mechanisms by which institutional linkages influence the effectiveness of multilevel governance efforts and actors' roles in managing institutional interaction (Oberthür and Gehring 2006; Selin 2010; Oberthür and Stokke 2011). Greater attention to institutional interactions has led some scholars to change focus from studying individual institutions to studying sets of institutions that simultaneously influence an issue area. For example, Raustiala and Victor's (2004) "regime complex" describes sets of specialized sectoral and issue-based regimes and other governance arrangements more or less loosely linked together, sometimes mutually reinforcing and sometimes overlapping and conflicting. Similarly, Oberthür and Stokke (2011) discuss "institutional complexes" and Biermann and his colleagues (2009) use global governance "architectures." Concerns with increased complexity, proliferating jurisdictions,

and overlapping, parallel and nested agreements, among other challenges reflecting the growth of the international system, have also given rise to debates on networked politics in broader international relations scholarship (Kahler 2009). The consequences of increasing complexity for policy-making remain contested: while some argue that complexity creates greater leeway for opportunistic behavior by states and undermines institutions (Alter and Meunier 2009), others demonstrate that there are significant constraints on opportunistic behavior and that institutional divisions of labor are more stable than expected (Papa 2010; Oberthür and Stokke 2011).

As this discussion illustrates, when shared competencies are the point of departure for investigating environmental foreign policy, the analytical emphasis moves from the pursuit of state goals across levels to responding to an environmental problem through multilevel governance. This perspective positions foreign policy decision-makers in the context of broader efforts to address the problem, helps map other key actors, and identifies the factors that lead to institutional failures or successes. Increasing complexity of governance gives foreign policy officials additional opportunities to promote their preferred policy agendas as they engage in negotiations and broker deals at and across scales. However, many processes (including those outside state influence, such as private regulation) take place "away from the negotiating table," thus shaping situations in ways that are not the most promising for achieving desired foreign policy goals (see also Lax and Sebenius 2006). As insights from this and the state-centric approach illustrate, when states broker among multiple levels and constituencies of environmental governance, the parameters within which they operate are being redefined.

The politics of foreign policy-making at the crossovers

Shifts in the political authority of the state and the growing complexity of the international system challenge the traditional practice of foreign policy. Environmental foreign policy decision-makers face competing claims and demands, and they need to choose where and how they may act, what difference their action makes, to whom they are responsible and to what degree (Hill 2003: 284). Foreign policy-making at the crossovers among multiple levels of governance highlights several political challenges: whether to pursue rescaling of issues, how to make institutional choices and assess what institutions are relevant, how to deal with transscalar civil society, and how to respond to equity concerns due to the system's growth.

Issue definitions are unstable: rescaling as a political pursuit

The ability of foreign policy decision-makers to derive gains from international cooperation depends on their ability to reach consensus with others on the nature of the problem they are addressing. When they enter into negotiations, decision-makers may have an issue-framing preference that reflects the amount of control and responsibility they are ready to assume. While the promotion of their own agenda and problem framing has traditionally been a characteristic of skillful foreign policy, the increasing complexity of governance means that issues can be taken to multiple venues by multiple actors and (re)defined through political contestation. Foreign policy officials can behave strategically and engage in upscaling and downscaling of issues to shape policy-making in ways that meets their needs, but they also need to be alert to similar efforts of other actors and to block them if needed (Gupta 2008). Rescaling occurs at any stage of the international cooperation process, both as a result of self-interested opportunism and as a pragmatic search for more effective solutions to collective action problems (Spector and Zartman 2003).

Loyalty of institutions cannot be assumed: challenges of institutional choice and relevance

Foreign policy decision-makers have traditionally been oriented towards institutions that would act as focal points for states in the international system, and states would coordinate their bargaining and their expectations around them (Schelling 1960). Yet the increasing institutional density means that new problems arise against a backdrop of preexisting and potentially relevant institutions, and old problems may be simultaneously managed by more institutions (Jupille and Snidal 2006). As a result, deciding where and how to act raises questions of institutional choice from among multiple institutional alternatives and judgment about institutional relevance. Environmental foreign policy-making has largely been oriented towards environmental institutions, but scholars have found that these institutions are not necessarily the institutions most important in shaping human behavior that drives environmental change (Underdal 2008). Given the common formula for the aggregate impact of human activities on the environment (i.e., impact = population × affluence × technology), the institutional arrangements most important to the environment are likely to be those that influence major economic activities, technological change and collective systems of beliefs, values and practices, such as the World Trade Organization (WTO), the EU, and transnational religious and cultural communities (Underdal 2008; Ehrlich and Holdren 1971). Yet engaging in such institutions generates other concerns. For example, when environmental issues are taken to the WTO's dispute settlement body, the question becomes whether the WTO is an appropriate venue and sufficiently equipped to address them. Other examples include challenges to the EU moratorium on genetically modified food and crops imports, and the legality of Chinese subsidies to its wind power manufacturers and government support for "green economy" (see Lieberman and Gray 2008).

Dealing with transscalar civil society

As the societal regulation now spans and interlinks multiple spaces – global, regional, national, provincial, local – civil society has more opportunities for access and influence and can use them to drive state agendas (Scholte 2010). This contributes to the lack of predictability in foreign policy-making: the boundary between domestic and foreign policy can blur rapidly and create inconsistencies in governmental responses as different parts of the government (e.g., federal and local) pursue different agendas (see Chapter 14). For example, Alcañiz and Gutiérrez (2009) illustrated how civil society can push a small conflict over the planned construction of two pulp plants on the Uruguay River, shared by Uruguay and Argentina, to grow and spread across multiple regional and global forums. Pralle (2006) demonstrated how, in the conflict over preserving old-growth forests in Clayoquot Sound in Canada, various political actors – local and national civil society, timber companies and different levels of government – created and reconfigured alliances and drew in different governmental institutions to pursue their goals.

When civil society is present at multiple sites where rule-making takes place, it can also make foreign policy officials more accountable by revealing when they engage in symbolic politics rather than actually promoting environmental problem-solving. Given that states operate in global information space and seek to be perceived as supportive of environmental values, foreign policy officials carry the intellectual burden of defending their decisions (Chong 2007: 197).

Inconsistencies often emerge when states conduct environmental foreign policy across different forums. The United States advocates the precautionary principle in the whaling regime and downplays it in the climate regime. China argues that the Security Council is not an appropriate forum to address climate change because it does not have universal participation, but then seeks

to narrow the number of actors engaged in the issue. Such inconsistencies can ideally enable the "civilizing force of hypocrisy" to work: civil society can challenge inconsistencies. They can use the public sphere to induce states to use the language of reason when formulating their interests and positions, in turn confirming the validity of norms and reproducing them (Elster 1998; Risse 2000). While environmental politics has been one of the subfields of international relations where civil society has played a very active role and broken new ground in terms of participation on behalf of states and with states in decision-making, the impact of civil society on foreign policy-making in the context of complexity remains unclear. Under what conditions is civil society supportive of states' efforts to rescale issues, change focal points of cooperation or shift to non-environmental institutions?

Towards more power politics and less democracy?

Questions of equity and justice, particularly regarding the common but differentiated responsibility norm, have been prominent in environmental diplomacy (see Chapter 23). The increasing complexity of environmental governance highlights two additional equity concerns. One is that the very nature of multilevel governance conflicts with existing norms of democratic legitimacy because, although policy bargaining in this context encompasses multiple levels, it lacks the control of elected politicians and can lack transparency and democratic legitimacy (Jordan 2000). The other concern is that the proliferation of international agreements at all levels may negatively affect the rule of law in the long term because it leads to normative fragmentation, which weakens legal obligations and challenges the integrity of international law (ILC 2006) and potentially enhances rather than limits great powers (Drezner 2009). Countries need substantial analytical capacity to navigate across multiple and complex levels of governance and to design optimal foreign policy strategies; this gives countries with greater resources an advantage. For example, Pistorius (1995) analyzed negotiations over plant genetic resources in three international arenas and found that issue linkages among these arenas put developing countries at a disadvantage because the countries lacked the capacity to manage spillovers among arenas in a way that could serve their interests (see Chapter 37).

The practice of environmental foreign policy-making is concerned with both making the right policy choices and improving these choices over time. When decision-makers operate at the crossovers among multiple negotiation processes, the menu for choice enlarges and highlights the question of the relevance of various cooperation channels. At the same time, the exposure of foreign policy decision-makers to transscalar civil society can increase, raising the bar for civil society to optimize its influence across multiple forums. Greater awareness of equity concerns illustrates the importance of examining whether environmental foreign policy has a role in ensuring that the international system itself develops in a more sustainable way.

Conclusion

In order to reveal the various ways in which environmental foreign policy operates at the crossovers among multiple levels of governance, as well as to offer greater conceptual clarity in this context, this chapter has looked at environmental foreign policy from a state-centric perspective and from the perspective of multilevel governance. Drawing on these two approaches highlights the issues that foreign policy decision-makers face as brokers at the domestic–foreign frontier. Shifts in political authority and increasing complexity at and between different levels of governance lead to changes in the politics of foreign policy decision-making.

Despite the proliferation of research on environmental governance, our understanding of the impact of increasing institutional complexity on foreign policy decision-making and strategizing is still limited and could be advanced with more empirical work in the area. Other promising areas for future research include: examining how major emerging powers, which increasingly seek to establish themselves as rule-makers in world politics, take advantage of different levels of environmental governance; looking at the conditions under which multilateralism, as a traditionally celebrated level of international environmental cooperation, can be revived; and investigating how environmental foreign policy can help define and ensure the sustainable development of the international system. The promise of multiple levels of governance lies in states' ability to use the new opportunities for action and to address the international system's weaknesses. Greater attention to this endeavor can help states and processes of international cooperation become viable instruments for the political innovation that is required to cope with global environmental change.

References

Alcañiz, Isabella and Gutiérrez, Ricardo A. (2009) "From Local Protests to the International Court of Justice: Forging Environmental Foreign Policy in Argentina," in Paul G. Harris (ed.) *Environmental Change and Foreign Policy: Theory and Practice*, London: Routledge, pp. 109–20.

Ali, Saleem H. (ed.) (2007) *Peace Parks: Conservation and Conflict Resolution*, Cambridge, MA: MIT Press.

Alter, Karen J. and Meunier, Sophie (2009) "The Politics of International Regime Complexity," *Perspectives on Politics* 7(1): 13–14.

Bache, Ian and Flinders, Matthew (2004) "Themes and Issues in Multi-Level Governance," in Ian Bache and Matthew Flinders (eds) *Multi-Level Governance*, Oxford: Oxford University Press, pp. 1–11.

Barrett, Scott (2003) *Environment and Statecraft: The Strategy of Environmental Treaty-Making*, Oxford: Oxford University Press.

Biermann, Frank, Pattberg, Philipp and van Asselt, Harro (2009) "The Fragmentation of Global Governance Architectures: A Framework for Analysis," *Global Environmental Politics* 9(4): 14–40.

Bodansky, Daniel (2000) "What's So Bad about Unilateral Action to Protect the Environment?" *European Journal of International Law* 11(2): 339–47.

Brown Weiss, Edith and Jacobson, Harold K. (eds) (1998) *Engaging Countries: Strengthening Compliance with International Environmental Accords*, Cambridge, MA: MIT Press.

Bulkeley, Harriet (2005) "Reconfiguring Environmental Governance: Towards a Politics of Scales and Networks," *Political Geography* 24: 875–902.

Burns, Tom R. and Stöhr, Christian (2011) "Power, Knowledge, and Conflict in the Shaping of Commons Governance. The Case of EU Baltic Fisheries," *International Journal of the Commons* 5(2).

Chasek, Pamela S., Downie, David Leonard and Brown, Janet Welsh (2010) *Global Environmental Politics*, Boulder, CO: Westview Press.

Chayes, Abram and Chayes, Antonia Handler (1995) *The New Sovereignty: Compliance with International Regulatory Agreements*, Cambridge, MA: Harvard University Press.

Chong, Alan (2007) *Foreign Policy in Global Information Space: Actualizing Soft Power*, New York: Palgrave.

Cottier, Thomas and Hertig, Maya (2003) "The Prospect of 21st Century Constitutionalism," *Max Planck Yearbook of United Nations Law* 7: 261–328.

Davidson, Debra, J. and Frickel, Scott (2004) "Understanding Environmental Governance: A Critical Review," *Organization & Environment* 17(4): 471–92.

Delaney, David and Leitner, Helga (1997) "The Political Construction of Scale," *Political Geography* 16(2): 93–7.

Dinar, Shlomi, Dinar, Ariel and Kurukulasuriya, Pradeep (2011) "Scarcity and Cooperation along International Rivers: An Empirical Assessment of Bilateral Treaties," *International Studies Quarterly* 55(3): 809–33.

Drezner, Daniel W. (2009) "The Power and Peril of International Regime Complexity," *Perspectives on Politics* 7(1): 65–70.

Ehrlich, Paul R. and Holdren, John P. (1971) "Impact of Population Growth," *Science* 171(3977): 1212–17.

Elster, Jon (1998) "Deliberation and Constitution Making," in Jon Elster (ed.) *Deliberative Democracy*, Cambridge: Cambridge University Press.

Epstein, Charlotte (2008) *The Power of Words in International Relations: Birth of an Anti-Whaling Discourse*, Cambridge, MA: MIT Press.

Finger, Matthias, Tamiotti, Ludivine and Allouche, Jeremy (eds) (2006) *The Multi-Governance of Water: Four Case Studies*, New York: SUNY Press.

Gupta, Joyeeta (2008) "Global Change: Analyzing Scale and Scaling in Environmental Governance," in Oran Young, Leslie A. King and Heike Schroeder (eds) *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, Cambridge, MA: MIT Press, pp. 225–58.

Harris, Paul G. (2008) "Bringing the In-Between Back In: Foreign Policy in Global Environmental Politics," *Politics & Policy* 36(6): 914–43.

—— (ed.) (2009) *Environmental Change and Foreign Policy: Theory and Practice*, London: Routledge.

Hasenclever, Andreas, Mayer, Peter and Rittberger, Volker (1997) *Theories of International Regimes*, Cambridge: Cambridge University Press.

Hill, Christopher (2003) *The Changing Politics of Foreign Policy*, New York: Palgrave Macmillan.

Hooghe, Liesbet and Marks, Gary (2003) "Unraveling the Central State, but How? Types of Multi-Level Governance," *American Political Science Review* 97(2): 233–43.

Howlett, Michael and Rayner, Jeremy (2011) "Overcoming the Challenges to Integration: Embracing Complexity in Forest Policy Design through Multi-Level Governance," in Jeremy Rayner, Alexander Buck and Pia Katila (eds) *Embracing Complexity: Meeting the International Forest Governance Challenge*, IUFRO World Series vol. 27, Vienna, pp. 93–110.

ILC (International Law Commission) (2006) "Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law," Report of the ILC Study Group chaired by Martti Koskenniemi. Fifty-eighth session, Geneva, 1 May–9 June and 3 July–11 August.

Jordan, Andrew (2000) "The Politics of Multilevel Environmental Governance: Subsidiarity and Environmental Policy in the European Union," *Environment and Planning A* 32(7): 1307–24.

Jupille, Joseph and Snidal, Duncan (2006) "The Choice of International Institutions: Cooperation, Alternatives and Strategies." Unpublished Paper. Available at SSRN: http://ssrn.com/abstract=1008945.

Kahler, Miles (ed.) (2009) *Networked Politics: Agency, Power, and Governance*, Ithaca, NY: Cornell University Press.

Kanie, Norichika and Haas, Peter M. (eds) (2004) *Emerging Forces in Environmental Governance*, Tokyo: United Nations University Press.

Lax, David A. and Sebenius, James K. (2006) *3-D Negotiation: Powerful Tools to Change the Game in Your Most Important Deals*, Cambridge, MA: HBS Press.

Lieberman, Sarah and Gray, Tim (2008) "The World Trade Organization's Report on the EU's Moratorium on Biotech Products: The Wisdom of the US Challenge to the EU in the WTO," *Global Environmental Politics* 8(1): 33–52.

Marks, Gary, Nielsen, F., Ray, L. and Salk, J. (1996) "Competencies, Cracks and Conflicts: Regional Mobilization in the European Union," in Gary Marks, Fritz W. Scharpf, Philippe H. Schmitter and Wolfgang Streck (eds) *Governance in the European Union*, London: Sage, pp. 40–63.

Matthews, Jessica T. (1997) "Power Shift," *Foreign Affairs* 76(1), January/February.

Mitchell, Ronald B. (2012) *International Environmental Agreements Database Project (Version 2012.1)*. Available at: http://iea.uoregon.edu/ (accessed 25 May 2012).

Moss, Timothy and Newig, Jens (2010) "Multi-Level Water Governance and Problems of Scale: Setting the Stage for a Broader Debate," *Environmental Management* 46: 1–6.

Najam, Adil, Papa, Mihaela and Taiyab, Nadaa (2006) *Global Environmental Governance: A Reform Agenda*, Winnipeg, CA: International Institute for Sustainable Development.

Oberthür, Sebastian and Gehring, Thomas (eds) (2006) *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*, Cambridge, MA: MIT Press.

Oberthür, Sebastian and Stokke, Olav Schram (eds) (2011) *Managing Institutional Complexity: Regime Interplay and Global Environmental Change*, Cambridge, MA: MIT Press.

Ostrom, Elinor (2009) "A Polycentric Approach for Coping with Climate Change," Policy Research Working Paper WPS 5095, Washington, DC: World Bank.

Ostrom, Vincent, Tiebout, Charles M. and Warren, Robert (1961) "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry," *American Political Science Review* 55: 831–42.

Paavola, Jouni (2007) "Institutions and Environmental Governance: A Reconceptualization," *Ecological Economics* 63: 93–103.

Palmer, Glenn and Morgan, T. Clifton (2006) *A Theory of Foreign Policy*, Princeton, NJ: Princeton University Press.

Papa, Mihaela (2009) "Environmental Foreign Policy: Towards a Conceptual Framework," in Paul G. Harris (ed.) *Environmental Change and Foreign Policy: Theory and Practice*, London: Routledge, pp. 202–20.

—— (2010) "State Dissatisfaction in Global Environmental Fora: Explaining the Pursuit of Forum-Shopping," Doctoral Dissertation, Medford, MA: Fletcher School, Tufts University.

Piattoni, Simona (2010) *The Theory of Multi-Level Governance. Conceptual, Empirical, and Normative Challenges*, Oxford: Oxford University Press.

Pistorius, Robin (1995) "Forum Shopping: Issue Linkages in the Genetic Resources Issue," in Robert V. Bartlett, Priya A. Kurian and Madhu Malik (eds) *International Organizations and Environmental Policy*, Westport, CT: Greenwood Press, pp. 209–22.

Pralle, Sarah B. (2006) *Branching Out, Digging In: Environmental Advocacy and Agenda Setting*, Washington, DC: Georgetown University Press.

Putnam, Robert (1988) "Diplomacy and Domestic Politics: The Logic of Two-Level Games," *International Organization* 42: 427–60.

Raustiala, Kal and Victor, David G. (2004) "The Regime Complex for Plant Genetic Resources," *International Organization* 58(2): 277–309.

Rhodes, R.A.W. (1996) "The New Governance: Governing without Government," *Political Studies* 44: 652–67.

Risse, Thomas (2000) " 'Let's Argue!': Communicative Action in World Politics," *International Organization* 54(1): 1–39.

Rosenau, James N. and Czempiel, Ernst-Otto (eds) (1992) *Governance without Government: Order and Change in World Politics*, Cambridge: Cambridge University Press.

Schelling, Thomas C. (1960) *The Strategy of Conflict*, Cambridge, MA: Harvard University Press.

Scholte, Jan Aart (2010) "Civil Society in Multi-Level Governance," in Henrik Enderlein, Michael Zürn and Sonja Wälti (eds) *Handbook on Multi-Level Governance*, Cheltenham: Elgar, pp. 383–96.

Schreurs, Miranda (2010) "Multi-Level Governance and Global Climate Change in East Asia," *Asian Economic Policy Review* 5(1): 88–105.

Selin, Henrik (2010) *Global Governance of Hazardous Chemicals: Challenges of Multilevel Management*, Cambridge, MA: MIT Press.

Slaughter, Anne Marie (1997) "The Real New World Order," *Foreign Affairs*, September/October.

Spector, Bertram I. and Zartman, I. William (eds) (2003) *Getting it Done: Post-agreement Negotiation and International Regimes*, Washington, DC: United States Institute of Peace Press.

Stoker, Gerry (1998) "Governance as Theory: Five Propositions," *International Social Science Journal* 50(155): 17–28.

Tal, Alon and Cohen, Jessica A. (2007) "Bringing 'Top-Down' to 'Bottom-Up': A New Role for Environmental Legislation in Combating Desertification," *Harvard Environmental Law Review* 31: 163–217.

Thompson, Alexander and Verdier, Daniel (2010) "Multi-Lateralisms: Explaining Variation in Regime Instruments," Discussion Paper 2010–34, Cambridge, MA: Harvard Project on International Climate Agreements, March.

Underdal, Arild (2008) "Determining the Causal Significance of Institutions: Accomplishments and Challenges," in Oran R. Young, Heike Schroeder and Leslie A. King (eds) *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*, Cambridge, MA: MIT Press, pp. 49–78.

Woolcock, Stephen (2011) "Multi-Level Economic Diplomacy: The Case of Investment," in Nicholas Bayne and Stephen Woolcock (eds) *The New Economic Diplomacy. Decision-Making and Negotiation in International Economic Relations*, 3rd edn, Aldershot: Ashgate, pp. 131–51.

Young, Oran R. (1997) "Rights, Rules and Resources in World Affairs," in Oran R. Young (ed.) *Global Governance: Drawing Insights from the Environmental Experience*, Cambridge, MA: MIT Press.

—— (2002) *The Institutional Dimensions of Environmental Change: Fit, Interplay, Scale*, Cambridge, MA: MIT Press.

Zürn, Michael, Wälti, Sonja and Enderlein, Henrik (2010) "Introduction," in Henrik Enderlein, Sonja Wälti and Michael Zürn (eds) *Handbook on Multi-Level Governance*, Cheltenham: Elgar, pp. 1–17.

12

Comparative environmental politics

Domestic institutions and actors

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Comparative environmental politics is the systematic study and comparison of environmental politics in different countries around the globe. The importance of a comparative approach to global environmental politics stems from the fact that the political processes that promote or impede trends like deforestation (see Chapter 38), water scarcity (Chapter 34), and climate change (Chapter 28) play out every day in places as diverse as the American state of Maine, the Indonesian island of Java, rapidly developing countries such as Chile and China, poor and unstable political systems like those of Haiti and Guinea, highly industrialized countries like Germany, and post-communist countries such as Belarus. To understand global environmental governance thus requires an appreciation for complexity – for the unique ways that actors and institutions interact in particular places and at specific historical junctures – and the use of theoretical tools to help us make sense of this complexity. With this overarching goal in mind, in this chapter we make two claims. First, comparative inquiry brings a great deal to the study and practice of global environmental politics and should occupy a more prominent position in the field (see Chapter 2). Second, to realize this potential, and to cohere into a cumulative literature, comparative environmental research should give substantially greater attention to theories of comparative politics.

By connecting environmental research to the broader scholarly tradition of comparative politics, we can gain important insights into practical questions of environmental governance while addressing many of the enduring concerns of social science. Why are social movements more successful in some countries than in others (Dryzek et al. 2003)? What processes govern the spread of policy ideas across borders (Busch and Jörgens 2005)? Which types of policies achieve what goals – and under what conditions (Harrington et al. 2004)? Why do many political leaders choose to squander their countries' natural wealth, seemingly against their own national interests (Ross 2001)? Will the decentralization of political power produce better social outcomes (Ribot 1999; Kingston 2001)? Can global governance objectives be achieved while respecting local autonomy (Brechin et al. 2003)? Under what circumstances are new political parties likely to have an influence (Kitschelt 1989; M. O'Neill 2012)?

Elsewhere we provide a comprehensive introduction to this important new field (Steinberg and VanDeveer 2012). Here our goal is to demonstrate why theories of comparative politics are indispensible for understanding the human dimensions of global environmental problems and

how we might bring comparative analysis into the fold of global environmental politics research (see Chapter 5).

Viewing global environmental politics through comparative lenses

As is demonstrated throughout this handbook, since the 1980s the most prolific area of political science research on the environment has been in the field of international relations. Research grounded in international relations theory has expanded our understanding of the prospects for international cooperation (see Chapters 3, 4, and 8), the interplay of state and non-state actors (Chapters 7 and 14), the effectiveness of international regimes (see Chapter 9), and the distributive results among participants (see Dauvergne 2005; Mitchell 2002; K. O'Neill 2009; Mitchell 2010; and Axelrod et al. 2011). As global environmental politics research expands its disciplinary and methodological interests, the time is ripe to mine the comparative politics tradition and bring its insights to bear on environmental questions (see Chapter 5). Indeed, comparativists have been advocating such an agenda for a long time (Lundqvist 1978; Kamieniecki and Sanasarian 1990; Steinberg 2001; McBeath and Rosenberg 2006).

Comparative political inquiry is a rich intellectual tradition encompassing diverse areas of research that share two distinctive features. First, comparative politics research takes seriously the role of domestic politics. Second, comparative politics draws on and contributes to an understanding of political phenomena in more than one country. Together these two commitments allow the field to pay careful attention to national and subnational contexts while promoting a broader understanding of politics that transcends national boundaries. To say that comparative research focuses on domestic politics does not mean that it downplays international phenomena. To the contrary, comparativists are keenly interested in the ways in which international processes – such as trade, war, colonialism, European Union formation, and transnational advocacy, to name a few – influence and are shaped by domestic politics.

What then does comparative politics have to offer the field of global environmental politics? Scholars of global environmental politics have a strong interest in understanding the domestic sources of state preferences, divergent national implementation of international accords, and the rapidly evolving role of non-state actors and transnational social movements (O'Neill 2009; see Chapter 14). Systematic cross-national comparison demonstrates the importance of studying these issues in light of their political context – and this context varies substantially across borders and localities (Goodin and Tilly 2006). Nations, cities, and regions display unique combinations of interests, ideas, and institutions. Notwithstanding globalization (Chapter 22) and intensified cross-border exchanges of resources, norms, and policy practices, these combine in distinctive ways in particular places. In every locale, socialization, interpretive frameworks, traditions, and expectations based on historical experience shape what actors see as feasible, normal, and right. As Chinua Achebe noted in *Things Fall Apart*, "what is good among one people is an abomination with others" (Achebe 2000: 99). As a result, even deeply integrated economies like those of Europe and North America respond differently to issues like climate change (Chapter 28), hazardous waste (Chapter 33), and genetically engineered food (Chapter 40) despite having access to the same scientific and technical information (Schreurs 2002; Jasanoff 2005; see Chapter 17). Differences in legal traditions, administrative structures, and political processes produce divergent outcomes, even in a world where international agreements, multinational corporations, and transnational actor networks push for political and regulatory convergence across borders.

In short, there are a host of good reasons to compare political systems. Here we focus on four areas that stand to benefit from greater interaction between comparative politics research and the field of global environmental politics: (1) gaining greater insight into the causal processes linking

international and domestic politics (see Chapter 11); (2) appreciating the enduring importance of domestic politics and of the nation-state in particular (Chapter 7); (3) placing non-state actors in their broader social and historical contexts (Chapter 14); and (4) expanding the political imagination by studying social change and institutional innovation in diverse geographic settings (Chapters 5 and 8).

Understanding causal processes

To be effective, international environmental initiatives – be they treaties, conservation projects, citizen campaigns, or other cross-border collaborations – require an understanding of the behaviors and social relations driving environmental outcomes (Young 1999). Effectiveness also requires an appreciation for what it takes to bring about change in a given political system. These are precisely the sorts of insights to be found in the field of comparative politics, which boasts an intellectual pedigree stretching back a century and includes analyses of state structures, policy-making styles, modes of social mobilization, state–society relations, institutional change, and the origins of public preferences (for overviews see Kopstein and Lichbach 2009; Lichbach and Zuckerman 1997; Rogowski 1993). If we wish to understand water governance in Egypt, for example, we need to know something about institutional change and multilevel governance in authoritarian systems (Sowers 2012). If we want to understand why the United States and Europe have responded differently to climate change, we need to appreciate differences in the structure of their federal systems of government (Selin and VanDeveer 2012).

Comparative research into causal processes can help shed light on a central question in global environmental politics – namely, why do countries support or shun international environmental cooperation (Bernauer et al. 2010; Bernhagen 2008; Bättig and Bernauer 2009; Raustiala 1997; see Chapter 8)? If a country's support for a climate change treaty is a function of national interests, as Sprinz and Vaahtoranta (1994) argue, we are left with the question of where national interests come from. Material conditions alone cannot provide a satisfactory answer. For example, when policy-makers in the Philippines are formulating a national position with respect to mandatory limits on carbon dioxide emissions, several conflicting interests are at play: from concerns about rising sea levels (of special concern to a country with over 7,000 islands), to the state's strategic links to the Middle East, and its role within the G-77 coalition of developing countries (Steinberg 2002). It is only through the comparative study of political parties, think tanks, legislatures, electoral systems, bureaucracies, and social movement influence that we can begin to come to terms with the domestic origins of national interests (Moravcsik 1997; Putnam 1988).

The enduring relevance of domestic politics

The growth of transnational activity by non-state actors is among the most important developments in global environmental politics in recent decades. In the rush to document and understand this new phenomenon, however, it would be a mistake to overlook the enduring relevance of government institutions and associated political processes. National governments have a profound impact on the size and impacts of nongovernmental organizations (NGOs) and social movements (Steinberg 2005; Schreurs 2002; see Chapter 14). As Barry and Eckersley argue, "Despite the changes wrought by globalization, democratic states still have more steering capacity and legitimacy to regulate the activities of corporations and other social agents along ecologically sustainable lines in more systematic ways than any non-state alternative" (Barry and Eckersley 2005: xii). The field of comparative politics has produced a vast literature devoted to

modern states and their evolving policy priorities (Krasner 1984; Skocpol 1979; Anderson 1991; Esping-Andersen 1990; Herbst 1990). Drawing on this tradition, Meadowcroft (2012) traces the unsteady evolution of the modern welfare state to understand the prospects for the "greening" of nations – the notion that environmental governance is part of what it means to be a modern state. Comparative political inquiry can infuse the broader field of global environmental politics with a greater understanding of this central player in global environmental politics and its many roles.

From non-state actors to social histories

Too often NGOs are described in published accounts of international environmental affairs in ways that offer little context or understanding of the societies in which they operate. Indeed, the non-state actors that participate in transnational advocacy are a small and unrepresentative subset of social actors in their home countries (Steinberg and Garcia-Johnson 2001). Their origins and impacts are shaped by connections with other domestic social movements, by their access to domestic political parties and state institutions, and by strategic choices about how to mobilize constituencies and connect their concerns with established national discourses (Dalton 1994; Dryzek et al. 2003). Rather than study NGOs only when they appear on the international stage, we can gain a deeper understanding of the role of non-state actors in global environmental politics through comparative historical analysis (Lipschutz 2001; Skocpol 1984; George and Bennett 2005). The key is to combine in-depth histories of social actors in particular places with theories that facilitate comparisons across borders. Lee and So (1999) use such an approach to help us understand the cultural repertoires that environmental activists throughout Asia draw on when pressing for change. The point is not to downplay in any way the importance of transnational processes. Comparative social history enhances our appreciation for how exactly transnational exchanges of resources and ideas take place in the context of domestic environmental movements and opportunity structures shaped by national processes such as democratization, economic development, urbanization, decentralization, and state-building.

Expanding the political imagination

Given the well-documented challenges facing efforts at global environmental cooperation – from least-common denominator agreements to contentious debates pitting national sovereignty against the provision of global public goods – it is not uncommon for students (and indeed professors) in global environmental politics courses to become discouraged about the prospects for change. Yet comparative research on domestic policy innovation reveals a more complex and encouraging story. While North and South are often at loggerheads in multilateral diplomatic venues (see Chapter 21), far removed from the halls of the United Nations one finds countless collaborations between developing and industrialized countries, ranging from the creation of innovative institutions for financing conservation to transnational partnerships among air quality regulators. The contrast between international stalemate and domestic action can also be seen with the US position toward climate change (see Chapter 28). At the international level, the United States became the pariah of climate change policy after shunning the Kyoto Protocol, and indeed showed a dismal record of ratifying and implementing the environmental treaties it signed (Schreurs et al. 2009). Domestically, however, during this same period a grassroots movement for the reduction of greenhouse gases emerged at the level of American cities, college campuses, and states – many of which adopted reduction targets more stringent than those required under the protocol (Rabe 2004; Selin and VanDeveer 2009, 2012).

At a broader level, the comparative study of efforts at institutional reform expands the political imagination, helping researchers and practitioners to see how outcomes often assumed to be technically or politically impossible have been achieved in different settings. Innovative environmental governance initiatives involving the private, public, and civil society sectors are taking place in a diverse array of countries – including many developing and post-communist countries that have made significant strides despite the challenges of building effective institutions in these political settings (Carmin and VanDeveer 2005; Steinberg 2012). Renewable energy in Portugal, pollution reduction in Indonesia, local water governance in Brazil, biodiversity conservation in Costa Rica, corporate environmental leadership in Mexico, and public legal access and right-to-know legislation in the United States all offer models worthy of careful study (Pulver 2007; Hochstetler and Keck 2007; Hettige et al. 1996; Steinberg 2001; Grant 1997). If some countries have well-managed and popular national park systems, what can these places teach those who do not? When a green party has electoral success and legislative influence, what can other parties learn from their accomplishments? Conversely, when proposals for carbon taxes or other environmental policies fail, what might be gained from understanding why?

Building bridges to comparative politics

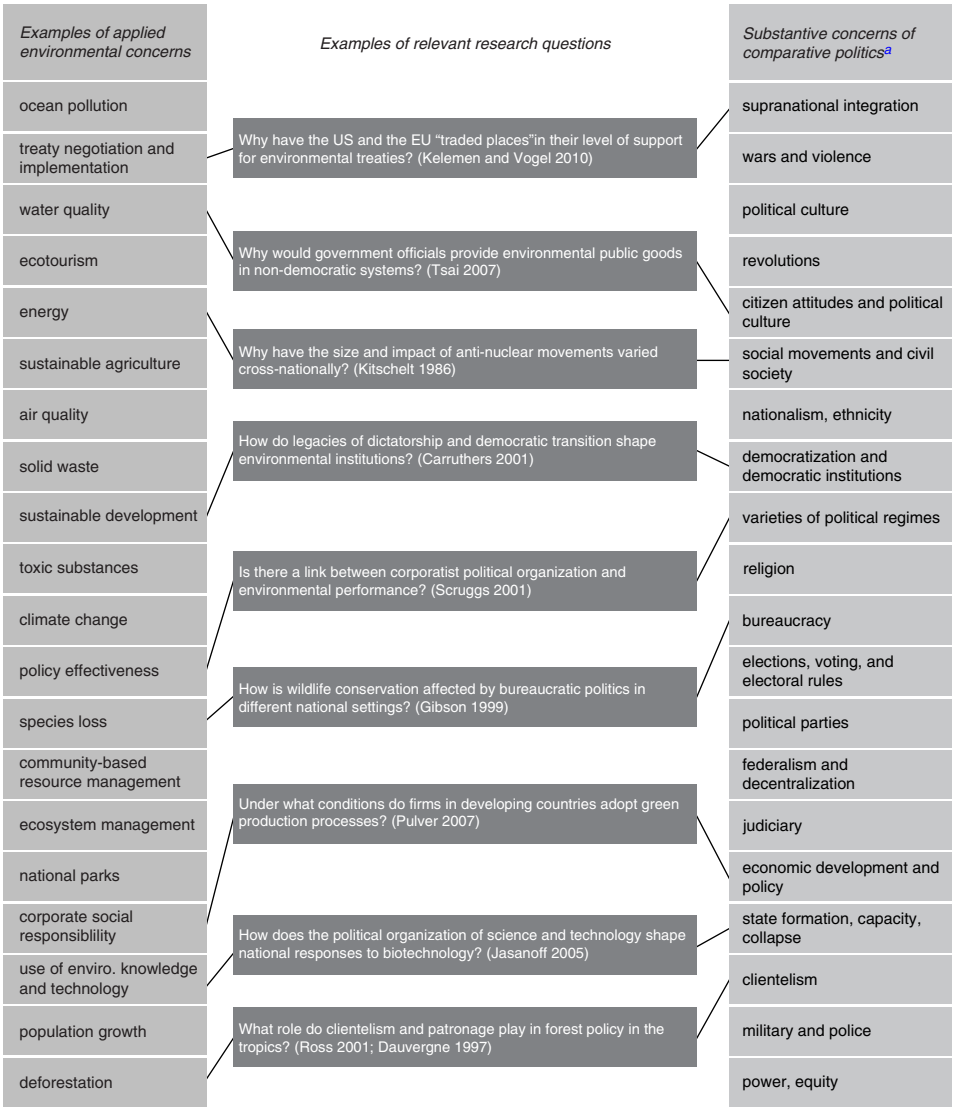
In our review of the comparative environmental politics literature, we find that, on the one hand, there are many hundreds of publications on domestic environmental politics around the globe. On the other hand, there have been few attempts to connect this research to the vast literature in comparative politics. Too often researchers confine the scope of discussion to the case at hand, without drawing on or contributing to larger bodies of knowledge about the very phenomena (policy change, political participation, institutional effectiveness, and so forth) they are studying. The field of comparative politics has played its part in this disjuncture; despite their claim to straddle the worlds of theory and social practice, leading researchers in comparative politics have paid scant attention to the environment. In an analysis of 614 articles published in leading comparative politics journals between 1990 and 2010, we found that environmental concerns were featured in a mere 1 percent of articles – compared with 35 percent focusing on economic growth and development (Steinberg and VanDeveer 2012).

More recently there have been efforts to bridge this gap and to establish a distinctive tradition in comparative environmental politics. Examples of research that links insights from comparative politics with environmental concerns are shown in Table 12.1. Building on these efforts, here we categorize this work in terms of four thematic "bridges" that span the core interests of both comparative politics and global environmental politics: (1) political institutions and governance; (2) values, culture, and knowledge; (3) non-state actors and social mobilization; and (4) multilevel linkages (Steinberg and VanDeveer 2012).

Political institutions and governance

Born of unique social histories and reflecting distinctive constellations of political demands, domestic political institutions channel domestic interests, respond to international pressures, and shape social and environmental outcomes. In Western Europe, green parties have created a political space for articulating the demands of environmental movements and have sometimes reshaped traditional party politics (M. O'Neill 2012; Kitschelt 1989). Comparativists have examined how institutions such as voting rules affect the development of new parties and the salience of environmental ideas within traditional party politics, and how new parties handle the competing

Table 12.1 Examples of relevant research questions



*Adapted from Steinberg and VanDeveer 2012. [a] Major clusters of comparative politics research draw on Table 1 of Munck and Snyder 2007.

demands of accountability to grassroots constituencies and the parliamentary requirements of bargaining, professionalization, and electoral success.

Beyond political parties, analysts have compared environmental regulatory styles and policy processes across various types of political systems (corporatist, pluralist, parliamentary, presidential, federalist, authoritarian, and so on) to better understand how change occurs in diverse settings and whether some political systems are more amenable to achieving environmental goals

than others (Aguilar 1993; Scruggs 2001; Hochstetler 2012; Sowers 2012; Steinberg 2012). Studies of European Union expansion show considerable disparities in national regulatory styles and environmental outcomes despite strong incentives for regulatory convergence (Andonova and VanDeveer 2012), while research in the political ecology tradition demonstrates how institutions inherited from the colonial era continue to shape state–society relations in the tropics (Peluso 1992). Research on state capacity explores the conditions under which national and local institutions achieve environmental goals (VanDeveer and Sagar 2005; Jänicke and Weidner 1997), while the literature on common-pool resources documents the heterogeneous and changing prerequisites for institutional effectiveness in managing shared local resources (Agrawal 2012). A growing literature on comparative regional environmental governance is also developing (Balsiger and VanDeveer 2010, 2012). Other researchers have assessed the merits of specific environmental policy approaches, comparing national experiences with instruments such as tradable permits, environmental taxes, the polluter-pays principle, right-to-know legislation, product certification, voluntary industry agreements, the precautionary principle, and participatory scientific assessments (Blackman 2008; Eckley and Selin 2004; Jordan, Wurzel and Zito 2003; Cashore et al. 2004; Harrington et al. 2004; Durant et al. 2004; de Bruijn and Norberg-Bohm 2005; Grant et al. 2000).

Values, culture, and knowledge

Environmental problems are shaped by predominant cultural understandings, modes of knowledge production and transmission, and the values and interpretive frameworks of specific actors and institutions (Harris 2011; see Chapter 17). It is hardly surprising, therefore, that environmental advocates often seek to instill in publics and elites new ways of thinking and relating to the world. Comparative research has documented public and elite attitudes in different national settings and looked at how these change over time – and in the process it has debunked widespread misperceptions, such as the notion that people in industrialized societies care more about environmental protection than do citizens of developing countries (Dunlap and York 2012; Steinberg 2001; see Chapter 27). Many scholars have moved beyond basic comparisons of survey responses to craft theories that identify clusters of attitudes, values, and interpretive frameworks, their relation to actual behaviors, and how these viewpoints differ across social groups and national borders (Inglehart 1990; Oreg and Katz-Gerro 2006; Dunlap et al. 2000; Brechin 1999). Indeed, many of the canonical theories of policy change emerged from studies of the connections between ideas and institutions in environmental policy-making (Baumgartner and Jones 2009; Weible et al. 2009; see Chapter 4). Comparative research also explores how norms, regulatory styles, and legitimizing discourses shape environmental movement tactics and state policy (O'Neill 2000).

Environmental governance is often associated with vast quantities of technical information, raising questions about how knowledge is generated and interpreted in different national settings and by diverse social groups ranging from indigenous peoples to land-use planners (Jasanoff 1990, 2005; Wilkening 2004; Jasanoff and Martello 2004; Agrawal 1995; Farrell and Jäger 2006; see Chapter 17). Comparative research reveals how domestic institutions (such as those mediating the relationship between technical experts and law-makers) shape the manner in which policy-makers, interest groups, and the public at large interpret and respond to scientific information. Comparative inquiry also sheds light on how ideas move across borders, including dynamics of policy convergence and the cross-national diffusion of social movement demands (Busch and Jörgens 2005; McAdam and Rucht 1993).

Non-state actors and social mobilization

Environmental movements have attracted the attention of comparative social movement scholars in political science and sociology, who offer perspectives on the goals, tactics, and impacts of environmental movements around the world (K. O'Neill 2012; see Chapter 14). Environmental movements are not all cut from the same cloth, but instead typically represent a blend of domestic and international influences (Steinberg 2003). Comparativists have explored the relationship between environmental movements and domestic social mobilization around gender, organized labor, nationalism, social justice, indigenous peoples, and democratization (Carmin and Bast 2009; Kim 2000; Adeola 2000; Bennett et al. 2005; Obach 2002; Dawson 1996; Carruthers 1996; Taylor 2000; see Chapters 14 and 24). Much of the observed cross-national variation in movement activity can be understood as strategic responses to these other movements – making common cause with mass movements for democracy, for example – and as attempts to cope with barriers and opportunities created by states (Schreurs 2002; Dryzek et al. 2003). But environmental movements can also transform social and institutional contexts, causing states and social actors to take greater account of environmental quality. Environmental movements are also shaped by transnational influences in their roles in broader citizen coalitions responding to globalization (O'Neill and VanDeveer 2005; Fox and Brown 1998; see Chapters 14, 22, and 27).

Multilevel linkages

The pursuit of sustainability (Chapter 15) is often hobbled by a mismatch between the geographic scope of environmental problems and the spatial jurisdiction of the political institutions tasked with addressing them. Research on multilevel governance is motivated by an awareness that environmental problems require sustained institutional responses operating at multiple organizational and geographic scales (Ostrom 1998; Young 2002; Selin and VanDeveer 2009; see Chapter 11). A primary concern for comparativists is whether and how international regimes affect a country's interests, ideas, and institutions, and how domestic political forces mediate these influences (O'Neill et al. 2004; DeSombre 2006; Cass 2006; O'Neill 2000; Schreurs 2002; see Chapters 9 and 8). Particularly in Europe, with its increasingly integrated states and societies and extensive participation in multilateral institutions, researchers have focused on the mechanisms underlying "Europeanization" (Andonova and VanDeveer 2012). Even where states seek harmonized policy outcomes, comparative research reveals diverse patterns of convergence, divergence, and hybridization over time, rather than a simple process of homogenization (Knill and Lenschow 1998). Moreover, domestic interests frequently shape the content and structure of trans-jurisdictional institutions (Schreurs and Tiberghien 2007; DeSombre 2000).

The complexities of multilevel governance are at least as great within nations as they are across them (Selin and VanDeveer 2009, 2012). Research on "environmental federalism" examines the impact of federalist structures on environmental performance; the relationship between the locus of regulatory authority and the relative influence of environmental and industrial interests (Revesz 2001; see Chapter 13); cross-national differences in the operation of federalist institutions (Kelemen 2004; Gillroy 1999); and the influence of federalist structures on social movement strategy and organization (Dryzek et al. 2003; Pralle 2006). Research on common-pool resource regimes has shown how local outcomes are shaped by larger-scale political institutions and processes (Agrawal 2000), while comparative social scientists in anthropology and rural sociology have explored the impact of state structures on local conflicts and patterns of resource use (Blaikie 1985; Gadgil and Guha 1985; Baver and Lynch 2006).

Conclusion

International relations scholars have long recognized the need for research on domestic politics and institutions and their interactions with international policy processes (Krasner 1976; Putnam 1988; Moravcsik 1997). Within the field of global environmental politics, the literature on domestic–international linkages has grown steadily over the past two decades (e.g., Schreurs and Economy 1997; Weinthal 2002; Harris 2003; Harrison and Sundstrom 2010), but has yet to affect many of the basic premises of the field. For too long, analyses of global environmental politics have been confined to international negotiations and the challenge of implementing international agreements, paying lip service to the role of domestic politics and institutions without engaging in theoretically grounded empirical research on these topics. Yet a distinctive tradition in comparative environmental politics is now beginning to emerge. This new field will likely constitute one of the leading edges of the next generation of research on global environmental politics. It is essential, however, that a comparative agenda develops in close conversation with international relations research. At a time when the discipline of political science is witnessing increasing integration between international relations and comparative politics, we do not propose the creation of a new fiefdom. Rather, we hope that comparative environmental politics rapidly matures into one major stream in the mainstream of global environmental politics.

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References

Achebe, Chinua. 2000 [1958]. *Things Fall Apart*. Johannesburg: Heinemann Educational Publishers.

Adeola, Francis O. 2000. Cross-National Environmental Injustice and Human Rights Issues. *American Behavioral Scientist* 43(4): 686–706.

Agrawal, Arun. 1995. Dismantling the Divide between Indigenous and Scientific Knowledge. *Development and Change* 26(3): 413–39.

—— 2000. Small Is Beautiful, but Is Larger Better? Forest-Management Institutions in the Kumaon Himalaya, India. In *People and Forests: Communities, Institutions, and Governance*, edited by Clark C. Gibson, Margaret A. McKean, and Elinor Ostrom, 57–85. Cambridge, MA: MIT Press.

—— 2012. Local Institutions and the Governance of Forest Commons. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 313–40. Cambridge, MA: MIT Press.

Aguilar, Susana. 1993. Corporatist and Statist Designs in Environmental Policy: The Contrasting Roles of Germany and Spain in the European Community Scenario. *Environmental Politics* 2(2): 223–47.

Anderson, Benedict R. 1991. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. New York: Verso.

Andonova, Liliana B. and Stacy D. VanDeveer. 2012. EU Expansion and the Internationalization of Environmental Politics in Central and Eastern Europe. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 287–312. Cambridge, MA: MIT Press.

Axelrod, Regina, Stacy D. VanDeveer, and David Downie, eds. 2011. *The Global Environment: Institutions, Law, and Policy*. Washington, DC: CQ Press.

Balsiger, Jörg and Stacy D. VanDeveer. 2010. Regional Governance and Environmental Problems. *International Studies Encyclopedia*, v. 9, 6179–200 Robert A. Denemark, ed. Oxford: Blackwell Publishing.

Balsiger, Jörg and Stacy D. VanDeveer. 2012 Navigating Regional Environmental Governance. *Global Environmental Politics* 12(3): 1–17.

Barry, John and Robin Eckersley, eds. 2005. *The State and the Global Ecological Crisis*. Cambridge, MA: MIT Press.

Bättig, Michèle B. and Thomas Bernauer. 2009. National Institutions and Global Public Goods: Are Democracies More Cooperative in Climate Change Policy? *International Organization* 63(2): 281–308.

Baumgartner, Frank and Bryan D. Jones. 2009. *Agendas and Instability in American Politics*, 2nd Edition. Chicago, IL: University of Chicago Press.
Baver, Sherrie L. and Barbara Deutsch Lynch, eds. 2006. *Beyond Sun and Sand: Caribbean Environmentalisms*. Piscataway, NJ: Rutgers University Press.
Bennett, Vivienne, Sonia Davila-Poblete, and Maria Nieves Rico. 2005. *Opposing Currents: The Politics of Water and Gender in Latin America*. Pittsburgh, PA: University of Pittsburgh Press.
Bernauer, Thomas, Anna Kalbhenn, Vally Koubi, and Gabriele Spilker. 2010. A Comparison of International and Domestic Sources of Global Governance Dynamics. *British Journal of Political Science* 40(3): 509–38.
Bernhagen, Patrick. 2008. Business and International Environmental Agreements: Domestic Sources of Participation and Compliance by Advanced Industrialized Democracies. *Global Environmental Politics* 8(1): 78–110.
Blackman, Allen. 2008. Can Voluntary Environmental Regulation Work in Developing Countries? Lessons from Case Studies. *Policy Studies Journal* 46(4): 119–41.
Blaikie, Piers. 1985. *The Political Economy of Soil Erosion in Developing Countries*. New York: John Wiley.
Brechin, Steven R. 1999. Objective Problems, Subjective Values, and Global Environmentalism: Evaluating the Postmaterialist Argument and Challenging a New Explanation. *Social Science Quarterly* 80(4): 793–809.
Brechin, Steven R., Peter R. Wilshusen, Crystal L. Fortwangler, and Patrick C. West, eds. 2003. *Contested Nature: Promoting International Biodiversity with Social Justice in the Twenty-First Century*. Albany: SUNY Press.
Busch, Per-Olof and Helge Jörgens. 2005. The International Sources of Policy Convergence: Explaining the Spread of Environmental Policy Innovations. *Journal of European Public Policy* 12(5): 860–84.
Carmin, JoAnn and Elizabeth Bast. 2009. Cross-movement Activism: A Cognitive Perspective on the Global Justice Activities of US environmental NGOs. *Environmental Politics* 18(3): 351–70.
Carmin, JoAnn and Stacy D. VanDeveer. 2005. *EU Enlargement and the Environment: Institutional Change and Environmental Policy in Central and Eastern Europe*. London: Routledge.
Carruthers, David. 1996. Indigenous Ecology and the Politics of Linkage in Mexican Social Movements. *Third World Quarterly* 17(5): 1007–28.
Cashore, Benjamin, Graeme Auld, and Deanna Newsom. 2004. *Governing Through Markets*. New Haven, CT: Yale University Press.
Cass, Loren R. 2006. *The Failures of American and European Climate Policy: International Norms, Domestic Politics, and Unachievable Commitments*. Albany: SUNY Press.
Dalton, Russell J. 1994. *The Green Rainbow: Environmental Groups in Western Europe*. New Haven, CT: Yale University Press.
Dauvergne, Peter. 2005. Research in Global Environmental Politics: History and Trends. In *Handbook of Global Environment Politics*, edited by Peter Dauvergne, 8–32. Northampton: Edward Elgar.
Dawson, Jane I. 1996. *Eco-Nationalism: Anti-Nuclear Activism and National Identity in Russia, Lithuania and Ukraine*. Durham, NC: Duke University Press.
de Bruijn, Theo and Vicky Norberg-Bohm, eds. 2005. *Industrial Transformation: Environmental Policy Innovation in the United States and Europe*. Cambridge, MA: MIT Press.
DeSombre, Elizabeth R. 2000. *Domestic Sources of International Environmental Policy: Industry, Environmentalists, and U.S. Power*. Cambridge, MA: MIT Press.
—— 2006. *Flagging Standards: Globalization and Environmental, Safety and Labor Regulations at Sea*. Cambridge, MA: MIT Press.
Dryzek, John S., David Downes, Christian Hunold, and David Schlosberg. 2003. *Green States and Social Movements: Environmentalism in the United States, United Kingdom, Germany, and Norway*. New York: Oxford University Press.
Dunlap, Riley E., Kent D. Van Liere, Angela G. Mertig, and Robert Emmet Jones. 2000. New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues* 56(3): 425–42.
Dunlap, Riley E. and Richard York. 2012. The Globalization of Environmental Concern. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 89–112. Cambridge, MA: MIT Press.
Durant, Robert F., Daniel J. Fiorino, and Rosemary O'Leary. 2004. *Environmental Governance Reconsidered: Challenges, Choices and Opportunities*. Cambridge, MA: MIT Press.
Eckley, Noelle, and Henrik Selin. 2004. All Talk, Little Action: Precaution and European Chemicals Regulation. *Journal of European Public Policy* 11(1): 78–105.

Esping-Andersen, Gøsta. 1990. *The Three Worlds of Welfare Capitalism*. Princeton, NJ: Princeton University Press.
Farrell, Alex E. and Jill Jäger, eds. 2006. *Assessments of Regional and Global Environmental Risks: Designing Processes for Effective Use of Science in Decisionmaking*. Washington, DC: Resources for the Future Press.
Fox, Jonathan A. and L. David Brown, eds. 1998. *The Struggle for Accountability: The World Bank, NGOs, and Grassroots Movements*. Cambridge, MA: MIT Press.
Gadgil, Madhav and Ramachandra Guha. 1985. *Ecology and Equity: The Use and Abuse of Nature in Contemporary India*. New York: Routledge.
George, Alexander L. and Andrew Bennett. 2005. *Case Studies and Theory Development in the Social Sciences*. Cambridge, MA: MIT Press.
Gillroy, John Martin. 1999. American and Canadian Environmental Federalism: A Game-Theoretic Analysis. *Policy Studies Journal* 27(2): 360–88.
Goodin, Robert E., and Charles Tilly, eds. 2006. *The Oxford Handbook of Contextual Political Analysis*. New York: Oxford University Press.
Grant, Don S. 1997. Allowing Citizen Participation in Environmental Regulation: An Empirical Analysis of the Effects of Right-to-Sue and Right-to-Know Provisions on Industry's Toxic Emissions: Research on the Environment. *Social Science Quarterly* 78(4): 859–73
Grant, Wyn, Duncan Matthews, and Peter Newell. 2000. *The Effectiveness of European Union Environmental Policy*. New York: St. Martin's Press.
Harrington, Winston, Richard D. Morgenstern, and Thomas Sterner, eds. 2004. *Choosing Environmental Policy: Comparing Instruments and Outcomes in the United States and Europe*. London: RFF Press/Earthscan.
Harris, Paul G. (ed.), 2003, *Global Warming and East Asia: The Domestic and International Politics of Climate Change*, Routledge Research in Environmental Politics. New York: Routledge.
—— (ed.). 2011. *China's Responsibility for Climate Change: Ethics, Fairness and Environmental Policy*. Portland, OR: Policy Press.
Harrison, Kathryn, and Lisa McIntosh Sundstrom. 2010. *Global Commons, Domestic Decisions: The Comparative Politics of Climate Change*. Cambridge, MA: MIT Press.
Herbst, Jeffrey. 1990. War and the State in Africa. *International Security* 14: 117–39.
Hettige, Hemamala, Mainul Huq, Sheoli Pargal, and David Wheeler. 1996. Determinants of Pollution Abatement in Developing Countries: Evidence from South and Southeast Asia. *World Development* 24(12): 1891–904.
Hochstetler, Kathryn. 2012. Democracy and the Environment in Latin America and Eastern Europe. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 199–230. Cambridge, MA: MIT Press.
Hochstetler, Kathryn and Margaret E. Keck. 2007. *Greening Brazil: Environmental Activism in State and Society*. Durham, NC: Duke University Press.
Inglehart, Ronald. 1990. *Culture Shift in Advanced Industrial Society*. Princeton, NJ: Princeton University Press.
Jänicke, Martin and Helmut Weidner, eds. 1997. *National Environmental Policies: A Comparative Study of Capacity-Building*. Berlin: Springer.
Jasanoff, Sheila. 1990. *The Fifth Branch: Science Advisors and Policy Makers*. Cambridge, MA: Harvard University Press.
—— 2005. *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton, NJ: Princeton University Press.
Jasanoff, Sheila and Marybeth Long Martello, eds. 2004. *Earthly Politics: Local and Global in Environmental Governance*. Cambridge, MA: MIT Press.
Jordan, Andrew, Rüdiger K. W. Wurzel, and Anthony R. Zito. 2003. "New" Instruments of Environmental Governance: Patterns and Pathways of Change. *Environmental Politics* 12(1): 1–24.
Kamieniecki, Sheldon and Eliz Sanasarian. 1990. Conducting Comparative Research on Environmental Policy. *Natural Resources Journal* 30(2): 321–39.
Kelemen, R. Daniel. 2004. Environmental Federalism in the United States and the European Union. In *Green Giants? Environmental Policies of the United States and the European Union*, edited by Norman J. Vig and Michael G. Faure, 113–34. Cambridge, MA: MIT Press.
Kim, Sunhyuk. 2000. Democratization and Environmentalism: South Korea and Taiwan in Comparative Perspective. *Journal of Asian & African Studies* 35(3): 287–302.
Kingston, Paul. 2001. Patrons, Clients and Civil Society: A Case Study of Environmental Politics in Postwar Lebanon. *Arab Studies Quarterly* 23(1): 55–72.

Kitschelt, Herbert P. 1989. *The Logics of Party Formation: Ecological Politics in Belgium and West Germany*. Ithaca, NY: Cornell University Press.

Knill, Christoph and Andrea Lenschow (1998) Coping with Europe: The Impact of British and German Administrations on the Implementation of EU Environmental Policy. *Journal of European Public Policy* 5(4): 595–614.

Kopstein, Jeffrey and Mark Lichbach, eds. 2009. *Comparative Politics: Interests, Identities, and Institutions in a Changing Global Order*. Cambridge, New York: Cambridge University Press.

Krasner, Stephen D. 1976. State Power and the Structure of International Trade. *World Politics* 2(3): 317–47.

—— 1984. Approaches to the State: Alternative Conceptions and Historical Dynamics. *Comparative Politics* 16(2): 223–46.

Lee Yok-Shiu F. and Alvin Y. So, eds. 1999. *Asia's Environmental Movements: Comparative Perspectives*. Armonk, NY: M.E. Sharpe.

Lichbach, Mark Irving and Alan S. Zuckerman. 1997. Research Traditions and Theory in Comparative Politics: An Introduction. In *Comparative Politics: Rationality, Culture, and Structure*, edited by Mark Irving Lichbach and Alan S. Zuckerman, 3–16. New York: Cambridge University Press.

Lipschutz, Ronnie D. 2001. Environmental History, Political Economy and Change: Frameworks and Tools for Research and Analysis. *Global Environmental Politics* 1(3): 72–91.

Lundqvist, Lennart J. 1978. The Comparative Study of Environmental Politics: From Garbage to Gold? *International Journal of Environmental Studies* 12(2): 89–97.

McAdam, Doug and Dieter Rucht. 1993. The Cross-National Diffusion of Movement Ideas. *Annals of the American Academy of Political and Social Sciences* 528: 56–74.

McBeath, Jerry and Jonathan Rosenberg. 2006. *Comparative Environmental Politics*. New York: Springer.

Meadowcroft, James. 2012. Greening the State? In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 63–87. Cambridge, MA: MIT Press.

Mitchell, Ronald. 2002. International Environment. In *Handbook of International Relations*, edited by Thomas Risse, Beth Simmons, and Walter Carlsnaes, 500–16. Thousand Oaks, CA: Sage Publications.

Mitchell, Ron. 2010. *International Politics and the Environment*. Thousand Oaks, CA: Sage Publications.

Moravcsik, Andrew. 1997. Taking Preferences Seriously: A Liberal Theory of International Politics. *International Organization* 51(4): 513–53.

Obach, Brian K. 2002. Labor–Environmental Relations: An Analysis of the Relationship between Labor Unions and Environmentalists. *Social Science Quarterly* 83(1): 82–100.

O'Neill, Kate. 2000. *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*. Cambridge, MA: MIT Press.

—— 2009. *The Environment and International Relations*. New York: Cambridge University Press.

—— 2012. The Comparative Study of Environmental Movements. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 115–42. Cambridge, MA: MIT Press.

O'Neill, Kate and Stacy D. VanDeveer. 2005. Transnational Environmental Activism after Seattle: Between Emancipation and Arrogance. In *Charting Transnational Democracy: Beyond Global Arrogance*, edited by Janie Leatherman and Julie Webber, 195–220. New York: Palgrave Macmillan.

O'Neill, Kate, Jörg Balsiger, and Stacy D. VanDeveer. 2004. Actors, Norms, and Impact: Recent International Cooperation Theory and the Influence of the Agent-Structure Debate. *Annual Review of Political Science* 7: 149–75.

O'Neill, Michael. 2012 Political Parties and the "Meaning of Greening" in European Politics. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 171–95. Cambridge, MA: MIT Press.

Oreg, Shaul and Tally Katz-Gerro. 2006. Predicting Proenvironmental Behavior Cross-Nationally: Values, the Theory of Planned Behavior, and Value-Belief-Norm Theory. *Environment and Behavior* 38(4): 462–83.

Ostrom, Elinor. 1998. Scales, Polycentricity, and Incentives: Designing Complexity to Govern Complexity. In *Protection of Global Biodiversity: Converging Strategies*, edited by Lakshman D. Guruswamy and Jeffrey A. McNeely, 149–67. Durham, NC: Duke University Press.

Peluso, Nancy Lee. 1992. *Rich Forests, Poor People: Resource Control and Resistance in Java*. Berkeley: University of California Press.

Pralle, Sarah B. 2006. Timing and Sequence in Agenda-setting and Policy Change: A Comparative Study of Lawn Care Pesticide Politics in Canada and the US. *Journal of European Public Policy* 13(7): 987–1005.

Pulver, Simone (2007) Importing Environmentalism: Explaining Petroleos Mexicanos' Cooperative Climate Policy. *Studies in Comparative International Development* 42(3–4): 233–55.
Putnam, Robert D. 1988. Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization* 42(3): 427–60.
Rabe, Barry. 2004. *Statehouse and Greenhouse: The Emerging Politics of American Climate Change Policy*. Washington, DC: Brookings Institution Press.
Raustiala, Kal. 1997. Domestic Institutions and International Regulatory Cooperation. *World Politics* 49(4): 482–509.
Revesz, Richard L. 2001. Federalism and Environmental Regulation: A Public Choice Analysis. *Harvard Law Review* 115(2): 553–641.
Ribot, Jesse C. 1999. Decentralisation, Participation, and Accountability in Sahelian Forestry: Legal Instruments of Political-Administrative Control. *Africa* 69(1): 23–65.
Rogowski, Ronald. 1993. Comparative Politics. In Political Science: The State of the Discipline II, edited by Ada W. Finifter, 431–50. Washington, DC: American Political Science Association.
Ross, Michael L. 2001. *Timber Booms and Institutional Breakdown in Southeast Asia*. New York: Cambridge University Press.
Schreurs, Miranda. 2002. *Environmental Politics in Japan, Germany, and the United States*. New York: Cambridge University Press.
Schreurs, Miranda and Elizabeth Economy, eds. 1997. *The Internalization of Environmental Protection*. New York : Cambridge University Press.
Schreurs, Miranda and Yves Tiberghien. 2007. Multi-Level Reinforcement: Explaining European Union Leadership in Climate Change Mitigation. *Global Environmental Politics* 7(4): 19–46.
Schreurs, Miranda, Henrik Selin, and Stacy D. VanDeveer. 2009. *Transatlantic Environmental and Energy Politics*. Burlington, Vt.: Ashgate Press.
Scruggs, Lyle. 2001. Is There Really a Link Between Neo-Corporatism and Environmental Performance? Updated Evidence… *British Journal of Political Science* 31(4): 686–92.
Selin, Henrik and Stacy D. VanDeveer. 2009. *Changing Climates in North American Politics: Institutions, Policymaking and Multilevel Governance*. Cambridge, MA: MIT Press.
Selin, Henrik and Stacy D. VanDeveer. 2012. Federalism, Multilevel Governance, and Climate Change Politics across the Atlantic. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 341–68. Cambridge, MA: MIT Press.
Skocpol, Theda. 1979. *States and Social Revolutions: A Comparative Analysis of France, Russia, and China*. New York: Cambridge University Press.
—— 1984. Emerging Agendas and Recurrent Strategies in Historical Sociology. In *Vision and Method in Historical Sociology*, ed. Theda Skocpol, 356–91. New York: Cambridge University Press.
Sowers, Jeannie. 2012. Institutional Change in Authoritarian Regimes: Water and the State in Egypt. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 231–54. Cambridge, MA: MIT Press.
Sprinz, Detlef and Tapani Vaahtoranta. 1994. The Interest-Based Explanation of International Environmental Policy. *International Organization* 48(1): 77–105.
Steinberg, Paul F. 2001. *Environmental Leadership in Developing Countries: Transnational Relations and Biodiversity Policy in Costa Rica and Bolivia*. Cambridge, MA: MIT Press.
—— 2002. Environmental Foreign Policy in Developing Countries: A Capacity-Building Approach. Paper presented at the International Studies Association Annual Convention, New Orleans, March 24–27.
—— 2003. Understanding Policy Change in Developing Countries: The Spheres of Influence Framework. *Global Environmental Politics* 3(1): 11–32.
—— 2005. From Public Concern to Policy Effectiveness: Civic Conservation in Developing Countries. *Journal of International Wildlife Law and Policy* 8: 341–65.
—— 2012. Welcome to the Jungle: Political Theory and Political Instability. In *Comparative Environmental Politics: Theory, Practice, and Prospects*, edited by Paul F. Steinberg and Stacy D. Vandeveer, 255–84. Cambridge, MA: MIT Press.
Steinberg, Paul F. and Ronie Garcia-Johnson, 2001. Transnational Environmental Actors: Toward an Integrative Approach. Paper presented at the International Studies Association Convention, Chicago, February 20–24.
Steinberg, Paul F. and Stacy D. VanDeveer, eds. 2012. *Comparative Environmental Politics: Theory, Practice, and Prospects*. Cambridge, MA: MIT Press.

Taylor, Dorceta E. 2000. The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses. *American Behavioral Scientist* 43(4): 508–80.
VanDeveer, Stacy D. and Ambuj Sagar. 2005. Capacity Development for the Environment: Broadening the Focus. *Global Environmental Politics* 5(3): 14–22.
Weible, Christopher M., Paul A. Sabatier, and Kelly McQueen. 2009. Themes and Variations: Taking Stock of the Advocacy Coalition Framework. *Policy Studies Journal* 37(1): 121–40.
Weinthal, Erika. 2002. *State Making and Environmental Cooperation: Linking Domestic and International Politics in Central Asia*. Cambridge, MA: MIT Press.
Wilkening, Kenneth E. 2004. *Acid Rain Science and Politics in Japan*. Cambridge, MA: MIT Press.
Young, Oran R., ed. 1999. *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Cambridge, MA: MIT Press.
—— 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay, and Scale*. Cambridge, MA: MIT Press.

13

Corporations

Business and industrial influence

Kyla Tienhaara

International Relations scholars are beginning to acknowledge the limitations of a state-centered approach to global politics (see Chapter 4). In the sub-field of global environmental politics, much of the new focus on "non-state" actors has been on nongovernmental organizations (NGOs) (see Chapter 14); considerably less attention has been paid to business actors (Clapp 2007). Although there have been a number of excellent studies conducted in recent years on the role of corporations in shaping international responses to a diverse range of issues (e.g., climate change, biodiversity, ozone depletion, and trade in hazardous waste), the literature is dominated by only a handful of researchers (Levy and Newell 2005b; Falkner 2008; Clapp and Fuchs 2009).

This relative indifference to corporations is puzzling given the many critical roles that they play in creating and solving environmental problems. In 2010, a study commissioned by the United Nations Environment Programme Finance Initiative (UNEP FI) and the Principles for Responsible Investment (PRI) group estimated that the top 3,000 public companies were responsible for 35 percent of all global environmental damage (UNEP FI and PRI 2010). Five sectors were singled out in the report for causing the most harm: utilities, oil and gas, industrial metals and mining, food production, and construction.

At the same time, few scholars would accept a portrayal of the business community, or even individual industrial sectors, as either homogeneous or one-dimensional. In addition to being "polluters," corporations are also seen as potential partners and even leaders in efforts to mitigate environmental damage and solve environmental problems (Levy and Newell 2005a; Jones and Levy 2007; Pattberg 2007; Falkner 2008). Furthermore, for those who accept the tenets of "ecological modernization," firms can provide the expertise, technological prowess, and financial resources necessary to achieve sustainability (Hajer 1995).

Corporations and the environment

The antagonism that characterized early relations between corporations and the environmental movement has not completely disappeared, but there has been a notable change in attitudes within the business community. This has been driven by external pressure (e.g., consumer and shareholder activism) and by the discourses of market environmentalism and corporate social responsibility, which suggest that certain initiatives can be "win–win" for the environment and a

company's bottom line (Esty and Winston 2006). According to Braithwaite and Drahos (2000: 268), "the change in business leaders' attitudes on this issue is unmistakable. Many more now believe that green is lean and profitable." Nevertheless, as Gunningham (2009: 221) points out, it remains unclear how much of this change in attitudes reflects empty rhetoric and to what extent corporations are actually "walking the talk." Furthermore, although there has been an observable trend over the past three decades toward greater business action on environmental issues, there have also been instances of renewed opposition to regulation (Jones and Levy 2007).

Some have argued that the "business case" for environmental initiatives has been exaggerated; this remains open for debate. What is undeniable is that the purported benefits of environmental management (e.g., increased efficiency, decreased costs) do not apply uniformly across the great diversity of business actors that have an impact on the environment. Corporations are differentially affected by environmental regulation and vary greatly in their approaches to environmental issues. Several factors are considered especially relevant: the country or region in which the corporation is based; the sector in which it operates; its position on a particular supply chain; its access to markets and technologies; its exposure to environmental risks (e.g., climate change); and the structure and style of the corporation's leadership (Clapp 2005a; Newell and Levy 2006; Jones and Levy 2007). Additionally, a company's history can be relevant. As Levy and Kolk (2002: 281) point out, fossil fuel companies that have had a negative experience investing in alternative energy sources have tended "to institutionalize a negative view toward the future prospects of such technologies," which in turn shapes their response to particular proposals in the climate change negotiations (see Chapter 28).

A corporation's size and position in the global economy is also significant. Although small and medium-sized enterprises have increasingly become involved in environmental policy debates, they have limited capacity to lobby in international forums and tend to prefer to engage at the national level (Newell and Levy 2006). As such, the main focus of this chapter is on global (or multinational/transnational) corporations, which are much better positioned to influence international policy-making.

Global corporations have grown in both size and number since the early days of the environmental movement. In 1970 there were approximately 7,000 global corporations (Clapp 2005b). According to the latest data from the United Nations Conference on Trade and Development (UNCTAD), there are now over 100,000 global parent firms associated with nearly 900,000 foreign affiliates (UNCTAD 2011: web table 34). In terms of size, the Internet is replete with comparisons of the gross domestic product (GDP) of countries to company revenue, which usually suggest that there are more corporations in a list of the top 100 economies in the world than states. However, these reports are misleading because GDP, which is a value-added measure, is not directly comparable to revenue. That said, it is certainly possible to argue that there are a number of global corporations with more economic clout than some small states and that the recent trend toward corporate consolidation through mergers and acquisitions has led to ever larger business entities over time (Clapp 2005b).

The sections that follow will specifically address the involvement of global corporations in international environmental policy development through an examination of three related issues that are of particular interest to international relations scholars: power, influence, and authority.

Dimensions of corporate power

Power is defined by Barnett and Duvall (2005: 3) as "the production, in and through social relations, of effects that shape the capacities of actors to determine their own circumstances and fate." This definition is purposefully broad, and Barnett and Duvall stress that "power does not have a

single expression or form" (Barnett and Duvall 2005: 3). Global environmental governance scholars appear to agree: they have outlined three key dimensions of corporate power: structural, instrumental, and discursive (Levy and Egan 1998; Fuchs 2007; Falkner 2008; Clapp and Fuchs 2009). Some authors have pointed to other possible forms of corporate power, namely technological power and institutional power (see below). The structural dimension of corporate power stems from the central role that business plays in the economy. In capitalist countries corporations are the main sources of economic growth, employment, and innovation. These are issues of paramount importance to governments. Regulators endeavor to avoid hurting business or creating competitive disadvantages for companies that might encourage them to move offshore (Falkner 2008).

The extent to which companies actively exercise their structural power – punishing and rewarding countries by moving investments in response to regulation – is contested. In the environmental sphere, there was an intense debate in the 1990s over the occurrence of regulation-induced capital flight to "pollution havens" (for an overview of the literature, see Clapp 2002). Although structural power can be effective even if it is not actively employed by a corporation, the mere threat of capital flight, particularly in a globalized world characterized by high capital mobility, can be sufficient to shape public policy. However, although the structural power that corporations possess arguably gives them a privileged position in relation to other non-state actors such as NGOs, the fact that environmental regulations exist at all suggests that it is not all-encompassing. Other forms of power are also relevant.

Instrumental power (also referred to as "relational power" by Falkner 2008), which is certainly not exclusive to corporate actors, concerns the power of one individual (or group) over another (Fuchs 2007; Falkner 2008). Lobbying is a classic example of the exercise of instrumental power (see Chapter 12). Corporations have long engaged in lobbying domestic government delegations that attend international meetings, but increasingly they lobby directly at the international level as well (Clapp 2005b). Vormedal (2008: 43) argues that corporations increasingly engage in "information-based" lobbying, which "may involve providing governments with expert advice, technical reports and position papers, and assisting decision-makers directly with policy formulation and the writing of legal texts." In addition to making their preferences known to decision-makers, lobbying of this sort can also remind government officials of the potential costs of regulation for the economy.

Although various kinds of interest groups engage in lobbying, corporations (especially large ones) have several advantages over their non-profit counterparts, including: access to substantial material resources; possession of specialized expertise; and personal connections to government officials (which are enhanced by the "revolving door" between government and industry) (Newell 2000; Newell and Levy 2006; Falkner 2008; Sell 2009). The organizational strength of corporations also enhances their instrumental power (Falkner 2008). In this respect, it is important to highlight the rise in coalition-building at the international level. There are business coalitions (often referred to as Business and Industry Non-Governmental Organizations or BINGOs), business–state coalitions, and business–NGO coalitions (sometimes referred to as Baptist–bootlegger coalitions) (Meckling 2011: 31). BINGOs provide corporations with a number of benefits: they allow for cost sharing and information pooling; they can establish and maintain access channels to forums and negotiations that individual companies would not be invited to; and they can monitor negotiation processes to ensure that industry perspectives are provided at every opportunity (Vormedal 2008). Examples of BINGOs that have been actively involved in global environmental politics include the International Chamber of Commerce (ICC) and the World Business Council for Sustainable Development (WBCSD).

BINGOs can be sector-specific, but they are increasingly issue-specific. For example, the Global Climate Coalition (GCC), which operated from 1990 to 2002, represented major

producers and users of fossil fuels such as mining, oil and gas companies, car manufacturers, and the chemicals industry (Levy and Egan 2003). The GCC engaged in lobbying against action on climate change and commissioned a number of economic studies that gave high estimates for the costs associated with reducing emissions (Levy and Egan 2003; Ihlen 2009). In addition to organizing amongst one another, individual corporations and BINGOs also enhance their instrumental power by mobilizing state allies (Meckling 2011). For example, the fossil fuel lobby has cooperated closely with the Organization of Petroleum-Exporting Countries (OPEC), and biotech companies often work with the "Miami group" of states that export genetically modified organisms (Newell and Levy 2006; see Chapter 37).

A third key dimension of corporate power relates to the "potency of the frames that actors use to couch their preferences," which has been referred to as discursive power (Sell 2009: 188). Discursive power is the least studied dimension of corporate power and possibly the most difficult to measure. However, in the view of Fuchs (2007: 140), it is potentially also the dimension of greatest significance in terms of corporate influence on policy. This is because it is the power not only to pursue interests but also to create them (Clapp and Fuchs 2009: 10). While corporations do not have a monopoly on public discourse, they do have substantial financial resources to devote to advertising, to funding studies that support their view of a particular environmental issue, or even to funding specific individuals (e.g., climate skeptics) who will promote their views (Newell 2000; Newell and Levy 2006; Falkner 2008). These last two strategies are particularly important in light of the link between discursive power and political legitimacy (Clapp and Fuchs 2009: 10–11). If a corporation makes a discursive claim, that claim may be easily dismissed by a skeptical and cynical public. However, if the same claim is made by a scientist or another expert, it can carry significant weight.

Falkner (2008) points out that corporations also derive discursive power from their central position in the technological innovation process; in effect, they can define the discourse on what is possible in terms of technological solutions to environmental problems. He has also argued more generally that "technological power" can be considered a distinct dimension of corporate power in itself (see also Vormedal 2008). Technological power is the "power to direct technological innovation and its introduction to the market" (Falkner 2005: 130).

Tienhaara et al. (2012) have highlighted another distinct dimension that they refer to as "institutional power." This form of power derives from the ability of global corporations to shift environmental issues from "regulatory institutions," like multilateral environmental agreements, to "enabling institutions" that are designed to facilitate economic processes such as trade and investment (Levy and Egan 1998; Levy and Prakesh 2003). International investment agreements are especially important in this regard because they provide global corporations direct recourse to international dispute settlement – a process that has been used extensively to challenge environmental regulation (Tienhaara 2009).

In the end, it does not make a great deal of difference whether one adopts a framework with three dimensions of corporate power, or five, or more. In fact, the lines between the different forms of power often blur, as they are clearly interrelated. For example, corporations benefit from structural power when they seek to gain access to government officials in the exercise of instrumental power. What is important is that scholars recognize that there are multiple dimensions and that they consider how these dimensions interact and relate to one another (Barnett and Duvall 2005: 4).

Before concluding this section, it must be noted that corporate power should not be considered in isolation from the broader context of global politics. Business actors often have to contend with "countervailing forces," particularly from the non-profit sector (Levy and Egan 2003). Although NGOs are generally not as well resourced as large global corporations, they have

developed sophisticated strategies to cajole or pressure corporations into more environmentally friendly behavior, giving rise to a new form of "world civic politics" (Wapner 1996) or "civil regulation" of business (Newell 2001) (see Chapter 14).

Additionally, Falkner (2005, 2008) has stressed that conflict within the business community can undermine corporate power. Discord is most likely to be sown between: international and national firms; market leaders and laggards; and firms at different points in the production or supply chain (Falkner 2009, 2010). For example, several authors have noted that North American-based corporations often diverge from the approach of their European counterparts because they have a very different (more adversarial) lobbying style and can get away with certain tactics (e.g., questioning scientific claims) that would not be accepted in Europe (Newell and Levy 2006). Levy and Kolk (2002) argue that these transatlantic differences have manifested themselves in the climate negotiations. However, these differences are thought to be diminishing as the integration of capital increases globally (Newell and Levy 2006).

In the case of the biodiversity regime, it has largely been different industry sectors that have clashed over issues such as access to genetic resources and benefit sharing (see Chapters 37 and 40). There are not only two BINGOs – the Global Industry Coalition and the International Grain Trade Coalition – that are competing to be the voice of business in the negotiations, but also divisions within the former body between pharmaceutical and agricultural biotech companies (Tienhaara et al. 2012: 54). While corporations have certainly had some success in shaping the biodiversity regime, their influence has arguably been limited by a lack of business unity on key issues.

From power to influence?

Power and influence are closely connected concepts, but it is worth distinguishing them. If an actor has power, this suggests that it has a capability or a resource; this capability or resource exists whether an actor chooses to use it or not (Vormedal 2008). Influence is the effect that the power wielded by one actor or group has on the actions of another actor or group, although in Meckling's (2011) view, political environment and political strategy also matter significantly in the calculation of corporate influence.

Measuring business influence in global environmental politics is methodologically challenging. Arguably, one can search for causal links between the exercise of instrumental power (lobbying and campaign finance) and policy outcomes (Falkner 2008). However, scholars need to be careful not to assume causal effects – that is, if the outcome of a policy process is favored by business, it does not necessarily indicate that corporate influence was a decisive factor in that outcome. As Falkner (2008: 31) points out, weak environmental regimes do not reflect solely the preferences of corporations but also "the inherent difficulties of multilateral policy-making…as well as the complex political trade-offs that societies have to make between environmental protection, technological innovation, economic development and poverty reduction."

Furthermore, tracing the links between non-relational forms of power, such as structural power and discursive power, and influence is even more complicated. As Meckling (2011: 38) notes, public discourse emerges from a "cacophony of voices," not single actors. This is arguably the case with the rise of discourses on ecological modernization, corporate social responsibility, and sustainability, which may very well "legitimize and consolidate the power of large corporations" (Banerjee 2008: 51) but have been promoted not only by corporations but also by other actors, including academics.

Despite these obstacles, scholars have attempted to demonstrate the extent and nature of business influence in several areas of global environmental politics. The remainder of this section will examine several examples.

One of the earliest cases of corporate influence in global environmental politics was the negotiation of the Montreal Protocol in 1987. The Protocol was a key step in the development of the regime to combat stratospheric ozone-layer depletion, which is widely considered the most successful international environmental regime (see Chapter 29). Scholars have documented how companies shifted from an initial stance of fierce opposition to any regulation of ozone-depleting substances like chlorofluorocarbons to the support of their phase-out, arguing that this transformation was critical to the ultimate success of the regime (Levy 1997; Litfin 1994; Oye and Maxwell 1995). More recent research has examined the role that business has played in shaping the evolution of the ozone regime after 1987 (Falkner 2005, 2008).

In the area of climate change, it has been argued that the absence of binding targets in the United Nations Framework Convention on Climate Change (UNFCCC) was a victory for business, although an incomplete one as they would have preferred that no treaty was adopted at all (Newell 2000; Falkner 2010; see Chapter 28). Corporate influence has also been linked with the refusal of the United States to sign the Kyoto Protocol (Falkner 2008). Furthermore, in the climate regime, corporations have influenced not only when commitments have been adopted, but also what types of regulatory instruments have been employed by states. Vormedal (2008) discusses the role that corporations have played in pushing carbon capture and storage as a viable mitigation option. Similarly, Meckling (2011: 4) argues that although business actors "could not prevent mandatory emissions controls" from eventually being adopted, they did succeed in "influencing the regulatory approach in favor of market-based climate policy." In particular, he suggests that "carbon trading would have been unlikely to globalize within a decade" in the absence of business support (Meckling 2011: 5). Newell (2008) describes this type of outcome as emblematic of a broader phenomenon – the "marketization" of environmental governance – pushed by corporations and other actors, such as the World Bank.

In addition to these outcomes in specific areas of environmental policy, several authors have argued that the absence of any global convention on corporate accountability can be attributed to the influence of corporations. After the United Nations Commission on Transnational Corporations (UNCTC) was dismantled in 1992, the main venues for discussions on corporate accountability have been UN "Earth Summits." Corporations had a notable presence at the UN Conference on Environment and Development in Rio de Janeiro in 1992 (the so-called Earth Summit) and the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 (so-called "Rio+10" conference). The Business Council for Sustainable Development (BCSD) reportedly drafted most of the language on business roles and responsibilities in the original Rio documents (Pattberg 2007: 89). Provisions on environmental regulations for business that had been developed by the UNCTC were not incorporated into the conference declaration, "Agenda 21"; instead, there was an exclusive focus on voluntary initiatives (Clapp 2005a; Newell and Levy 2006).

Efforts to create a convention on corporate accountability failed again at the WSSD (Newell and Levy 2006). In this case, it was Business Action for Sustainable Development (BASD) – formed by the ICC and the WBCSD and representing over 150 global corporations – that led the lobbying efforts against the convention (Clapp 2005a). In the lead-up to the 2012 UN Conference on Sustainable Development (UNCSD, popularly known as "Rio+20"), it was clear that the role that business plays in UN summits had, if anything, grown since the 2002 Summit in Johannesburg. An entire day of UNCSD was designated as a "business day," and the "official United Nations coordinator of business and industry" for the conference was the BASD (BASD 2012).

Finally, it is important to note that although most scholars of global environmental politics focus their research exclusively on "environmental" regimes and conferences, there are other international forums with implications for environmental governance. Rules on trade, intellectual

property, and foreign investment "serve to narrow the menu of regulatory choices open to governments" (Newell 2007: 75), and, unlike many multilateral environmental agreements, they are highly enforceable through mechanisms of binding dispute settlement (Tienhaara 2009). As such, it is relevant that corporations regularly tap into their instrumental power in order to shape market enabling agreements and that they are considered to be highly influential actors in forums such as the World Trade Organization (Newell 2007; Banerjee 2008). Furthermore, many of the successes that corporations can claim from their lobbying efforts in the environmental realm relate to their ability to shift issues between forums and maintain a hierarchy in which norms on free trade and the protection of investments and property rights trump environmental ones (Sell 2009; see Chapter 22).

While all of these examples suggest a strong role for business in shaping global environmental politics, much progress has been made in some areas despite the resistance of corporations. For example, the Cartagena Protocol on Biosafety entered into force even though there was strident opposition from biotech firms (Falkner 2009; see Chapter 37). Corporations have at times also overestimated the extent of their discursive power. Attempts to shape public discourse through public relations and advertising not only can fail but also can prove counterproductive. Newell (2007) notes that the efforts of biotech companies to make inflated claims about the ability of biotechnology to tackle poverty and food insecurity resulted in a backlash from NGOs and were generally viewed skeptically by the public (see Chapter 40). The same could be said of the attempts of mining and utilities companies to rebrand coal as "clean"; this spurred the launch of a large "Beyond Coal Campaign" by NGOs in the United States, as well as a number of fake advertisements that mocked the terminology "clean coal."

From influence to authority?

Although it is difficult to make generalizations about the business community, Clapp's (2005b: 290) observation that most business actors will favor voluntary initiatives and self-regulation over binding rules appears to hold true. In this respect, the preferences of corporations have largely prevailed on the international stage. Very little has been accomplished globally in terms of binding environmental standards for business actors. In fact, as is noted in a textbook on business law, when it comes to the regulation of global corporations "it is probably accurate to say that multilateral rules that are of a directly binding character are virtually nonexistent" (Head 2007: 500). There was a concerted effort in the 1970s and 1980s by the UNCTC to codify the duties of global corporations, including their environmental responsibilities (Correa and Kumar 2003; Hansen 2002). However, due to opposition from developed countries, an economic recession, and the debt crisis, the drive to adopt the UNCTC Code faded in the 1980s and the body was officially dismantled in 1992.

In place of binding rules, soft, voluntary forms of regulation have materialized, such as the OECD Guidelines for Multinational Enterprises, the UN Norms on the Responsibilities of Transnational Corporations and other Business Enterprises with regard to Human Rights, and the Global Compact (for an overview of these initiatives see Clapp 2005a; Tienhaara 2009: ch. 2). Another notable phenomenon is the emergence of an increasing number of private and public–private regulatory efforts that are voluntary and often market-based. Scholars have argued that these initiatives are a manifestation of "private authority" (Cutler et al. 1999; Hall and Biersteker 2002; Cashore et al. 2004). As Pattberg (2007: 79) explains,

> The roles of business actors and NGOs are no longer limited to shaping the traditional policy cycle. Next to agenda setting, influencing decision making processes, implementing

> commitments and monitoring state compliance, private actors increasingly begin to establish, maintain, verify and monitor their own private regulations beyond the international arena.

What distinguishes authority from mere decision-making power is that the exercise of power is considered legitimate (Cutler et al. 1999: 5). The rise of private authority has presented a challenge to traditional theories of International Relations (see Chapter 3) because legitimate power has traditionally been considered the sole purview of sovereign states (see Chapter 7). It has fed into broader debates about neoliberalism and the "retreat of the state," but it has also sparked scholarly interest in the accountability structures (or lack thereof) of these new forms of governance (Chan and Pattberg 2008).

Private and public–private initiatives that have developed in the environmental field include reporting schemes (e.g., the Global Reporting Initiative), certification and labeling schemes (e.g., the Forest Stewardship Council, the Marine Stewardship Council), sets of voluntary principles and codes of conduct (e.g., ICC Business Charter for Sustainable Development), private partnerships (e.g., WSSD "type 2" outcomes), and standards regimes (see Chapters 36 and 38; Cashore et al. 2004; Gulbrandsen 2004; Pattberg 2007; Levy et al. 2010; Pattberg et al. 2012).

One of the best-known standards/certification regimes is the International Organization for Standardization (ISO) 14000 series on environmental management. While the majority of ISO standards are highly specific to a particular product, material, or process, ISO 14000 standards are generic management system standards, meaning that they can apply to any product or process in any sector. ISO 14001 is the most important standard in the series. It basically requires that firms comply with domestic environmental regulations, commit to continual improvement and prevention of pollution, and set up an environmental management system and have that system audited (Clapp 2005b). Up to the end of 2010, at least 250,972 ISO 14001 certificates had been issued in 155 countries (ISO 2011).

ISO 14001 has thus gained wide recognition, and according to Clapp (2005b: 230), it has eclipsed other voluntary initiatives, becoming a "condition for firms that wish to compete in the global marketplace." However, there are debates about the legitimacy of the ISO because it is an industry-dominated body and lacks transparent and participatory procedures. There are also questions as to the actual value that ISO standards play in improving environmental conditions. For example, Clémençon (2000) points out that ISO 14001 certification does not require a company to set verifiable environmental quality targets and does not require standardized reporting or provide for outside environmental performance reviews. ISO 14001 has also been said to provide little incentive for firms to go beyond the minimum requirement of meeting domestic laws and regulations, which in many developing countries is insufficient to ensure environmental protection (Gulbrandsen 2004). Environmental groups have therefore criticized ISO 14001 certification as little more than a labeling ploy to give companies access to Northern markets. Some scholars have also argued that ISO 14001, as well as other certification schemes, can drive smaller businesses and operators out of certain markets, which is not necessarily good for sustainability (Newell and Levy 2006; Clapp and Fuchs 2009).

Conclusion

Global corporations have received greater attention from environmental scholars in recent years, but significant gaps in our knowledge remain. The great diversity in the business community makes generalizing and theorizing about their behavior difficult. Scholars have convincingly argued that there are multiple dimensions of corporate power, but providing clear evidence of business influence in international policy development is challenging. Demonstrating the impact

of instrumental power on policy outcomes is far from straightforward, but the effects of structural and discursive power are even more intangible.

Nevertheless, empirical research has proven fruitful in contextualizing business power and examining the question of influence in a number of areas of environmental policy. Recent studies have paid careful attention to conflicts between corporate actors, which can diminish business power and influence, as well as the role of countervailing forces, particularly NGOs, in contesting business interests. Future research should build on the work reviewed in this chapter and expand it into less-studied areas of global environmental politics, such as the emerging regime on persistent organic pollutants (see Chapter 32). Environmental governance scholars should also pay close attention to negotiations in market-enabling regimes that may have implications for environmental governance, and to corporate actors, such as commercial banks, that have been given less attention in the literature to date (Bowman 2010). The rise of the "green economy" discourse (a dominant theme of Rio+20) could also usefully be analyzed within a corporate power framework.

Research has been much more prolific in the area of private authority, although a significant proportion of studies have focused on the emergence of private and public–private regimes and their subsequent effectiveness, rather than the specific role that corporations have played in shaping rules or creating competing initiatives. Empirically, many scholars have been preoccupied with forest certification, although this appears to be changing (see, e.g., Gulbrandsen 2009; Pattberg et al. 2012; Chapter 38).

Finally, while much has been made of corporate social responsibility and the rapid increase in voluntary, public–private, and private environmental regimes, the results of most business-led activities have been disappointing. One could conclude that this indicates widespread "greenwashing." However, an alternative perspective suggests that most of these initiatives are only tinkering at the margins of environmental issues when what is really needed is a fundamental re-examination of business models and of the political economy itself (Banerjee 2008; Ihlen 2009). In this respect it is encouraging that there appears to be a growing scholarly interest in issues such as over-consumption (see Chapter 16; Dauvergne 2008) and a resurgence of concern about the limits to growth (Jackson 2009). Further research could provide closer connections between these issues with the role of business in society. There is also significant scope for scholars to discuss how businesses could be reshaped or reimagined in more fundamental ways than the corporate social responsibility paradigm envisions. For example, Phelan et al. (2012) suggest that producer, consumer, and worker cooperatives provide an alternative business model that better supports efforts to achieve environmental sustainability. More work in this vein would be welcomed in the literature on global environmental politics.

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References

Banerjee, B. (2008) "Corporate social responsibility: the good, the bad and the ugly", *Critical Sociology*, 34(1): 51–79.

Barnett, M. and Duvall, R. 2005. "Power in global governance", in M. Barnett and R. Duvall (eds) *Power in Global Governance*, Cambridge: Cambridge University Press.

BASD (Business Action for Sustainable Development) (2012) "Key role for private sector acknowledged: governments and business representatives discuss role of private sector during UN Intersessional meeting in New York". Online. Available HTTP: <http://basd2012.org> (accessed 30 April 2012).

Bowman, M. (2010) "The role of the banking industry in facilitating climate change mitigation and the transition to a low-carbon global economy", *Environmental Planning and Law Journal*, 27: 448–68.
Braithwaite, J. and Drahos, P. (2000) *Global Business Regulation*, Cambridge: Cambridge University Press.
Cashore, B., Auld, G., and Newson, D. (2004) *Governing through Markets: Forest Certification and the Emergence of Non-State Authority*, New Haven, CT: Yale University Press.
Chan, S. and Pattberg, P. (2008) "Private rule-making and the politics of accountability: analysing global forest governance", *Global Environmental Politics*, 8(3): 103–21.
Clapp, J. (2002) "What the pollution havens debate overlooks", *Global Environmental Politics*, 2(2): 11–19.
—— (2005a) "Global environmental governance for corporate responsibility and accountability", *Global Environmental Politics*, 5(3): 23–34.
—— (2005b) "Transnational corporations and global environmental governance", in P. Dauvergne (ed.) *Handbook of Global Environmental Politics*, Cheltenham: Edward Elgar.
—— (2007) "Transnational corporate interests in international biosafety negotiations", in R. Falkner (ed.) *The International Politics of Genetically Modified Food*, Basingstoke: Palgrave Macmillan.
Clapp, J. and Fuchs, D. (2009) "Agrifood corporations, global governance, and sustainability: a framework for analysis", in J. Clapp and D. Fuchs (eds) *Corporate Power in Global Agrifood Governance*, Cambridge, MA: MIT Press.
Clémençon, R. (2000) "Foreign direct investment and global environmental protection: why environmentalists should favour multilateral investment rules", *Journal of World Investment*, 1(1): 199–223.
Correa, C. and Kumar, N. (2003) *Protecting Foreign Investment: Implications of a WTO Regime and Policy Options*, London: Zed Books.
Cutler, A.C., Haufler, V., and Porter, T. (1999) "Private authority and international affairs", in A.C. Cutler, V. Haufler, and T. Porter (eds) *Private Authority in International Affairs*, Albany: SUNY Press.
Dauvergne, P. (2008) *The Shadows of Consumption: Consequences for the Global Environment*, Cambridge, MA: MIT Press.
Esty, D.C. and Winston, A.S. (2006) *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage*, New Haven, CT: Yale University Press.
Falkner, R. (2005) "The business of ozone layer protection: corporate power in regime evolution", in D.L. Levy and P. Newell (eds) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
—— (2008) *Business Power and Conflict in International Environmental Politics*, Basingstoke: Palgrave Macmillan.
—— (2009) "The troubled birth of the 'Biotech Century': global corporate power and its limits", in J. Clapp and D. Fuchs (eds) *Corporate Power in Global Agrifood Governance*, Cambridge, MA: MIT Press.
—— (2010). "Business and global climate governance: a neo-pluralist perspective", in M. Ougaard and A. Leander (eds) *Business and Global Governance*, London: Routledge.
Fuchs, D. (2007) *Business Power in Global Governance*, London: Lynne Rienner.
Gulbrandsen, L. (2004) "Overlapping public and private governance: can forest certification fill the gaps in the global forest regime?", *Global Environmental Politics*, 4(2): 75–99.
—— (2009) "The emergence and effectiveness of the Marine Stewardship Council", *Marine Policy*, 33(4): 654–60.
Gunningham, N. (2009) "Shaping corporate environmental performance: a review", *Environmental Policy and Governance*, 19: 215–31.
Hajer, M.A. (1995). *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*, Oxford: Clarendon Press.
Hall, R.B. and Biersteker, T.J. (2002) "The emergence of private authority in the international system", in R.B. Hall and T.J. Biersteker (eds) *The Emergence of Private Authority in Global Governance*, Cambridge: Cambridge University Press.
Hansen, M. (2002) "Environmental regulation of transnational corporations: needs and prospects", in P. Utting (ed.) *The Greening of Business in Developing Countries: Rhetoric, Reality and Prospects*, London: Zed Books.
Head, J. 2007. *Global Business Law: Principles and Practice of International Commerce and Investment*, 2nd edn, Durham, NC: Carolina Academic Press.
Ihlen, O. (2009). "Business and climate change: the climate response of the world's 30 largest corporations", *Environmental Communication: A Journal of Nature and Culture*, 3(2): 244–62.
ISO (International Organization for Standardization) (2011) The ISO Survey of Certifications 2010. Online. Available HTTP: <http://www.iso.org/iso/iso-survey2010.pdf> (accessed 30 April 2012).

Jackson, T. (2009) *Prosperity without Growth: Economics for a Finite Planet*, London: Earthscan.
Jones, C. and Levy, D.L. (2007) "North American business strategies towards climate change", *European Management Journal*, 25(6): 428–40.
Levy, D.L. (1997). "Business and international environmental treaties: ozone depletion and climate change", *California Management Review*, 39(3): 54–71.
Levy, D.L. and Egan, D. (1998) "Capital contests: national and transnational channels of corporate influence on the climate change negotiations", *Politics & Society*, 26(3): 337–61.
—— (2003) "A neo-Gramscian approach to corporate political strategy: conflict and accommodation in the climate change negotiations", *Journal of Management Studies*, 40(4): 803–29.
Levy, D.L. and Kolk, A. (2002) "Strategic responses to global climate change: conflicting pressures on multinationals in the oil industry", *Business and Politics*, 4(3): 275–300.
Levy, D.L. and Newell, P. (2005a) "Introduction: the business of global environmental governance", in D.L. Levy and P. Newell (eds) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
—— (eds) (2005b) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.
Levy, D.L. and Prakesh, A. (2003) 'Bargains old and new: multinational corporations in global governance', *Business and Politics*, 5(2): 131–50.
Levy, D.L., Brown, H.S., and de Jong, M. (2010). "The contested politics of corporate governance: the case of the global reporting initiative", *Business & Society*, 49(1): 88–115.
Litfin, K. (1994) *Ozone Discourses: Science and Politics in Global Environmental Cooperation*, New York: Columbia University Press.
Meckling, J. (2011) *Carbon Coalitions: Business, Climate Politics and the Rise of Emissions Trading*, Cambridge, MA: MIT Press.
Newell, P. (2000) *Climate for Change: Non-state Actors and the Global Politics of the Greenhouse*, Cambridge: Cambridge University Press.
—— (2001) "Managing multinationals: the governance of investment for the environment", *Journal of International Development*, 13: 907–19.
—— (2007) "Corporate power and 'bounded autonomy' in the global politics of biotechnology", in R. Falkner (ed.) *The International Politics of Genetically Modified Food: Diplomacy, Trade and Law*, Basingstoke: Palgrave Macmillan.
—— (2008) "The marketization of global environmental governance: manifestations and implications", in J. Park, K. Conca, and M. Finger (eds) *The Crisis of Global Environmental Governance: Towards a New Political Economy of Sustainability*, London: Routledge.
Newell, P. and Levy, D.L. (2006) "The political economy of the firm in global environmental governance", in C. May (ed.) *Global Corporate Power*, London: Lynne Rienner.
Oye, K.A. and Maxwell, J.H. (1995) "Self-interest and environmental management", in R.O. Keohane and E. Ostrom (eds) *Local Commons and Global Interdependence: Heterogeneity and Cooperation in Two Domains*, Newbury Park, CA: Sage.
Pattberg, P. (2007). *Private Institutions and Global Governance: The New Politics of Environmental Sustainability*, Cheltenham: Edward Elgar.
Pattberg, P., Biermann, F., Chan, S., and Mert, A. (eds) (2012) *Public–Private Partnerships for Sustainable Development. Emergence, Influence and Legitimacy*, Cheltenham: Edward Elgar.
Phelan, L., McGee, J., and Gordon, R. (2012) "Cooperative governance: one pathway to a stable-state economy", *Environmental Politics*, 21(3): 412–31.
Sell, S.K. (2009) "Corporations, seeds, and intellectual property rights governance", in J. Clapp and D. Fuchs (eds) *Corporate Power in Global Agrifood Governance*, Cambridge, MA: MIT Press.
Tienhaara, Kyla. (2009) *The Expropriation of Environmental Governance: Protecting Foreign Investors at the Expense of Public Policy*, Cambridge: Cambridge University Press.
Tienhaara, K., Bled, A., and Falkner, R. (2012) "Global corporations", in F. Biermann and P. Pattberg (eds) *Global Environmental Governance Reconsidered*, Cambridge, MA: MIT Press.
UNCTAD (United Nations Conference on Trade and Development) (2011) *World Investment Report 2011*. Online. Available HTTP: <http://archive.unctad.org/sections/dite_dir/docs/WIR11_web%20tab%2034.pdf> (accessed 30 April 2012).
UNEP FI and PRI (2010) "Universal ownership: why environmental externalities matter to institutional investors". United Nations Environment Programme Finance Initiative and Principles for Responsible Investment Group. Online. Available HTTP: <http://www.unpri.org/files/6728_ES_report_environmental_externalities.pdf> (accessed 30 April 2012).

Vormedal, I. (2008) "The influence of business and industry NGOs in the negotiation of the Kyoto mechanisms: the case of carbon capture and storage in the CDM", *Global Environmental Politics*, 8(4): 36–65.

Wapner, P. (1996) *Environmental Activism and World Civic Politics*, Albany: SUNY Press.

14

Transnational actors

Nongovernmental organizations, civil society and individuals

Christian Downie

The modern era of global environmental politics coincided with contemporary scholarship on transnational actors. The 1972 United Nations Conference on the Human Environment took place in Stockholm one year after a special issue of *International Organization* was released entitled "Transnational Relations and World Politics" (Nye and Keohane 1971). Since then, there has been a dramatic growth both in the involvement of transnational actors in environmental politics and research on their activities. The growing presence of transnational actors has been evident at the principal global environmental conferences. At the Stockholm Conference in 1972 some 170 nongovernmental organizations were present, in 1992 around 1,400 were registered at the Rio Earth Summit, 8,000 at the World Summit on Sustainable Development in Johannesburg in 2002, and 9,856 at the Rio+20 Summit held in 2012. Indeed, it is estimated that transnational organizations generally had grown from 2,795 in 1970 to 48,220 by 2010 (Andonova 2011).

The ubiquitous presence of transnational actors reflects the increasingly cross-border nature of environmental problems. It is widely recognized that across environmental issues from whaling, to ozone depletion, to biodiversity loss and climate change, international cooperation is needed. It is no surprise then that a wide range of transnational actors with varying motivations and pursuing different strategies have been a constant presence in the world of environmental politics. The aim of this chapter is to survey the role of these actors. It seeks to consider the types of transnational actors, their strategies and their influence across the field of environment politics. In doing so, it seeks to move beyond traditional debates about whether the rise of transnational actors requires that we replace a state-centred view of the world with a society-dominated view. Rather the discussion in this chapter supports the view of many scholars in the field that global environmental problems cannot be solved without governments and hence networks of state and non-state actors are required.

The chapter proceeds as follows. The next section charts the evolving body of literature on transnational actors. It then proceeds to consider three types of transnational actors – for-profit, non-profit and individual actors – and the role they have played in environmental politics. The focus is on civil society actors given the attention paid to business actors in the previous chapter and for the simple reason that in environmental politics that is where most of the scholarship has focused. Drawing on this discussion, the chapter turns to reflect on the principal question most scholars seek to answer, that is, under what conditions do transnational actors influence policy

outcomes? The chapter concludes with some reflections on how we are to understand the role of transnational actors in environmental politics and world politics more generally.

What are transnational actors? An evolving literature

In the international sphere, especially in the world of environmental politics, the growth in the number of transnational actors since the end of the Cold War has led to a burgeoning literature on their role and impact. Generally used to refer to nongovernment actors that organize in network forms across state borders, the term transnational actors includes for-profit actors such as multinational corporations (MNCs) and business associations (see Chapter 13) and non-profit actors such as environmental NGOs and advocacy networks (see, e.g., Bexell et al. 2010; Jönsson and Tallberg 2010). Scholars in this tradition argue that "transnational relations matter in world politics" and that state behaviour in international relations cannot be understood without taking account of the cross-boundary activities of sub-units of government and non-state actors (Risse-Kappen 1995b: 280). In this view an intergovernmental approach to world politics is too narrow because it implies limited access to the international system, which "no longer holds true in many issue areas" (Keck and Sikkink 1998: 4). In other words, we must look inside and outside state borders (see Chapter 11).

The concept of transnational actors, which came to prominence with the work of Robert Keohane and Joseph Nye in the 1970s, presented a direct challenge to the conventional view of realists and neorealists, among others, that the state is a primary actor in a system characterized by anarchy (Keohane and Nye 1972; see Chapter 3). Indeed this literature is based on a more substantive critique of intergovernmental approaches in arguing that states have lost control over non-state actors who can organize and move across national borders, be they individuals, multinational corporations or advocacy networks (Lake 2008). However, the research agenda proffered by Keohane and Nye did not prosper in the short term, especially in the field of environmental politics, with much of the literature concentrating on the role of multinational corporations and economic issues (Keohane and Nye 1972). In the 1980s, the dominance of neorealist approaches under the influence of Kenneth Waltz (1979) and the intensification of the Cold War, meant that much scholarly work returned to focus on nation-states and security issues (Jönsson 2010).

It was not until the 1990s, with Risse-Kappen's volume *Bringing Transnational Relations Back In* (1995), that a renewed interest was taken in transnational actors. He defined transnational relations as "regular interactions across national boundaries when at least one actor is a non-state agent or does not operate on behalf of a national government or an intergovernmental organization" (Risse-Kappen 1995a: 3). The 1990s also marked a turning point in the literature, with earlier disputes about whether transnational actors influence outcomes replaced by a focus on the conditions under which their influence is felt. Indeed, Risse-Kappen's volume set out the broad terrain for transnational relations research in asking: under what conditions do transnational coalitions and actors succeed or fail in changing the policy outcomes of states in a specific issue-area? In the study, the success of transnational actors was dependent on the domestic structure of the state and the role of international regimes.

However, the following sections will look more specifically at under what conditions different types of actors have influenced international environmental outcomes. Before doing so, it is important to note several trends in the contemporary literature on transnational actors, which have also come to the fore in studies of global environmental governance. First, there has been a growing concern about the democratic legitimacy of international institutions. For many scholars, the involvement of transnational actors, specifically civil society actors, offers a source of

democracy (see Chapter 26). For instance, former UN Secretary Generals Boutros Boutros-Ghali and Kofi Annan have both argued that the participation of non-state actors in international institutions can help to reinvigorate such institutions and enhance their democratic legitimacy (Tallberg and Jönsson 2010: 7–8). While not all scholars accept that there are democratic deficits in the first place, or that transnational actors offer the solution, debates about the democratizing potential of these actors has been a common theme in much of the literature (Bexell et al. 2010; Tallberg and Jönsson 2010).

Second, a distinguishing feature of the literature on transnational actors is the focus on networks. This trend is especially evident among civil society actors, as will be discussed below. In essence, much of the research indicates that while states and international institutions are organized in hierarchical forms, networks that are characterized by voluntary, reciprocal and horizontal patterns of communication and exchange are much more flexible and effective in complex environments (Keck and Sikkink 1998). The emphasis on "governance" and "networks" has led some theorists to claim that the discipline is moving away from the study of "international relations" and toward the study of "global society" (Barnett and Sikkink 2008; Lake 2010).

Three types of transnational actors

While there is no definitive typology within the literature on transnational actors, a distinction is typically made between for-profit actors and non-profit actors. In essence, this is a distinction based on motivations. For-profit actors, such as MNCs and various business associations, are primarily motivated by instrumental goals, normally the pursuit of profit for their owners or shareholders (see Chapter 13). Non-profit actors, on the other hand, such as epistemic communities (see Chapter 17), environmental NGOs and advocacy networks, often referred to as civil society, lay claim to a common good. In environmental politics this is commonly a precautionary approach to environmental protection (Risse 2002; Jönsson 2010; Oberthür et al. 2002). Of course, it goes without saying that such distinctions are never perfect. For example, some business associations are strictly speaking non-profit, even though their members are likely to be for-profit MNCs, and for-profit actors can also lay claim to a common good. In addition, some scholars categorize transnational actors according to their structure rather than their motivation (Oberthür et al. 2002). Nevertheless for the purpose of this chapter actors will be distinguished based on their motivations in line with the majority of scholars.

For-profit actors

While most of the research on transnational actors in environmental politics is concerned with civil society actors, it is important to consider the role of transnational for-profit actors briefly here, not only because studies of MNCs shaped much of the early transnational relations literature, but also because MNCs tend to invest in environmentally sensitive areas such as the energy sector. MNCs and business associations have been prominent players in international environmental discussions. Despite the limited voice of business at the Stockholm Conference in 1972, the influence of individual MNCs and business associations has been more than evident at the Rio Earth Summit and every major forum since. For example, the World Business Council for Sustainable Development (WBCSD), which first came to the fore in 1995 (after an earlier merger) and includes some of the largest and most powerful companies in the world, such as General Motors,DuPont, Deutsche Bank, Coca-Cola, BP and Wal-Mart, has been an active player in discussions on everything from climate change to biosafety (Clapp 2005; see Chapters 28 and 37).

While some for-profit actors outwardly support sustainable development and have worked cooperatively on environmental initiatives, in many critical cases they have not. It is no surprise then, that scholars have sought to explain under what conditions, transnational business actors have succeeded in limiting the ambition of global environment governance and eschewing the need for business regulation. The literature commonly converges on three means (see Chapter 13). First is the structural power of business. In the tradition of the critical theories described in Chapter 4, some scholars focus on the dominant position of these actors in the global economy (see Chapters 4 and 22). When a group with the membership of the WBCSD stakes out its position, as it did, for example, in opposition to a global corporate accountability agreement, which was raised at multiple sustainable development forums, governments take notice (Clapp 2005).

Second, almost all studies of for-profit actors point to their lobbying power (see Chapter 12). In the case of climate change, for example, US-based groups such as the Global Climate Coalition (GCC) and the Climate Council, which largely represented the interests of fossil fuel companies, such as Exxon and Shell, had a well-documented strategy of combining domestic and international lobbying to thwart agreement in the lead up to the United Nations negotiations in Kyoto in 1997. As well as domestic lobbying in the US, these groups organized across borders to form alliances with the Organization of the Petroleum Exporting Countries (OPEC), principally Saudi Arabia, who had a similar interest in seeing the negotiations stall. For instance, the Climate Council is reported to have written the negotiating statements for many small OPEC countries (Leggett 1999; Newell 2000; Downie 2012a).

Third, over the last decade in particular, business groups have supplemented, or in some cases even substituted, direct lobbying efforts with attempts to promote green business ideologies and voluntary codes and guidelines. For example, the WBCSD, the International Chamber of Commerce, the International Business Leadership Forum and the World Economic Forum have all promoted such initiatives (Andonova and Mitchell 2010). Former members of the GCC too, which collapsed in 2000 after sustained criticism from environmental NGOs, have attempted to reframe their image. One of the most famous examples is BP's name change from British Petroleum to Beyond Petroleum (Downie 2012a; Newell 2000). Yet as we saw in the last chapter, many see this as little more than "greenwash".

Non-profit actors

Since the 1990s and the renewed interest in transnational actors, the vast majority of work has been concerned with civil society actors. One of the most influential attempts to analyse the effectiveness of these actors was Peter Haas's pioneering work on epistemic communities. That is, a "network of professionals with recognised expertise and competences in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area" (Haas 1992: 3). In his early work, Haas used the case of the Mediterranean Action Plan, a regime for marine pollution control in the Mediterranean Sea, to argue that countries that were most supportive of the plan were those in which the epistemic community had been strongest (Haas 1989). Indeed throughout his work, Haas argued that the language of science is becoming a worldview that penetrates politics everywhere and hence could affect how states' interests are defined (see Chapter 17). This would be especially so in issue-areas with high complexity and uncertainty, though he recognized that there must be demand for such knowledge from policy-makers. The empirical inquiries of Haas and others showed that the involvement of epistemic communities can promote organizational learning by helping to create shared understandings in their specialized field and hence to improve state cooperation (see, e.g., Braithwaite and Drahos 2000; Raustiala and Bridgeman 2007)

Perhaps the most influential epistemic community of the last 20 years in environmental politics has been the United Nations Intergovernmental Panel on Climate Change (IPCC). Established in November 1988 around a small core of reputed scientific experts, its scientific assessments are considered to have been the catalyst for much of the diplomatic activity on climate change and, at least in the 1990s, for shifting the consensus among key policy elites (Boehmer-Christiansen 1994; Agrawala and Andresen 1999; Andresen and Agrawala 2002). For example, a large study of the role of the United States (USA) and the European Union (EU) in the international negotiations found that the IPCC helped to establish a consensus among government leaders and policy elites that human influence was the cause of climate change, which did not exist in the 1980s. This was one of the reasons that the administration of President Clinton agreed to accept binding greenhouse gas emission targets in 1996 and part of the reason that then US Vice President Al Gore supported an agreement at Kyoto a year later (Downie 2012a: ch. 3; see Chapter 28).

Other scholars have focused on "transnational advocacy networks", which are formed around shared principled ideas, instead of scientific knowledge and expertise (True and Mintrom 2001; Schroeder 2008; Tarrow 2005; Smith and Wiest 2005). According to Keck and Sikkink (1998: 2) a transnational advocacy network "includes those relevant actors working internationally on an issue, who are bound together by shared values, a common discourse, and dense exchanges of information and services". They argue that these networks are created, for example, when domestic actors find their influence over a nation-state is blocked. Because transnational advocacy networks are not powerful in a traditional sense they rely on persuasion or socialization. This entails more than reasoning with opponents, but also bringing pressure, arm-twisting, encouraging sanctions and shaming. Keck and Sikkink claim that their influence derives from strategies of persuasion through the quick movement of information and the framing of particular problems, staging symbolic events, calling on powerful actors for leverage and holding states to account for international commitments (Keck and Sikkink 1998). Importantly, the research on transnational advocacy networks directly addressed the question posed by Risse-Kappen (1995a), that is, under what conditions do advocacy networks have influence? Keck and Sikkink (1998) identify five stages of network influence: issue creation and agenda setting; influence on the discursive positions of states and international organizations; on institutional procedures; on policy change of target actors; and influence on state behaviour.

Much of the literature that has followed has sought to investigate the success transnational advocacy networks have had under such conditions when adopting different strategies. For some time now the consensus has been that these networks are most influential during the agenda-setting phase of the policy cycle (Finnemore and Sikkink 1998). In the field of environmental politics, and across other issue-areas such as trade and human rights, there is considerable evidence to indicate that the use of strategic framing is a particularly successful strategy under such conditions (see, for instance, Sell and Prakash 2004; Joachim 2003). For example, in their study of international environmental negotiations, Corell and Betsill (2008) have highlighted the importance of issue framing during the course of the negotiation process (see Chapter 20). Others too have pointed to the success that environmental NGOs have had using such strategies during the early years of the international climate change negotiations (see, e.g., Newell 2000).

However, within the tradition of the transnational relations literature, some scholars have argued that the research on epistemic communities and transnational advocacy networks remains wedded to the state-centric view of the world because these actors are only relevant in so far as they affect state policies. One of the leading proponents of this view, Paul Wapner (1995), argues that the best way to think about transnational activists is through the concept of "world civic politics" where activists work to change conditions without directly pressuring states.

For example, he uses the anti-whaling campaigns led by Greenpeace and the Sea Shepherds Conservation Society to argue that these actors disseminate an ecological sensibility not restricted to governments, but circulated throughout all areas of collective life (see Chapter 36).

Nevertheless, most of the literature on transnational actors remains focused on the relations between state and non-state actors. This is further evident in recent studies that draw attention to the growth in transnational partnerships, which have proliferated in the areas of climate change and biodiversity, among other issue-areas. In essence, such partnerships represent "soft agreements between state and non-state actors on specific governance objectives and on means to advance them across borders" (Andonova 2011: 2). For example, the agreement between the World Bank and WWF to establish the Amazon Regional Protected Areas is one such partnership. While there remain serious reservations about the environmental effectiveness of some of these partnerships, the range of actors that now engage in global environmental politics, vertically across geographical and jurisdictional space, and horizontally across networks of state and non-state actors, has led some to suggest that we are witnessing a "rescaling of global environmental politics" (Andonova and Mitchell 2010). It also highlights how far the literature on transnational actors has moved beyond earlier debates about whether we need to replace a state-centred view of the world with a society-dominated view.

Individuals

Much less theorized in the transnational relations literature is the role of individuals. Yet while individuals may not possess the institutional power they had in feudal and early modern times, as Braithwaite and Drahos (2000: 495) point out, "we must still be wary of an institutional analysis of TNCs, states, NGOs and business organizations that treat them as institutional actors, writing their enrolment by individuals out of the script". That said, to the extent that individuals are considered in the transnational literature, it is generally as non-profit actors motivated by a common good. Indeed much of the work in environmental politics focuses on the relationship between individuals and civil society groups. For example, Tarrow (2005: 28) argues, in his work on transnational activists, that some of these individuals are "seeking the development of a global civil society or a world polity; but many others are people who are simply following their domestically formed claims into international society when these claims can no longer be addressed domestically". The stories of Chico Mendes, Wangari Maathai or Ken Saro are all instances of activists seeking to increase the awareness of local environmental problems by exploiting transnational networks. In doing so, the efforts of such individuals also have the potential to influence the ideas and norms of global environmental politics (Andonova and Mitchell 2010: 263–4).

As transnational actors, individuals also have a history in environmental politics of making critical interventions on the international stage. The leadership of Mostafa Tolba, former executive director of the United Nations Environment Programme (UNEP), during the negotiations on ozone depletion is often pointed to as an example of the role individuals can play to further international efforts to address global environment problems (Braithwaite and Drahos 2000: ch. 12). Likewise the literature on the Kyoto Protocol negotiations is almost unanimous in its praise for the role Ambassador Estrada of Argentina played in bringing the negotiations to a successful conclusion. In a section of their book on the negotiations entitled "The Estrada Factor", Oberthür and Ott (1999: 54) claim that "the outcome of the Kyoto process cannot be fully understood without paying tribute to Chairman Estrada". Former American and European negotiators have also described how his use of the gavel at critical junctures was "brilliant", with one stating that he "stitched together a deal all by himself, it was unbelievable" (Downie 2012a: 117).

It is not only individuals at the helm of international institutions that have the potential to be important transnational actors. The development of the Internet and the proliferation of social media, such as Facebook, YouTube and Twitter, provide ordinary individuals with the opportunity to influence global environmental politics. For example, individuals successfully used Twitter, an online microblogging service, to publicly shame BP in the wake of the devastating oil spill in the Gulf of Mexico in 2010, as the company tried to control the public outrage. Other environmental groups, such as 350.org, which seeks to build a global grassroots movement for action on climate change, rely heavily on social media to link individuals so they can share information, organize public events and pressure governments to act to reduce global greenhouse gas emissions. While some deride social media because individuals may do little more than click "like" to show their support for a cause (White 2010), there is little doubt that such technologies are allowing individuals to have an influence across borders via pathways that did not exist a decade ago.

Nevertheless, for the most part, scholars have and continue to focus on transnational networks, with the role of individuals therein generally consigned to that of anecdotes. This is not to say that individuals are unimportant as transnational actors, but it does mean that we know much less about under what conditions their actions have proved successful. It is to this general question that we now return.

Under what conditions do transnational actors influence environmental outcomes?

Broadly speaking, three sets of conditions that affect transnational actor influence can be identified from the above discussion. First is the domestic structure of the "target state". To affect state policies transnational actors have to access the political system of the target state and they must be able to contribute to the creation of "winning coalitions" within that polity (see Chapters 11 and 12). According to this logic it follows that the more open the domestic policy-making process and the more pluralist the society, the easier it should be for transnational actors to access the decision-makers and build coalitions (Risse-Kappen 1995a). For example, in the relatively open political systems of the USA and the EU environmental NGOs and business groups have been particularly successful at infiltrating orthodox policy networks to affect state policies. This has been especially evident throughout the history of the climate change negotiations, as the Global Climate Coalition, among others, has showed (see, e.g., Downie 2012a; see Chapters 13, 8 and 28).

However, there are limits to how much domestic conditions can explain. For one thing, as Keck and Sikkink have argued, "they cannot tell us why some transnational networks operating in the same context succeed and others do not" (Keck and Sikkink 1998: 202). While many scholars have attempted to address this problem, particularly from a constructivist perspective (see Chapter 4), by looking at norms and ideas, at the very least it is clear that domestic conditions are not all that matter for assessing the impact of transnational actors (Risse 2002).

Accordingly, a second set of international conditions are commonly identified in the literature. Research has shown that international regimes and institutions can facilitate the efforts of transnational actors by facilitating the formation of coalitions and legitimating their attempts to influence policy outcomes (see Chapter 9). For example, Risse-Kappen has argued that the more an issue-area is regulated by international norms of cooperation, the more permeable state boundaries become for transnational activities. He states that "highly regulated and cooperative structures of international governance tend to legitimize transnational activities and to increase their access to the national polities as well as their ability to form 'winning coalitions' for policy

change" (Risse-Kappen 1995a: 6–7). Others have gone as far as to suggest that the access international regimes and agreements grant to networks may be as important as the content of the agreement itself (Hafner-Burton et al. 2009: 573).

However, facilitating access does not equate to influence nor is it certain that when access becomes more difficult the influence of transnational actors declines. As Risse (2002: 268) points out, "we probably need to differentiate among various phases in the international policy cycle". On this front, there is a consensus, as discussed, that transnational actors are most influential during the agenda-setting phase of the international policy cycle because of their capacity to affect ideas and norms. Studies in the field of environmental politics have also highlighted other conditions that warrant further research. For example, Betsill and Corell (2008) suggest that environmental NGOs could be more influential when the political stakes of an international negotiation are relatively low or, for instance, that environmental NGOs may have greater difficulty exerting influence when there is a high level of contention over entrenched economic interests. In the course of prolonged international environmental negotiations, these ideas have been taken further to suggest that there are strategic opportunities for highly networked actors to influence state behaviour depending on the elements of long negotiations (Downie 2012b). Much of this work also recognizes that non-state actors should exploit the potential of the "two-level game", while at the same time building transnational coalitions be it with states or other non-state actors (see Chapter 11). The concept of a two-level game seeks to account for the role of domestic politics in international negotiations. It suggests that at the national level, domestic groups pressure their governments to adopt policies they support, while governments seek power by engineering coalitions among their national constituents. At the international level, governments want to satisfy domestic pressures, while limiting any negative consequences from foreign developments (Putnam 1988).

Third, putting aside the structural conditions of the domestic and international sphere, the characteristics of transnational actors themselves will also mediate their influence. While material resources and organizational capabilities are clearly important, as for-profit actors such as the WBSCD, or non-profit actors such as Greenpeace have shown, it is not all that matters. The knowledge and expertise of transnational actors, as we have seen with epistemic communities such as the IPCC, can be critical to creating shared understandings among policy elites about the nature of a problem (Haas 1992; see Chapter 17). However, the influence of knowledge will also be dependent on the demand for it from other actors. In environmental politics, in particular, where many issues are characterized by high complexity and uncertainty, knowledge is likely to be a more powerful resource. In addition, as Keck and Sikkink (1998: 28) argue, the networks that transnational actors participate in will "operate best when they are dense, with many strong actors, strong connections among groups in the network, and reliable information flows". While this may be so, more recent studies have shown that coordination among environmental NGOs does not necessarily increase their influence (Betsill and Corell 2008). This is one more area where further empirical research is needed to specify the conditions under which transnational actors influence environmental outcomes.

Conclusion

There is no doubt that transnational actors are now central players in world politics. Over the last 40 years for-profit actors, various civil society groups and individuals have all helped shape the modern era of global environmental politics (see Table 14.1). The literature on transnational actors no longer debates whether these actors matter, nor does it debate whether a state-centred view of the world should be replaced by a society-centred view. Instead contemporary scholarship

Table 14.1 The influence of transnational actors

Type of actor	*Means of influence*	*Examples*
For-profit	structural power	the Climate Council
	lobbying power (domestic and international)	Coca-Cola
		DuPont
	green business ideologies and voluntary codes and guidelines	Deutsche Bank
		General Motors
		Global Climate Coalition (GCC)
		Wal-Mart
		World Business Council for Sustainable Development (WBCSD)
Non-profit	language of science	epistemic communities (e.g., the United Nations Intergovernmental Panel on Climate Change (IPCC))
	persuasion and socialization	transnational advocacy networks (e.g., Climate Action Network (CAN))
	partnerships	World Bank and WWF partnership for the "Amazon Regional Protected Areas"
Individuals	exploiting transnational networks	Chico Mendes, Wangari Maathai and Ken Saro
	interventions in international negotiations	Mostafa Tolba and Ambassador Estrada of Argentina
	technology and social media	individuals building grassroots movements such as 350.org

focuses more squarely on the interactions between state and non-state actors and their influence on domestic and international outcomes. In particular, this literature is characterized by a focus on networks – networks of scientific experts, environmental NGOs, business associations or collaborative partnerships between state and non-state actors, to name a few examples. In this sense, research on transnational actors is very much part of the discussion about "governance without government" (see, e.g., Börzel and Risse 2010), discussed in previous chapters, and it is part of the reason that some international relations scholars now argue that terms such as "global governance" more closely resonate with reality than "international relations" (Lake 2010).

Accordingly, much of the most recent scholarship is concerned with the conditions under which transnational actors influence policy outcomes. As this survey shows, three sets of conditions can be broadly identified, domestic conditions such as the political structure of the target state, international conditions including the role of international institutions, and finally the characteristics of transnational actors themselves such as their resources and the density of their networks. Yet, as others have pointed out, existing empirical studies remain dominated by single case-studies (Bexell et al. 2010). There is a need for comparison across cases, not only within environmental politics, but across other issue-areas, so that the lessons from other domains where transnational actors are prominent, such as trade and development, can inform research in global environmental politics.

Finally, as alluded to, with transnational actors now an accepted feature of the international political landscape, there is a growing interest in what role they might play in "democratizing global governance" (see Chapters 26 and 27). Even a cursory glance of journals in the fields of international relations, global governance and environmental politics over the last several years highlights this as a growing area of scholarship (see, e.g., Cerny 2009). This chapter has not

focused on this issue because the primary concern has been with transnational actors in environmental politics rather than transnational relations more generally. Nevertheless, it is clear that the outcomes of these debates will be critical for transnational actors given the underlying assumption of many scholars that they can contribute to democracy and that better global governance is a cornerstone of their legitimacy. While further normative and empirical work is required before their potential role in democratizing global governance is settled, it seems likely that in the context of environmental politics, where international institutions are critical to addressing environmental problems, these debates will have particular resonance.

References

Agrawala, S. and Andresen, S. 1999. Indispensability and Indefensibility? The United States in the Climate Treaty Negotiations. *Global Governance*, 5, 457–82.

Andonova, L. B. 2011. Boomerangs to Partnerships? Explaining State Participation in Transnational Partnerships for Sustainability. Conference on Research Frontiers in Comparative and International Environmental Politics. Princeton University.

Andonova, L. and Mitchell, R. 2010. The Rescaling of Global Environmental Politics. *Annual Review Environment and Resources*, 35, 255–82.

Andresen, S. and Agrawala, S. 2002. Leaders, Pushers and Laggards in the Making of the Climate Regime. *Global Environmental Change*, 12, 41–51.

Barnett, M. and Sikkink, K. 2008. From International Relations to Global Society. In Reus-Smit, C. and Snidal, D. (eds.) *The Oxford Handbook of International Relations*. Oxford: Oxford University Press.

Betsill, M. and Corell, E. 2008. Introduction to NGO Diplomacy. In Betsill, M. and Corell, E. (eds.) *NGO Diplomacy: The Influence of Nongovernmental Organizations in International Environmental Negotiations*. Cambridge: MIT Press.

Bexell, M., Tallberg, J. and Uhlin, A. 2010. Democracy in Global Governance: The Promises and Pitfalls of Transnational Actors. *Global Governance*, 16, 81–101.

Boehmer-Christiansen, S. 1994. Scientific Uncertainty and Power Politics: The Framework Convention on Climate Chnage and the Role of Scientific Advice. In Spector, B., Sjostedt, G. and Zartman, I. W. (eds.) *Negotiating International Regimes: Lessons Learned from the United Nations Conference on Environment and Development (UNCED)*. London: Graham & Trotman/Martinus Nijhoff.

Börzel, T. A. and Risse, T. 2010. Governance Without A State: Can It Work? *Regulation and Governance*, 4, 113–34.

Braithwaite, J. and Drahos, P. 2000. *Global Business Regulation*, Cambridge: Cambridge University Press.

Cerny, P. G. 2009. Some Pitfalls of Democratisation in a Globalising World: Thoughts from the 2008 Millennium Conference. *Millennium–Journal of International Studies*, 37, 767–90.

Clapp, J. 2005. Transnational Corporations and Global Environmental Governance. In Dauvergne, P. (ed.) *Handbook of Global Environmental Politics*. Cheltenham: Edward Elgar.

Corell, E. and Betsill, M. 2008. Analytical Framework: Assessing the Influence of NGO Diplomats. In Corell, E. and Betsill, M. (eds.) *NGO Diplomacy: The Influence of Nongovernmental Organizations in International Environmental Negotiations*. Cambridge: MIT Press.

Downie, C. 2012a. The Long Negotiation: Strategies and Variables in the Climate Change Negotiations. PhD Thesis, Canberra: Australian National University.

—— 2012b. Toward an Understanding of State Behavior in Prolonged International Negotiations. *International Negotiation*, 17, 295–320.

Finnemore, M. and Sikkink, K. 1998. International Norm Dynamics and Political Change. *International Organization*, 52, 887–917.

Haas, P. 1989. Do Regimes Matter? Epistemic Communities and Mediterranean Pollution Control. *International Organization*, 43, 377–403.

—— 1992. Introduction: Epistemic Communities and International Policy Coordination. *International Organization*, 46, 1–35.

Hafner-Burton, E., Kahler, M. and Montgomery, A. 2009. Network Analysis for International Relations. *International Organization*, 63, 559–92.

Joachim, J. 2003. Framing Issues and Seizing Opportunities: The UN, NGOs, and Women's Rights. *International Studies Quarterly*, 47, 247–74.

Jönsson, C. 2010. Capturing the Transantional: A Conceptual History. In Jönsson, C. and Tallberg, J. (eds.) *Transnational Actors in Global Governance: Patterns, Explanations, and Implications*. London: Palgrave Macmillan.

Jönsson, C. and Tallberg, J. (eds.) 2010. *Transnational Actors in Global Governance: Patterns, Explanations, and Implications*, London: Palgrave Macmillan.

Keck, M. and Sikkink, K. 1998. *Activists Beyond Borders: Advocacy Networks in International Politics*, Ithaca, NY: Cornell University Press.

Keohane, R. and Nye, J. (eds.) 1972. *Transnational Relations and World Politics*. Cambridge, MA: Harvard University Press.

Lake, D. 2008. The State and International Relations. In Reus-Smit, C. and Snidal, D. (eds.) *Oxford Handbook of International Relations*. Oxford: Oxford University Press.

—— 2010. Rightful Rules: Authority, Order, and the Foundations of Global Governance. ISA Presidential Address.

Leggett, J. 1999. *The Carbon War: Dispatches from the End of the Oil Century*. London: Allen Lane.

Newell, P. 2000. *Climate for Change: Non-state Actors and the Global Politics of the Greenhouse*. Cambridge: Cambridge University Press.

Nye, J. S. and Keohane, R. O. 1971. Transnational Relations and World Politics: An Introduction. *International Organization*, 25, 329–49.

Oberthür, S. and Ott, H. 1999. *The Kyoto Protocol: International Climate Policy for the 21st Century*. Berlin: Springer.

Oberthür, S., Buck, M., Müller, S., Pfahl, S., Tarasofsky, R. G. and Werksman, J. 2002. Participation of Non-Governmental Organisations in International Environmental Governance: Legal Basis and Practical Experience. Berlin: Institute for International and European Environmental Policy.

Putnam, R. 1988. Diplomacy and Domestic Politics: The Logic of Two-Level Games. *International Organization*, 42, 427–60.

Raustiala, K. and Bridgeman, N. 2007. Nonstate Actors in the Global Climate Regime. Public Law and Legal Theory Paper Research Series, Research Paper No. 07–29.

Risse-Kappen, T. 1995a. Bringing Transnational Relations Back In: Introduction. In Risse-Kappen, T. (ed.) *Bringing Transnational Relations Back In: Non-state Actors, Domestic Structures and International Institutions*. Cambridge: Cambridge University Press.

—— 1995b. Structures of Governance and Transnational Relations: What Have We Learned? In Risse-Kappen, T. (ed.) *Bringing Transnational Relations Back In: Non-state Actors, Domestic Structures and International Institutions*. Cambridge: Cambridge University Press.

Risse, T. 2002. Transnational Actors and World Politics. In Carlsnaes, W., Risse, T. and Simmons, B. (eds.) *Handbook of International Relations*. London: Sage.

Schroeder, M. 2008. Transnational NGO cooperation for China's Climate Politics. *Cambridge Review of International Affairs*, 21, 505–25.

Sell, S. and Prakash, A. 2004. Using Ideas Strategically: The Contest Between Business and NGO Networks in Intellectual Property Rights. *International Studies Quarterly*, 48, 143–75.

Smith, J. and Wiest, D. 2005. The Uneven Geography of Global Civil Society: National and Global Influences on Transnational Association. *Social Forces*, 84, 621–39.

Tallberg, J. and Jönsson, C. 2010. Transnational Actor Participation in International Institutions: Where, Why, and with What Consequences? In Jönsson, C. and Tallberg, J. (eds.) *Transnational Actors in Global Governance: Patterns, Explanations, and Implications*. London: Palgrave Macmillan.

Tarrow, S. 2005. *The New Transnational Activism*. New York: Cambridge University Press.

True, J. and Mintrom, M. 2001. Transnational Networks and Policy Diffusion: The Case of Gender Mainstreaming. *International Studies Quarterly*, 45, 27–57.

Waltz, K. 1979. *Theory of International Politics*. New York: Random House.

Wapner, P. 1995. Politics Beyond the State: Environmental Activism and World Civic Politics. *World Politics*, 47, 311–40.

White, M. 2010. Clicktivism Is Ruining Leftist Activism. *The Guardian*, 12 August.

Part III

Ideas and themes in global environmental politics

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15

Sustainability

Foundational principles

Thomas Princen

Institutions, from the local to the global, are constructed, built out of raw materials such as beliefs, ideas, and values. Like the doors, windows, and walls of buildings, though, most of what we see is only the outward manifestations: the laws, regulations, treaties, procedures, and practices (see Chapters 8, 10, 12). Yet underlying these is a foundation: norms and principles (see Chapter 9). These too are constructed, and even easier to ignore; they are just there, down below, well hidden, the infrastructure that holds everything up because, we assume, it is well built, appropriate to the task of supporting the superstructure, the walls, floors, and roof. And, of course, we assume that altogether the infrastructure and superstructure will shelter the occupants well.

When the goal of the construction – the building or the institution – changes, sometimes it is enough to just change the superstructure: move a wall, tile the floor, add a window; revise a law, tighten enforcement, subsidize a program. Other times entirely new structures are in order, a new foundation, a new set of norms and principles. A premise of this chapter is that the constructed institutions for material and energy use in modern industrial societies are not up to the task of living within our means, of global society functioning within global ecological constraints.

Existing institutions for material provisioning, generally subsumed under the term "the economy," are supremely well built to extract resources rapidly and thoroughly, to convert them into products people will buy, and to dispose of the wastes in the least-cost, least-noticeable manner possible. But they are not constructed to operate within immutable constraints such as a single planetary climate system, a self-sustaining level of biological diversity, or humans' limited cognitive and social capacities. Rebuilding the infrastructure is in order. For that the builders and occupants alike must rethink how humans relate to nature, how the economy is structured, how industry is organized, how communities and individuals produce and consume and dispose. And that very rethinking is, arguably, at the root of a politics of the global environment where the goal is to reverse current biophysical trends and get on a socially and ecologically sustainable path.

In that rethinking, in that institutional design for global sustainability, new norms and principles are needed. Just as the house builder must survey the site and determine whether stone or brick or concrete is best suited as the foundation, a global environmental politics must ask whether prevailing norms and principles – growth, efficiency, specialization, mobility, speed, consumer sovereignty – are appropriate to the task of avoiding ecological overshoot and sustaining the biophysical prerequisites to life. This chapter, then, is an attempt to point in a different

direction, describing, developing, and justifying a preliminary set of norms and principles for global sustainability. I first lay out the role of principles and define ecological consonance. I then develop first-order, second-order, and third-order propositions and principles grounded, respectively, in the biophysical, the human, and the political. I conclude by identifying key questions of institutional design and human propensity.

Ecological consonance

Principles have relevance to ecological sustainability when the locus of decision-making is at the intersection of the human and biophysical systems. Neither the purely human nor the purely biophysical is the primary realm: it is the decision-making *at the intersection* – the cutting of trees, the plowing of ground, the casting of fishnets, the pumping of water, the generating of power – that leads to either depletion or conservation. Decisions are "ecological" to the extent they (i) entail effective feedback loops, positive and, especially, negative from both the human and biophysical systems; (ii) have a long-term orientation (relevant to ecosystem functioning and geologic processes); (iii) preserve genetic and cultural information; and (iv) build in buffers to account for irreducible uncertainties (Dryzek 1987; Princen 2005: 23–47).

Decision-making is informed by worldviews mediated by institutions (norms and principles, rules, procedures and practices) and language (concepts, ideas, metaphors, myths). While worldviews vary widely among individuals and across societies, institutions are designed to achieve particular goals and thus they appropriate institutional features selectively. Early promoters of industrialization, for example, appropriated principles from a mechanistic worldview – speed, clock time, efficiency. Later, advocates of consumerism appropriated the economistic principles of consumer sovereignty and factor mobility from economics to construct consumer-led capitalism.

The challenge for sustainability advocates is to develop principles that meet two conditions: (1) they are consonant with ecosystem functioning; and (2) they can be appropriated from extant worldviews (i.e., they do not have to be created de novo). Put differently, if the ecological is a necessary condition for sustainable practice, it does *not* follow that all members of a society must convert to an ecological worldview. Rather, the ecological worldview, grounded in ecosystem functioning alongside human interaction with that functioning (practices that can be put under an agrarian worldview), is the *source* of first-order principles (Princen 2010a, 2010b: 147–77). Second- and third-order principles can come from elsewhere, however ecological. The most ready sources, those with the highest likelihood of adoption, are extant principles, not completely new ones. They must, nevertheless, be governed by the ecological to qualify as principles of sustainability. This grounding and governing I call *ecological consonance*. From this arises my first proposition:

> *Proposition 1*: Decision-making and design are more likely to lead to sustainable practice to the extent they are governed by ecological principles which are in turn governed by the constraints of ecosystem functioning, that is, to the extent decision-making criteria and design principles are *ecologically consonant*.

Because humans unavoidably organize themselves and do so at many scales, they employ principles: principles of social organization, whether implicit or explicit. Principles are rules of a system, with moral claims. They are "should" statements that guide a relevant set of actors toward an agreed goal in an issue area. They are not universal guidelines, but *particular guidelines* for those actors, that issue, and that goal. Principles can arise spontaneously (witness children playing: "You can't do that! It is not fair!") or, in cases of enduring social organization, they are deliberately

constructed (e.g., the core of a country's constitution; the pillars of a world trade regime). If a principle does evolve into a universal statement, applicable to many sets of actors in varied contexts (e.g., freedom, growth, efficiency), then it is an ethic, a myth, or a taboo. Principles therefore work only in limited contexts, and new contexts demand new principles. From this arise two additional propositions:

> *Proposition 2*: A social system (e.g., the economy) has high integrity to the extent: (i) its principles match a system goal (e.g., labor specialization leads to wealth generation); and (ii) principles across goals and issues mesh (e.g., labor specialization promotes job creation).

> *Proposition 3*: For the large social goal of sustainability, principles are effective and systems have integrity to the extent they simultaneously match the goals of the social system and the biophysical system (see principles below).

The biophysical grounding: the source of first-order principles

Two broad biophysical phenomena define the conditions around which society can organize itself for long-term ecological and social sustainability – ecological capacity and natural flux. Each, singly and in combination, leads to a set of design principles, the first set static, the second dynamic. First-order principles are those tightly linked to the biophysical phenomena. That is, they (i) have *ecological content* (hierarchically structured complex biophysical systems that are adaptive and resilient at the same time they are subject to flipping into a degraded state, and that accounts for all species, *Homo sapiens* included); (ii) focus on the *intersection* of the biophysical and the social (mutual feedback of critical system-maintaining and system-adapting information, positive and negative); and (iii) are oriented to the *long term* (via cycles of life, nutrients, water).

Second- and third-order principles (see below) are oriented to other conditions, even industrialization and economic expansion, yet offer guidance to the sustainability goal to the extent they mesh with the first-order principles. All of these principles are stronger to the extent they embody features of *biophysical* and *human capacity*:

- absolute limits – e.g., a single water supply; critical nutrients; need for sleep; amount of directed attention.
- periodicity – e.g., reproductive periods, diurnal and seasonal fluctuation.
- bioassimilation – e.g., decomposition, nutrient uptake, energy flow.
- complexity – e.g., successional stages; predator–prey dynamics; self-organization; collective action; strategic behavior.

Ecological capacity

Although ecosystems are resilient and adaptive, they have limits. On the strictly physical side, the amount of water on the planet is fixed, and there are no substitutes (see Chapter 34). Minerals, once mined and dissipated or burned, are permanently removed from human use. The ultimate physical limit is the planet itself and its solar flux, the mostly constant flow of energy from the sun and mostly uncontrolled escape of energy into space. No amount of tinkering, no pricing scheme, no new technology will change these immutable and unavoidable constraints. On the biological side, organisms are limited to a narrow band of temperatures, pH levels, and pressures. An astronaut's view of the planet reveals just how thin is the skin of life – some 10 cm deep into the soil, less than a hundred meters high into the air, and only a few hundred meters

deep into lakes and oceans. In that skin, organisms live and die, species emerge from novel environmental conditions and they go extinct. All these are immutable facts. Humans can act as if they do not exist, but not indefinitely.

A primary social principle corresponding to the constraints of *ecological capacity* is the *ecological cap*. Cap-and-trade programs for emissions reductions are well known and broadly accepted. Implementation, especially of carbon emissions, is still contentious, but the idea of setting an upper bound on pollution (the capping being the ecologically significant piece of cap-and-trade, not the trading) is widely acknowledged. Target loadings is a similar concept: biological pollutants (e.g., sewage, phosphorous, nitrogen compounds) can be introduced to an ecosystem only to a point, that of assimilative capacity. To the extent the target is set according to downstream assimilative capacity (e.g., in the case of acid rain, the buffering capacity of downwind alkaline soils and bodies of water; see Chapter 30) and not to status quo emissions (often the "politically acceptable" target level), the cap is ecologically grounded and thus a first-order principle for ecological sustainability.

Emissions, though, are only one realm where biophysical capacity limits must be matched by caps on human activity to ensure long-term resource use. Harvest rates tend upward for economic reasons – short-term returns on investment increase, for example, as forest rotations shorten and fishnets lengthen. A cap on harvest rate indicates that regenerative capacities of populations and, most important, of entire ecosystems – forests and fisheries, for example (see Chapters 38 and 36) – are limited, unlike the seemingly unlimited capacity of industrial systems such as monoculture tree plantations and fish pens. Water use is an obvious area for caps: to ensure long-term water security, the withdrawal rate cannot exceed the recharge rate.

If caps on emissions, harvest levels, and withdrawal rates make sense – ecological sense, that is – then under certain conditions, so would caps on entrants, consumption, throughput, technologies, and even GDP and trade. The primary condition would be a tight, demonstrable link to limited ecological capacity. What is more, the limiting case for caps is, at one end of the organizational spectrum, a ban or prohibition. That is, processes and substances that are fundamentally unecological, that generate non-assimilative waste (e.g., nuclear waste) (see "Cycling" below), that cause irreversibilities (e.g., habitat destruction that drives species extinct; see Chapter 37), have no place in an ecologically sustainable society (Princen 1996). At the other end of the spectrum, there are activities and substances that, having no inherent ecological content, require no capping. Freedom, artistic expression, democratic participation, human rights, parental love, sport are examples. Every activity in between requires some kind of limitation, some kind of check to function within the ecological capacities on which that activity depends. This brings us to the first principle of sustainability:

> *Principle 1*: When human activity is inherently constrained by biophysical conditions, *capping* those activities according to ecological functioning enables sustainable practice. Conversely, not to impose caps, even on distal processes such as technology or consumption, is to invite depletion and irreversible diminution of ecosystem services.

Caps imply maximums, ceilings against which producers of wealth tend to push their resource use, if not push the ceiling itself higher. Thus, two necessary complements to the principle of ecological capping are the principles of restraint and buffer, what emerge from complex systems and limited control perspectives.

Complex systems, write systems analysts James J. Kay and Eric Schneider, "do not maximize or minimize their functioning" (Kay and Schneider 1994: 35). To push a component of the

system to its maximum, to spin a wheel at its fastest speed, to reduce forest tree species to only those that have commercial value, to pump water just as fast as the estimated recharge, is to make such systems "brittle," vulnerable to disturbance and likely to flip into a degraded state. Integrity, resilience, and adaptiveness come to a system (or follow an intervention) when each factor varies within a comfortable range, when a "red zone" at the extremes of the range exists (or is created through intervention). An animal's heart beats rapidly in a fight-or-flight response to a threat; its heart can also lumber along during sleep or hibernation. But if the animal functions at either extreme for long, if its adrenaline pumps constantly (a caribou pursued for hours by a pack of wolves) or it lies about day after day (a zoo specimen), the system deteriorates – or it requires more input, more energy, more nutrients, more protection, more technical fixes. In short, systems must allow for occasional activity at the extremes yet, at the same time, they need mechanisms that keep activity mostly within the safe range, the "green and yellow zones." Like governors on a flywheel that automatically engage when the wheel exceeds its safe speed, systems must have built-in mechanisms of restraint to keep in the safe range, to operate in the middle ground, below the ceilings and above the floors, to be, in a word, *sufficient*. A first-order principle under the biophysical condition of ecological capacity constraint is thus *restraint*.

The economy, that social system of material and energy flow, part of which is measured by GDP, investment, savings, consumption, capital and trade flows, has, at present, no governors, not with respect to irreversible change in natural resources and waste sinks anyway. Monetary supply is tempered by inflation and employment concerns, trade by imbalances. But there are no brakes on the system that keep it within rates of change commensurate with ecological change, that, as Herman Daly continuously reminds us, keeps the scale of the economy in tune with the scale of the biosphere of which the economy is a subset (Daly and Townsend 1993: 360–1). The industrial, growth- and efficiency-oriented, consumerist economy is all about maximizing (e.g., output, return on investment) and minimizing (e.g., prices and labor).

Social systems can have caps on expansion and prohibitions on non-assimilative substances, but given the human tendency to explore, to innovate, and to expand, changes in the system are likely to bump up against *absolute limits*. What is more, they can do so with inadequate or delayed feedback. Overshoot is a constant threat because individuals and collectivities do not know of their predicament until it is too late to reverse course. Hence, another first-order social organizing principle under the biophysical condition of ecological constraint is *buffer*. Social systems, themselves complex and often exhibiting expansionist tendencies driven by positive feedback loops and cause–effect time lags (think a modern industrial economy), must build in a cushion, a margin of error, a safety barrier, some "slack," to keep from going over the edge, from incurring irreversibilities. Often as not, a buffer takes the form of rules of thumb, not precise measures, what typify maximization strategies (Scot 1998; Gadgil and Guha 1992). Engineers build bridges and levees and automobiles to withstand expected stresses; then they multiply by 1.5 to give a 50 percent safety margin. Farmers clear land to plow but leave a hedgerow or patch of forest or stretch of marshland, enough to block the wind, retain moisture, and allow useful predators to pass.

> *Principle 2*: All material systems, including the human economy, are subsystems of larger systems. To sustain themselves, systems must remain within the adaptive capacities and scale of the larger system. When the human scale of activity tends to exceed ecological capacities, social limits must be built in to be sustainable. Maximization strategies thwart social limits while *sufficiency* strategies – *restraint* and *buffer* – enable them.

Natural flux

The flux of nature includes (1) the flows of energy, nutrients, and water, and (2) the fluctuations of these flows and all life processes. Like a river defined as an identifiable flow of water, its water level rises and falls, it course meanders across flat plains changing, it seems, on a whim, and its volume occasionally crashes violently over precipitous falls. What is more, a river is never finished, never complete, only cycling, only channeling its portion of the hydrologic cycle. Thus, two features of natural flux are cycling and recurrent change. The primary social analogs are flexibility (or adaptiveness) and congruent change.

Cycling

Life processes go in cycles; things go up and down, back and forth, around and around; they assimilate, decompose, and reassimilate. Organisms follow diurnal, lunar, and seasonal cycles and variations in temperature, humidity, nutrients, and water flows. They experience periods of intense activity and periods of rest. Nearly all advanced animals sleep and they have distinct times for feeding, reproducing, and wakeful rest. Machines are just the opposite. The best ones run constantly, all the time, 24/7/365, or at least whenever we want them to. The clock is the archetype, but the generator, the refrigerator, the radio, and the computer also typify the machine's constancy. Because organisms cannot function constantly (even if we wanted them to), because resiliency among organisms and within ecosystems requires "down time" in one form or another, it follows that this observed periodicity in the non-human world requires periodicity in the humanly constructed world. The requisite socially constructed down time I'll call *respite*, a first-order principle most evident in social systems that depend directly on resilient natural systems – e.g., farms and timber operations and water supply systems.

To illustrate, consider lobster fisheries in the western North Atlantic. One of the healthiest is that surrounding a small island called Monhegan. There the fishers have a six-month season, with the off-season corresponding to the lobsters' molting and reproducing. Marine biologists see more than coincidence in the health of the local fishery (and, through larval dispersion, nearby fisheries) and this annual respite from fishing pressure. Similar stories can be told almost anywhere there are successfully managed fisheries (Acheson 1988; Princen 2005: 223–89). Among agriculturalists, a fallow serves a similar purpose. Allowing the land to "rest" breaks disease cycles, allows nutrients to rebuild, and restores water balance (see Chapter 40). Among wildlife managers, refuges provide spatial respite from harvesting and hunting (Gadgil and Guha 1992; see Chapter 37).

> *Principle 3*: The more tightly human *respite* is connected to natural cycles, the more likely the social system will operate within ecological constraints and be self-sustaining. For sustainable resource use, from the local to the global, periodicity must be built in.

Cycling not only implies fluctuation and downtime but the *absence* of one-way flows (the one exception being, at the planetary scale, solar energy). Materials that do not decompose (e.g., persistent substances such as DDT and PCB, heavy metals, and radioactive waste; see Chapters 32 and 33) are one-way creations. They cannot be assimilated and thus cannot supply nutrients or energy to other organisms. Many of these substances bioaccumulate and interfere with endocrine and reproductive functions of higher animals, including humans. They are thus alien to ecosystem functioning and have no place in an ecologically sustainable society.

Hence, with the possibility of human-induced one-way substances the necessary social principles for capping these substances at zero are *prevention* and *prohibition*. Small, highly controlled

experiments with constant monitoring are associated practices. The burden of proof would be on those who would risk creating such substances, however inadvertent; it would not be on those who bear the biological insult as is the case now in most industrial societies (the notable exception being pharmaceuticals).

> *Principle 4*: There is no ecological basis for anthropogenic non-assimilative substances and they therefore have no place in a sustainable society. As a necessary step for sustainable resource use, they must be *prohibited*, *eliminated*, and *prevented*.

If this proposition appears to be overly stringent, consider the position of the US–Canada body, the International Joint Commission, charged with, among other things, ensuring the water quality and ecological integrity of boundary waters such as the Great Lakes: There is no "acceptable assimilative capacity for persistent, bioaccumulative toxic substances.…The only appropriate water quality objective is zero." And this is not simply a biological or economic issue, nor even strictly a health issue, the IJC told its clients, the governments and publics of the two countries: "The production and release of these substances into the environment must…be considered contrary to the [Great Lakes Waters Quality] Agreement legally, unsupportable ecologically and dangerous to health generally. Above all, it is ethically and morally unacceptable" (International Joint Commission 1994).

Recurrent change

Ecosystems are in constant flux. They have bursts of energy, they mature, they stabilize, then they decline and rebuild. Populations rise and fall. Species adapt. Biomass fluctuates. And sometimes, with external shocks (due to shifts in climate or geologic formations, for instance), ecosystems "flip"; they slide into a permanent state of low biological activity. For all this dynamism, ecologists still talk about ecosystem "integrity" (high levels of bioproductivity or genetic diversity, for example) and "resilience" (the ability to withstand perturbations without flipping). Humans can perturb an ecosystem, intervening to extract food or fiber. They can cause ripples that eventually flatten out leaving the ecosystem intact. Or they can send tsunamis through the system, permanently degrading it.

From the perspective of human use, the question is how to intervene without degrading the system, how to maintain its essential ecological functioning, however variable, while still participating in that functioning. Human use of ecosystems, like ecosystem functioning itself, is about change. But not all change is the same. From the human use perspective (especially with the goal of long-term resource use), human-induced change must be *of a sort* and *at a rate* such that the ecosystem can change accordingly, that is, that it can *adapt*, and avoid flipping. In fact, ecologically sound human intervention is one that entails adaptation by *both* the biophysical system and the social system (see Proposition 3). The issue, thus, is less about control – humans controlling yield, biomass, species, habitat, or flow – and more about human adaptability – the ability of human systems to *adapt to* biophysical systems, and to do so as those very systems are adapting, all without incurring irreversible loss.

To illustrate, a timber company can adopt harvesting methods and hiring practices to extract only mature, slow-growing trees in a natural forest, taking specimens from all species and allowing the ancient trees to reseed and the young ones to fill the gaps. Or it can select the most commercially valuable trees, replant only those species, clear away competing plants and, as a result, risk a forest collapse with an invasion of bark beetles. A coastal town can institute water conservation measures and pump underground freshwater only in the rainy season when

recharge keeps the saline front at bay. Or it can pump year-round and hope that the front doesn't move in and permanently salinize the freshwater aquifer.

Put differently, change in complex adaptive systems (ecosystems with high levels of integrity and resilience) is fundamentally different from change in highly engineered, highly simplified systems. When the world is seen as a complex adaptive system, one that has multiple interconnections and many equilibrium states, one that changes discontinuously, predictability and, hence, control, are highly limited, sometimes impossible (Costanza et al. 1993; Schneider and Root 1996; Perrings 1991). "There are points in any system's development where several possible directions of radical change are open," write systems analysts Kay and Schneider, "and it is not possible to predict, with certainty, which one will occur" (Kay and Schneider 1994: 34). And, then, when interactions accumulate, predictability is even more difficult. Advances in meteorology have led to vast amounts of data feeding into sophisticated computer models. Yet weather forecasts are still limited to about five days. The dynamics of land, water, air, and biological activity accumulate, creating chaotic behavior of such proportions that no amount of data or sophistication of modeling can capture it. "Computers cannot substitute for crystal balls," say Kay and Schneider, "except for very limited classes of problems that occur over short spatial and temporal dimensions" (Kay and Schneider 1994: 34). The second law of thermodynamics states that energy dissipates and systems tend to run down. But an open system with high-quality energy inputs (low entropy) resists this tendency; it self-organizes. Self-organizing systems, write Kay and Schneider,

> exist in a situation where they get *enough* energy, but *not too much*. If they do not get sufficient energy of high enough quality (beyond a minimum threshold level), organized structures cannot be supported and self-organization does not occur. If too much energy is supplied, chaos ensues in the system, as the energy overwhelms the dissipative ability of the organized structures and they fall apart. So self-organizing systems exist in a middle ground of *enough*, but not too much.
>
> (Kay and Schneider 1994: 34; emphasis added)

Change is inherent in complex adaptive systems. But to have integrity, to be self-sustaining, systems must find that *middle ground*, that in-between position of changing enough but not too much. *Sufficient change* is thus the social analog to recurrent biophysical change.

> *Principle 5*: Because (i) recurrent change is inherent to both biophysical and social systems, (ii) dramatic biophysical change can undermine social systems, and (iii) fundamental biophysical processes are given (e.g., forests accumulate biomass, organisms reproduce), sustainable practice requires that social systems adapt to biophysical change, not the other way around. *Primacy* in resource decision-making (regarding, for example, harvest, withdrawal, emission rates) accords to the biophysical in sustainable systems, not to the economic or political.

> *Principle 6*: Social adaptations to biophysical change must aim at middle-ground operations, not maximums or minimums. *Sufficient change* is inherently risk-averse and adaptive – i.e., *prudent*.

The human grounding: the source of second-order principles

The preceding propositions, deriving directly from demonstrable biophysical phenomena – capacity constraints, cycling, recurrent change – lead to a set of first-order social organizing principles: ecological capping, restraint and buffer, respite, prevention and prohibition, resource

primacy, and sufficient change. Second-order principles are less tightly connected to the biophysical. They are nonetheless necessary for sustainability because they aim at human behavioral propensities, individual and collective, that otherwise thwart long-term resource use. In other words, they deal primarily with *human capacity*, again individual and collective, and thus parallel the first-order principles that primarily address biophysical capacity. An ideal set of second-order principles would deal with:

i. human group tendencies to:
   a. minimize variabilities in food, water, temperature, light;
   b. accrue surpluses;
   c. externalize resource costs while internalizing benefits;
   d. shift and expand territorial boundaries;
   e. aggress against others for resource access, surpluses, technology, and labor.
ii. inherent problems of collective action (e.g., free-riding, individual versus collective rationality, limited iteration, mixed motives, commitment, and communication).
iii. physiological limits (of, e.g., sleep, nutrition, sex).
iv. cognitive limits (e.g., directed attention, spatial and temporal orientation, ability to deal with only a handful of issues at a time).

Here, however, I focus on those principles affecting direct interactions between human action and biophysical functioning – i.e., ecological consonance. A comprehensive theory would encompass these and the well-known and well-studied (from evolutionary biology to psychology to political science) issues of territorial expansion, aggression, collective action, personal health, cognition, and the like.

Selectively permeable boundaries

All systems have boundaries, however arbitrarily they may be drawn. Farmers put fences around their land; fishing communities plot points in nearby waters. Some things flow freely across those boundaries – air, water, insects, plankton, fish, grain, seed, fertilizer, machines, money. Other things must be restricted to maintain the system – users, disease organisms, predators, pollutants, destructive technologies, and overwhelming financial capital. Inshore fisheries are not open to all-comers, nor to all technologies (e.g., giant trawls, dynamite), and many restrain capital flow via owner-operator and residency requirements. Such measures limit the otherwise very human tendencies to expand and to encroach. What's more, many such measures connect to reproductive, trophic, or predator–prey dynamics – e.g., catch limits, harvesting seasons. So the boundaries of resource systems are permeable, but *selectively* permeable. To the extent the selection criteria are ecologically grounded, *selective permeability* is a second-order principle for sustainability.

> *Principle 7*: Because the boundaries of resource systems are inherently permeable and because a free flow of materials and agents can overwhelm a system, selective entry and exit are necessary for system integrity and resilience. To increase the likelihood of sustainable practice, *selective permeability* requires ecologically grounded criteria.

Problem absorption

All environmental problems are, in some sense, both local and global. With ecological frontiers unavailable, a society's attempt to develop by constantly exploiting resources and moving on

bumps up against others' attempts to do likewise. Similarly, attempts to solve one's waste problem by sending it away eventually engenders resistance from those downriver or downwind. Protecting the environment by reducing a pollutant or saving a species often means that the pollutant is transferred to another medium (e.g., from land to air to water) or another species becomes threatened (e.g., a charismatic mammal such as the dolphin is protected while so-called trash fish are ignored to the detriment of the functioning of the food web). When everything is connected and the planet is finite, seemingly local activities cannot depend on an infinite supply of "other places" or on an "away" to throw wastes. To truly solve an environmental problem, that is, to use resources sustainably, is to *absorb the problem*, not displace it.

When a town's aquifer no longer satisfies growing demand for water, it doesn't look for "new supplies," an untapped aquifer (in a "full world" there are none) or a nearby river. Rather, to function in a sustainable society, it looks for ways to develop within the regenerative capacity of its own aquifer. When a near-shore fishery declines, fishers don't move to the next harbor (it's fished, too). Rather, they find ways to reduce fishing pressure. When a timber company can't buy more timberland to feed its mills, it sets milling capacity at a level supportable by existing timberland. When a city's traffic is so heavy that gridlock is a daily occurrence, it doesn't build more parking garages but reduces the incentives for easy access to the city center (which may include *reducing* parking). Problem absorption becomes a necessary condition of sustainable practice and thus another second-order principle of sustainability.

> *Principle 8*: In an ecologically full world, a world full of human impacts, there is no "away" for solving environmental problems. For sustainability, resource users must *absorb environmental problems*, not displace them.

Decision proximity

Decisions about resource use – whether to harvest now and at what rate, for instance – are rarely single-node decisions. Only within a household, say, might decisions be made by those who both produce and consume (i.e., subsistence use). Otherwise, resource decisions result from a sequence of decisions, some resembling straight chains, others networks: a timber owner decides to cut a parcel of timberland followed by a mill owner who decides how to carve up the logs into planks and chips. A shipper then decides where to send the wood for further processing until a retailer decides to carry the product and a consumer decides to buy it. Finally, the consumer, or the consumer's municipality, decides how the discarded product is to be disposed of. Along the way, decisions about waste products – wood waste, heat, pollutants – are made by producers, consumers, and government officials. The more the consequences of those decisions, especially the negative consequences over time, are borne by the decision-makers themselves and relevant populations (downstream or future generations), the more likely they will be made on a sustainable basis (Princen 2002: 103–31). Those whose worldview has a strong agrarian component (e.g., people who procure directly many of their necessary resources and depend on that procurement for their livelihood) and therefore have local knowledge of resource conditions are most likely to perceive and experience the closeness of such decisions. This is *decision proximity*.

The proximity principle is ecologically consonant in part because it follows from an essential feature of well-functioning ecosystems, indeed of any high-integrity complex system, namely, feedback loops. Feedback loops, positive and negative, are more effective the tighter their connection to critical nodes within the system. Systems whose feedback is delayed, fuzzy, remote, or roundabout tend to get too much positive feedback before the negative kicks in, risking overshoot via continuous growth. Similarly, systems that have too-ready negative feedback may

whither as the positive feedback, delayed through time or distant agents, say, is never enough to reach a minimal viable size.

An ecologically informed principle of proximity increases the chances of effective feedback by putting priority on those nested layers of social organization most in tune with the biophysical and social environments. For example, the beginning of a fishing season is often dictated by a national resource agency on a given calendar day, June 1, say. The target species may be offshore that day, ocean currents may have shifted, a storm may be brewing, or predators may have just moved in. Or a fishing family may have suffered a personal tragedy. By the proximity principle, the start decision would go to those who best know such conditions and most depend on the resource. In this example, it is those who work on the water and whose livelihood depends on knowing how the combination of currents, weather, and predator–prey relations affects the target species and whose success depends on everyone getting a fair chance regardless of personal circumstance. Of course, fisheries biologists and remote-sensing technicians will also have data. But the essential knowledge, that which combines direct experience and need, will be held by the fishers. What's more, they will know what non-fishers cannot know: whether boats are ready to go out, crews have arrived, loans secured. The conditions in the harbor constitute the relevant social system at that particular time, what also has its feedback loops. Knowing whether it makes sense to go out on a given day is therefore hardly a simple question; any arbitrariness in setting the start day effectively erases large amounts of relevant information – that is, it breaks essential feedback loops between the biophysical and social systems.

Notice that in this construction of knowledge and decision authority relevant to sustainable resource use, "making sense" is, from a systems perspective, shorthand for effective feedback loops between the biophysical and social systems. From a perceptual perspective, it is drawing on all relevant senses (sight, touch, smell, say), what those who steer a boat experience, and those who stare at a computer screen do not (Abram 1996). It is in the fisher's realm of *practice* that key actors "read" the environment and "the environment" reacts, prompting those actors to adjust behavior, to cope, to live *with* their environment, not simply manage that environment (Bavington 2002). It is here that incentives for short-term profit align with incentives for long-term productiveness. In short, this is where sustainable practice is most likely to be enacted.

Proximity is thus not a romantic ideal. It is a *scientific ideal*, a social scientific and biophysically scientific ideal, and it is an *experiential ideal*, an ideal born of practice and need. What is more, it is an economic ideal if, by "economic," we mean economical (i.e., frugal, prudent) use of a resource over the long term, the ecologically meaningful long term (Daly and Cobb 1989).

> *Principle 9*: Because *decisions proximate* to the resource draw on experiential knowledge to tighten feedback loops, feedback within and between social and biophysical systems, such decisions are more likely to be sustainable than those distal or distanced, whether in space or time or both.

The political grounding: the source of third-order principles

Third-order principles are distal to the ecological, proximate to the mechanistic and strategic. That is, they are tightly associated with the economistic, the industrial, the commercial, the political – in short, with all that makes for an endlessly expanding, fossil-fuel-based, consumer-oriented political economy. Consequently, third-order principles would appear to have little to contribute to a sustainable economy, and, in fact, would appear to be a sustainable economy's very nemesis. But the premise here is that a broad-scale societal transformation necessarily starts with what exists (De Young and Princen 2012: 325–40). Yet not with all that exists, not with

every behavioral assumption, every value, every concept. Rather, the transformation selects from what exists, much as new species in effect select from genetic material that exists, or new technologies select from scientific knowledge (and technologies) that exist. And the criteria for the social selection are, once again, ecological, not industrial, not mechanical, not expansionist, not colonial, but ecological – biophysical, cyclical, fluctuating, relational.

So third-order principles, being distal to the biophysical, relate to the social organization for sustainability by analogy, by the abstract social constructions of markets and laws, of physics, chemistry, and biology. They are disconnected from long-term biophysical functioning yet necessary for other goals – e.g., material wealth generation, waste reduction, justice (see Chapter 24). They are, therefore, technical, economic (as in market behavior), legal, moral (see Chapter 25). They accept contemporary practices, however unsustainable, as an unavoidable part of the platform from which a sustainability trajectory can be launched. They are, in short, a necessary part of an adaptive strategy since all adaptations, physical and cultural, proceed from preexisting conditions. And they are a necessary part of a political strategy since all politics, local to the global, are about influence, about marshaling forms of power (ideas, knowledge, resources, manpower) to chart a course.

Priority use

In fisheries law, formal and common, subsistence fishers are typically accorded top priority followed by commercial and sport fishers. The practices may be identical – longlining, say, or setting crab pots – but the uses are widely recognized as different: those who fish to put food on the table, their own table and that of their families and immediate community, take precedence over those who fish to sell in a market and those who fish for recreation. Similar priorities of use exist in other forms of hunting – deer, birds, rodents – and gathering – wood, herbs, thatch – especially where some kind of common property, public or open or common, exists (Birkes et al. 1998). Extensions to private property regimes would follow logically to the extent such regimes have common or public components, or both, which is generally the case (Ostrom 1990). For instance, in the face of water privatization efforts around the world, water law is increasingly moving toward a presumption that water *sources* – headwaters, aquifers, lakes, and springs – must be held publicly even if downstream flows are extracted and traded privately (Palaniappan et al. 2004).

These fishing and water use examples suggest that the general case for a priority use principle in resource use situations is where competition is high and technologies and capital access vary. As an ethic, the priority use principle is commonsensical. As an organizational principle it makes common sense – and ecological sense – as well: subsistence use tends to have more brakes, more built-in mechanisms for restraint than commercial and sport uses. And, as with the proximity principle, users "sense" their environment differently depending on the mode of resource use – subsistence versus market versus recreation. So if the priority use principle makes sense ethically, organizationally, and ecologically, it is noteworthy that it does not make sense economically, or, more accurately, economistically. An economistically oriented policy-maker would measure the value (read economic value) of each competing use and prescribe a mix of uses that equates marginal values. In other words, following the economic principles of maximization and efficiency with market price the metric, subsistence would prevail, even exist, only if the dollar value of the fish consumed exceeded that sold in the market or the dollar value for sport fishing exceeded that of subsistence. The fact that such situations rarely, if ever, occur (wealthy sports individuals can always outbid subsistence fishers) suggests that market principles are orthogonal to the priority use principle. And, because the priority use principle is demonstrably ecological

and market principles are not (see efficiency below), it suggests that market principles can, at best, only be subsidiary, not primary, in an ecologically sustainable order (see Principle 5).

> *Principle 10*: Because subsistence use meets basic needs directly, is tied to the resource, has built-in restraints, and tends to operate for the long term, it has *priority of use* in a sustainable economy. Commercial use meets needs indirectly, is mobile, tends toward expansion, and responds to short-term incentives. Subsistence use thus trumps commercial use of resources in a sustainable economy.

Efficiency

Resource efficiency occurs when the ratio of individual or societal benefit to resources expended (and wastes emitted) increases. Sustainable-use efficiency occurs when that ratio increases *and* resource use levels off or reduces so as to stay within regenerative and assimilative capacities. Put differently, under conditions of *excess throughput*, an efficiency gain can be presumed beneficial to the goal of sustainability if and only if it does not result in a net increase in consumption and deposition and there is no net loss in social welfare (see Chapter 16). Otherwise, a prudent approach to efficiency measures would be to assume that, in a growth-centric economy, efficiency gains will be taken to *increase* resource use and waste deposition: more efficient automobile engines will be more powerful and the cars will be driven faster and farther; more efficient light bulbs will result in more lighting.

A stringent efficiency, one aimed at reducing or leveling resource use, contributes to a reversal in a trend of ever-increasing use and the threat of overshoot. Coupled with caps and buffers, such an efficiency, a throughput-reducing or throughput-leveling efficiency, helps put a society on a sustainable path and is thus a third-order principle for sustainability.

> *Principle 11*: To contribute to sustainability, *efficiency gains* in resource use must be coupled with measures (e.g., ecological design principles 1–8) that hold resource use within ecological capaciies. The result is a net reduction or leveling of resource use or waste sink filling.

Propensity and primacy

Principles for sustainability will be effective to the extent they aim at human propensities, individual and collective, to exceed biophysical capacity. These propensities have likely been shared by our ancestors, including those who appear to have lived sustainably. And many are shared by other animals. One might, consequently, claim that propensities toward excess are perfectly "human," even "natural," and hence should not be tampered with: It is who we are. When they get us in real trouble, we'll adjust; we always have. There is a certain truth in this position, a truth worth examining in a project of designing systems for global sustainability. First, yes, as a species we've always had a growth imperative, a tendency to fill a habitat, create new niches, grow our population, consume at increasing rates, and move on. In such a pattern, we've extended our ecological reach around the world, from savannah to tundra, from desert to mountain, from river bed to ocean beach. We've always done this and always either adapted or crashed. Those groups who adapted did so in part by creating their own niche and in part by squeezing out others – predators and unwanted trees, for example. In that sense, they weren't unlike the starlings and kudzu that have spread globally.

For human communities, though, the adaptations were both ecological and cultural; success was not a matter of continuous expansion, of endless "moving on." Among those who came to the Nile River, for example, the successful ones were those who settled and developed an agriculture to match the annual flooding. And that agriculture was indeed cultural, a set of institutions for using and sharing water, and doing so not just for a few seasons, but for generation after generation, for some 5,000 years as it were. At the center of those institutions were *principles*, principles derived from biophysical conditions and social demands. As far as is known, the principles and corresponding rules evolved over centuries, possibly the entire 5,000 years. Whatever agricultural practices the early peoples brought with them, such practices most likely changed dramatically (from those, say, of the desert or savannah or marshland). What's more, the river changed as the flow changed, evaporation increased, the delta shifted, and so forth. It was in constant flux. The two, the human system and the riparian system, co-evolved, both, in a sense, in response to the other and all without degrading one another.

Second, the notion of "propensity" itself requires explanation. Humans have a broad range of propensities, from competition to cooperation, selfishness to altruism, exploitation to nurturing. To say people have a propensity – say, competitiveness – is not to say that that propensity is exclusive or dominant. Few would dispute that humans are competitive. But we are also cooperative. Pick the most competitive individual you've ever known, or the most ruthless corporation, and you can find a cooperative side. The individual assembles a team that cooperates to out-compete opponents. The corporation cooperates within its board and among its managers and staff, and it colludes with governments (a form of cooperation with a negative connotation, but cooperation nonetheless).

So along any continuum – cooperation–competition, selfishness–altruism, say – human behavior can be located simultaneously at different points. The issue from a social change perspective is this: What are the conditions under which humans lean one way and not the other with respect to a social goal? Under what conditions will humans be mostly cooperative or mostly competitive, mostly selfish or mostly altruistic in society's efforts to promote economic development or democracy or human rights? With respect to the goal of long-term resource use (i.e., sustainability), what propensities contribute to sufficient use, which do not, and what conditions encourage those that do? In a sense, the essence of the sustainability project is just this – identifying relevant propensities and specifying their enabling conditions. It is not persuading people to love nature, not bribing them to act correctly, not scaring them out of their denial and lethargy (Norgaard 2011).

The challenge before us today is one of dealing with our "natural" propensities, what we indeed have a long history of doing and, arguably, a mental capacity to handle. Only the scale is greater. Spatially, it is not one people and one river valley, as with the Egyptians, but all peoples and the entire globe. Temporally, it is not marginal change by trial and error over decades and centuries, but the imperative to rapidly arrest ecological decline in a matter of years and decades. But just as every Egyptian farmer and village developed its own practices within the larger Nile system, so each nation, each region, even each village and borough will develop its own practices and, when necessary, will do so rapidly. What they will need is a set of overarching principles, principles consonant with biophysical realities of the planet's ecosystems and with the social realities of diverse societies. Those principles, to repeat, must aim at human propensities to exceed ecological capacity, propensities that may have a long biological and cultural history, but for which countervailing cultural adaptations – norms and principles, myths and metaphors – also have a long history. In other words, there's nothing new in deliberately constructing new norms and principles, new myths and metaphors, all to meet the peculiarities of an ecological challenge. What may be new is the scale, spatial and temporal.

Conclusion

The core elements of institutions are norms and principles. They set the broad normative context – the "shoulds" – from which specifics – rules, procedures, practices, habits, rituals, laws, regulations, treaties – follow. Long-standing institutions may develop norms and principles over time through trial and error. Their rules and procedures emerge to meet needs while norms and principles are implicit yet governing. New institutions may start from scratch and, if the need is pressing, require not just new rules and procedures but new, and explicit, norms and principles. In fact, arguably all new institutions and all substantial changes in existing institutions require the explicit articulation of norms and principles from which specifics follow. It has certainly been the case for the creation of a world trade order (centering on the World Trade Organization), a Western security alliance (centering on the North Atlantic Treaty Organization), international peacemaking (centering on the United Nations), not to mention the founding of new constitutional democracies. In all cases, the test for an institution's norms and principles is their *congruence* with the nature of the need: commercial institutions require market transparency and enforceable contracts, military institutions require hierarchy and loyalty, diplomatic institutions require prevention and collective decision-making, democracies require shared powers and due process.

With the need for sustainability becoming ever more pressing, from the local to the global, old institutions must change and new institutions must be devised. While much of sustainability has features in common with existing institutions – the need for cooperation and the minimization of waste, for instance – what defines sustainability is its focus on the ecological, especially human *interaction* with the biophysical, and a long-term orientation. Norms and principles *for* sustainability must account for these special features. In fact, to construct and implement a strong notion of sustainability, a notion that is more than conventional conservation or pollution control, such norms and principles must be accorded *primacy* in the building of institutions for sustainability. The three propositions and eleven principles developed here thus constitute a provisional set of conditions under which sustainability might proceed. They can also serve as criteria to evaluate projects and policies purporting to be sustainable.

References

Abram, D. (1996) *The Spell of the Sensuous: Perception and Language in a More-than-Human World*, New York: Pantheon Books.

Acheson, J.A. (1988) *The Lobster Gangs of Maine*, Hanover, NH: University Press of New England.

Bavington, D. (2002) "Managerial Ecology and its Discontents: Exploring the Complexities of Control, Careful Use and Coping in Resource and Environmental Management", *Environments* 30: 3–21.

Birkes, F., Folke, C., and Colding, J. (eds) (1998) *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, Cambridge: Cambridge University Press.

Costanza, R., Kemp, W.M., and Boynton, W.R. (1993) "Predictability, Scale, and Biodiversity in Coastal and Estuarine Ecosystems: Implications for Management", *Ambio* 22: 88–96.

Daly, H.E. and Cobb, J.B., Jr. (1989) *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*, Boston, MA: Beacon Press.

Daly, H.E. and Townsend, K.N. (1993) *Valuing the Earth: Economics, Ecology, Ethics*, Cambridge, MA: MIT Press.

De Young, R. and Princen, T. (2012) *Localization: Adaptations for the Coming Downshift*, Cambridge, MA: MIT Press.

Dryzek, J.S. (1987) *Rational Ecology: Environment and Political Economy*, New York: Basil Blackwell.

Gadgil, M. and Guha, R. (1992) *This Fissured Land: An Ecological History of India*, Berkeley: University of California Press.

International Joint Commission (1994) *Seventh Biennial Report under the Great Lakes Water Quality Agreement of 1978 to the Governments of the United States and Canada and the State and Provincial Governments of the Great Lakes Basin*, Windsor, Ontario: International Joint Commission.

Kay, J.K. and Schneider, E. (1994) "Embracing Complexity: The Challenge of the Ecosystem Approach", *Alternatives* 20: 32–9.

Norgaard, K. (2011) *Living in Denial: Climate Change, Emotions, and Everyday Life*, Cambridge, MA: MIT Press.

Ostrom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge: Cambridge University Press.

Palaniappan, M., Gleick, P.H., Hunt, C., and Srinivasan, V. (2004) "Water Privatization Principles and Practices", in P.H. Gleick, *The World's Water: 2004–2005: The Biennial Report on Freshwater Resources*, Washington, DC: Island Press.

Perrings, C. (1991) "Reserved Rationality and the Precautionary Principle: Technological Change, Time and Uncertainty in Environmental Decision Making", in R. Costanza (ed.) *Ecological Economics: The Science and Management of Sustainability*, New York: Columbia University Press.

Princen, T. (2010a) "Speaking of Sustainability: The Potential of Metaphor", *Sustainability: Science, Practice, & Policy* 6: 1–6, http://ejournal.nbii.org.

—— (2010b) "To Sustainabilize: The Adaptive Strategy of Worldviews", in T. Princen, *Treading Softly: Paths to Ecological Order*, Cambridge, MA: MIT Press.

—— (2005) *The Logic of Sufficiency*, Cambridge, MA: MIT Press.

—— (2002) "Distancing: Consumption and the Severing of Feedback", in T. Princen, M. Maniates, and K. Conca (eds) *Confronting Consumption*, Cambridge, MA: MIT Press.

—— (1996) "The Zero Option and Ecological Rationality in International Environmental Politics", *International Environmental Affairs* 8: 27–71.

Schneider, S.H. and Root, T.L. (1996) "Ecological Implications of Climate Change will Include Surprises", *Biodiversity and Conservation* 5: 1109–19.

Scot, J.C. (1998) *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, New Haven, CT: Yale University Press.

16

Consumption

Institutions and actors

Gabriela Kütting

Consumption is an economic and social activity that can be analyzed as being at the end of the production chain but also as a political and economic institution. The world consumes at a rate that exceeds the planet's capacity to regenerate itself. This is why consumption is such an important topic and at the heart of the global environmental politics concern. Academics who study consumption address the type of economic system we have and its ability to deal with climate change and environmental problems in general. They also analyze the behavioral habits of the "consuming classes". This chapter will provide an overview of consumption in global environmental politics. It is organized in the following way: First, the consumption will be outlined in a historical context. Then the political institutions of consumption in a global framework will be analyzed. Finally, the chapter will critically analyze consumption as a social activity and explore the role of the individual, in the process exploring the notion of "sustainable consumption".

The history of consumption

Depending on how consumption is defined, it is of course an activity that is integral to human survival. If we did not consume water and food, we would not be able to sustain ourselves. However, with increasing technological progress, people have started to extract more resources from the planet than it has the capacity to replenish. This results in sterile soils, depleted seas, polluted air and water and ultimately climate change. It can also mean that in certain localities people who are dependent on their immediate environment for sourcing cannot fulfill their needs any longer.

Historically, different ideological approaches to consumption date the point differently where consumption becomes unsustainable from an environmental point of view. Some approaches see it as a scientific point where carrying capacity of the planet is reached; other approaches see it as a systemic point where the economic activity of a society went beyond production for subsistence (production for accumulation) or where the production system per se was based on an unsustainable model (such as the modern capitalist system based on mass production and a fossil fuel economy). All of these approaches, and incidentally many other approaches to global environmental politics that do not put consumption to the forefront of their concerns, agree that the Earth is out of balance in terms of the effects of human activity. They agree that the

damaged relationship between society and nature, or between human beings and the environment, needs to be improved.

From a historical perspective, one approach is to talk about the rise of consumerism as opposed to consumption itself, implying that consumerism is qualitatively different from the act of consumption. Campbell (1987) argues that the rise of a romantic and a Protestant ethic coincides with the evolution of the spirit of modern consumerism. McKendrick, Brewer and Plumb (1982) discuss the consumer revolution and the commercialization of economics, particularly in the field of fashion. They argue that, in addition to economic changes that came with the industrial revolution, industrialized society also underwent a cultural change that made people more consumption-oriented or consumerist. Furthermore, consumption has obviously been integrated into economic analysis through the inclusion of the "demand curve".

Literature suggests that changes in consumerism can be equated with the rise of modern capitalism and that the evolution of a consumerist ethic contributed to the success of the industrial revolution and modern forms of economic organization. In the postwar period, a definite change in the ethics of consumption can be discerned in the 1960s and 1970s with the spread of post-Fordism (see below), which in turn coincided with what is conceived of as the rise of globalization (see Chapter 22). Both Campbell (1987) and McKendrick et al. (1982) trace changes in consumption patterns in the late eighteenth century back to a shift in the nascent middle classes, which aspired to emulate the spending behavior of the upper classes. The early industrial revolution produced consumer rather than capital goods, and by the eighteenth century most people in Britain, the home of the industrial revolution, had disposable incomes that they tended to spend on consumer goods (Campbell 1987: 19–25). Although the phenomena of consumer spending and of emulating higher classes are not new in history, the changing income structure of early modern capitalism led to yet more disposable income in the middle classes.

McKendrick et al. (1982) also note the increasing velocity of changes in fashion as a key contribution to increased consumerism. Up to about 1750 ladies' fashions took decades or longer to change, while between 1753 and 1757 fashion changed dramatically in the course of only four years, and between 1776 and 1777 the change took only one year (1982: 56). The enthusiasm to be fashionable permeated all spheres of society and was carefully manipulated by the fashion industry. This was a Western phenomenon; fashions in other parts of the world, such as Japan, China, North Africa or the Muslim countries, remained virtually the same for hundreds of years (1982: 36). Another increase in the velocity of fashion can be identified with the rise of globalization and post-Fordism in the 1970s when fashion/clothing gradually became cheaper and consumption rates of fashion items increased exponentially, further accelerating fashion changes in the 1980s and 1990s.

This connection between socio-cultural factors in consumption and production is particularly obvious in the case of commodity chain analysis. Loosely based on world systems theory, this approach takes a linear view of the production process with consumption as the final stage of production. Commodity chains are a good analytical tool for tracing the global nature of the production process, without which the nature of consumption cannot be understood. This type of analysis takes a commodity as the starting point for analyzing the political, economic, social and, to a much lesser extent, ecological linkages between the different production and consumption stages. Therefore commodity chain analysis is not exclusively concerned with the different stages of production in the life of a commodity per se; it also places commodities in a social context.

Hopkins and Wallerstein describe commodity chains as networks "of labor and production processes whose end result is a finished commodity" (1986: 159 quoted in Gereffi and Korzeniewicz 1994). Thus, a global commodity chain comprises not only the different production processes from raw material to finished product but also links households, firms, states and social actors across spatial and temporal boundaries and analyzes their relationship with each other. There are

producer-driven and consumer-driven commodity chains. Commodity chain analysis comprises a strong historical component in that it sees variances in the production process over time and it is generally a world-systems approach and can also be seen as a general historical materialist approach. As such, it obviously places its emphasis on production rather than consumption and sees consumption primarily as a spatial issue in the context of unequal social relations.

As the primary venue of consumption, households are more or less integrated into commodity chain analysis as the final destination of the product but do not link back into the chain as a factor influencing production processes. Thus commodity chain analysis takes a linear approach rather than letting the ethic of consumption feed back into the production process through attitude changes, taste, social consciousness and so forth. Consumption by consumers/households is seen as the last link in the chain rather than as a structural force or agent influencing production or other social processes.

The commodity chain approach traditionally operates without locating itself in its environmental context. This means it regards resources as inputs, disregards waste output and sidelines the finite nature of resources and sinks. In short, it does not take account of the fact that the social construct of an economy is physically located within the global ecosystem and is dependent on drawing on its resources as well as on putting its waste into this system. The finite nature of the resources used for production and the fragile nature of the ecosystem as a recipient of waste products (in the form of pollution) are complicating factors that need to be incorporated into commodity chain analysis because they are also part of the chain. It could be argued that part of this task is actually fulfilled in a life cycle analysis approach. Life cycle analysis "measures the environmental impacts of products over their entire life cycle from cradle to grave" (Berkhout 1997). However, life cycle analysis is part of the environmental management school of thought rather than part of commodity chain analysis.

Consumption or consumerism is often reduced to the spending power of an individual, which is dependent on her or his position within the division of labor. Therefore the increasingly global division of labor spatially distanciates the locations of production and consumption, meaning that there is no (or only a distant) relationship between the production and the consumption process. In the twentieth century, this division of labor was characterized by Taylorism, Fordism and post-Fordism (Lipiètz 1997: 2). All three models are based on making consumer goods available to a wider user circle through a revised wage structure and through mass production, thus making consumer goods cheaper.

Whilst Taylorism was mainly about the streamlining of the production process, Fordism had a more definite consumerist argument to it. The idea behind Fordism was not only the automation of the production process but also the making available of mass-produced consumer goods to a wider base. The rationale was simple: there was a limited market for capital goods such as cars because these products have a relatively long life span and there were only a limited number of consumers that could afford these products. Therefore new markets needed to be created and the logical solution was to make luxury consumer goods available to workers by reducing the prices through mass production and increasing workers' wages. Thus cars became available for much larger segments of society. In the 1950s and 1960s Fordism was also characterized by stable jobs for life, wage settlements that meant steadily increasing wages every year, a general rise in the standard of living, redistributive state policies and institutionalized collective bargaining. These conditions were meant to secure an outlet for production and led to drastically increased consumption behavior as households spent their income, as well as leading to vastly increased expectations in terms of standards of living.

However, this increase in consumption and standard of living was limited to the developed world, and mostly countries of the Organization for Economic Cooperation and Development

(OECD). Although production was becoming internationalized at this stage, the consuming classes were still almost exclusively situated in the North/West. At the end of the 1960s, markets in industrialized countries were slowly becoming saturated. Consumer spending was down and profitability of companies went down, too (Mittelman 1997). Logically, the perks of job security and ever-increasing wages in real terms could not be sustained in this period. Rather than expanding markets in the search for new consumers, other changes happened. As Hoogvelt summarizes:

> By the late 1960s that distinctive period of mass production and Fordist accumulation had come to an end. The rigidities of the Fordist regime showed up with irrepressible frequency. There were many instances of rigidity at all levels but the most important was undoubtedly the deepening global inequalities. These put a limit on the further expansion of that particular system of mass production. There was a global demand crisis and thus capitalism had to reconstitute itself on an entirely new basis. In a world economy where 20 per cent of the population has 150 times the spending capacity of the poorest 20 per cent, clearly a new production system was needed that could fully exploit consumer demand from the 'have-lots' in an ever fiercer climate of global competition.
>
> (Hoogvelt 1997: 93)

Enter the era of post-Fordism, which is characterized by economies of flexibility. The economic instability of the 1970s made workers in industrialized countries lose many of the perks they had quickly become accustomed to, such as more-or-less permanent jobs, generous wage settlements, social benefits. As Cox puts it: "The new strategies emphasized a weakening of trade union power, cutting of state budgets (especially for social policy), deregulation, privatization and priority to international competitiveness" (1996: 22) The new economic organization was much leaner and based on maximizing profits. Conca sees the post-Fordist mode of production to be based on flexible capital, vertical disintegration and select markets, that is, "flexible specialization" (2001: 61). This was done not so much by broadening the consumer base but by making products cheaper and more easily available for those who had the spending power.

The post-Fordist flexible mode of production has not only led to a separation of the activities of production and consumption, with the consequence that consumers are not aware of the ethical and environmental conditions under which the product they consume was made. It has also led to a further globalizing of production, which is not matched by a globalized consumption pattern (Kütting 2004). While there is a very definite rise in consumption in many developing countries and consuming middle classes have established themselves, overall consumption and production trajectories still show that the vast bulk of consumption takes place in high GNP countries (although this is changing). As is often said, the workers who make the shirts or electronic gadgets in the factories in many Asian countries could never afford to wear or use them.

Thus the rise of consumerism is embedded into the economic system. It has increased exponentially with the rise of modern capitalism and the industrial revolution. It reached new heights with the beginning of the age of globalization in the 1970s, which is closely linked to the principles of a post-Fordist way of production. This process goes hand in hand with the institutionalization of consumption at the global level.

Institutionalization and the concept of sustainable consumption

The focus on production as the precursor to consumption is obviously a natural method of analysis but some authors argue that it is not a useful starting point because it neglects certain angles of the problem of overconsumption. Of course there are fewer producers than individual

consumers, and from that point of view it is easier to regulate production processes to make them more sustainable. It is also politically more palatable to propose policies regulating production than to talk about curbing consumption and questioning lifestyles. By regulating production and not framing the problem in terms of unsustainable consumption, it is also possible to avoid a discussion on the central question, namely whether a system based on infinite economic growth is sustainable. It also does not address the question of global equity, where extremely unequal patterns of consumption mean that an individual in the United States consumes 80 times as many resources as an individual in one of the world's poorest countries. These issues are particularly pertinent in the negotiations on the Kyoto Protocol and per capita greenhouse gas emissions in rising powers such as India and China, but also when we measure greenhouse gas emissions by the final recipient of the goods produced rather than by the producer (see Chapters 28 and 23).

Consumption as a political institution of importance has been recognized by international organizations dealing with sustainable development. But, like sustainable development in general, it suffers from definitional problems: what is sustainable can be defined in vastly different ways depending on the author's environmental ideology (see Chapter 15). Doris Fuchs points out that in 1994 the Oslo Roundtable defined sustainable consumption as "the use of services and related products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations" (Ministry of the Environment Norway 1994 quoted in Fuchs and Boll 2010). Sustainable consumption as a political concept was integrated into the global governance agenda with the United Nations Conference on Environment and Development's *Agenda 21* (1992), which dedicated chapter four to the topic. As a result, several international organizations and nongovernmental organizations (NGOs) have espoused the topic of consumption, but limited progress in institutionalizing the concept has been made.

The UN's Commission on Sustainable Development is one of the policy drivers in the field of sustainable consumption. In 1995 it published a report, the *International Work Program on Changing Consumption and Production Patterns*, and it commissioned several research projects on consumption trends and policies. In particular, it advocated the establishment of sustainable consumption indicators as well as consumer protection guidelines. However, critics argue that none of these efforts made their way into official reports and documents (Fuchs and Boll 2010). The United Nations Environment Program (UNEP) also has a Sustainable Consumption Program, which is located in the Production and Consumption Unit of the Division of Technology, Industry, and Economics (DTIE). It aims to study and analyze the forces behind global consumption patterns in order to help businesses and other stakeholders find suitable strategies to improve their activities. Its work is focused on helping businesses innovate and achieve efficiency gains in production that filter through to consumption activities. UNEP published a report on "Consumption Opportunities" in 2001, raising the issue of consumption quantity as opposed to consumption quality, but it did not take this initiative any further and also did not specifically address the issue of highly consuming countries. With its *Global Status Report* (UNEP 2002), UNEP highlighted six core areas in which future work or research on sustainable consumption ought to be concentrated. These deal with definitional issues, development of indicators, and the interplay between local and global policies. However, UNEP has so far not indicated a desire to be a leading actor in the consumption issue.

Another international organization that has taken on the issue of consumption is the OECD. This is a particularly pertinent organization since only about 20 percent of the world's population lives within the borders of the OECD region, yet they consume about 80 percent of the

world's resources. The OECD integrated Agenda 21's aims into its work by setting up a work program in 1995 called *Environmental Impacts of Production and Consumption*. Again, the focus was on efficient use of resources and encouraging suitable technological change. In other words, this work program was about making economic growth more sustainable rather than debating the nature of growth per se. The OECD referred to this as "sustainable consumption". The OECD focused its efforts on development of policy instruments for sustainable consumption in the fields of tourism, food, energy and water, as well as the volume of waste generated. In 2008, the OECD widened its scope and included equity aspects in its policy research. If followed through consistently, such an angle could lead to a new life and different focus in its efforts to develop a sustainable consumption framework.

The European Union (EU) arguably has the world's most rigorous environmental policy as well as having enshrined the precautionary principle and the polluter-pays principle in its framework. Not surprisingly it also adopted a *Sustainable Development Strategy*, which included dimensions on sustainable production and consumption. Nevertheless, it was not until 2007 that a monitoring report was first published by Eurostat. This report paid homage to the idea of sustainable growth through greater technological efficiency. It made the point that effective change can also be achieved through changing production and consumption patterns. Arguably, the EU has the most promising framework of all international governance institutions to tackle the problem of consumption. However, as Fuchs (Fuchs and Boll 2010) argues, while the EU has taken a number of initiatives and in many ways is the leading actor promoting sustainable consumption, it has not consistently followed through with this intention, and it is still linked to the belief of sustainable economic growth as the way forward.

The definition, analysis and institutionalization of the concept of consumption is not confined to the role of international organizations and attempts to produce a global governance framework. National governments can also be instrumental in this field. The Norwegian and Danish governments tried to push the global consumption agenda by hosting workshops and facilitating the efforts of global governance institutions. However, these efforts failed to make much headway. The United Kingdom government established a Commission on Sustainable Development. As part of its remit, the Commission published a report in 2009 called "Prosperity without Growth?", which "analyses the complex relationships between growth, environmental crises and social recession." (Sustainable Development Commission 2009). The Commission's contribution to the field of sustainable consumption was seminal in its own right, but its work was cut short with the change of government in the UK in 2010. However, the report constitutes one of the most important documents in providing guidance toward a transition to an economic system not dependent on infinite economic growth.

Many initiatives from outside the OECD countries have also developed interesting and important frameworks addressing consumption, consumerism and the growth economy. Bhutan developed its Gross National Happiness Index as early as 1972 because it was not satisfied with the exclusive material focus of the standard GNP measurement. The index defines happiness as inclusive of harmonious social relations and harmony between nature and society. While this is not a blueprint for sustainable development, it has become an oft-cited model for alternatives to the sole focus on material well-being engrained in conventional measures. Another more recent model is the concept of *buen vivir* that has been enshrined in at least two national constitutions in Latin America. Early forms of the *buen vivir* concept arose in resistance to classical development policies applied in Latin America, which were perceived not to be working economically as well as having a negative impact on society and environment. As a result, a strand of social thinkers felt it was time to abandon the classical development model embedded through the Washington Consensus. *Buen vivir* finds its origins in contributions from indigenous

knowledge, which culturally lack concepts of development and progress. Indigenous concepts in Ecuador and Bolivia stress the fullness of life in a community setting, in harmony with society and nature (Gudynas 2011). Both countries incorporated the concept of *buen vivir* into their constitutions in 2008 and 2009 respectively. In Bolivia, it is included as part of the "moral and ethical principles describing the values, ends and objectives of the State" (Gudynas 2011: 442). The constitution of Ecuador uses a framework of rights to integrate *buen vivir*. As Gudynas puts it, the concept "is not an ethical principle for the State as in Bolivia, but a complex set of several rights, most of them found in the Western tradition, although fitted in a different framework. These are in the same hierarchy level with another set of rights, that include, among others, those of freedom, participation, communities, protection, and also the rights of Nature" (2011: 443).

Contributions of the national governments of the UK (under the Labour government), Bhutan, Boliva and Ecuador are seminal. They are probably the most promising starting points for an institutionalization of the concept of sustainable consumption.

Nongovernmental organizations have also tried to make their contributions to the consumption problematique. They are at liberty to ask fundamental questions about lifestyles and the underlying values of the consumer society. Movements such as *voluntary simplicity* or *need not want*, local currency organizations, fair trade networks, the freecycle movement and others have drawn substantial support, but there is no collaboration between these movements to organize larger action. While many of these movements and NGOs have a large following and even a global resonance, this does not translate into the means to contribute to a global governance of consumption (see Chapter 14).

The business sector has also addressed the issue of consumption, for example through a consultation exercise with consumers and report by the World Business Council for Sustainable Development (WBCSD 2002). Not surprisingly, the business community has seen itself as responsible for increasing ecological efficiency, but it has firmly placed responsibility for levels of consumption with the consumer. So, one could argue that consumption is a difficult sell for many actors because it threatens many interests. From that point of view, it is dependent on consumers making rational and ethical choices for the benefit of future generations and less fortunate contemporaries. However, social psychology research in other fields has shown that only a minority of the population will actively make these choices. They need an institutional framework as an incentive, yet an institutional framework will only be constructed when there is sufficient political pressure to do so (see Chapters 15, 25 and 27).

Sustainable consumption: the problems

Consumption as a subject of political economy and as a subject of global environmental politics has received substantial attention from a variety of perspectives. First of all, consumption as a political activity has been highlighted, whether in shareholder activism, sustainable consumption, the sociology of consumption, or the relationship between consumption and production. The role of unequal consumption has been raised as an equity issue. Likewise, the ethics of consumption has seen a wealth of writings. While some of these are normative (Schor and Holt 2000; Jackson 2006), some are empirical and deal with increasing consumer choices and ethical consumerism (Dauvergne 2008; Kütting 2010). The literature can be condensed into two questions: How to consume? and How much to consume? The lion's share of the literature is on the former question, while the latter question is generally avoided because it is so contested. A path-breaking work on the topic of consumption is Princen, Maniates and Conca's *Confronting Consumption* (2002). The book addresses the concept and issue of consumption from a variety

of angles, but is based on the premise that some resources are finite and that the capacity of sinks (places to put waste and pollution) is also finite.

There is an ever-increasing world population. While the issue of population growth is contested, with some arguing that the population increase will put dramatic pressure on resources, others argue that it is an issue of distribution and that there would be plenty left over for everybody if unequal consumption levels could be tackled. While it is uncontested that the world's richest people consume far more than the poorest, it is also true that the ranks of the high consumers are swelling. Therefore the problem of population is real, even if not quite in the terms presented by those that point to population growth in an undifferentiated manner.

Clearly, for a sustainable future, the pressure on resources and sinks needs to ease. Modern technology and ecological modernization may provide at least some of the tools to achieve this, but they do not supply the distribution mechanisms that will provide more equal access to resources and sinks, nor do they address the question of how such a redistribution could be handled given the entrenched political and economic interests behind a consumerist economic system. Recent technological developments have shown that the availability of more sustainable technology alone is not enough to achieve more equity and sustainability, or to eradicate poverty, because the cost and access to such technologies makes them unattainable to the majority of people who need them most. Some would go much further, as, for example, David Harvey, who argues that the current international or global system can only be described as "accumulation by dispossession" (Harvey 2003: 137). Thus, the existence of solutions to a particular problem does not necessarily solve it. And this is exactly where the notion of sacrifice becomes important because it highlights the chasm between technological capability and political reality.

Michael Maniates and John Meyer (2010) have identified the concept of sacrifice as an important issue that society ought to engage with, yet they have not yet addressed the question of a redistribution of resources. Thomas Princen's *Logic of Sufficiency* (2006) is an important text on consumption issues, in part because it does not suggest sacrifice or radical lifestyle change. Rather, it is based on questioning the logic that efficiency, as defined by economies of scale and instantly maximized profits without regard for the future, is the best organizing principle for economy and society. Consumer psychology writers have conducted studies that show that instant gratification and indiscriminate material consumption actually lead to less rather than more happiness. A burgeoning literature on the ethics of consumption has questioned neoliberal lifestyles. Of course there are various civil society movements doing the same. Princen's work contributes to and defines this literature in a new way by using the logic of sufficiency (see Chapter 15). He illustrates with case studies that the concept of sufficiency can indeed by applied to mainstream economic, social and political scenarios, using diverse examples of citizens of a Toronto island, Maine fishers and a West coast logging company. However, his studies are all of a particularly local nature and deal with the local part of society's interactions. It is not clear whether the concept of sufficiency can be applied to the global level or whether it would generate the kind of political consensus needed for a global framework.

A relatively new school of thought, also touching on consumption, is found in the literature on "degrowth". Academics write about degrowth from a variety of perspectives, basing their ideas around three pillars. The first pillar is culturalist. Like the *buen vivir* concept, it is based on the understanding that it may not be the most appropriate path for developing countries to follow in the footsteps of the most industrialized countries. This goes back to earlier critiques of modernization theory. The second pillar of degrowth takes its source from a more democratic and pluralist understanding of how economic and social systems ought to function. The third pillar is derived from ecology and the need for environment–society relations that reflect the finite nature of many ecosystems and the human dependence on them. Degrowth is the logical

pathway to take in order to ensure the sustainability of resources and the capacity of sinks. The concept has long been integrated into the fundamentals of ecological economics and suggested by writers such as Herman Daly (1973, 1996) and Joan Martinez-Alier (2002). However, the discussion on how degrowth of the economy is needed as a first step towards social and ecological transformations is new. It is fundamentally different from the market-based idea of a green economy, which was one of the key projects at the Rio+20 conference in June 2012.

Conclusion

The study of consumption is very much in flux, and it is also very much an inter- and transdisciplinary field of study. Researchers are still trying to create a bigger picture of consumer behavior, consumer motivations, consumer rationality and of course the social relations between consumer and "the system", or rather between the various political, economic, social and ecological systems in which consumption is embedded. As Fuchs puts it,

> the structural contexts of the consumer environment strongly influence the characteristics of the available options for decisions regarding consumption. In order to not overestimate the responsibility and ability for change of the individual consumer, sustainable consumption research has to take an integrated perspective and link consumer decisions to their societal environment as well as develop a joint production–consumption strategy.
>
> (Fuchs and Boll 2010: 84)

It is clear that in order to tackle global environmental problems that form the most formidable challenges of the twenty-first century, we cannot avoid looking at consumption, the distribution of consumer power, and the sociology and culture of consumption.

References

Berkhout, F. (1997) *Life cycle assessment and industrial innovation*. ESRC Global Environmental Change Programme Briefing No. 14. Swindon: Economic and Social Research Council.

Campbell, C. (1987) *The romantic ethic and the spirit of modern consumerism*, London: Blackwell Publishers.

Conca, K. (2001) "Consumption and environment in a global economy", *Global Environmental Politics* 1(3), 53–71.

Cox, R. (1996) *Approaches to world order*, Cambridge: Cambridge University Press.

Daly, H. (1996) *Beyond growth – the economics of sustainable development*, Boston, MA: Beacon Press.

—— (1973) *Toward a steady state economy*, San Francisco, CA: Freeman.

Dauvergne, P. (2008) *The shadows of consumption: consequences for the global environment*, Cambridge, MA: MIT Press.

Fuchs, D. and Boll, F. (2010) "Sustainable consumption," in G. Kütting (ed.) *Global environmental politics – concepts, theories, case studies*, London: Routledge.

Gereffi, G. and Korzeniewicz, M. (eds) (1994) *Commodity chains and global capitalism*, London: Praeger.

Gudynas, E. (2011) "Buen vivir: today's tomorrow", *Development* 54(4), 441–7.

Harvey, D. (2003) *The new imperialism*, Oxford: Oxford University Press.

Hoogvelt, A. (1997) *Globalisation and the postcolonial world*, Basingstoke: Macmillan.

Jackson, T. (2006) *The Earthscan reader on sustainable consumption*, London: Earthscan/James & James.

Kütting, G. (2010) *The global political economy of the environment and tourism*, Basingstoke: Macmillan Palgrave.

—— (2004) *Globalization and environment, greening global political economy*, Albany, NY: SUNY Press.

Lipièt z, A. (1997) "The post-Fordist world: labour relations, international hierarchy and global ecology", *Review of International Political Economy* 4(1), 1–41.

McKendrick, N., Brewer, J. and Plum, J.H. (1982) *The birth of a consumer society*, London: Europa.

Maniates, M. and Meyer, J. (2010) *The environmental politics of sacrifice*, Boston, MA: MIT Press.

Martinez-Alier, J. (2002) *The environmentalism of the poor*, Cheltenham: Edward Elgar.

Mittelman, J.H. (ed.) (1997) *Globalisation, critical reflections*, London: Lynne Rienner.
Princen, T. (2006) *The logic of sufficiency*, Cambridge, MA: MIT Press.
Princen, T., Maniates, M., and Conca, K. (eds) (2002) *Confronting consumption*, Cambridge, MA: MIT Press.
Schor, J. and Holt, D. (eds) (2000) *The consumer society reader*, New York: New Press.
Sustainable Development Commission (2009) "Prosperity without growth? – The transition to a sustainable economy". Available HTTP: <http://www.sd-commission.org.uk/publications.php?id=914>
UNEP (2001) "Consumption opportunities. Strategies for change", *A report for decision makers*, Paris: United Nations Environmental Programme.
—— (2002) *A global status report*, Paris: United Nations Environmental Programme.
United Nations Department of Economic and Social Affairs Division for Sustainable Development (1992) *Agenda 21*. Available HTTP: <http://www.un.org/esa/dsd/agenda21/res_agenda21_00.shtml>
United Nations Division for Sustainable Development (UNDSD) (1995) The CSD Work Programme on Indicators of Sustainable Development. Available HTTP: <http://www.unece.org/fileadmin/DAM/stats/documents/2001/10/env/wp.27.e.pdf>
WBCSD (2002) *Sustainable production and consumption: a business perspective*, Geneva: World Business Council for Sustainable Development.

17

Expertise

Specialized knowledge in environmental politics and sustainability

Andrew Karvonen and Ralf Brand

The dominant role of technology in contemporary societies requires the public to rely on individuals with specialized knowledge to invent, design, manufacture, and maintain increasingly complex artifacts and networks. As Stilgoe et al. (2006: 16) note, "Our everyday lives are played out through a series of technological and expert relationships." In spite of the increasing reliance on technologies and technical expertise, there has been an erosion of trust between the public and technical experts since the 1970s as contemporary environmental, social, and economic problems have revealed the limitations and unintended consequences of scientific and technological development. Thus, the role of technical experts in contemporary society is in flux. The emphasis in recent decades on creating more sustainable modes of life has only increased the tensions between scientific and technological development, environmental impacts, social conditions, and specialized knowledge.

In this chapter, we draw on work from the fields of environmental sociology (Hajer 1995; Dryzek 1997; Hannigan 2006), political science and policy analysis (Fischer 1990, 2000, 2006; Irwin 1995; Bäckstrand 2003, 2004; Stilgoe et al. 2006), and Science and Technology Studies (STS; Sclove 1992, 1995; Moore 2001, 2007; Brand 2005a) to explore the relationship between experts and non-experts in environmental and sustainable decision-making. These authors have examined how specialized knowledge of technical experts and the informal knowledge of non-experts has been expressed in environmental politics, policy debates, urban development, and other venues. Of particular interest is how experts from different disciplines interact with one another and the public they are ostensibly chartered to serve. We begin with an overview of the ascendancy of the technical expert in contemporary society and a summary of the critiques of expertise. We then provide a brief discussion of sustainability, with particular emphasis on how it differs from previous conceptualizations of environmental problems, and question how traditional models of expertise fit within this new paradigm (see also Chapter 15). Finally, we present four models of expertise that have been applied since the 1980s to create more sustainable modes of human life and conclude with a discussion of the implications that sustainability has for technical experts in the future (see also Chapter 18).

The rise of the technical expert

The beginnings of technocracy – or perhaps more accurately termed "expertocracy" – can be traced to the Enlightenment when individuals began to acquire or were granted the power to shape and direct societies through scientific and technological development. Their efforts produced large complex systems including gas, electric, water, sewage, and transit networks, making technical experts particularly influential in public policy and city-building activities (Seely 1996). We might say that experts served as the "human face" of technological networks, symbolizing the founding tenets of modernity including efficiency, stability, functionality, objectivity, and perhaps most importantly, progress (Hickman 1992). The rise of the technical expert in modern societies resulted in a privileged status for those with specialized knowledge. For example, vernacular German includes proverbs expounding the superiority of the engineer, such as *dem Ingeniör ist nichts zu schwör* (no task is too difficult for the engineer), with the engineer serving as a prominent symbol of national identity. The slogan "Made in Germany" was conceived after the Second World War to tie the nation's future to earlier technical achievements of genius inventors such as Werner von Siemens. In the USA, a similar trend occurred at the turn of the twentieth century as the cowboy was replaced by the engineer as the symbol of American culture (Hickman 1992). Thayer describes the importance of the expert to the collective American psyche as follows:

> We have never lost the myth that technological innovation and invention is America's rightful spiritual territory…Clearly Americans place greater social value upon those people whose occupations involve scientific discovery and technological development than on those who deal with social issues or problems. Starting salaries for engineers are roughly twice those of social workers or teachers.
>
> (Thayer 1994: 32)

Today, the most conspicuous technical experts in developed countries include natural scientists and engineers whose specialized knowledge is based on the formal study of a scientific or technical discipline. We can also include other disciplines under the banner of technical expertise, including architects, planners, lawyers, and policy experts. In this chapter, we focus specifically on technical experts in urban contexts – urban planners and designers, civil and environmental engineers, architects and landscape architects – but intend for the discussion to address all forms of expertise that explicitly address scientific and technical issues. In all of these cases, the social power of the technical expert is derived from a combination of professional status (e.g., engineers and architects), adherence to the scientific method (natural scientists), or simply the mastery of a specialized field of knowledge through formal training (urban planners).

The technical expert is differentiated from non-experts by the possession of a "core set" of specialized knowledge as well as an elevated position in society, with non-experts deferring to the expert's superior judgment. As Selinger and Crease (2006: 230) point out, "The phenomenon of expertise…is ultimately and inextricably tied to its social utility."

While the pursuit of expertise has the social effect of elevating the individual to semi-god status, it comes at the expense of a narrowed perception through specialization. Experts are celebrated for their microscopic, specialized analysis of problems rather than emphasizing a macroscopic, holistic perspective. As such, it would be antithetical to be considered a "holistic expert." Cliff Hague, former president of the UK's Royal Town Planning Institute, remarks in this context that:

> Twentieth century higher education and research has been dominated by analysis. Ever more sophisticated ways have been found to break experience down into its constituent

> parts. New disciplines have been built by reducing scope while deepening, and making more particular, the knowledge and methodologies.
>
> (Hague 1997: 4)

Critiques of expertise

This sacrifice of breadth for depth seems the logical price to pay for the acquisition of expert knowledge. Such a strategy facilitates the division of labor among different disciplines, a pragmatic approach to dealing with the increasingly complex technical artifacts and systems that comprise contemporary societies. However, the specialized worldview of the technical expert has not gone unchallenged. At the most basic level, the limited perspective of the expert is problematic because of the inability to "see the forest for the trees." As Lane and McDonald (2005: 724) argue, "technical knowledge simultaneously sharpens our focus and obscures our vision." But specialized knowledge has deeper problems beyond its atomistic worldview, four of which we discuss briefly in the following paragraphs.

First, ontological and epistemological critiques of expertise challenge the commonly held assumptions about knowledge generation practices. The ontological assumption of traditional forms of expertise is that of a knowable and unequivocally re-presentable world "out there," the basis of positivist philosophy (see Chapter 25). Harding (2000: 129) describes this stance as the dream of "one world, one and only one possible true account of it, and one unique science that can capture that one truth most accurately reflecting nature's own order." It follows that there is a universal knowledge free from the shackles of context, its validity and applicability independent of both time and space. In this perspective, knowledge overcomes immanence and rises to the realm of transcendence. Thus, the positivist approach to problem solving, environmental or otherwise, is through the application of universal knowledge. Adherents of universal knowledge tend to adhere to a teleological notion of progress and believe in ultimate solutions that can be discovered by following the "proper path of science" (Moore 2001). Naturally, positivists tend to ignore post-modern and post-structural scholars who argue that science is plural rather than unitary (Harding 2000). Critics of positivism dismiss foundational claims that are universal and ahistorical because they allegedly reduce the world to isolated, discrete, and meaningless pieces. Instead, they forward a holistic, pluralistic imagination (Schlosberg 1999; Guy and Moore 2007).

A second critique of expertise is that it relies on a positivist worldview that couples the universality of scientific and technical knowledge with the notion that this knowledge is value-free and neutral. Technical experts tend to be portrayed as objective actors in policy-making activities, transcending partisan interests and "speaking truth to power" (Fischer 2006; Stilgoe et al. 2006). However, the existence of multiple forms of formal knowledge, and the inherent political character of this knowledge, is readily apparent in environmental conflicts.

The institutional bias toward expert knowledge has been countered by the emergence of counter-experts, individuals who can dispute technical experts on their own terms (Yearley 2000). Arguably the most famous of environmental counter-experts is Rachel Carson, whose writings were highly influential during the founding of contemporary environmental movements. In *Silent Spring*, Carson (1962) relied on a network of researchers and scientific evidence rather than moral arguments to make the case against the indiscriminate use of pesticides in the USA (Lytle 2007). Her approach of "fighting science with science" helped to spawn the emergence of counter-expertise in environmental conflicts where a high degree of uncertainty and the presence of conflicting values are both common and unavoidable.

Since the 1960s, environmental nongovernmental organizations (NGOs) have become increasingly adept at employing counter-experts, muddying the scientific waters through the

introduction of competing interpretations of a particular scientific or technical issue. Outside of scientific debates, other technical experts can also serve as counter-experts, as in the case of Jane Jacobs (1961) intervening in master planning efforts in the 1960s. This is not to say that counter-experts are equals to experts but rather that they challenge their authority using equivalent methods and language. For example, competing expert knowledges are frequently marshaled by property developers and NGOs to deliberate over the implications of environmental impact assessments (see Chapters 13 and 14).

The rise of counter-experts is a response to the inclination for technical experts to frame technical problems through the eyes of their elite employers (Fischer 2000). Foreman (1998: 60) argues that technical experts in government and corporations become the "perceived handmaidens in science and technology" and can even work at odds with the public they are ostensibly chartered to serve. In this context, Fischer notes that the emergence of the counter-expert in contemporary environmental disputes:

> redirects our attention…to the limits of our knowledge…[and] uncertainties [that] have shaken the public's faith in the experts. After having long trusted experts generally, citizens are confronted with the task of choosing which experts to believe and trust.
>
> (Fischer 2000: 61)

A third critique of technical expertise points to the existence of experiential, local, or tacit knowledge arising from personal experience and exploration outside the confines of educational institutions and without strict adherence to the scientific method. Thus, multiple forms of formal knowledge are joined by multiple forms of informal knowledge. Scott (1999: 320) differentiates between formal and informal knowledge using the classical notions of techne and metis where the former involves "impersonal, often quantitative precision and a concern with explanation and verification," while the latter refers to indigenous knowledge, meaning, experience, and practical results. This distinction is particularly apparent when comparing Western science to other forms of knowledge, with the former being abstract, reductionist, and oriented toward the separation of humans from non-humans (Lane and McDonald 2005). Stakeholders who lack formal knowledge are often portrayed as being "incapable of grasping the technical nuance and methodological complexity of science" (Kleinman 2000: 139). In this regard, Turner (2001: 123) observes that, "expertise is treated as a kind of possession which privileges its possessors with powers that the people cannot successfully control, and cannot acquire or share in."

The recognition of different forms of knowledge by post-positivists highlights the tension between democratic forms of governance and technical expertise. When discussing scientific and technical problems, holders of experiential, local, or tacit knowledge are generally not granted a seat at the decision-making table due to an institutional bias toward formal knowledge.

As such, the possession of technical expertise has significant political implications by marginalizing those who do not subscribe to a positivist worldview and the primacy of expert opinion. The centrality of the technical expert in political systems is commonly referred to as technocracy, where technical experts rule by virtue of their specialized knowledge and position in the dominant political and economic institutions. Here, expert knowledge is applied to the task of governance and promotes technical solutions to political problems, with the technical expert assumed to be above partisan politics and an irrational general public (Fischer 1990).

Fourth and finally, there are important practical issues that cannot be resolved through the application of technical expertise. For example, Ulrich Beck (1992) argues that the question of whether we should use nuclear energy can never be answered with an objective "yes" or "no" because issues of risk and risk perception require "soft" and culturally specific responses

(see Chapter 18). Values and politics are embedded in sociotechnical developments and no "Pareto optimum" calculation can ever offset a collective preference for caution. This is clearly the case with contemporary scientific disputes over climate change, genetically modified organisms, human cloning, nanotechnology, and the like. A technocratic response to these conflicts is to portray critics of scientific and technical solutions as irrational and the mission of technical experts often becomes one of educating objectors to the "facts" of a particular problem or even ignoring their pleas. However, the idea that solving "wicked problems" by uncovering all of the facts is not only delusional; it can lead to an impasse in decision-making due to the lack of data (the common problem of "paralysis by analysis").

Clearly, the contemporary model of technical expertise has numerous problems related to epistemological and ontological issues, objectivity, political power, and practical matters, as summarized above. The deficiencies of the positivist worldview become even more apparent when we consider the notion of sustainability in the following section.

Sustainability as a challenge to the technical expert

Sustainability has multiple meanings and interpretations, although most advocates would probably agree that it involves a holistic approach to solving complex, interrelated, and multidimensional problem (see Chapter 15). Dryzek (1997: 126) argues that the main accomplishment of sustainability has been "to combine systematically a number of issues that have often been treated in isolation, or at least as competitors." Thus, the principal advantage of sustainability is that it takes a pluralistic and inclusive view of problem solving, as opposed to conventional problem solving that limits its focus to particular elements while overlooking unintended consequences as well as the proverbial "big picture."

The conceptual comprehensiveness of the sustainability agenda is, for better or worse, a result of its multidisciplinary genealogy. One of the earliest examples of this holistic form of thinking can be traced to English and German forest management practices in the seventeenth century, as articulated by John Evelyn and Hans Carl von Carlowitz (see Chapter 38). They argued that one should not harvest more wood than a particular forest yields, instead advocating for a form of steady-state resource extraction. In the nineteenth century, urban social reformers such as Edwin Chadwick extended the degradation of environmental conditions beyond economic management by recognizing the link between the poor health conditions of the British working class and urban sanitary conditions. The contemporary notion of sustainability has its roots in these early modern practices that recognize the interrelated quality of seemingly independent problems.

The most widely cited definition of sustainability is attributed to the so-called Brundtland Commission, and states that sustainable development "is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 43). This broad definition of the concept has proven diffcult to translate into practice, and many scholars have developed heuristic models to elucidate the application of sustainability. Perhaps the most famous of these is the Three E model that describes sustainability as the triad of Economic viability, Environmental protection, and social Equity. The model is intended to highlight the challenge of simultaneously accommodating a multiplicity of competing demands. In other words, the openness of the sustainability concept to various claims and concerns comes at the price of compromise. Campbell (1996) highlights a crucial implication of this model by identifying the inherent conflicts between each pair of "Es" and the pressing need for strategies to resolve these tensions. From this perspective, sustainability issues involve the management of conflict through a "restless, dialectical process" of open discussion and negotiation (Healey 2004: 95).

Recognizing the importance of negotiation between competing interests reveals sustainability as an inherently political endeavor. Prugh et al. (2000: 7) note that "sustainability is provisional; it is subject to multiple conceptions and continuous revision, the very stuff of politics." Sustainability is also context-specific, or as Guy and Moore (2005: 1) argue, it is "more a matter of local interpretation than of the setting of objective or universal goals." Identifying the most suitable political system to facilitate successful resolution of conflicts and the amicable exchange of interpretations then becomes a pressing concern for sustainability advocates (Moore and Brand 2003; Moore 2007). Clearly, then, the conventional model of technical expertise that purports to be objective, apolitical, and value-free is not an ideal fit for political interpretations of sustainability.

Despite the inherent politics of the sustainability charter, the Western world has generally addressed this challenge by relying heavily on technical expertise (see Tate et al. 1998). Technical experts have been tapped to develop more efficient and effective technologies to avoid stakeholder conflicts and unintended consequences, a prime example being the development of renewable energy strategies to replace fossil fuels (see Chapter 28). This is the underlying message of ecological modernization advocates in Northern Europe and their green business counterparts in North America who argue that industrial society's harmful aspects can be expunged through the application of improved technologies (e.g., see Hawken et al. 1999; McDonough and Braungart 2002). The attractiveness of ecological modernization stems from its implicit assumption that environmental and social problems can be overcome without leaving the path of modernization (Hannigan 2006). Thus, sustainability becomes a technocratic endeavor, one that retains power in the hands of the political and economic elites, strengthening the compact between technical experts and their elite employers. As Dryzek (1997: 147) concludes, "in its most limited sense, ecological modernization looks like a discourse for engineers and accountants."

Bäckstrand (2004: 707) is equally critical of ecological modernization because it exacerbates "the dichotomous divide between nature and society, social and scientific knowledge, expert and non-expert knowledge…hence, ecological modernization does not rely on a new conception of science." However, she adds that more radical forms of ecological modernization are possible. Strong, bottom-up notions of ecological democracy that champion public deliberation, communication, and participation by civil society can serve as an antidote to the technological fix approach of weak or top-down ecological modernization approaches (see Chapters 14 and 26). Bäckstrand and other critics of ecological modernization do not call for the wholesale abandonment of technical expertise, but rather contend that technology can be directed by society as a whole rather than imposed from above by powerful elites. Such bottom-up approaches emphasize the creation of political communities to deliberate on conflicts and to transform them via equitable and lasting solutions.

Finding common ground between technical experts and sustainability

Those who advocate for the deliberative, bottom-up model of sustainability will likely agree that conventional notions of expertise are not an optimal fit with notions of sustainability. In other words, we should be careful when employing the term sustainable expert because of the inherent conflicts between specialized and holistic worldviews as well as the related political issues. Does this mean that there is no such thing as expertise in sustainability? Do we need to abandon specialized knowledge and adopt a holistic worldview that takes into account multiple viewpoints? Is there reason to believe that the technical expert may gradually become an endangered species, as Dreyfus and Dreyfus (1986) fear? We argue that while the fit between technical expertise and

sustainability is not ideal, it is far from a hopeless endeavor. Rather than abandoning specialized knowledge outright, we see possibilities for renovating technical expertise to align with the goals of sustainability. In the following paragraphs, we identify four types of expertise that have been employed since the 1980s to reorient holders of specialized knowledge toward more sustainable goals. We label these approaches the outreach expert, the multidisciplinary expert, the meta-expert, and the civic expert. Each makes unique and helpful contributions to the renovation of conventional forms of expertise.

The outreach expert

One response to the eroding credibility of technical experts has been a call for a more informed and scientifically literate public. This movement, first taken up in the 1980s, focuses on issues of risk and uncertainty in science and technology, and is frequently referred to as "the public understanding of science" (see Chapter 18). The intent has been to improve communication of scientific and technical knowledge to affected citizenry and, in turn, to educate the public about the importance of this knowledge (Wynne 1996; Turner 2001; see Chapters 26 and 27). Jamison (2005) argues that "using science and technology appropriately means, for one thing, that we know how to talk about it and that we have what might be called a collectively shared understanding of the relevant science or technology, that is, that we are scientifically literate." Clearly, this is an appealing and desirable model; it would be diffcult to argue against a more educated public, particularly with respect to important issues of science and technology.

One way that scientists and technical experts have imparted their knowledge to the public has been through Science Shops that have proliferated in the United Kingdom, the Netherlands, and other Northern European countries (see Irwin 1995). The concept has also been adopted by several universities in these countries, and we describe these activities collectively as the outreach model. We define outreach as "the activity of an organization in making contact and fostering relations with people unconnected with it, [especially] for the purpose of support or education and for increasing awareness of the organization's aims or message" (OED 2007). The model implies that scientific and technical organizations (and universities in particular) should serve as repositories of wisdom, reaching out to those who are implicated in the application of specialized knowledge.

In some circumstances, the dissemination of specialized knowledge can be useful for at least partially resolving the tensions between experts and non-experts. It has the potential to level the knowledge playing field to some degree and open up debate over technical and scientific problems by disseminating shared language and understanding of the problems. As such, it can be an effective strategy for rebuilding trust between the techno-scientific community and the general public. However, this model has significant shortcomings. First, it does little to address existing power differentials between experts and non-experts, and instead falls back on the conventional "sage on the stage" model of modern scientific and technological development. It has a tendency to reinforce paternalistic, positivist notions of expertise where knowledge elites retain a core set of knowledge that they impart to an ignorant public.

This approach can be seen as token reform of technical expertise because its sole emphasis is to bring the public up to speed while leaving expert practice unchanged. Furthermore, it implies that the public, through its ignorance of science and technology, is largely to blame for scientific and technical failures, further exacerbating the lack of trust between experts and non-experts. Finally, it continues to adhere to the "truth to power" model of expertise with respect to the public; it talks to the public but does not listen (Stilgoe et al. 2006). Thus, we conclude that the outreach expert model is a necessary but insufficient form of technical expertise.

The multidisciplinary expert

A second option for accommodating and aligning technical expertise with the discursive and political nature of sustainability is to increase the permeability between existing disciplinary boundaries. The notion of "disciplinary silos" is familiar to anyone who has worked in a university setting where scholars in different departments pursue similar problems in parallel rather than collaboratively, due to ingrained disciplinary habits and restrictive institutional and disciplinary norms and structures (Fischer 2006). The pursuit of sustainability research agendas has the potential to transcend these norms and structures by recognizing the overlaps between related disciplines and by initiating collaborative work. The aim here is not to abandon specialized knowledge but rather to improve experts' understanding of their role with respect to other technical disciplines, particularly where commonalities or overlaps exist.

Multidisciplinary expertise can, of course, reside in the individual. For example, the groundbreaking work of physician John Snow in mid-nineteenth-century London to address the problem of cholera is a famous example of an individual employing multidisciplinary expertise. Snow transgressed the disciplinary boundaries of medicine, chemistry, demography, sociology, and cartography to debunk the widely embraced miasma theory as the primary cause of urban disease transmission (see Johnson 2006). Likewise, the father of landscape architecture and urban planning, Frederick Law Olmsted, was a multidisciplinary expert who incorporated issues of functionality, aesthetics, and social needs in his parks and urban designs. He acknowledged the connections between social and environmental problems, although the political and cultural dimensions of his projects tended to be less successful than his engineering and landscape design elements (Spirn 1996).

While multidisciplinarity can be an individual endeavor, we are more interested here in partnerships that are formed by experts from two or more disciplines to address problems of sustainability. The formation of multidisciplinary teams is a common practice in sustainability, as exhibited in the partnership of architect William McDonough and chemist Michael Braungart (McDonough and Braungart 2002) or the collaboration between business entrepreneur Paul Hawken, physicist Amory Lovins, and management consultant Hunter Lovins (Hawken et al. 1999). Collaboration leads to the identification of commonalities and the formation of a new core set related to but independent of the core sets of each individual. Thus, multidisciplinary expertise reinforces the legitimacy and power of expert knowledge through an alliance between two or more core sets of technical expertise.

An example of the benefits of multidisciplinary cooperation is illustrated by activities in the Belgian city of Hasselt in the mid- to late 1990s. Located 70 kilometers east of Brussels, Hasselt was plagued by severe traffic-related problems. Engineers proposed a conventional technical solution of building a third ring-road around the city to divert automobile traffic from the historic center. Those trusting in the virtue of individuals argued that the transportation problems could be solved through campaigns to change citizen behavior by encouraging walking, cycling, and public transport (see Chapters 14, 27, and 31). However, the city council chose to ignore both the proposed technological fix and the behavioral fix solution and, instead, embarked on a multi-pronged approach to encourage non-automobile forms of transportation. The driving lanes in the inner city were narrowed and hundreds of trees were planted to create a more pleasant and walkable city-center environment. Facilities for bicyclists (bicycle lanes, storage sheds, and showers) were introduced along with bicycle pool programs where adults could volunteer to accompany children to school. Another program was established to provide bonuses to employees who cycled to work. Public transport services were increased eightfold and included new bus routes with five-minute intervals and heated rooms for waiting passengers.

As a whole, the multifaceted planning solution undertaken in Hasselt involved a partnership of public policy, urban design, and engineering experts that created a combination of "hard" infrastructure strategies and "soft" social solutions to form a multifaceted transportation strategy at several levels. One of the co-designers of these solutions contended that the technical experts initially "made the mistake of only looking at the 'engineering' side of it," and went on to argue that the success of the project "is all about a combination of measures, definitely not only by engineers: engineering, mentality, environment, city building, social issues, communication" (Moerkerk 2002).

There are, of course, a number of formidable barriers to overcome in the pursuit of multidisciplinary research agendas including but not limited to jargon, epistemological assumptions, funding protocols, and the portioning of reputational credit arising from joint projects. For example, the politics of "units of assessment" (UoA) as promulgated by the UK Research Assessment Exercise is an example of an institutional structure that creates disincentives to collaborate across disciplinary boundaries. The work of every UK academic researcher has to be allocated to one of the 67 subject-based UoAs, and critics argue that this mechanism poses problems for the practice of multidisciplinary research – although the responsible organization denies that this is the case (HERO 2002).

Similar to the previous model of the outreach expert, the multidisciplinary expert has merit but again fails to question the idea of a core set of specialized knowledge being retained by technical experts. Sustainable problem solving remains in the elitist province of the alma mater and does not challenge the boundary between experts and non-experts. Also, the multidisciplinary expert continues to promote technocratic approaches over the inclusion of tacit and experiential forms of knowledge.

The meta-expert

Taken to its extreme, the preceding notion of the multidisciplinary expert begins to resemble an entirely new class of expert that we label here the meta-expert. The role of the meta-expert goes beyond disciplinary collaboration and is dedicated to juggling the sundries of multiple specialized knowledges and, in effect, acting as a broker of technical expertise. Meta-experts are generalists with a clear understanding of what specific disciplines can and cannot contribute to problems of sustainability. They do not subscribe to a core set of knowledge but rather have the license to "pick cherries" – they are unabashed "eclecticists" who have the skill to translate across different clusters of expertise. As such, meta-experts act as interdisciplinary brokers, developing specific solutions through the synergy of multiple core sets of knowledge.

An example of meta-expertise is evident in sustainable building practices that have emerged in North America and Northern Europe in the past decade. In sustainable building projects, the building owner or developer hires a sustainable building consultant to facilitate brainstorming sessions or charrettes with project team members and identify synergies between different building strategies. For instance, the meta-expert might recognize the multiple benefits of designing the project with a green or vegetated roof (insulating properties, increased roof life, stormwater runoff, aesthetics, etc.) and then coordinate the strategy by facilitating discussion and design between the various project team members (architect, mechanical engineer, structural engineer, landscape architect, and civil engineer). The sustainable building expert recognizes that sustainability strategies are multivalent and have numerous intended and unintended implications for the project as a whole. In the above example, the green building consultant might recognize how the green roof strategy could interfere with other project goals such as rainwater harvesting, a daylighting approach that relies on roof skylights, or cost limitations. By identifying these

conflicts in advance, the meta-expert can initiate dialogue among the team members to decide on the optimal strategies to pursue.

Meta-experts adhere to the ontological assumption that sustainability is neither a problem of simplicity nor a problem of disorganized complexity but rather a problem of "organized complexity" (Jacobs 1961). Under the first model, cause-and-effect chains can be fully explained, and thus, solved by formulaic management rules. Under the second model, these chains are too complex to be fully described and can be tackled only with stochastic evaluations of previous interventions. The third model as followed by meta-experts recognizes that patterns can be understood but not by a sole individual. As such, technical expertise consists of "situated knowledges" and solving problems requires the pooling of knowledges to develop a shared asset base. The purpose of the meta-expert is to identify potential linkages and facilitate their co-discovery by mediating between different technical experts. Unlike the multidisciplinary expert who retains a core set of specialized knowledge, the meta-expert coordinates many core sets to devise a meta-set of knowledge. Cliff Hague (1997: 4) argues that planners are reasonably well equipped to play the role of the meta-expert because "town planning…has [always] prioritized synthesis over analysis. Planners have been magpies across the disciplines, picking relevance where they found it." One could also imagine public policy experts, sociologists, anthropologists, and geographers being particularly well positioned for such roles.

The civic expert

The previous three models of expertise have advantages over traditional models of expertise because they improve non-expert understanding of scientific and technical knowledge (the outreach expert model) or increase communication and collaboration between experts (the multidisciplinary expert and meta-expert models). However, none of these models systematically challenges the privileged status of expert knowledge or attempts to engage in a substantive manner with non-experts. In other words, they do not challenge the technocratic mode of decision-making and fail to require that technical experts also listen to the so-called non-experts. Brand (2005b: 19) describes these seemingly ordinary individuals as the "ultimate experts in user behavior" because they literally create everyday conditions.

John Dewey advocated for new forms of collaboration between experts and the public as early as the 1920s, arguing that, "The man who wears the shoe knows best that it pinches and where it pinches, even if the expert shoemaker is the best judge of how the trouble is to be remedied" (Dewey 1927/1954: 207). The attitude towards experts as first suggested by Dewey, William James, and other American Pragmatists, has more recently been forwarded by advocates of civic environmentalism such as DeWitt John (1994) and William Shutkin (2000). Here, a number of informal expertises (experiential, local, tacit, and indigenous) are also perceived to be valid. The acknowledgment of a plurality of expert knowledge challenges what Bruno Latour (1987) refers to as "science-as-institution" by admitting other actors to scientific and technical decision-making processes. This is not a direct assault on the conventional technical expert but rather a call to enrich science and technological decision-making by embracing a wider range of expert opinion (Stilgoe et al. 2006).

To accommodate ideas of tacit or experiential knowledge, and to facilitate two-way communication between experts and non-experts, we introduce a fourth category of expertise, the civic expert. Civic expertise revolves around participatory models of specialized knowledge and highlights the social contingency of technological endeavors by eliciting critical reflection on social circumstances and needs, and allows for the transparent and accountable recognition of non-focal technological consequences (Sclove 1992; Bäckstrand 2004). For example, new

models of scientific debate that have emerged in Northern Europe in the last decade over genetically modified foods and nanotechnology represent a softening in the stance of experts and a new relationship with the public that replaces passive acceptance for interested partnership (Stilgoe et al. 2006). From this perspective, the top-down authority of the expert involved in technocratic forms of politics is replaced by democratic politics where experts and non-experts function as collaborators or partners in problem solving. This arrangement does not guarantee an equitable distribution of power between stakeholders but, at the very least, allows for the possibility that non-expert voices can be heard.

A number of promising techniques have been developed to advance the notion of civic science and expertise, including constructive technology assessment, strategic niche management, citizen panels, and the L'Eprouvette initiative at the University of Lausanne. The intent of these approaches is to open policy-making procedures to actors other than technical experts by including citizen voices in scientific and technological debates (see Rip et al. 1995; see Chapter 26). Schot and Rip (1997) refer to these processes as "second-order learning" that involve critical reflection upon the assumptions that underpin the pursuit of factual and technical first-order learning. The involvement of citizens in technical decision-making broadens expertise by not only asking the question of "how" but also of "why." These notions of civic expertise have been adopted by a wide variety of STS scholars including Arie Rip, Richard Sclove, Sheila Jasanoff, Brian Wynne, and Steve Fuller, among others.

Civic expertise is not only a policy model but can be project-oriented and hands-on. An example of civic expertise in architectural practice is the emergence of design/build practices since the 1990s that involve service learning and project-based education. The most widely known design/build program in the USA is the Rural Studio at Auburn University in Alabama, founded by Samuel Mockbee and Dennis K. Ruth in 1992. This approach has spread to several other architecture schools, notably the University of Virginia, the University of Washington, and the University of Texas at Austin. The purpose of design/build is to increase the public role of the architect through advocacy and engagement with under-served communities. Design/build programs combine community outreach, formal education, and architectural design and production through a one- or two-semester engagement in a small building project such as a house or community center. The technical expert (architecture professor) acts as the moderator between the experts-to-be (architecture students) and community members, resulting in "a mutual exchange between the designer and the client, and in the best cases, a mutual benefit to both. Through a participatory process these benefits are defined, clearly understood by all, and mutually sought" (Bell 2004: 13). Architectural design thus becomes a democratic process of negotiation between all interested parties.

The idea here is that public engagement in scientific and technological development needs to move upstream, rejecting the "end-of-pipe" model where the public is reactive to the consequences of science and technology and, instead, makes transparent the assumptions, values, and visions that drive science in the first place (Wilsdon and Willis 2004). Proponents of civic expertise argue that this mode is not antithetical to science and technological development. Indeed, the spirit of science is skeptical, exploratory, and uncertain, with the practices of peer review, publication, and argument being a foundational practice in the scientific and technical communities, if only to a select group within the community. Advocates of civic science argue that new questions about scientific and technological development are not a threat but rather an opportunity to develop better scientific and technological solutions. As such, experts should be "on tap, not on top" (Stilgoe et al. 2006).

Nowotny et al. (1999) argue that it is only through participatory, discursive, and multifaceted approaches that science can become socially robust and accountable. The civic expertise model

is the point where practical considerations about the feasibility, acceptability, and efficacy of technological interventions for sustainability converge with the normative call for the democratization of technology (see Sclove 1995; Fischer 2000). Civic expertise is a significant departure from conventional technical expertise, relying on the notion that "the rules for [the] *production* of scientific [and technical] knowledge will have to change in order to enact civic science" (Bäckstrand 2003: 34, emphasis added). This approach is related to Mode 2 Science as proposed by Gibbons et al. (1994) by involving non-experts through transdisciplinary practices such as citizen juries and consensus conferences.

Similar to the meta-expert model, an existing group of technical experts is aligned toward a civic mode of expertise. Forester describes the role of participatory planners as follows:

> In cities and regions, neighborhoods and towns, planners typically have to shuttle back and forth between public agency staff and privately interested parties, between neighborhood and corporate representatives, between elected officials and civil service bureaucrats. They do not just shuttle back and forth though. Trying to listen carefully and argue persuasively they do much more. They work to encourage practical public deliberation – public listening, learning and beginning to act on innovative agreements too – as they move project and policy proposals forward to viable implementation or decisive rejection.
>
> (Forester 1999: 143)

The civic expert model moves beyond the ecological modernization version of sustainable development and frames knowledge generation as a socially distributed phenomenon that includes experts and non-experts alike. The goal of the expert is not to generate reliable knowledge validated by disciplinary peers but to develop robust knowledge from socially distributed expertise (Nowotny et al. 1999; Bäckstrand 2004). Robust knowledge emphasizes the processes of knowledge generation rather than the end product of these processes (Nowotny 2003).

The ultimate benefit of the civic expertise model and the increased input of non-experts is the potential for improved decision-making via "the intelligence of democracy" (Lindblom and Woodhouse 1993). Searching for agreement among multiple stakeholders allows for the acknowledgment of the polyvalent nature of science and technology and enlists stakeholders in the process of characterizing and considering a technology's social implications (Sclove 1992).

As a whole, the practice of discursive technological development suggested by the civic expertise model is the most ambitious proposal outlined here. However, it faces specific and particularly significant barriers, including entrenched power relations, as well as a lack of familiarity and experience with deliberative practices among all involved parties, experts and non-experts alike. Likewise, there is a significant epistemological difference in that knowledge emerges from deliberation rather than being imparted by the technical expert to non-experts. It should be no surprise that these more democratic forms of technological development have emerged in political cultures such as Denmark and the Netherlands where citizen participation in political decision-making processes is encouraged and commonplace (see Chapter 26). However, participatory technological policy-making continues to be an exception to the rule even in these countries, highlighting the formidable challenges to expanding scientific and technological debates to include the general public.

Towards an ecosystem of expertise

Table 17.1 provides a summary of the four models of expertise described above. The models can be differentiated by their epistemological and disciplinary assumptions, their attitudes toward

Table 17.1 Four models of expertise to address sustainability

	Outreach expert	*Multidisciplinary expert*	*Meta-expert*	*Civic expert*
Cliché role	"The educator"	"The good neighbor"	"The broker"	"The democrat"
Epistemological assumptions	Core set of scientific principles	Overlap of disciplinary core sets	Cherry-picking and synergism of core sets	Emergent from discourse
Disciplinary assumption	Monodisciplinary	Multidisciplinary	Interdisciplinary	Transdisciplinary
Attitude toward other experts	Competitors	Potential collaborators	Necessary collaborators	One of many sources of knowledge
Attitude toward the public	Receivers of expert wisdom	Not considered	Not considered	Partner in generating solutions
Knowledge flow	Top-down	Lateral	Lateral and discursive	Multidirectional and discursive
Role of power	Competition between disciplines for the exclusive claim to truth	Defined by overlaps between disciplines	Emergent from collaboration between disciplines	Shared and contested between experts and non-experts
Example	Science Shops	Hasselt transportation	Sustainable building consultant	Design/build programs

other experts and the public, and how they envision the flow of technical knowledge. We have argued elsewhere that these models as a whole comprise an ecosystem of expertise where different niches are filled by different interpretations of what it means to be an expert in sustainability issues (Brand and Karvonen 2007).

There are clearly merits to each approach and a general conclusion we forward is that, at this early stage in the development, it is not important to determine which model is most effective. In other words, each of these models should be welcomed because it challenges traditional roles of the technical expert in different ways. Each model encourages holders of specialized knowledge to consider their multiple roles as experts, citizens, and participants in democratic politics, to assess their individual strengths and weaknesses, and determine how to orient their work and allegiance toward one or more of these models (see Chapters 26 and 27). For example, those of us who are better at collaborating with other experts should do so while those of us who are better at communicating with the public might choose the outreach expert model or the more aggressive civic expert model.

We recognize that such a pluralist attitude toward expertise is an idealized perspective whose implementation will face numerous hurdles in terms of institutional incentives, vested interests, power gradients, and so on. We describe these modes of expertise in the hope of arousing debate among practitioners and theorists of sustainability as an invitation to strategize on methods to overcome these barriers.

Conclusion

An important question that lurks in the background of this framework is the motivation for technical experts to change their attitudes and orientations toward other disciplines and the public. Why should experts sacrifice their relatively privileged social position? Three points come to mind that may make these models more appealing. First, the models of expertise presented above can potentially help to reverse the erosion of trust between experts and the general public. Sustainability problem solving can be seen as a way to bridge the gulf between those with specialized knowledge and those who are implicated in the application of this knowledge.

Second, the quest for more sustainable solutions can appeal to the problem solving disposition shared by most, if not all, technical experts. The promise of more socially acceptable and, in essence, more effective solutions is worth the work required in renovating existing scientific and technical approaches to problem solving.

Finally, there is an ethical dimension to expertise. With professionals such as architects and engineers, ethics is embodied in their commitment to serve society and thus, new models of expertise offer a way to fulfill their social contract. For non-professionals, an ethical argument cannot rely on the professional's social contract but can appeal to the citizen within the technical expert. We leave these normative dimensions of expertise for future study but recognize that this is perhaps the most formidable barrier to adopting these models (see Chapter 25).

In conclusion, we venture two challenges to all technical experts. First, it is important to maintain a bird's-eye view of the system and resist the temptation of adopting old or new claims of exclusivity. There are advantages to all of the different niches that these emerging models of expertise offer, and the goal of experts should be to appreciate these different niches and seek strategic collaborations and new modes of practice. Second, a formidable barrier to the further development of these modes of expertise is the institutional barriers that inhibit multidisciplinary, interdisciplinary, and transdisciplinary collaboration. There is a need to lobby for the dissolution or at least lowering of these barriers if sustainable approaches to scientific and technological development are to become widespread. The former is an individual challenge, the latter a political one.

References

Bäckstrand, K. (2003) "Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance," *Global Environmental Politics* 3: 24–41.

—— (2004) "Scientisation vs. Civic Expertise in Environmental Governance: Eco-feminist, Eco-modern and Post-modern Responses," *Environmental Politics* 13: 695–714.

Beck, U. (1992) *Risk Society: Towards a New Modernity*, Newbury Park, CA: Sage Publications.

Bell, B. (2004) *Good Deeds, Good Design: Community Service through Architecture*, New York: Princeton Architectural Press.

Brand, R. (2005a) *Synchronizing Science and Technology with Human Behaviour*, London: Earthscan.

—— (2005b) "Urban Infrastructures and Sustainable Social Practices," *Journal of Urban Technology* 12: 1–25.

Brand, R. and Karvonen, A. (2007) "The Ecosystem of Expertise: Complementary Knowledges for Sustainable Development," *Sustainability: Science, Practice, and Policy* 3: 21–31.

Campbell, S. (1996) "Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development," *Journal of the American Planning Association* 62: 296–312.

Carson, R. (1962) *Silent Spring*, Boston, MA: Houghton Miffin.

Dewey, J. (1927/1954) *The Public and Its Problems*, Athens, OH: Swallow Press.

Dreyfus, H. L. and Dreyfus, S. E. (1986) *Mind Over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*, New York: Free Press.

Dryzek, J. S. (1997) *The Politics of the Earth: Environmental Discourses*, New York: Oxford University Press.

Fischer, F. (1990) *Technocracy and the Politics of Expertise*, Newbury Park, CA: Sage Publications.

—— (2000) *Citizens, Experts, and the Environment: The Politics of Local Knowledge*, Durham, NC: Duke University Press.
—— (2006) "Environmental Expertise and Civic Ecology: Linking the University and its Metropolitan Community," in A. C. Nelson, B. L. Allen, and D. L. Trauger (eds.) *Toward a Resilient Metropolis: The Role of State and Land Grant Universities in the 21st Century*, Alexandria, VA: Metropolitan Institute at Virginia Tech.
Foreman, C. H., Jr. (1998) "Blended Rationality and Democracy: An Elusive Synthesis for Environmental Policy Reform," *Science Communication* 20: 56–61.
Forester, J. (1999) *The Deliberative Practitioner: Encouraging Participatory Planning Processes*, Cambridge, MA: MIT Press.
Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., and Trow, M. (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, London: Sage Publications.
Guy, S. and Moore, S. A. (2005) "Introduction: The Paradoxes of Sustainable Architecture," in S. Guy and S. A. Moore (eds.) *Sustainable Architectures: Cultures and Natures in Europe and North America*, New York: Spon Press.
Guy, S. and Moore, S. A. (2007) "Sustainable Architecture and the Pluralist Imagination," *Journal of Architectural Education* 60: 15–23.
Hague, C. (1997) "Foreword," in M. Higgins and F. Simpson (eds.) *Work-Based Learning Within Planning Education*, London: University of Westminster Press.
Hajer, M. A. (1995) *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*, Oxford: Clarendon Press.
Hannigan, J. (2006) *Environmental Sociology: A Social Constructionist Perspective*, 2nd ed., New York: Routledge.
Harding, S. (2000) "Should Philosophies of Science Encode Democratic Ideals?" in D. L. Kleinman (ed.) *Science, Technology, and Democracy*, Albany: SUNY Press.
Hawken, P., Lovins, A., and Lovins, L. H. (1999) *Natural Capitalism: Creating the Next Industrial Revolution*, Boston, MA: Little, Brown.
Healey, P. (2004) "Creativity and Urban Governance," *Policy Studies* 25: 87–102.
HERO (Higher Education and Research Opportunities in the United Kingdom) (2002) "Briefing Note 14: Interdisciplinary Research and the RAE." Online. Available HTTP: <http://admin.hero.ac.uk/sites/hero/rae/Pubs/briefing/note14.htm> (accessed August 3, 2006).
Hickman, L. A. (1992) "Populism and the Cult of the Expert," in L. Winner (ed.) *Democracy in a Technological Society*, Dordrecht, the Netherlands: Kluwer Academic Publishers.
Irwin, A. (1995) *Citizen Science: A Study of People, Expertise and Sustainable Development*, New York: Routledge.
Jacobs, J. (1961) *The Death and Life of Great American Cities*, New York: Random House.
Jamison, A. (2005) "On Nanotechnology and Society," *EASST Review* 24: 3–5. Online. Available HTTP: <www.easst.net/review/sept2005/jamison> (accessed February 1, 2008).
John, D. (1994) *Civic Environmentalism: Alternatives to Regulation in States and Communities*, Washington, DC: CQ Press.
Johnson, S. (2006) *The Ghost Map: The Story of London's Most Terrifying Epi-demic – and How it Changed Science, Cities, and the Modern World*, New York: Riverhead Books.
Kleinman, D. L. (2000) "Democratizations of Science and Technology," in D. L. Kleinman (ed.) *Science, Technology, and Democracy*, Albany: SUNY Press.
Lane, M. B. and McDonald, G. (2005) "Community-based Environmental Planning: Operational Dilemmas, Planning Principles and Possible Remedies," *Journal of Environmental Planning and Management* 48: 709–31.
Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers Through Society*, Philadelphia, PA: Open University Press.
Lindblom, C. E. and Woodhouse, E. J. (1993) *The Policy-Making Process*, 3rd ed., Englewood Cliffs, NJ: Prentice Hall.
Lytle, M. H. (2007) *The Gentle Subversive: Rachel Carson, Silent Spring, and the Rise of the Environmental Movement*, New York: Oxford University Press.
McDonough, W. and Braungart, M. (2002) *Cradle to Cradle: Remaking the Way We Make Things*, New York: Northpoint Press.
Moerkerk, G. (2002) Personal communication, July 16.
Moore, S. A. (2001) *Technology and Place: Sustainable Architecture and the Blueprint Farm*, Austin: University of Texas Press.
—— (2007) *Alternative Routes to the Sustainable City: Austin, Curitiba, and Frankfurt*, Lanham, MD: Lexington Books.

Moore, S. A. and Brand, R. (2003) "The Banks of Frankfurt and the Sustainable City," *Journal of Architecture* 8: 3–24.
Nowotny, H. (2003) "Democratising Expertise and Socially Robust Knowledge," *Science and Public Policy* 30: 151–56.
Nowotny, H., Scott, P., and Gibbons, M. (1999) *Re-thinking Science: Knowledge and the Public in an Age of Uncertainty*, Malden, MA: Blackwell.
OED (Oxford English Dictionary Online) (2007) Definition of "outreach." Online. Available HTTP: <http://dictionary.oed.com> (accessed February 1, 2008).
Prugh, T., Costanza, R., and Daly, H. (2000) *The Local Politics of Global Sustainability*, Washington, DC: Island Press.
Rip, A., Misa, T. J., and Schot, J. (eds.) (1995) *Managing Technology in Society: The Approach of Constructive Technology Assessment*, New York: St. Martin's Press.
Schlosberg, D. (1999) *Environmental Justice and the New Pluralism*, New York: Oxford University Press.
Schot, J. and Rip, A. (1997) "The Past and Future of Constructive Technology Assessment," *Technological Forecasting and Social Change* 54: 251–68.
Sclove, R. (1992) "The Nuts and Bolts of Democracy: Democratic Theory and Technological Design," in L. Winner (ed.) *Democracy in a Technological Society*, Dordrecht, the Netherlands: Kluwer Academic Publishers.
—— (1995) *Democracy and Technology*, New York: Guilford Press.
Scott, J. C. (1999) *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, New Haven, CT: Yale University Press.
Seely, B. E. (1996) "State Engineers as Policymakers: Apolitical Experts in a Federalist System," in J. R. Rogers, D. Kennon, R. T. Jaske, and F. E. Griggs, Jr. (eds.) *Civil Engineering History: Engineers Make History*, New York: ASCE.
Selinger, E. and Crease, R. P. (2006) "Dreyfus on Expertise: The Limits of Phe-nomenological Analysis," in E. Selinger and R. P. Crease (eds.) *The Philosophy of Expertise*, New York: Columbia University Press.
Shutkin, W. A. (2000) *The Land That Could Be: Environmentalism and Democracy in the Twenty-First Century*, Cambridge, MA: MIT Press.
Spirn, A. W. (1996) "Constructing Nature: The Legacy of Frederick Law Olmsted," in W. Cronon (ed.) *Uncommon Ground: Rethinking the Human Place in Nature*, New York: Norton.
Stilgoe, J., Irwin, A., and Jones, K. (2006) *The Received Wisdom: Opening Up Expert Advice*, London: Demos.
Tate, J., Mulugetta, Y., Sharland, R., and Hills, P. (1998) "Sustainability: The Technocratic Challenge," *Town Planning Review* 69: 65–86.
Thayer, R. L., Jr. (1994) *Gray World, Green Heart: Technology, Nature, and the Sustainable Landscape*, New York: John Wiley.
Turner, S. (2001) "What is the Problem with Experts?" *Social Studies of Science* 31: 123–49.
Wilsdon, J., and Willis, R. (2004) *See-through Science: Why Public Engagement Needs to Move Upstream*, London: Demos.
World Commission on Environment and Development (WCED) (1987) *Our Common Future*, New York: Oxford University Press.
Wynne, B. (1996) "May the Sheep Safely Graze? A Reflexive View of the Expert–Lay Knowledge Divide," in S. Lash, B. Szerszynski, and B. Wynne (eds.) *Risk, Environment and Modernity: Towards a New Ecology*, Thousand Oaks, CA: Sage Publications.
Yearley, S. (2000) "Making Systematic Sense of Public Discontents with Expert Knowledge: Two Analytical Approaches and a Case Study," *Public Understanding of Science* 9: 105–22.

18

Uncertainty

Risk, technology and the future

Karen Hussey and Stephen Dovers

For thousands of years, economies and societies have been transformed by scientific discoveries and their innovative use in new products and processes. History is replete with examples of societal transformations that have been ushered in by new technologies, often in "waves" of change, such as in the agricultural revolution, industrial revolution and most recently the information revolution (Boyden 1987). Human ingenuity and inventiveness – often spurred by human desperation and misery or by commercial drive – has undoubtedly spawned remarkable achievements. Yet the development and implementation of new technologies has also produced unintended, often unwanted, outcomes.

In the 1950s, nuclear energy was considered a "panacea" for energy security concerns, but disasters in Chernobyl, Three Mile Island and, most recently, Fukushima are stark reminders of the risks of that technology. Similarly, advancements in irrigation technologies, crop varieties, and synthetic fertilizers and pesticides in the so-called "Green Revolution" emerged as the solution to world famine and malnutrition. While significant successes were achieved in some countries, the persistence of both famine and malnutrition is testament to the limitations of relying on technology and management practices to solve problems in what are complex, social systems (Wynne 1992). Very recently, critics of geo-engineering proposals to address climate change point out that climate change is itself the unintended effect of the deployment of technologies once regarded as benign (Gardiner 2011). Indeed, so devastating have been some of the consequences of our ingenuity that the names alone are synonymous with what can go horribly wrong: "Hiroshima", "Bhopal", "*Exxon Valdez*" and "Deepwater Horizon". Such prominent and tragic events have spurred developments in regulatory and other responses to assessment and management of risk; no doubt other events in future will also. Technology and risk are as much, if not more so, political as well as technical issues.

Despite the impacts, risks and uncertainties created by technologies (Hennen 1999), our capacity to build a sustainable future will rely on *our capacity to develop yet more innovative technology*. Population growth, combined with rising expectations of quality of life, unsustainable production and consumption patterns, as well as concerns about water, energy and food security, the depletion and degradation of scarce natural resources and the potential impacts of a changing climate mean that the challenges facing humankind today are more complex, interconnected and urgent than ever before (see Chapters 16 and 15, and Part IV of this volume). Certainly, there

will be multiple channels through which solutions will be sought (see Chapters 8, 9, 10, 20 and 26), but there is little doubt that society is committed to building a sustainable future on technology innovation.

Precisely where these new technologies will come from – and which of the many problems they will "fix" – is inherently uncertain, but governments and industries around the world are investing heavily in new areas of science, such as renewable energy, nanotechnology, synthetic biology, biotechnology and information technology. Some scholars believe that truly transformational breakthroughs will emerge in the spaces "between" these technology platforms, opening up new synergistic possibilities. Yet these platforms, and the technologies they are spawning, come at a time when there is a rapidly widening gap between emerging technologies and the national and global social, political and oversight frameworks necessary for their effective, safe development (Maynard and Harper 2011).

Understanding and managing uncertainty and risk with respect to new ideas and/or technologies has been a core focus of global environmental politics since the 1970s. It has centered on the call for governments to act with *caution*. The concept of "precaution" has become a feature of environmental, public health and other risk regulation regimes in many jurisdictions (Fisher 2007). While numerous, many of the processes and methodologies that have been developed are ill-equipped to deal with the rapid pace and scale of change currently confronting the world, demonstrating that future policy and regulatory frameworks will need to be more rigorous, proactive and adaptive to manage risk. Precisely what such policies and frameworks might look like is uncertain, but the field of global environmental politics will be a critical source of thought and scholarship in the future.

This chapter explores how risks and uncertainties surrounding new technologies are currently governed, the complex and often unique characteristics of emerging technologies, and the problems they pose for existing governance arrangements. It considers what future governance arrangements might look like. The chapter begins with a sketch of significant "cutting-edge" technology platforms and their (potential) application to some emerging global problems. Next we examine the current treatment of risk and uncertainty in policy and regulatory design. We then explore some of the inherent challenges of managing risk and uncertainty in existing technology governance arrangements. The chapter concludes by identifying possible future solutions.

Global challenges and technology innovation

Global environmental politics emerged as a field of research in the 1980s, distinct from but building on the established scholarly domains of International Relations and Political Economy (see Chapter 2). At that time, environmental priorities for the international community tended to be issue-specific and discrete, for example protecting the ozone layer (Chapter 29), managing trade in endangered species (Chapter 37) and protecting rainforests (Chapter 38). In the 1990s, efforts focused on agreeing to, and institutionalizing, a number of overarching principles or concepts, including "sustainable development", the "precautionary principle" and "inter-generational equity". Just two decades later, shifts in demographics, geopolitics, and the extraordinary growth in information technology have resulted in a world that is more interconnected, interdependent and complex, and thus significantly different, than the one for which the governance and institutional arrangements of the 1990s and early 2000s were designed.

Concerns about increasing pressures on already scarce resources have produced new foci, many framed in a security discourse: food security, water security, energy security and climate security have all become accepted terms (Barnett 2001; Barnett et al. 2008; Hussey and Pittock 2012; see Chapter 19). In addition, new schools of research have emerged, such as "earth system

science", "resilience", "adaptive governance" and "complex socio-ecological systems" (e.g., Steffen et al. 2004; Folke 2006; Smit and Wandel 2006). The names themselves illustrate the advancements made in our understanding of the environment and our impact on it, but also the need to move away from tackling environmental problems by sector toward more holistic solutions.

Maynard and Harper (2011) have identified twelve technology platforms from which incalculable technology innovations will emerge (see Table 18.1). Doubtless the landscape of innovation and discovery will change in coming decades, but their framework provides a broad and current picture of major areas of technological prospect. The applications for technologies span multiple sectors, and address many of the global challenges identified in Table 18.1. However, the risks and uncertainties around technologies are largely unknown or unquantified, and our capacity to assess and manage those risks into the future will necessarily start from current risk management practices in policy and regulatory design, to which we now turn our attention.

Table 18.1 Global trends, technology innovations and technology/science platforms

Global trends			
Climate change, environment and sustainability		Increasing scarcity and unequal distribution of water	
Rapidly growing demand for energy		Corporate global citizenship	
Limited resources		Social life in a technological world	
Shifting centres of economic activity		Demographics, including shifting populations and mobility	
Growing demand for food, nutrition and health			
Technology innovations			
Vaccines	Carbon sequestration	Smart grids	Better health diagnostics
Advanced sensors	Soil management	Smart materials	High conductivity materials
Next-generation electronics	Efficient resource use	Bottom-up manufacturing	Safer nuclear power
Point of use energy generation	Climate control	Renewable energy sources	Substitute materials
Better food preservation	Resilient crops	Immersive communications	Targeted pesticides
Smart drugs	Increased land productivity	High value crops	Biofuels
Water desalination	Thermal insulators	Efficient resource extraction	Water separation
Strong, lightweight materials	Irrigation	Disease management	Sustainable production processes
Automated traffic management	Better batteries	Advanced prosthetics	At-source water purification
Technology/science platforms			
Nanotechnology	Synthetic biology	Information technology	Bio-interfaces
Geo-engineering	Robotics	Biotechnology	Web 2.0
Cognitive technology	Computational chemistry	Artificial intelligence	Data interfaces

Source: Maynard and Harper (2011).

Managing risk and uncertainty in policy and regulation

Attempts to manage uncertainty and risk with respect to science and technology have been core to developments in global environmental politics. These attempts have intensified in parallel with the proliferation of technological applications.

Definitions and perceptions of risk and uncertainty

Before exploring how uncertainty and risk are accounted for in existing policy and regulatory design, it is useful to consider what these key terms mean, particularly because they are often used interchangeably and our understanding of both has evolved in recent years. As techniques of risk assessment have been applied beyond the domains of engineering and toxicology to the environmental field, they have increasingly encountered issues of "uncertainty" (Peel 2006: 205). Definitions of uncertainty abound. Wynne (1992) and Dovers and Handmer (1995) note the following three terms used to distinguish increasing levels of difficulty:

Risk, where believable probabilistic estimations of possible outcomes can be assigned and we "know the odds";
Uncertainty, where the nature of possible outcomes is believed to be known, but quantification in probabilistic terms is not possible; and
Ignorance, where we have a basis for believing that a range of impacts or changes are likely to occur, but the direction or nature of these is unknowable and/or highly contested.

With measurable *risk*, where data and precedents exist, existing processes and assessment methods will likely suffice, such as with a varied application of a known technology. Even then, given the limits of knowledge and our ability to forecast into the future, there will be some degree of residual uncertainty at the further end of an acceptable probability range (e.g., 1 in 1 million chance of infection, or 95 percent likelihood of a species being unaffected). The more problematic domains of *uncertainty* and *ignorance* are more relevant to unfolding technologies. For now we will use the single term, uncertainty.

In a more detailed dissection, Smithson (1989) defines two broad categories under the general term ignorance: *irrelevance* (to ignore) and *error* (to be ignorant of). In his schema, probabilistic risk and uncertainty (defined as incompleteness of knowledge in degree) are forms of error, which also include forms such as ambiguity, confusion and vagueness. Under irrelevance, Smithson identifies "untopicality" (outside cognitive domain), "undecidability" (believed insoluble or not requiring verification) and "taboo" (socially enforced ignorance). This seems complicated, but a crucial and general point emerges: risk and uncertainty are value-laden and not reducible to agreed numbers in many situations. Social, scientific and political arguments over technologies such as nuclear power, genetically modified organisms or the use of nanotechnologies inside human bodies will often feature confusion, taboo and other essentially qualitative dimensions. Risk and uncertainty are not simply objective and measurable; they are socially constructed and negotiated through political processes (Smithson 1989; Handmer and Dovers 2013). Assessment and regulation of technological risk is above all political, and unavoidably so.

In the context of technology, there are two broad kinds of uncertainty: first, uncertainty about the consequences of introducing and applying new technologies; and second, uncertainty about the world in which those technologies will be deployed. The latter can mean that there is genuine ignorance about the potential consequences of emerging technologies, rather than simply uncertainty (Rip 2006). Beneath these two there is considerable detail. With respect to the

uncertain consequences, this may be about the likelihood of predicted benefits being gained, or about the impacts on other things such as health or environmental quality. In terms of the nature of the world in which the technology is applied, this includes changing social values in the future, the efficacy of the assessment and regulatory regime over time, or a changing operating environment as a result of demographic, climate, economic or other technological change.

The many technological possibilities into the future and the multiple forms and kinds of uncertainty summarized above present a highly complex environment in which to consider assessment approaches and regulatory regimes.

There are numerous scientific and policy process options in place that can apply to assessing the risks of technologies across different sectors, some regularly in use, others less so. These include strategic environmental assessment of policies, plans and programs; broader sustainability assessment that explicitly deals with social and economic as well as environmental concerns; integrated assessment in many forms; technology assessment targeting new or proposed scientific and technological developments; social impact assessment; as well as many medical and pharmaceutical testing and screening processes (Porter and Fittipaldi 1998; Partidário and Clark 2000; Bond et al. 2001; Marsden and Dovers 2002; Jakeman and Letcher 2003; Gibson et al. 2005; Rid and Wendler 2010; Russell et al. 2011). Within all of these procedural assessment approaches, there is wide variation in analytical methods, data requirements and the strength of regulatory requirement. Methods used within these assessment procedures range from epidemiological tests, ecotoxicological studies, chemical analyses, cost–benefit studies, risk assessment models, multi-criteria assessment, socio-economic models, scenarios and a range of more "deliberative" or consultative measures, such as citizens' juries or commissions of inquiry.

In their work on risk management for information systems, Stahl, Lichtenstein and Mangan (2003) suggest that "we need to be more modest with regards to the aims of risk management, agreeing that the elimination of risk is not only practically difficult, but also fundamentally impossible". Arguably the same can be true of all technologies, not only in terms of whether the technology will succeed or fail in relation to its intended application, but also as to whether it poses a threat of unintended, unwanted outcomes. This position is entirely reasonable, but the scientific, policy and political difficulty is defining what level of residual risk is socially acceptable, and upon what basis that level is defined. While the sorts of assessment and policy processes referred to above can advance understanding of risk, and define residual uncertainty to a greater or lesser degree depending on the data available, the timescale in question, and the complexity of the technology and its applications, in many cases those assessment and policy processes cannot provide society and policy-makers with definitive "yes/no" answers. This is because many positions held on the desirability or otherwise of a technology are defined by values, and by risk perception and tolerance, in many cases making forward decisions over future technologies a fundamentally *political* question to be decided by political processes.

Perceptions of risk and uncertainty vary widely amongst different groups in society (Sjoberg 1979; Bammer and Smithson 2008). Differences in the perception of risk across different expert, industry, community and political groupings will vary depending on the technology and the context. Factors that influence perception include trust in science or in those with regulatory responsibility, proximity to the site of application, visibility of the technology, and familiarity or the availability of analogue comparisons. Understanding perceptions of risk has been an intense area of scholarship since the mid-1970s, around the same time the concept of "precaution" started to appear in policy debates and in national legislation (Fisher 2007). Critical studies in risk perception intensified with the emergence of social studies of disasters and of the global environmental change discourse from the late 1980s to the early 1990s (e.g., Krimsky and Golding 1992; Warner 1992; Wynne 1992; see Chapter 2).

Experience with other similar issues indicates that public perceptions of some technologies are likely to be dominated by the risk of something going wrong. An example is geo-engineering, which is intended to address climate change. It appears that important factors involved in geo-engineering are whether the methods proposed involve the following (Shepherd et al. 2009: 42–3; see Chapter 28):

- contained engineered systems, or the manipulation of the natural environment and ecosystems;
- intervention only in physical and chemical processes, or in biological processes and systems (including humans);
- activities (and/or substances) that are localized (intensive), widely distributed or dispersed (extensive);
- effects that are primarily local/regional, or that are of global extent;
- "big science" and centralized control, or small-scale activity and local control;
- processes that are perceived as familiar, or novel and unfamiliar.

These issues characterize many of the new technology platforms identified in Table 18.1.

The treatment of risk and uncertainty

In their broadest sense, technologies are complex social systems, comprising not only technological artifacts but also the infrastructure, designs, standards, procedures, applications, knowledge and social arrangements specifically associated with the design and use of those artifacts (Williams and Edge 1996; Wynne 1988). The tasks of understanding and governing technological change, therefore, require information that extends far beyond the technical aspects of individual technologies (Russell et al. 2011: 158). To date, the management of these complex systems has fallen largely to the inclusion of the precautionary principle in regulation, which is variably stated but generally in accord with Principle 15 of the UN *Rio Declaration*: "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations 1992).

There is a voluminous and contested literature on the precautionary principle, including many statements in policy and in international and domestic law (Fisher et al. 2006). There is some way to go in reaching agreement on the meaning and implementation of the principle because, according to Fisher, it "has tended to be dissected in an analytical vacuum, considered from a single disciplinary perspective, or treated in a 'plug and play' manner in that its implementation is characterized as simply requiring the inclusion of the principle into policy or a legislative scheme for it to be effective" (Fisher et al. 2006: 1). Such an approach ignores many important variables, for example ascertaining where appropriate triggers and thresholds should be in place to initiate a risk assessment and establish how much risk is acceptable; ascertaining who should be involved in any given risk assessment, especially with respect to the breadth of expertise required; and how assessments can be conducted to facilitate engagement from a broad range of stakeholders. This last point reinforces the point emphasized earlier, namely that risk is a social construct that is politically negotiated.

The embedded politicization and contextualization of applying a precautionary approach is evident in the commercialization of biotechnology products. Multiple and varied issues in the early development of that technology platform evoked considerable debate, including the ethics of patenting living organisms, the adverse effects of exposure to recombinant proteins, confidentiality issues, the morality and credibility of scientists, and the role of government in regulating

science (see Chapter 37). In response to these debates, in 1972 the US Congress established the Office of Technology Assessment (OTA), which in turn developed several initiatives that were eventually adopted worldwide (Bimber 1996). During its tenure, the small, politically neutral OTA performed an invaluable function, providing informed advice to policy-makers on the possible societal impacts of emerging technologies. Crucially, it was joined institutionally to the political process (through Congress) but with no vested political authority of its own (Bimber 1996: x). Others have pointed to the OTA's strengths, recommending that similar institutions be established today (Russell et al. 2011).

However, the contextual factors of assessing risk invariably demand a focus on decision-making processes, which Peel argues is required because

> implementation of precaution reveals the importance of exposing risk assessment to a broader range of views than the traditional inputs provided by scientists and regulatory "experts". Opening up risk assessment in this way can ensure a comprehensive consideration of the issues of uncertainty that frequently arise in the identification and evaluation of health and environmental risks associated with new technologies.
>
> (Peel 2006: 203)

Attempts to exercise a "precautionary approach" have been expressed through various assessment and approval methods and processes, including through technology assessment, in legal review where the principle is stated as a statutory objective, and within broader policy and political processes, such as legislative reviews, reviews of cabinet submissions, independent statutory authorities with the mandate to assess policies or emergent technologies, and industry-based assessments often done in conjunction with research institutes, universities or government (Russell et al. 2011; Dovers 2006).

The array of processes available for assessing future technologies and risks is bewildering, and the choice of which to use depends on the nature of the technology and context of its development and applications, but also on the requirements of the responsible jurisdiction. However, whatever process or method is used, the issues of triggers, thresholds and standards of proof arise (Dovers 2006), and the design of regulatory or assessment regimes needs to state these clearly and apply them consistently. Triggers for assessment are crucial because not every proposal or technological possibility can or should be thoroughly assessed, or even assessed at all: triggers define the targets of assessment. Thresholds for the application of more intensive assessment, and possible precaution, relate to the scale of possible impacts and implementations. Less intensive or screening assessments may be appropriate, or far more rigorous and lengthy ones may be needed. The dividing line between these is an important issue for both proponents and opponents of a technology.

The issue of standards of proof that might be applied in deciding whether a technology should be subject to scrutiny, or permitted to be applied in the real world, is the least resolved issue. Standards of proofs vary greatly between, for example, scientists (e.g., 95 percent confidence limits, wariness of "Type I" errors or false positives) and legal reasoning (balance of probabilities and beyond reasonable doubt, wariness of "Type II" errors or false negatives) (Cranor 1999). The media, politicians or local communities may apply quite different standards of proof to a technology. The strictness of the standard of proof in technology risk assessment equals an increase in the strictness of the application of the precautionary principle. The precautionary principle does not instruct a particular level of precaution or otherwise, and thus does not necessarily make decisions easier or simple. What the principle does is recognize uncertainty and risk while requiring that they are addressed through some process that uses the best available information, makes risks and trade-offs transparent, and allows for informed decision-making.

Challenges in managing risks and uncertainties in the public policy process

The challenges in assessing risks and uncertainties surrounding technologies are made more difficult by the following (often shared) characteristics:

- risks may be direct, indirect and/or cumulative;
- there are often long time horizons before impacts arise or can be detected;
- applications are often possible in multiple sectors and using multiple sources of scientific discovery (i.e., knowledge generated "between" the technology platforms);
- the rapid pace of technological change makes it difficult for regulation and policy to keep up; and
- increasing globalization of trade and exchange, and the nature of pervasive new technologies, mean that the impacts of a technology may be experienced at some distance, and in a different jurisdiction, from where it was developed or applied.

These characteristics are true of both traditional and emergent technologies, and the extent to which those risks will be "captured" by existing regimes depends on the governance and institutional regimes in place. It is clear, however, that the types of technologies emerging today, and the world into which they are emerging, are different from earlier periods. Five challenges can be identified which pose significant problems for managing risk in emerging technologies. We will explore each in turn.

The first challenge for the governance of emerging technologies is that, while potential problems may be identified, often these can only be resolved through research, development and demonstration. This is the classic "technology control dilemma" (Collingridge 1980). Ideally, appropriate safeguards would be put in place during the early stages of the development of any new technology, but anticipating in the early stages how a technology will evolve is difficult. By the time it is widely deployed, it is often too late to build in desirable characteristics without major disruptions, perhaps because significant financial and/or political capital has already been invested. The control dilemma has led to calls for a moratorium on certain emerging technologies and, in some cases, on field experiments, for example with geo-engineering (Shepherd et al. 2009: 37). In some respects, this first challenge is the one least likely to be addressed, not only on economic grounds, but also on moral and ethical grounds: if a new technology has the potential to address one or all of the global challenges identified in the second section, then it should be given the opportunity to prove itself.

The second challenge lies in the fact that there has been a distinct shift in *where* science and technological innovation is undertaken. In the past, research and development was almost always exclusively the domain of government-funded research institutes, within a scientific establishment or in a large corporation, with the obvious benefit that the research was subject to strict oversight. The reality is somewhat different today; as Maynard and Harper so eloquently put it, "we are in the midst of a shift from innovation occurring as a result of a directed programme at large institutions like Bell Labs, Bayer or IBM to a world where a college student can create Facebook, Do-It-Yourself biotechnology has a growing following, and work that used to require a lab full of people and equipment can now be done on a laptop" (2011: 5). As a consequence, technologies can be developed and deployed before communities and governments are aware of their potential. As technologies like nanotechnology, computational chemistry and synthetic biology evolve, top-down oversight will become increasingly difficult to implement.

Related to this is a geopolitical shift. Until very recently, the vast majority of technology innovation was achieved in the United States or Europe, which have over time developed

comprehensive risk governance regimes, ranging from implementation of the precautionary principle to statutory bodies to oversee technology development and undertake risk assessments. But the locus of technology development, broadly measurable through patent applications, is shifting. While the United States continues to dominate annual patent application statistics, interesting trends can be seen over the past decade which signal a shift in where technological innovation is currently intensifying (WIPO 2012: 39). Between 2001 and 2010, China experienced an average yearly growth rate of 22.6 percent, bringing its yearly patent applications from 63,450 in 2001 to 391,177 in 2010, and making it the fastest growing patent office in the world. Furthermore, global trends in patent applications show that while Japan's dominance in the 1990s is waning significantly and Canada is similarly faltering, other countries, such as Russia, India, Brazil and Mexico, are showing upward trends in patent applications. This development has important implications for how risks are assessed and managed, not least because rigorous risk assessment requires a high degree of institutional capacity, but also because it reflects societal values and the extent to which those values are shared universally.

The third challenge exists because of the rapid pace of change in technology development today, which puts enormous pressure on the scientific community to identify risks in time, and on the policy and regulatory regimes to respond accordingly. Dunlop explains this dilemma:

> in issue areas marked by policy urgency and technical complexity, this temporal disjuncture can result in an array of evidence and signals about potentially countervailing risks that decision-makers are unable to weigh and navigate, in the time they have. In such circumstances, we can expect decision-makers to fall back on early policy frames and institutionalised ways of thinking.
>
> (Dunlop 2010: 344)

The result can be risk assessments and policy decisions that fail to integrate across policy domains (Hussey and Pittock 2012) or technology uptake that proliferates too quickly for regulators to keep up, as has been the case with the deployment of underground thermal energy systems in the Netherlands, with potentially dangerous consequences for urban water quality and the integrity of underground infrastructure (Bonte et al. 2011).

The fourth challenge exists in developing regulation or policy responses that "fit" the characteristics of emerging technologies. In his influential work on the development of nanotechnologies, Fiorino laments: "In many respects, the issues associated with nanotechnology are more typical of the future of environmental problem-solving than those of large manufacturing sources and high-volume commodity chemicals that determined the design and application of environmental statutes in the past four decades" (2010: 8). Fiorino goes on to point out that among the existing laws for regulating nanotechnology risks in the United States, the most likely initial mechanisms that could be, and in many cases are being, used include the Toxic Substances Control Act and the Federal Insecticide, Fungicide and Rodenticide Act (administered by the Environmental Protection Agency, or EPA); the Federal Food, Drug, and Cosmetic Act, administered by the Food and Drug Administration and the EPA; the Occupational Safety and Health Act, under the Occupational Safety and Health Administration; and the Consumer Product Safety Act, administered by the Consumer Product Safety Commission. None of these acts was designed with the characteristics of nanotechnology in mind. In the other aspects of nanotechnology regulation (e.g., air and water dispersion, soil contamination), the Clean Air Act, Clean Water Act, Resource Conservation and Superfund laws offer potential regulatory control points for managing other environmental exposures (Fiorino 2010: 13). Again, however, the fit between these laws and nanotechnology is problematic. Even where authorities exist, agencies face the

constraints of limited information and resources and the challenges of adapting an old regulatory framework to a rapidly developing technology.

The fifth challenge concerns an obvious disconnect between the problems that most need to be fixed and the technologies that are being supported. Notwithstanding the extraordinary advancements made in medical research over the past century, the enduring problems of famine, malnutrition, desperate poverty and disease in the developing world – in contrast to the extraordinary proliferation of (arguably) less important technological innovations such as the iPod and high definition television – gives credence to the argument that the vast majority of funding goes on problems of the "North" at the expense of addressing the problems of the "South" (Bozeman et al. 2011). This can best be described as inequity in the allocation of research funding, but a related and perhaps more surprising issue raised by Maynard and Harper lies in the *focus* of innovation: "the current technology innovation pipeline is geared to generating solutions in search of a problem. Sometimes there is a match, sometimes there is not. This leads to a risk of orphaned challenges – global challenges that remain poorly addressed simply because the technology pipeline has not delivered a matching solution" (2011: 10). While not directly related to the risks and uncertainties surrounding new technology, this last challenge encapsulates the biggest risk of all: that innovation in the future may remain focused on trivial advancements for the prosperous few, thus missing the global challenges, including those related to the environment, affecting the many.

Prospects for managing risk and uncertainty in global technology governance

Existing institutional arrangements to manage uncertainty and risk are ill-equipped for the fast-paced, complex and geographically and temporally disconnected world we live in. We now need more rigorous, proactive and adaptive tools to manage risk, and an overarching governance regime that provides the necessary oversight to avoid or mitigate any unintended consequences of new technologies. But what might the key elements of such a governance regime be? Future governance arrangements will need to include three main elements. First, efforts to assess and manage risk and uncertainty must not suffocate the innovation in science and technology that is required to address the global challenges identified in Table 18.1. Innovation requires a predictable social structure, an open marketplace, and a business culture amenable to risk and change (Marburger 2011: 213). One oft-cited example of how the state can encourage entrepreneurship and innovation is to provide flexible bankruptcy laws that protect entrepreneurs from failure, thereby encouraging them to "explore" (Ederer and Manso 2011: 98). Such a positive attitude toward failure epitomized the US system throughout the twentieth century.

A related issue is the regulatory burden imposed on technology companies throughout the discovery, development and authorization phase of the innovation cycle. A 2011 study of the costs and time associated with bringing one biotechnology plant crop to market found that overall the highest costs were associated with the discovery stages, but collectively the costs of meeting regulatory requirements amounted to over 25 percent of total costs (Phillips McDougall 2011: 7). In addition, the study found that the mean value for time taken throughout the research-and-development process was over 13 years. However, there was considerable variation in the responses between companies and between crop species, ranging from a low value of 7 years to the comparatively high value of 24 years (Phillips McDougall 2011: 10). While recognizing that regulation is itself a public good, and that the uncertainty and risk surrounding new technologies demands appropriate regulatory oversight, there is a need to find ways of regulating scientific discoveries without stifling them. One relatively urgent need is to achieve as much harmony

within and between countries as possible, thus reducing regulatory divergences, administrative redundancy and barriers to trade and consumer welfare (Hussey and Kenyon 2011).

Second, the fast-paced, geographically and temporally disconnected nature of contemporary research and development means the state is limited in how much oversight it can usefully provide. From the 1990s onwards, in parallel with the institutionalization of the "precautionary approach", disappointment with the success of traditional "command and control" regulation to manage environmental externalities saw the emergence of so-called second- and third-generation environmental policy (see Jordan et al. 2003; Knill and Lenschow 2003; Lenschow 2002). Including policy instruments such as market-based mechanisms and third-party certification schemes, the global environmental politics literature is replete with studies on the effectiveness and efficacy of those initiatives in mitigating the environmental consequences of production and consumption. Despite mixed results, some scholars are revisiting that literature in the hopes that instruments may prove more successful when applied to emerging, unpredictable technologies such as nanotechnology. According to Fiorino,

> The nature of nanotechnology as a rapidly growing and constantly evolving sector makes it an excellent application for voluntary initiatives. Their role would not be to replace government regulation, however, but to inform regulation and to complement existing and future actions. The flexibility, adaptability, relative ease of implementation and potential for constructive engagement of multiple parties commend them as a part of an oversight strategy. (Fiorino 2010: 7)

Notwithstanding the benefits of "new" environmental policy instruments, such as eco-labeling and third-party certification, the proliferation of such schemes can and does present a challenge for international trade (see Chapter 22), most obviously by imposing impediments to trade and investment, and by altering the competitive position of firms. Thus, "dealing with the negative trade impacts of divergent regulatory cultures, and putting in place mechanisms to minimize and resolve trade disputes stemming from regulatory divergences, will become an increasingly important trade policy issue for the twenty-first century" (Hussey and Kenyon 2011: 382). It would be perverse if governments devoted considerable energy to reducing trade barriers in one domain (i.e., the WTO), only to impose more in another (i.e., technology risk assessment regimes).

Finally, we can see an important role for governments in assessing potential risks, defining oversight structures and systems, promoting transparency, protecting workers, informing the public and generally steering the responsible development of any given technology industry. But the governance of technology can be both implicit and explicit, and it is useful to consider both aspects briefly. Implicit or embedded governance exists, for example, when the "notion of responsible innovation starts to make a difference in what actors do and do not do" (Rip 2006: 280). This is evident in the extensive research undertaken by both the scientific and industry sectors on the environmental, health and social effects of nanotechnologies (Fiorino 2010). It is also evident in voluntary initiatives from science and industry sectors to place "checks and balances" on their research, for example through moratoriums on particularly sensitive or high-risk areas of research or extensive, government-funded voluntary initiatives to examine the potential environmental and health risks of an emerging technology (Rip 2006). A major example of a collective industry initiative is the chemical sector's Responsible Care program. In the United States, the Chemical Manufacturers' Association (now the American Chemistry Council) adopted Responsible Care based on a model developed by its counterpart in Canada. Like similar initiatives, it was created because of concerns about public perceptions of the industry, especially after the Bhopal catastrophe in 1984 (Fiorino 2010: 15). Rip posits that voluntary "self-restraint" from the scientific

community in the early stages of development is motivated by desires to demonstrate willingness to respect the precautionary principle, but also to ensure that the field of research is not halted (Rip 2006: 273). Whatever the motivation, initiatives from industry that can complement or inform traditional forms of risk assessment are likely to be at least benign, and they may also offer confidence in the industry, its administrative efficiency and its cost-effectiveness.

Explicit governance includes more traditional tools such as regulation and publicly funded reviews of emerging technologies. With respect to existing authorities and regulations for nanotechnology, Davies (2009) concludes that although they provide a starting point, the current laws are not well suited to the needs of nanotechnology oversight. Ideally, then, a new law designed specifically for the given purpose, administered by stronger and more integrated government institutions, would be enacted. The theme of stronger, more integrated but also more objective institutions is reiterated in the academic literature, which reinforces our contention that strong oversight from government – or from publicly funded but politically neutral agencies, such as the former Office of Technology Assessments – will be essential.

Across multiple technology platforms, identifying precisely which part of the chain is best placed to impose regulatory measures is difficult. The temptation for governments might be to impose risk assessments at some or all stages of that supply chain, but that is a temptation that must be avoided for two reasons: first, because the innovation supply chain is more complicated and dynamic than ever before and thus more assessments are likely to add confusion where clarity is the goal; and second, because the imposition of more assessments imposes unwelcome constraints on competitiveness and potentially on the international system of "free" trade (Hussey and Kenyon 2011; Botterill and Daugbjerg 2011).

Governments are also best placed to consolidate and share the enormous amounts of data that these new technology platforms are creating. For example, with respect to the application of biotechnology in health products, the Organization for Economic Cooperation and Development (OECD) has foreseen a number of social and institutional challenges, many of which must remain the responsibility of governments:

> The ability to create and analyse large databases of genetic, phenotypic, prescribing, and health outcome information will be essential to predictive and preventive medicine. The construction of these databases will require solutions to confidentiality issues and the question of whether patients will be required to release information on risk factors to insurers. The increasing ability to discover adverse drug reactions or outcomes from analysing large longitudinal databases will increase risks for pharmaceutical firms and make it difficult to predict future sales. At the same time, these approaches could identify unknown health benefits, creating new markets.
>
> (OECD 2009: 12)

Governments will also need to identify, mitigate or otherwise address the *exogenous* risks to technological innovation. One such risk that has only appeared very recently is that new technologies depend increasingly on scarce and esoteric materials, such as rare earths. Control over access to these materials – together with the search for viable substitutes – will become increasingly important factors in ensuring sustainable technology innovation.

Conclusion

Our capacity to quickly and responsibly address global environmental challenges will to a very great extent rely on humankind's capacity to rethink global technological governance, which in

turn relies on developing inclusive, adaptive and innovative institutions that reflect changing geographical, political and social circumstances as they arise. At the start of this chapter, we noted the impact of events in driving public concern and the regulation of technology, referring to incidents that have become powerful by-words, such as Bhopal, Fukushima, *Exxon Valdez* and Deepwater Horizon. It is inevitable that there will be other incidents, and that these will drive further debate and policy change in the future in the context of evolving social values and economic conditions. The fact that we do not know what these will be, how serious, or what changes they will drive, underlines both the importance and difficulty of issues surrounding technology, risk and regulation.

References

Bammer, G. and Smithson, M. (eds) (2008) *Uncertainty and Risk: Multidisciplinary Perspectives*. London: Earthscan.

Barnett, J. (2001) *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*. London: Zed Books.

Barnett, J., Matthew, R.A. and O'Brien, K. (2008) "Global environmental change and human security". In Brauch, H.G., Oswald Spring, Ú., Mesjasz, C., Grin, J., Dunay, P., Behera, N.C., et al. (eds) *Globalization and Environmental Challenges: Reconceptualizing Security in the 21st Century*. New York: Springer.

Bimber, B. (1996) *The Politics of Expertise in Congress: The Rise and Fall of the Office of Technology Assessment*. New York: SUNY Press.

Bond, R., Curran, J., Kirkpatrick, C., Lee, N. and Francis, P. (2001) "Integrated impact assessment for sustainable development: a case study approach". *World Development* 29: 1011–24.

Bonte, M., Stuyfzand, P.J., Hulsmann, A. and van Beelen, P. (2011) "Underground thermal energy storage:environmental risks and policy developments in the Netherlands and European Union". *Ecology and Society* 16(1): 22.

Botterill, L. and Daugbjerg, C. (2011) "Engaging with private sector standards: a case study of GLOBALG.A.P". *Australian Journal of International Affairs* 65(4): 488–504.

Boyden, S. (1987) *Western Civilization in Biological Perspective: Patterns in Biohistory*. Oxford: Clarendon Press.

Bozeman, B., Slade, C.P. and Hirsch, P. (2011) "Inequity in the distribution of science and technology outcomes: a conceptual model". *Policy Sciences* 44: 231–48.

Collingridge, D. (1980) *The Social Control of Technology*. London: Pinter.

Cranor, C.F. (1999) "Asymetric information, the precautionary principle, and burdens of proof". In Raffensperger, C. and Tickner, J. (eds) *Protecting Public Health and the Environment: Implementing the Precautionary Principle*. Washington, DC: Island Press.

Davies, C.J. (2009) *Oversight of Next-Generation Nanotechnology*. Project on Emerging Nanotechnologies, Washington, DC. Online. Available HTTP: <http://www.nanotechproject.org/process/assets/files/7316/pen-18.pdf> (accessed 20 May 2012).

Dovers, S. (2006) "Precautionary policy assessment for sustainability". In Fisher, E., Jones, J. and von Schomberg, R. (eds) *Implementing the Precautionary Principle: Perspectives and Prospects*. Cheltenham: Edward Elgar.

Dovers, S. and Handmer, J. (1995) "Ignorance, the precautionary principle, and sustainability". *Ambio* 24: 92–7.

Dunlop, Claire A. (2010) "The temporal dimension of knowledge and the limits of policy appraisal: biofuels policy in the UK". *Policy Sciences*, 43: 343–63.

Ederer, F. and Manso, G. (2011) "Incentives for innovation: bankruptcy, corporate governance and bankruptcy systems". In Linat, R. (ed.) *Handbook on Law, Innovation and Growth*. Cheltenham: Edward Elgar.

Fiorino, D.J. (2010) *Voluntary Initiatives, Regulation, and Nanotechnology Oversight: Charting a Path*. Online. Available HTTP: <http://www.nanotechproject.org/publications/archive/voluntary/> (accessed 14 May 2012).

Fisher, E. (2007) *Risk Regulation and Administrative Constitutionalism*. Oxford: Hart Publishing.

Fisher, E., Jones, J. and von Schomberg, R. (2006) *Implementing the Precautionary Principle: Perspectives and Prospects*. Cheltenham: Edward Elgar.

Folke, C. (2006) "Resilience: the emergence of a perspective for socio-ecological systems analysis". *Global Environmental Change* 16: 253–67.

Gardiner, S. (2011) "Some early ethics of geoengineering the climate: a commentary on the values of the Royal Society Report". *Environmental Values* 20(2): 163–88(26).
Gibson, R.B., Hassan, S., Holtz, S., Tansey, J. and Whitelaw, G. (2005) *Sustainability Assessment: Criteria, Processes and Applications*. London: Earthscan.
Handmer, J. and Dovers, S. (2013) *The Handbook of Disaster and Emergency Policies and Institutions*. 2nd edition London: Earthscan
Hennen, L. (1999) "Participatory technology assessment: a response to technical modernity?" *Science and Public Policy* 26(5): 303–12.
Hussey, K. and Kenyon, D. (2011) "Regulatory divergences: a barrier to trade and a potential source of trade disputes". *Australian Journal of International Affairs* 65(4): 381–93.
Hussey, K. and Pittock, J. (2012) "The energy–water nexus: managing the links between energy and water for a sustainable future". *Ecology and Society* 17(1): 31. Available HTTP: <http://dx.doi.org/10.5751/ES-04641-170131> (accessed 15 May 2012).
Jakeman, A.J. and Letcher, R. A. (2003) "Integrated assessment and modelling: features, principles and examples for catchment management". *Environmental Modelling & Software* 18(6): 491–501.
Jordan, A., Wurzel, R.K.W., Zito, A.R. and Bruckner, L. (2003) "European governance and the transfer of 'New' Environmental Policy Instruments (NEPIs) in the European Union". *Public Administration* 18(3): 555–74.
Knill, C. and Lenschow, A. (2003) "Modes of regulation in the governance of the European Union: towards a comprehensive evaluation". *European Integration online Papers* (EIoP) 7(1).
Krimsky, S. and Golding, D. (eds) (1992) *Social Theories of Risk*. Westport, CT: Praeger.
Lenschow, A. (2002) "New regulatory approaches in 'greening' EU policies". *European Law Journal* 8(1): 19–37.
Marburger, J.H. (2011) "Science, technology and innovation in a 21st century context". *Policy Sciences* 44: 209–13.
Marsden, S. and Dovers, S. (2002) *Strategic Environmental Assessment in Australasia*. Sydney: Federation Press.
Maynard, A.D. and Harper, T. (2011) *Building a Sustainable Future: Rethinking the Role of Technology Innovation in an Increasingly Interdependent, Complex and Resource-constrained World*, a report for the World Economic Forum Global Agenda Council on Emerging Technologies. Online. Available HTTP: <http://www.scribd.com/doc/47096457/Building-a-Sustainable-Future> (accessed 28 March 2012).
Organization for Economic Cooperation and Development (OECD) (2009) *The Bioeconomy to 2030: Designing a Policy Agenda*. Paris. Online. Available HTTP: <http://www.oecd.org/dataoecd/5/24/42837897.pdf> (accessed 18 May 2012).
Partidário, M.R. and Clark, R. (2000) "Chapter 1". In Partidário, M. and Clark, R. (eds) *Perspectives on Strategic Environmental Assessment*. Boca Raton, FL: Lewis Publishers.
Peel, J. (2006) "Precautionary only in name? Tensions between precaution and risk assessment in the Australian GMO regulatory framework". In Fisher, E., Jones, J. and von Schomberg, R. (eds) *Implementing the Precautionary Principle: Perspectives and Prospects*. Cheltenham: Edward Elgar.
Phillips McDougall (2011) "The cost and time involved in the discovery, development and authorisation of a new plant biotechnology derived trait". A Consultancy Study for Crop Life International, September. Online. Available HTTP: <http://www.biotech.ucdavis.edu/PDFs/Getting_a_Biotech_Crop_to_Market_Phillips_McDougall_Study.pdf>.
Porter, A. and Fittipaldi, J. (1998) *Environmental Methods Review: Retooling Impact Assessment for the New Century*. Fargo, ND: Army Environmental Policy Institute.
Rid, A. and Wendler, D. (2010) "Risk–benefit assessment in medical research: critical review and open questions". *Law, Probability and Risk* 9(3–4): 151–77.
Rip, A. (2006) "The tension between fiction and precaution in nanotechnology". In Fisher, E., Jones, J. and von Schomberg, R. (eds) *Implementing the Precautionary Principle: Perspectives and Prospects*. Cheltenham: Edward Elgar.
Russell, A.W., Vanclay, F.M., Salisbury, J.G. and Aslin, H.J. (2011) "Technology assessment in Australia: the case for a formal agency to improve advice to policymakers". *Policy Sciences* 44: 157–77.
Shepherd, J., Caldeira, K., Cox, P., Haigh, J., Keith, D., Launder, B. et al. (2009) *Geoengineering the Climate: Science, Governance and Uncertainty*. London: Royal Society.
Sjoberg, L. (1979) "Strength of belief and risk". *Policy Sciences* 11: 39–57.
Smit, B. and Wandel, J. (2006) "Adaptation, adaptive capacity and vulnerability". *Global Environmental Change* 16: 282–92.
Smithson, M. (1989) *Ignorance and Uncertainty: Emerging Paradigms*. New York: Springer-Verlag.

Stahl, B.C., Lichtenstein, Y. and Mangan, A. (2003) "The limits of risk management: a social construction approach". *Communications of the International Information Management Association* 3(3).

Steffen, W., Sanderson, R.A., Tyson, P.D., Jäger, J., Matson, P.A., Moore III, B. et al. (2004) "Global change and the earth system: a planet under pressure". *Ecology and Society* 9(2): 2. Online. Available HTTP: <http://www.ecologyandsociety.org/vol9/iss2/art2/> (accessed 18 May 2012).

United Nations (1992) *Rio Declaration on Environment and Development*. Annex 1 of the UN Conference on Environment and Development, Rio de Janeiro, 3–14 June. New York: UN.

Warner, F. (ed.) (1992) *Risk Assessment, Perception and Management: A Study Group Report*. London: Royal Society.

Williams, R. and Edge, D. (1996) "The social shaping of technology". *Research Policy* 25(6): 865–99.

World Intellectual Property Organization (WIPO) (2012) *World Intellectual Property Indicators, 2011 edition*. Online. Available HTTP: <http://www.wipo.int/ipstats/en/statistics/patents/> (accessed 2 May 2012).

Wynne, B. (1988) "Unruly technology: practical rules, impractical discourses and public understanding". *Social Studies of Science* 18(1): 147–67.

—— (1992) "Uncertainty and environmental learning: reconceiving science in the preventative paradigm". *Global Environmental Change* 2: 111–27.

19

Environmental security

International, national, and human

Sabina W. Lautensach and Alexander K. Lautensach

Like all animals, we *Homo sapiens* evolved within a web of relationships among species, some of which constitute our food, others are our predators, others recycle our wastes, others provide us with shelter or with resources, and still others compete with us for those same resources or services. Such communities of species (also called biotic communities), together with their abiotic environment, make up ecosystems of all sizes throughout the Earth's biosphere. An ecosystem is a dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional system (Alcamo et al. 2003). All ecosystems share several characteristics: they contain living and non-living elements; they show a measurable degree of diversity (species, genes, epigenetics); they have a degree of resilience (defined as the system's ability to maintain relationships between system elements in the presence of disturbances.); a net flow of energy follows a one-way path from outside to inside to heat; they have a carrying capacity for particular kinds and numbers of organisms; they exist in a state of non-equilibrium (i.e., they change over time); changes are irreversible (i.e., ecosystems do not return to a previous state, but develop to a new form) (Bosselmann 2010; Molles and Cahill 2008).

Those characteristics are independent of scale. Ecosystems exist at the microscopic through macroscopic to global levels in complex nested arrangements. The top end is represented by the global ecosystem of the biosphere, sometimes referred to as Gaia. The Gaia theory states that this system exhibits certain characteristics that make it resemble a living organism. Embedded in this web of interactions and dependencies, each species contributes to the stability and resilience of its ecosystem, and in turn the system provides the basic requirements for each species in the form of so-called ecosystem services. These include provisioning services such as food and water; regulating services such as the regulation of floods, drought, land degradation, disease, and other physical variables; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits (Alcamo et al. 2003; Vitousek et al. 1997).

This ecological context provides the basis for environmental security. Environmental security is defined as security from "critical adverse effects caused directly or indirectly by environmental change" (Barnett 2007: 5). Phrased in terms of human agency, environmental security threats can be defined as "behaviour directed against the environment [which] might be seen as a threat to the security of the people or political entities associated with that environment"

(Weintraub 1995: 554–5). We emphasize once again (because this fact is still ignored much too frequently) that ecologically humans are just another animal species, utterly dependent on environmental support structures. Ecological support structures include ecosystems and the structural relationships among them and within them, biomass, biogeochemical cycles and other homeostatic mechanisms (Wackernagel and Rees 1996: 35).

The definition of environmental security covers a diverse range of environmental changes, from the subtle, gradual kind, such as climate change, to sudden, acute disasters, such as floods or earthquakes. Some of them are clearly caused by human mismanagement, as in the case of topsoil erosion; others are caused outside of the human sphere of influence (e.g., tectonics); in between lies a broad range of events where the causation is multifactorial and where our limited scientific understanding often does not allow an unequivocal determination of the extent of human involvement.

Forces that threaten environmental security

What distinguished our species and its immediate ancestors from other animals during the past million years or so was an exceptional proclivity for expanding our habitat, for colonizing diverse environments by adapting to them and by modifying them to our needs (Rees 2004). We did this mainly through the development and use of technology (Dilworth 2010). As noted by numerous authors (e.g., in Heinberg and Lerch 2010), that proclivity is now for the first time no longer working in our favor. By modifying almost every ecosystem on the planet, by extracting and processing resources in ever more complex ways, and by harnessing diverse energy sources to great effect we succeeded in propagating far beyond the numbers of other medium-sized omnivorous mammals. Even by the 1980s our species appropriated over 40 percent of the total photosynthetic production of all plants (the biosphere's net primary photosynthetic productivity, or NPPP) (Vitousek et al. 1986). As humans introduce competitor species, modify ecosystems, deplete habitats, and modify landscapes and climates, our environmental impact has driven hundreds of thousands of species into extinction and continues to do so at an increasing rate. Our limited skills at managing ecosystems could not prevent the "trophic downgrading" of many systems into less complex stable states with fewer species (Estes et al. 2011). Biologists are now referring to the "sixth extinction", a massive loss of species that resembles past cataclysms in the Earth's history but is proceeding much faster, at 5 to 74 species per day (Leakey and Lewin 1995; Wilson 1992).

The tragedy in this development lies not just in the irreversible loss of life forms that took millions of years to evolve; because we are still part of the web-like communities of species, subject to dependencies from which no species can be exempt, the loss of biodiversity threatens our very own security (see Chapter 37). The loss of biodiversity represents only one way in which the current global environmental crisis threatens our security. The crisis is also evident in the increasing rates of resource depletion as the global human population and its consumption patterns continue to grow out of control (see Chapter 16). Pollution continues with its disastrous effects on climate, habitat quality, and public health. Recent measurements indicate that greenhouse gas accumulation and associated climate change are likely to exceed the Intergovernmental Panel on Climate Change's worst-case scenarios (McKibben 2010; see Chapters 28 and 17). More specific manifestations of the crisis with specific security boundaries include ocean acidification (Chapter 35), stratospheric ozone depletion (Chapter 29), phosphorus turnover, freshwater overuse (Chapter 34), land mismanagement (Chapter 40), aerosol loading (Chapter 30), chemical pollution (Chapter 32), biodiversity loss (Chapter 37), CO_2 accumulation with its associated climate change (Chapter 28), and nitrogen turnover. Many

have already exceeded their secure boundaries (Rockström et al. 2009). All those factors are strongly interconnected.

The most pressing causes of the crisis are associated with human overpopulation *cum* overconsumption (McMichael 2001; UNEP–MAB 2005; see Chapter 16). Five causative and self-reinforcing processes have been identified: economic growth, population growth, technological expansion, arms races, and the growing inequity between rich and poor (McMichael 1993; Furkiss 1974; Coates 1991; Daly and Cobb 1994). While the detailed contributions of those processes remain debatable, most analysts agree that the crisis is unequivocally anthropogenic, that is, caused by humans.

As pointed out above, human populations are special in that they employ technology to maximize the benefits of ecosystem services. But regardless of that technological windfall, the capacities of local ecosystems remain limited. Generally, the environmental impact I of a human population on local ecosystems is described by the $I = PAT$ formula, where P means population size, A stands for the affluence or economic means per capita, and T represents the technological impact per capita (Ehrlich and Holdren 1971; York et al. 2003). The maximum sustainable impact, also referred to as carrying capacity (Curry 2011: 126), is thus described as the product of three variables. It can be reached by small populations with a high-impact lifestyle or by larger populations where each individual demands less in terms of support services (Myers and Kent 2004).

When a population exceeds the maximum sustainable impact it enters into overshoot, where the services of the local ecosystems are being overtaxed and, depending on their fragility, they may undergo irreversible structural changes (Catton 1980; McMichael 2001; Meadows et al. 2004). Inevitably the consequence of overshoot for the population is that various biological regulatory mechanisms lead to a decrease in population health and eventually a drop in population size, below the system's carrying capacity. Those mechanisms generally include infectious disease, predators, malnutrition, aggressive territorial behavior, and infertility. All but the last mechanism increase mortality to the effect that the population shrinks until its impact once more measures below the system's carrying capacity (which may have decreased in the meantime). Numerous case studies from animal populations have allowed ecologists to characterize and predict those dynamics with impressive accuracy. In our case, the signs of overshoot include planetary environmental degradation and the other manifestations of the global environmental crisis as evident from our transgression of sustainable quantitative limits (Rockström et al. 2009); economic instability, global resource scarcity, social polarization, and cultural conflict (Raskin et al. 2002) have followed; all the abovementioned biological control mechanisms are already in operation and intensifying (Dobkowski and Wallimann 2002).

The environmental impact of a human population can also be expressed in terms of the area of productive land required to support a population's lifestyle. This is referred to as that population's ecological footprint (Wackernagel and Rees 1996). A population whose footprint exceeds the amount of accessible productive land is clearly in local overshoot (Chambers et al. 2000). This may not always have immediate negative consequences for their security as they may obtain the shortfall from other regions that are either underpopulated, defenceless, or otherwise disempowered (hence the idea of colonialism). The practice is, however, often unjust and supports unsustainable patterns of consumption. Globally, of course, the shortfall is appropriated from future generations as we continue to draw on the biosphere's "ecological capital" instead of making do with the interest. A comparison of humanity's collective global footprint with the Earth's bioproductive capacity suggests that we first entered overshoot in the mid-1980s and that it has steadily increased since then to a current level above 140 percent (WWF 2012), equivalent to a demand on 1.4 planets. The fact that the majority consumes only small per capita

amounts while a minority consumes an obscenely excessive amount at their expense has no bearing on the basic fact that collectively we live "beyond our means" (UNEP–MAB 2005). The most worrying aspect is that all current trends still indicate that our overshoot is worsening, while elected officials everywhere remain obliged, at pain to their careers, to call for more "economic growth".

The extent to which human security and well-being is directly linked to ecological integrity is still under debate. An ecosystem has integrity when its native organisms (their species composition and their numbers) and processes (growth, reproduction, and interactions) are intact (Bosselmann 2010). Animal case studies indicate that overshoot can persist for considerable time spans; in other words, the feedback mechanisms that increase mortality often do not become active until quite some time after overshoot was first entered. The observation that some indicators of human well-being are still increasing even though ecosystem services are degrading and ecological integrity has been widely compromised has led some analysts to question the linkage altogether (Raudsepp-Hearne et al. 2010). However, in the absence of any scientific evidence to the contrary, it seems safe to assume that no animal species can maintain this extent of biomass appropriation, environmental impact, and species displacement for significant lengths of time. Overshoot threatens the environmental security of humanity at the global scale while in some regions the threats are more acute and severe. While environmental security has always been a concern since the evolutionary dawn of humanity, the advent of overshoot has vastly increased and fundamentally changed its significance.

Studies of regional precedents indicated that, as a secondary consequence of overshoot, the ecological carrying capacity gradually decreases because of irreversible damage to ecological support structures (Catton 1980). In other words, the Earth will be able to support fewer and fewer people while overshoot lasts. As the population continues to grow, efforts to extract the last remaining resources by desperate millions will impinge on marginal lands, national parks, and the last vestiges of wilderness. One can only hope that those efforts will be less aggressive because they will no longer be supported by cheap energy. These possibilities lend particular urgency to the imperative to reduce the extent of global overshoot and to protect ecological integrity while humanity's degree of desperation is still manageable.

The international dimension

At the international level, environmental security must address threats that act across national boundaries and globally. As those threats can also constitute reasons for armed conflict, they are also threats to international peace and should as such be considered grounds for United Nations (UN) intervention according to the Charter (Tinker 2001). Intervention can also be justified when a country violates the principle of intergenerational equity by destroying the basis of existence for future generations; this argument relies on the idea of a planetary trust or common heritage (Weiss 1989). This would theoretically place natural resources beyond the control of any single government. A first precedent for this argument is the 1991 UN Security Council (UNSC) Resolution 687 against Iraq for using environmental damage as a weapon of war (UNSC 1991). Further support came from a 1992 UNSC summit which recognized that "the non-military sources of instability in the economic, social, humanitarian *and ecological fields* have become threats to peace and security" (UNSC 1992; our emphasis). Still, those represent feeble beginnings compared with what the international community needs to accomplish (Nobel Laureate Symposium 2011).

Because ecosystems come in a large variety of sizes, overshoot can assume local, regional, or global dimensions. Local or regional overshoot by human societies is often masked by the

import of goods and services from other regions that offer a surplus. They allow for the environmental impact of the population to be distributed over a wider geographical area than its physical habitat. Nevertheless, some historical precedents indicate that this is not always feasible, especially for island populations. In many of those cases local overshoot resulted in severe contractions, invasions, natural disasters, or the cultures collapsed altogether (e.g., the Greenland Norse and the Easter Islanders) (Diamond 2005). Sometimes the crucial factor that drives a population into overshoot is not its excessive growth but a change in the physical environment (e.g., climate) that lowers the region's carrying capacity. The threat of collapse then presents an imperative for the culture to adapt quickly enough to the new contingencies. Examples of cultures that successfully adapted include the Icelanders and the Tikopians (Diamond 2005). Now it is the international community that chooses between those two fates.

At the international level, then, the symptoms of regional overshoot are nowadays often masked by global trade, and by neo-colonialist dependency relationships between "developed" and "developing" countries. In that sense, the current globalized economic and political order represents a threat to global environmental security because it renders less likely the timely rectification of local overshoot through measures towards efficiency, restraint, and adaptation (Lautensach 2010). On the other hand, by virtue of the fact that this order has largely done away with geographical isolation, local calamities can be relieved and collapse prevented in the short term through aid initiatives.

Besides numerous bilateral and multilateral aid agreements among governments and NGOs, the United Nations has effectively assumed the responsibility for environmental security at the international level (UN 2000), even though environmental security is not mentioned among its purposes in Article 1 of its Charter (UN 1945). The UN sets goals and targets for global development, and it plans and implements strategic development programs through subsidiaries such as the UN Development Program (UNDP), the UN Environment Program (UNEP), and the UN High Commission for Refugees (UNHCR). (See Chapters 8 and 9.) In the Secretary General's Millennium Report (UN 2000) those goals are classified into development agenda ("Freedom from Want"), security agenda ("Freedom from Fear"), environmental agenda ("A Sustainable Future"), and agenda towards the renewal of the UN. Most of those goals were reiterated and elaborated in the Millennium Development Goals (MDGs) (UN 2009). The environmental agenda focused on promoting ratification of the Kyoto Protocol on climate change, the adoption of green accounting practices, the organization of the Rio+20 Conference in 2012, and the completion of the Millennium Ecosystem Assessment to "map the health of the planet". That assessment was completed in 2005 and delivered in broad strokes a daunting picture of overshoot as was summarized above (UNEP–MAB 2005).

Unfortunately, that alarming news has not been followed by appropriate action, as illustrated by the failed attempts at high-level conferences to reach international consensus on effective greenhouse targets. Among the eight MDGs ("end poverty and hunger; universal education; gender equality; child health; maternal health; combat HIV/AIDS; environmental sustainability; global partnership") (UN 2009), only one (Goal 7) mentions the environment even though at least four others are now largely influenced by environmental factors. Towards the end of the last decade it was becoming increasingly clear that the MDG targets were not going to be achieved by 2015 as had been proclaimed (MDG Gap Task Force 2011).

The official report blamed the flagging global economic situation and a lack of political commitment for this lack of success (MDG Gap Task Force 2011). The report did not take into account global overshoot or its ramifications; it did not even account for the basic conceptual roots of environmental security as outlined above. That omission seems difficult to explain. Two factors might have conceivably contributed: the UN still suffers from a lack of real political

power which not only renders its policies subject to broad international consensus (particularly among the Security Council) but also limits its ability to spell out in unequivocal terms the findings of its research projects; and many analysts and policy-makers are influenced by what has been called the conventional development paradigm (Raskin et al. 2002). As will be explained below, it conceives of development as a fundamentally economic issue and assumes a basic continuity in current market-oriented policies without recognizing the role of physical limits.

In our discussion of human advancement we presented the ontologically objective context of development (Hawkins 2013) as largely ecological, determined by the laws of natural science. Development also has an ontologically subjective context that is formed by social norms, beliefs, values, and ideals that are culturally contingent and subject to change over time (Searle 1995). The problem with the MDGs and most other comprehensive development plans is that they disregard the former and overemphasize the latter. In particular, they are dominated by three counterproductive ideological beliefs that render those development plans ineffective and, in the long term, contribute to greater environmental destruction. They can therefore be considered threats to environmental security themselves. They illustrate the huge extent to which our actions towards "the environment" are determined by our worldviews. We will explain them briefly in turn.

The conventional development paradigm misleads on sustainability

Goal 7 of the MDGs, "Ensure Environmental Sustainability", consists of four targets:

> "Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources";
> "Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss";
> "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation";
> "By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers."
>
> (UN 2009)

From a humanitarian perspective these targets are entirely laudable – yet, had the MDGs' authors taken into account systemic ecological limits and the current state of overshoot, they would have realized that those targets are unachievable. That unrealistic assessment of the situation is a hallmark of the conventional development paradigm (Raskin et al. 2002).

The unfounded optimism in the conventional development paradigm dates back to the popularized "Brundtland Report" (WCED 1987: 24) that defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". Unfortunately it did not specify what those present needs might be, where to draw the line between needs and wants, how to comply with physical limits to growth, or how to address the implied intergenerational conflict. While it recognized sustainability as an important consideration in development, it ignored the fact that even then humanity had already transgressed beyond the sustainable limits in its collective global impact (WWF 2012). Efforts to merely increase the efficiency of our resource consumption cannot by themselves solve the problem of overshoot; nor would it help to increase equity under the banner of "eliminating poverty". Furthermore, the conventional development paradigm has nothing to say about population growth compounding those problems. In economic terms, "the growth effect outpaces the efficiency effect" of development efforts (Raskin et al. 2002).

More often than at any point in the past, development schemes that follow the conventional development paradigm tend to bump into unforeseen ecological obstacles (Lautensach and Lautensach 2013c). Definitions of sustainability based more explicitly on ecological limits would help to avoid that problem, such as "living off the income generated by the remaining natural capital stocks" (Wackernagel and Rees 1996: 55) or possibly "sustainable development is development that does not compromise the ability of future generations to meet their own needs" (Bartlett 2012: 2; see Chapter 15).

Cornucopianism causes blindness

The belief that the growth of populations and economies can continue forever, unencumbered by physical limits, is referred to as cornucopianism (Ehrlich and Holdren 1971). Despite the fact that it lacks any scientific basis and it blatantly contravenes the laws of thermodynamics, this belief has for decades dominated entire academic disciplines as well as mainstream economic planning and policies (Rees 2004). Many policy documents and development schemes treat it as an implicit assumption. Cornucopianism has hampered efforts at the policy level to relieve poverty, diverting attention from conceptions of development that do not depend on economic "growth".

The remarkable staying power of cornucopianism partly results from its role as mainstay of the ideology of growth, the modernist conviction that with respect to any positive attribute of the status quo, more and bigger constitutes better (Zimmerman 1994; Schumacher 1973). Explanations why some ideologies persist in the face of obvious cognitive dissonance include cognitive bias (including the inability to think holistically or to extrapolate to global dimensions; the inability to extrapolate to the long term; the inability to think critically) (Gordon and Suzuki 1990). Also involved are certain moral ineptitudes (denial of moral responsibility, lack of moral scruples, selfishness, chauvinism) and mental habits (wishful thinking, self-deception, groundless optimism, weakness of will) (Lautensach 2010).

We have presented a more detailed critique of cornucopianism on conceptual, empirical, and consequentialist grounds elsewhere (Lautensach 2010), as have others (e.g., Rees 2004; Nadeau 2009; Bartlett 2012). A further expansion of resource use seems unlikely in view of our present global appropriation; yet, our population growth has only just begun to level off perceptibly and is unlikely to cease before we reach 10 billion (Royal Society 2012). An escalation of the major control mechanisms – epidemics, malnutrition, and violent conflict – seems inevitable. Cornucopianism represents one of the greatest conceptual obstacles towards a transition to sustainable living because it makes sustainability appear unimportant. Thus it represents not merely another conceptual red herring but an extremely harmful ideology. Its dangers stem from the widespread support it still enjoys, much of it implicit, from the damage it causes through the overtaxing of environmental support structures, and from the powerful ways in which it tempts the wishful thinking of many, which is continuously reinforced by certain sectors of the media, advertising industry, and many political groups (Lautensach and Lautensach 2012). A scientific examination of the term "sustainable growth" reveals it as nonsensical unless applied (disingenuously?) to very short time frames, and "sustainable development" in a qualitative meaning only (Lautensach and Lautensach 2013c).

Anthropocentrism leads to dead ends

Anthropocentrists place humans at the center of their moral universe. The strong form of anthropocentrism imparts moral standing exclusively on the human species (Norton 1984). The narrow form is exclusively concerned with the welfare of humans that are presently in existence

(Lautensach 2010). Together those two *continua* map diverse varieties of environmental ethics (see Chapter 25). Anthropocentrism is often accompanied by a particularly pecuniary approach toward commodifying nature, the view that life forms and ecosystems only carry value if they can serve human ends and if their utility can be expressed in terms of monetary figures (Curry 2011). Elsewhere (Lautensach 2010) we have argued that anthropocentrism in its various forms lacks conceptual consistency in that its end values are shallow and ill-defined, and that it informs behavior that results in unintended and undesirable outcomes, even from the view of the anthropocentrist her/himself. Consequently, decisions informed by anthropocentrism carry risks for environmental security that are both unacceptable in the current crisis and avoidable if a more ecocentrist ethic were taken into consideration.

The national dimension

The importance of the national dimension arises from the considerable extent to which the principle of sovereignty overrides international regimes. The primacy of sovereignty is illustrated by the example of the UN Conference on Environment and Development's (UNCED) Agenda 21 action plans that are to be implemented at the national level and subject to government approval, financed through the contributions of developed donor countries. (The rights and obligations of states are discussed in Chapter 24.)

National initiatives can work in favor of environmental security, as illustrated by the examples of Germany and Japan forgoing nuclear power and citing explicitly reasons of environmental security. The interests of the transnational nuclear industry were evidently unable to prevent those decisions. In other cases national governments are often more responsive to corporate interests; nor are the interests of citizens necessarily adequately represented. The Rio Declaration on Environment and Development states: "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level" (Rio Declaration 1992). To that end, citizens are to be guaranteed access to relevant information and governments are to undertake impact assessments and provide venues for public deliberation. The implication is that effective policies at the national level presuppose a functioning civil society as well as mechanisms to prevent the tragedy of the commons. In situations where those prerequisites are absent the active influence of NGOs becomes a vital factor in decisions about environmental security (Tinker 2001).

Even in cases where the will of the citizenry is adequately represented at government level, national policies are also influenced by ideological factors as was discussed above in relation to international policies. Specifically, the powers of the conventional development paradigm, cornucopianism, and anthropocentrism are evident at both levels, reflecting the pervasive influence of the media, the entertainment industry, education systems, and other mechanisms that contribute to the reproduction of ideologies (Orr 2004).

Government intervention in favor of environmental security can be justified on the basis of a human rights theory of fundamental rights to clean air, safe potable water, adequate nutrition, shelter, the safe processing of wastes, and adequate health care (UN 2009). However, such rights are only grantable within the constraints of ecological support structures; in other words, the principle of distributive justice loses much of its benefits when the resulting per capita footprint is too small to adequately support human welfare (Lautensach and Lautensach 2013a). Moreover, many threats to environmental security, as well as possible solutions, are not confined to single countries. Besides the problems with political representation, those two factors severely limit the efficacy of national initiatives. On a more practical level, governments often find their latitude towards progressive policies to be severely limited by the powerful influence of transnational corporate interests and by trade agreements that are often shaped by those interests (Beder 2006; see Chapter 22).

While those contingencies often weaken legislative efforts to promote sustainability and environmental security (e.g., through tariffs, rationing, taxation), one area remains where national governments can make a huge difference: education. Despite attempts at privatization, governments are still largely in control of education systems worldwide. This places at their disposal an instrument that can influence the beliefs, values, attitudes, and ideals of entire generations, and thus their behavior (Bowers 1997; Orr 2004; Lautensach 2010). The UN offers its support in the context of the UN Decade of Education for Sustainable Development 2005–14 (Wals 2009). As we noted above, people's worldviews determine their actions towards the environment to a greater extent than their access to information; like no other state-controlled process, education shapes worldviews. In some legislative areas (such as the state of California) that potential is beginning to be realized but worldwide there remains much to be done.

The human dimension

Since it was first mentioned in the UN's Human Development Report in 1994 (UNDP 1994) the concept of human security has attracted increasing attention among theorists, policy-makers, and, to a limited extent (as in Canada during the 1990s), voters. The UNDP's Human Security Framework (Jolly and Ray 2006) and a report for the UN Centre for Regional Development (Mani 2002) summarized the influence of human security on UN policy. In 2003 the UN Commission on Human Security, chaired by Sadako Ogata and Amartya Sen, reported that the world needed "a new security framework that centers directly on people" (Commission on Human Security 2003). Conceptual reviews of human security have been contributed, for example, by Alkire (2003), Hampson et al. (2002), Kaldor (2007), and Lautensach and Lautensach (2013b). The Human Security Network, founded in 1998, includes 13 developed and developing countries worldwide (plus one observer country), that contributed to the UNDP's human security framework. The UN's development initiatives such as the pursuit of the MDGs are conceptualized under this shift from state security to human security.

One reason for the growing popularity of human security lies in the fact that the value priorities that inform its diverse components are shared widely, priorities that focus on the continued security and well-being of human individuals. Human security has been conceptualized as consisting of four pillars: the traditional area of military/strategic security of the state; economic security, particularly as described by heterodox models of sustainable economies; population health as described by epidemiology and the complex determinants of community health; and environmental security that is primarily determined by the interactions between human populations and the source and sink functions of their host ecosystems (Lautensach 2006). The four pillars include diverse sources of threats, covering the same ground as the "seven dimensions" of the 1994 Human Development Report (UNDP 1994) (economic, food, health, environmental, personal, community, and political security).

Another strength of the human security approach is its comprehensive coverage of interdependent sources of insecurity that were traditionally considered under the purview of different academic specialties and were (and still are) thus studied largely in isolation from each other. The strength of the comprehensive approach lies in its capacity to detect and characterize synergistic effects and multifactorial causation. Moreover, the comprehensive models of human security have allowed analysts to develop methods for assessing and verifying diverse determinants of human security (Hastings 2011). Notwithstanding those strengths, human security represents an intellectual construct, informed by various idiosyncratic notions of well-being, and only in a small part is it informed by objective truths. While it essentially focuses on the present, the priorities and time frames of the different pillars sometimes differ or even clash.

Our discussion of environmental security above showed that in many respects it provides the requisite conditions for the other three pillars of human security, affirming Myers's (1993) thesis of environmental security as the "ultimate security". This does not mean that all human problems are environmental in origin; it merely indicates that many conditions for human security cannot be fulfilled unless environmental security, particularly environmental sustainability, is ensured (Lautensach and Lautensach 2012). If it is not, secondary effects sooner or later ramify into the socio-political, economic, and health-related areas and compromise human security there. The dependence of population health on ecological integrity has been extensively documented (Karr 1997; Chivian 2001; Waltner-Toews 2004). The dependency of human security on environmental prerequisites has contributed to the growing acceptance of the principles of environmental justice (see Chapter 24). They include sustainable development, intergenerational equity, and the precautionary principle (Weintraub 1995). This rise of environmental justice to some extent counteracted efforts by corporate interests to relegate environmental issues to "special interests" (Beder 2006).

Those ramifications into diverse aspects of human security give particular poignancy to the problem of overshoot. As environmental security erodes, any hope of ensuring human security in other areas diminishes. Secondary effects, such as the erosion of the rule of law and of civil society (Myers 1993), as well as the threat of more widespread armed conflict over diminishing resources (Homer-Dixon 1999), add to the urgency of the problem.

Conclusion

To summarize this sequence of causation, unsustainable practices sooner or later lead a population into overshoot, which in turn erodes environmental support structures and decreases their capacity to deliver resources and to accept wastes in the future. This loss of ecological integrity and capacity means that the environmental security of the population is compromised which can manifest itself in shortages of food, energy, or of other commodities, or in elevated levels of pollution, and sometimes in the emergence of new pathogens (Garrett 1994). Such changes invariably diminish population health and lead to economic decline, civil disorder, and vulnerability to external enemies (Homer-Dixon 1999), all of which compromise health further. Evidence is provided by the historical precedents of cultures that disappeared as a result of this sequence of effects (Diamond 2005). The upshot is that whatever safeguards may be in place to protect the economic security of a population, its public health, its national security, and the rule of law – they seem of little help in the long term unless sustainability and environmental security are guaranteed. This resonates with Barnett's (2007) finding of a mutual dependence between environmental security and peace.

As with environmental security, human security is experienced in degrees. The Human Security Index takes into account multiple determinants (Hastings 2011). As our discussion of the $I = PAT$ formula indicated, the spectrum of possible combinations of different population sizes, consumption levels, and technological impacts illustrates the multiplicity of choices by which a society determines its *mode of survival*. The spectrum of choices was aptly described by Potter (1988) as five distinct modes of human survival: mere, miserable, unjust, idealistic, and acceptable. Each mode is characterized by a corresponding state of public health. Given the central importance of human well-being and of principles of justice in human security we can conclude that sustainable human security on a global scale is identical with the *acceptable* survival of humanity, including an acceptable quality of health for the population at large. Once its environmental impact approaches the sustainable maximum those modes become a function of population size, with *mere* survival becoming the most likely mode for a large population and

acceptable survival remaining an option only for relatively small populations. This choice between modes of survival is perhaps the toughest challenge that the ideals of environmental security and human security present to humanity at this time.

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References

Alcamo, J., Ash, N.J., Butler, C.D., Callicott, J.B., Capistrano, D., Carpenter, S.R. et al. (2003) *Ecosystems and Human Well-Being: A Framework for Assessment. A Report of the Conceptual Framework Working Group of the Millennium Ecosystem Assessment*. London: Island Press.

Alkire, S. (2003) Concepts of human security. In *Human Insecurity in a Global World*, Chen, L., Fukuda-Parr, S., and Seidensticker, E. (eds), Cambridge, MA: Asia Center, Harvard University, 15–39.

Barnett, J. (2007) Environmental security and peace. *Journal of Human Security* 3(1): 4–16.

Bartlett, A.A. (2012) The meaning of sustainability. *Teachers Clearinghouse for Science and Society Education Newsletter* 31(1) (Winter), 1–14.

Beder, S. (2006) *Suiting Themselves: How Corporations Drive the Global Agenda*. London: Earthscan.

Bosselmann, K. (2010) Ecological integrity as the core meaning of sustainability. Available HTTP: <www.phase2.org> (accessed 30 May 2012).

Bowers, C.A. (1997) *Liberation Paedagogy in the Age of Environmental Crisis: The Culture of Denial*. Albany: SUNY Press.

Catton, W.R. Jr. (1980) *Overshoot: The Ecological Basis of Revolutionary Change*. Urbana: University of Illinois Press.

Chambers, N., Simmons, C., and Wackernagel, M. (2000) *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability*. London: Earthscan.

Chivian, E. (2001) Environment and health: 7. Species loss and ecosystem disruption – the implications for human health. *Canadian Medical Association Journal* 164(1): 66–9.

Coates, J.F. (1991) The sixteen sources of environmental problems in the 21st century. *Technological Forecasting and Social Change* 40: 87–91.

Commission on Human Security. (2003) *Human Security Now*. New York: Commission on Human Security. Available HTTP: <http://www.humansecurity-chs.org/finalreport/English/FinalReport.pdf> (accessed 15 May 2012).

Curry, P. (2011) *Ecological Ethics: An Introduction*. Cambridge: Polity Press; 2nd edn, 2006.

Daly, H.E. and Cobb, J.B. (1994) *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*. 2nd edn. Boston, MA: Beacon Press.

Diamond, J. (2005) *Collapse: How Societies Choose to Fail or Succeed*. New York: Viking Penguin.

Dilworth, C. (2010) *Too Smart for our Own Good: The Ecological Predicament of Humankind*. Cambridge: Cambridge University Press.

Dobkowski, M.N. and Wallimann, I. (2002) *On the Edge of Scarcity: Environment, Resources, Population, Sustainability and Conflict*. Syracuse, NY: Syracuse University Press.

Ehrlich, P.R. and Holdren, J. (1971) The impact of population growth. *Science* 171: 1212–17.

Estes, J.A., Terborgh, J.S., Brashares, M.E., Power, J., Berger, W.J., Bond, S.R. et al. (2011) Trophic downgrading of Planet Earth. *Science* 333 (July 15): 301–6.

Furkiss, V. (1974) *The Future of Technological Civilisation*. New York: Braziller.

Garrett, L. (1994) *The Coming Plague: Newly Emerging Diseases in a World out of Balance*. New York: Farrar, Straus and Giroux.

Gordon, A. and Suzuki D. (1990) *It's a Matter of Survival*. North Sydney, NSW: Allen and Unwin.

Hampson, F.O., Daudelin, J., Hay, J., Reid, H., and Marton, T. (2002) *Madness in the Multitude: Human Security and World Disorder*. Oxford: Oxford University Press.

Hastings, D. (2011) The Human Security Index: an update and a new release. Document Report Version 1.0 (March). Available HTTP: <http://www.humansecurityindex.org/wordpress/wp-content/uploads/2012/02/hsiv2-documentation-report1_1.pdf>.

Hawkins, R. (2013) Our war against nature. In *Human Security in World Affairs: Problems and Opportunities*, A.K. Lautensach and S.W. Lautensach (eds), Vienna, Austria: Caesarpress.
Heinberg, R. and Lerch, D. (2010) *The Post-Carbon Reader*. Heraldsburg, CA: Watershed Media.
Homer-Dixon, T. (1999) *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press.
Jolly, R. and Ray, B. (2006) *The Human Security Framework*. New York: UNDP.
Kaldor, M. (2007) *Human Security: Reflections on Globalization and Intervention*. Cambridge: Polity Press.
Karr, James B. (1997) Bridging the gap between human and ecological health. *Ecosystem Health* 3: 197–9.
Lautensach, A.K. (2006) Expanding human security. *Journal of Human Security* 2(3): 5–14.
—— (2010) *Environmental Ethics for the Future: Rethinking Education to Achieve Sustainability*. Saarbruecken, Germany: Lambert.
Lautensach, A.K. and Lautensach, S.W. (2012) When should we care about sustainability? Applying human security as the decisive criterion. *Sustainability*. Special Issue "Advances in Sustainability: Selected Papers from 1st World Sustainability Forum", 4(5): 1059–73. Available HTTP: <http://ww.mdpi.com/2071–1050/4/5/1059>
Lautensach, A.K. and Lautensach, S. W. (2013a) Sustainable health for all? The tension between human security and the right to health care. *Ethics, Place and Environment* (submitted).
Lautensach, A.K. and Lautensach, S. W. (eds) (2013b) *Human Security in World Affairs: Problems and Opportunities*. Vienna, Austria: Caesarpress.
Leakey, R. and Lewin, R. (1995) *The Sixth Extinction*. New York: Doubleday.
McKibben, B. (2010) *Earth: Making a Life on a Tough New Planet*. New York: Times Books.
McKibben, B. (2010) A New World. In *The Post-Carbon Reader*. Heinberg, R. and D. Lerch (eds) Heraldsburg, CA: Watershed Media, 43–52.
McMichael, A.J. (1993) *Planetary Overload: Global Environmental Change and the Health of the Human Species*. Cambridge: Cambridge University Press.
—— (2001) *Human Frontiers, Environments and Disease: Past Patterns, Uncertain Futures*. Cambridge: Cambridge University Press.
Mani, D. (2002) *Human Security: Concepts and Definitions*. Tokyo: UN Centre for Regional Development.
Meadows, D., Randers, J., and Meadows, D. (2004) *Limits to Growth: The 30-Year Update*. White River Junction, VT: Chelsea Green Publishing.
Millennium Development Goals Gap Task Force (MDG Gap Task Force) (2011) MDG Gap Task Force Report: 2011 Update. New York: United Nations. Available HTTP: <http://www.un.org/en/development/desa/policy/mdg_gap/mdg_gap2011/mdg8report2011_engw.pdf>
Molles, M.C. and Cahill, J. F. (2008) *Ecology: Concepts and Applications*. Toronto: McGraw-Hill.
Myers, N. (1993) *Ultimate Security: The Environmental Basis of Political Stability*. New York: W.W. Norton.
Myers, N. and Kent, J. (2004) *The New Consumers: The Influence of Affluence on the Environment*. London: Island Press.
Nadeau, R.L. (2009) Brother, can you spare me a planet? Mainstream economic theory and the environmental crisis. *Sapiens* 2(1): 71–8.
Nobel Laureate Symposium. (2011) *The Stockholm Memorandum: Tipping the Scales towards Sustainability*. Stockholm Environment Institute. Available HTTP: <http://globalsymposium2011.org/wp-content/uploads/2011/07/memorandum-signed.pdf> (accessed 30 May 2012).
Norton, B. (1984) Environmental ethics and weak anthropocentrism. *Environmental Ethics* 6: 131–48.
Orr, D.R. (2004) *Earth on Mind: On Education, Environment and the Human Prospect*. Washington, DC: Island Press.
Potter, V.R. (1988) *Global Bioethics: Building on the Leopold Legacy*. East Lansing: Michigan State University Press.
Raskin, P., Banuri, T., Gallopín, G., Gutman, P., Hammond, A., Kates, R., and Swart, R. (2002) *Great Transition: The Promise and Lure of the Times Ahead*. Stockholm Environment Institute Polestar Report no. 10. Boston, MA: SEI. Available HTTP: <http://www.sei-international.org/publications?pid=1547>
Raudsepp-Hearne, C., Peterson, G., Tengo, M., Bennett, E.M., Holland, T., Benessaiah, K. et al. (2010) Untangling the environmentalist's paradox: why is human well-being increasing as ecosystem services degrade? *BioScience* 60(8): 576–89.
Rees, W.E. (2004) Waking the sleepwalkers: a human ecological perspective on prospects for achieving sustainability. In *The Human Ecological Footprint*. Guelph, Canada: Faculty of Environmental Sciences, University of Guelph.
Rio Declaration on Environment and Development (1992) Principle 10. UN Doc. A/Conf.151/5/Rev. 1. Reprinted in *International Legal Materials* 31: 874.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin III, F.S., Lambin, E. et al. (2009) A safe operating space for humanity. *Nature* 461 (September 24): 472–5.

Royal Society (UK) (2012) *People and the Planet*. Royal Society Science Policy Centre Report 01/12. London: Royal Society.

Schumacher, E.F. (1973) *Small is Beautiful: Economics as if People Really Mattered*. London: Abacus.

Searle, J.R. (1995) *The Construction of Social Reality*. New York: Free Press.

Tinker, C. (2001) Environmental security: finding the balance. In *Adapting the United Nations to a Postmodern Era: Lessons Learned*. W.A. Knight (ed.), New York: Palgrave Macmillan, 2nd edn, 212–28.

United Nations (UN) (1945) Charter of the United Nations. New York: United Nations. Available HTTP: <http://www.un.org/en/documents/charter/chapter1.shtml>

—— (2000) We the Peoples: The Role of the United Nations in the 21st Century. New York: UN. Available HTTP: <www.un.org/millennium/sg/report/key.htm>

—— (2009) End Poverty 2015: Millennium Development Goals. New York: UN. Available HTTP: <http://www.un.org/millenniumgoals/>

United Nations Development Programme (UNDP) (1994) *Human Development Report: New Dimensions of Human Security*. New York: UN.

—— (2011) *21 Years of Human Development Reports*. Available HTTP: <http://hdr.undp.org/en/reports/>

United Nations Environment Programme–Millennium Assessment Board (UNEP–MAB) (2005) *Living Beyond Our Means: Natural Assets and Human Well-being*. London: UNEP–WCMC. Available HTTP: <http://www.maweb.org/en/Reports.aspx>

United Nations Security Council (UNSC) (1991) UNSC Resolution 687, UN SCOR 45th Session, UN Doc. S/RES/687. Reprinted in *International Legal Materials* 30: 846.

—— (1992) *Statement of the President of the Security Council*. UN SCOR 47th Session, 3046th meetg. At 3, UN Doc. S/23500 (31 January).

Vitousek, P.M., Ehrlich, P.R., Ehrlich, A.H., and Matson, P.A. (1986) Human appropriation of the products of photosynthesis. *BioScience* 36: 368–73.

Vitousek, P.M., Mooney, H.A., Lubchenko, J., and Melillo, J.M. (1997) Human domination of Earth's ecosystems. *Science* 277 (25 July): 494–9.

Wackernagel, M. and Rees, W. (1996) *Our Ecological Footprint: Reducing Human Impact on the Earth*. Oxford: John Carpenter.

Wals, A. (2009). *United Nations Decade of Education for Sustainable Development 2005–14*. Paris: UNESCO. Available HTTP: <http://unesdoc.unesco.org/images/0018/001849/184944e.pdf> (accessed August 2010).

Waltner-Toews, D. (2004) *Ecosystem Sustainability and Health: A Practical Approach*. Cambridge: Cambridge University Press.

Weintraub, B.A. (1995) Environmental security, environmental management, and environmental justice. *Pace Environmental Law Review* 12. White Plains, NY: Pace University School of Law, 614–18.

Weiss, E.B. (1989) *In Fairness to Future Generations: International Law, Common Patrimony, and Intergenerational Equity*. Tokyo: UN University Press, 17–46, 385–412.

Wilson, E.O. (1992) Biodiversity threatened. In *The Diversity of Life*. Cambridge, MA: Harvard University Press, 253–80.

World Commission on Environment and Development (WCED) (1987) *Our Common Future: The Brundtland Report: The Brundtland Report*. Oxford: Oxford University Press.

World Wildlife Fund (WWF) (2012) *Living Planet Report 2012*. Available HTTP: <http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/>

York, R., Rosa, E.A., and T. Dietz. (2003) STIRPAT, IPAT and ImPACT: analytic tools for unpacking the driving forces of environmental impacts. *Ecological Economics* 46(3): 351–65.

Zimmerman, M.E. (1994) *Contesting Earth's Future: Radical Ecology and Postmodernity*. Berkeley: University of California Press.

20

Environmental diplomacy

International conferences and negotiations

Radoslav S. Dimitrov

> Those delegations who want [to postpone a climate agreement until after] 2020, I want to assure you that you are simply signing the death sentence of some countries. You have to be very aware of that.
>
> At the end of the day, I'm not going to march to my death voluntarily!…This is a most distressing moment for me, personally, and I'm quite sure for many of us – because if we were to accept this text as is, we really would be voluntarily stepping on our children's throats. And I have no intention of joining that parade because I believe we all have the right to exist.
>
> Statements by Cape Verde and Barbados during climate negotiations behind closed doors in Durban, December 9, 2011 (as recorded by the author)

The rise of environmental diplomacy is a distinct development in modern international relations. In recent decades, states have negotiated over 700 multilateral policy agreements and over 1,000 bilateral agreements on ecological issues (Mitchell 2003). At any given time, a multilateral environmental meeting of government representatives is taking place somewhere in the world, with Geneva, New York, Bonn, Bangkok, and New Delhi among the common venues of diplomacy. Climate change alone has been the subject of 20 rounds of formal negotiations between 2007 and the end of 2011. Policy-makers complain of "negotiation fatigue" and regime saturation. Between 1992 and 2007, major conferences related to 10 of the existing multilateral environmental agreements have taken 115 days per year (Muñoz et al. 2009). When we add other environmental issues as well as the plethora of pre-negotiation meetings and technical workshops, we observe a world in perpetual negotiation over environmental policy.

From an academic perspective, environmental diplomacy is important because negotiations are the principal means of constructing international institutions (Hasenclever et al. 1997; Young 1998; Haas et al. 1993; Levy et al. 1995; Goldstein et al. 2000). Negotiations have been described as "a process of mutual persuasion and adjustment of interests and policies which aims at combining non-identical actor preferences into a single joint decision" (Rittberger 1998: 17). The process unfolds in analytically distinct stages. Oran Young (1994) distinguished between pre-negotiation, negotiating, and implementation of international agreements and showed that each stage is affected by different political factors (see Chasek 2001). Negotiations typically

consist of years of formal and informal discussions on the rules of a treaty, including policy targets, timetables, implementation mechanisms, and compliance procedures.

This chapter surveys the main themes in the study of environmental diplomacy: game theory, the role of leadership, domestic–international connections, issue linkage, the influence of nonstate actors, norms and discourse, and argumentation and negotiating strategies. In recent years, repeated failures to create a climate treaty have discredited environmental diplomacy. Yet, environmental negotiations can affect perceived interests and contribute to a green policy shift even without producing formal agreements. We need to reconsider the role of diplomacy in governance and the meaning of negotiation "outcome".

Insider perspectives on environmental diplomacy

Empirical studies based on direct observation of negotiations are relatively few. Typically, studies produce a chronological list of conferences, their main outcomes, and select dramatic moves by particular countries such as Canada's withdrawal from the Kyoto Protocol publicized in newspaper headlines. The dynamics around the negotiation table often remain hidden. What is the verbal exchange among delegations? What are the bargaining offers and responses during informal consultations? Relevant literature tends to avoid these questions and gravitate toward related topics such as theorizing the creation and impact of institutions (Barrett 2003; Young 1994) or future policy options (Victor 2011). This tendency is understandable and perhaps unavoidable. Lack of direct access to negotiations is a major obstacle to studying diplomacy. Few scholars attend UN conferences or conduct extensive interviews with key actors. Even fewer have access to "working group" sessions and informal consultations where most negotiations take place.

Rich empirical accounts emerge from participants in environmental diplomacy. From Richard Benedick's classical story of ozone diplomacy (1998) to David Humphreys's dedicated work to chronicle forest policy negotiations to insiders' perspectives on climate negotiations (Depledge 2005b; Dimitrov 2010), participatory observations allow readers to get as close to reality as possible. Detailed accounts of negotiations offer an insider view, based on either interviews with key actors (Falkner 2000) or authors' direct involvement (Benedick 1998; Bodansky 2010; Depledge 2005a, 2005b, 2006; Dimitrov 2005, 2010; Kulovesi and Gutiérrez 2009; Rajamani 2008, 2010; Smith 2009). Writers for the *Earth Negotiation Bulletin* with extensive exposure to negotiations continue to offer valuable insights on various conferences (Chasek and Wagner 2012; Jinnah et al. 2009; Wagner 2007). These and other works offer a palpable taste of environmental diplomacy and in-depth expertise that can inform both theory and practice. One book from the frontlines of environmental diplomacy is by Richard Smith (2009), an American diplomat who helped negotiate several agreements. This experienced practitioner illuminates features of environmental diplomacy that often escape academic scholars: real negotiations take place in informal working groups and rarely in official Plenary discussions; breakthroughs occur in all-night sessions in the final days of conferences; and country delegations sometimes fall silent as a negotiating tactic.

Academic perspectives

Scholarship on diplomacy often seeks to explain particular country positions or collective negotiation outcomes. In one classical study, Detlef Sprinz and Tapani Vaahtoranta (1994) stress domestic cost–benefit analysis and explain country positions in negotiations with their expected policy costs and vulnerability to ecological problems. Early research also addressed why some

negotiations succeed while others fail to produce policy agreements. One project attempted to identify the determinants of success through a comparison of five empirical cases of successful regime formation (Young and Osherenko 1993). The authors concluded that none of the independent variables under consideration could explain the outcomes. Subsequent scholarship scaled down ambition and desists from broad theoretical explanations of negotiation outcomes.

Game theory

Game theory focuses on modeling of negotiations and utilizes formal logic to derive probable outcomes from fixed actor preferences. Bruce de Mesquita (2009) declared with confidence that predicting the future is possible. Using computer calculations, he wrote that the 2009 Copenhagen conference would fail and that global climate policy will gain momentum over several decades, then steadily decline between 2050 and 2100. In more conventional vein, Scott Barrett (1998, 2003) has built a body of work to clarify the obstacles to global environmental cooperation through game theory. Another pioneer in this realm is Hugh Ward who used the game of chicken to illuminate climate negotiations (1993) and later developed a model of climate negotiations incorporating divergent national positions of dragger and pusher countries (Ward et al. 2001).

Formal models of bargaining have rarely been applied to actual cases of environmental negotiations (Avenhaus and Zartman 2007). In a collection of essays using extended game theoretic methods to speculate on potential agreements on the reduction of greenhouse gases (Carraro 1997), heterogeneity of state actors was theorized to benefit the prospects for burden sharing arrangements and coalition building. Whether this actually occurs is unclear since studies do not compare formal models with actual negotiations. Oran Young (1994) developed a model of integrative bargaining that captures the role of multiple actors, the veil of uncertainty about future costs and benefits, and evolving interest configurations, among other factors. His model is commonly recognized as influential in the discipline but has yet to be applied systematically in empirical studies.

Power and leadership

Deborah Davenport (2005) argues that US preferences explain the failure of negotiations on a global forest convention. Most scholars of global environmental politics, however, generally agree that hegemonic power matters little in environmental diplomacy (Falkner 2005; Andresen and Agrawala 2002; Young 1991; Underdal 1994). In a thorough treatment of the topic, Robert Falkner (2005) shows that hegemony provides an incomplete perspective that explains neither the direction of US policy nor international outcomes. Moreover, even small countries can exercise strong influence in negotiations. The Netherlands have used initiative and shrewd diplomacy to influence both European and global climate negotiations (Kanie 2003). The Alliance of Small Island States are active participants in climate talks and influence the process by "borrowing external power" (Betzold 2010).

The weak relevance of structural power has led to a vibrant body of research on leadership. There are three principal types of leadership: structural, directional, and instrumental (Gupta and Grubb 2000). Structural leadership derives from material resources, including forest cover (Brazil) or share of polluting emissions (China). Directional leaders such as the European Union (EU) in climate change or the United States in the ozone negotiations lead by example through unilateral domestic policies that demonstrate feasible solutions to other countries (Underdal 1994). Instrumental leadership is a function of political initiative, skill, and creativity in the

process of negotiations, including submission of policy proposals and persuasive arguments. (Young (1991) offers an alternative typology and lists three leadership types: structural, entrepreneurial, and intellectual.)

Instrumental leadership can be further divided into entrepreneurial and intellectual (Young 1991; Kanie 2003). One entrepreneurial leader is the small island nation of Tuvalu whose delegation has been remarkably influential in climate discussions by providing concrete proposals, including an elaborate treaty text tabled in 2009 before Copenhagen. Intellectual leadership is particularly important in early stages of negotiations (Andresen and Agrawala 2002). The United States played an intellectual leadership role in the 1990s by introducing the idea of emission trading in the Kyoto Protocol negotiations.

How do we know who is a leader? Problematizing how we identify leaders is an important development because political self-proclamations of leadership are common and unreliable: even Canada's leaders claim leadership in climate policy! Recent innovative studies investigate the demand side of leadership. Interviews of diplomats in the climate negotiations reveal that the EU and China are most commonly perceived as leaders by their peers (Kilian and Elgström 2010; Karlsson et al. 2011). Other studies explore causal mechanisms through which leaders emerge, with European leadership being a common case study.

The EU has provided strong leadership in environmental negotiations on various issues (Gupta and Grubb 2000; Vogler 2005; Harris 2007; Schreurs and Tiberghien 2007; Oberthür and Kelly 2008; see Chapter 8). Some scholars argue that this role is a product of norms and identity of Europe as an ideational leader (Manners 2002; Krämer 2004; see Chapter 4). Vogler (2005) considers carefully institutionalist hypotheses and finds evidence of "normative entrapment": European leadership is a product of a normative stance on climate change and remains part of an enduring self-image that continues to propel strong policies. Others caution against idealism and maintain that political economy and material considerations drive the EU (Falkner 2007).

Jon Hovi and his colleagues (2003) compare four alternative explanations and argue that the EU persistence in the climate regime is the product of the combined effects of domestic institutional inertia and power-seeking desire for international leadership. By pulling out of the Kyoto Protocol in 2001, the USA offered the EU and other actors an opportunity to gain political power in one of the most important current negotiations. Similarly, Schreurs and Tiberghien (2007) focus on domestic institutions and argue that "multilevel reinforcement" between key EU states, the European Commission, and Parliament vying for power explains leadership. Norichika Kanie (2003) goes even deeper into domestic politics and provides us with a rich empirical study of the Netherlands' role in climate talks. He shows that Dutch leadership was made possible by domestic political processes and intense cooperation between the government delegation and Dutch NGOs during international conferences.

Domestic–international connections

The interplay between domestic politics and international discussions is another lucrative area of study (see Chapter 11). Robert Putnam's (1988) seminal work established that each delegation in negotiations plays two simultaneous "games" with domestic constituents and foreign counterparts. His concept of the two-level game continues to inform scholars in understanding state behavior (Agrawala and Andresen 2001). In her award-winning work, Beth DeSombre (2000) reveals the domestic sources of foreign environmental policy that can illuminate negotiations, too. Áslaug Ásgeirsdóttir (2008) examines bargaining between Iceland and Norway over fish stocks, and confirms Putnam's view that powerful domestic interest groups actually strengthen

the negotiating position of states vis-à-vis other countries. Iceland's strong fishing industry exerted pressures on the government that helped its delegation win concessions from Norway whose weaker internal pressures left the delegation with more maneuvering space and therefore more openness for compromise. Other empirical studies cast doubt on the theory and suggest that state leaders may choose to ignore domestic constraints and may pursue international strategies without paying close attention to the domestic game. In a study of the Kyoto Protocol, McLean and Stone (2012) argue that the EU has a principled commitment to climate cooperation and subordinates its domestic politics to the international level regardless of negotiation outcomes.

Issue linkage

Negotiations on a specific environmental problem rarely develop in isolation from policy discussions on other ecological problems. State and nonstate actors make deliberate decisions to affect policy outcomes by drawing linkages between climate change (Chapter 28), forestry (Chapter 38), desertification (Chapter 39), ozone depletion (Chapter 29), biodiversity (Chapter 37), and other issues. These strategies have inundated conferences of the United Nations Framework Convention on Climate Change (UNFCCC), making the climate problematique a central hub of global environmental politics (see below). Indeed, as Sikina Jinnah notes, "with over 1,200 NGO and IGO observers now accredited to attend the UNFCCC negotiations, representing over 22 issue areas, and drawing over 20,000 observers, it seems that everyone from McDonald's to the Vatican is jumping on the proverbial climate change bandwagon" (Jinnah 2011: 2).

Tapping into the literature on institutional interplay (Young 2002), studies have enriched our understanding of the impacts of issue linkage but also generate a debate. Linking environmental and trade issues made easier negotiations on ozone depletion and contributed to the success of the Montreal Protocol (Barrett 1997; see Chapter 29). Bandwagoning has the potential to facilitate more effective policy outcomes on climate change (Jinnah 2011). At the same time, linkages increase issue complexity that is already overwhelming in climate politics and present an obstacle to productive negotiations (Wapner 2011; Victor 2011; see Chapter 28).

Nonstate actors

The main actors in environmental diplomacy are state delegations, yet nonstate actors have access to conferences and affect the process (see Chapter 14). The mega-conference on climate change in Copenhagen in 2009 involved more than 20,000 NGO representatives, that is, half of all registrants. Kal Raustiala (2002) drew a comprehensive list of methods of NGO influence and revealed a symbiotic relationship between states and NGOs. Betsill and Corell (2001) developed an influential analytical framework to study systematically the role of civil society and environmental NGOs. Utilizing this framework, a study of forest negotiations reveals that green NGOs can influence negotiations if they get involved early in the process and phrase their policy recommendations in line with neoliberal discourse (Humphreys 2004). NGOs actively seek to influence climate change negotiations through awareness raising, coalition building, "corridor politics", and participation on state delegations, yet their actual impact on policy-making is unclear (Gulbrandsen and Andresen 2004). Recent years have seen disenfranchisement of civil society at environmental conferences (Fisher 2010). Academics also investigate the influence of business and industry groups on environmental negotiations (Mecking 2011; Vormedal 2009; Levy and Egan 2003). Corporate actors rarely manage to prevent international

regulation but influence the content of agreements toward market-based policy instruments such as emissions trading (Mecking 2011).

Norms, discourse, and argumentation in negotations

Constructivist scholars argue that shared global norms affect international environmental policy (see Chapter 4). Ozone treaties were products of social discourse tailored to favor the precautionary principle (Litfin 1994; see Chapter 29). A global norm of environmental multilateralism explains forest diplomacy, the creation of the impotent UN Forum on Forests, and universal state participation in it (Dimitrov 2005; see Chapter 38). And outcomes of the 1991 Earth Summit reflect a broad normative paradigm of liberal environmentalism (Bernstein 2001).

A major gap in the literature is the virtual absence of studies on argumentation in diplomacy. Sweeping literature reviews conclude that the exchange of arguments is the least explored topic in this field of research (Jönsson 2002; Zartman 2002). Despite the widespread recognition that "in essence, international negotiation is communication" (Stein 1988: 222), communication is the *terra incognita* of negotiation studies. What do delegations actually say to one another? According to Jönsson, "The back-and-forth communication…the dynamics of mutual persuasion attempts that we usually associate with negotiations are insufficiently caught" (Jönsson 2002: 224). This is unfortunate, especially given recent findings that the process of communicating policy preferences has a pronounced impact on the prospects for agreement – independent of distributional issues and concerns about cheating (Earnest 2008).

Thomas Risse (2000) and Harald Müller (2004) cogently argued the need to study communicative behavior but the few attempts produce inconclusive results, partly due to a lack of verbatim records of negotiations (Deitelhoff and Müller 2005). Scholars rarely have access to international negotiations, particularly behind closed doors. Important books by Farhana Yamin and Joanna Depledge rectify the general neglect of process and provide detailed descriptions of the logistical organization of climate negotiations but also leave out the political discursive exchange among delegations (Depledge 2005b; Yamin and Depledge 2004). Recently, Christian Grobe (2010) advanced a rationalist theory of argumentative persuasion and claimed that changes in bargaining positions are motivated not by arguments but by new causal knowledge about the problem at hand. Notably, his "functional persuasion theory" draws on secondary sources and includes no data on the conversation between delegations at conferences.

There is now evidence that persuasion and discourse alter policy preferences. A recent study explores the micro-dynamics of international conversations and identifies techniques of persuasion in climate diplomacy (Dimitrov 2012). Several findings emerge from this research. First, governments spend considerable efforts to persuade others and engage in purposeful communication aiming to reshape policy preferences in other countries. Quite simply, actors attempt to change each other's minds and not merely policy behavior. Second, governments use several principal types of arguments: pragmatic, moral, legal, procedural, and ideological. Third, some approaches to persuasion work better than others. Effective argumentation focuses on the interests of *other* countries. Shrewd negotiators formulate their own argumentation with a view to accommodating the interests of their target audience (Dimitrov 2012).

Climate change negotiations

Global climate negotiations present a special case and attract considerable public as well as academic attention (see also Chapter 28). Daniel Bodansky, Joanna Depledge, and others have spent decades documenting diplomatic efforts to formulate a global response to climate change

in the past 20 years (Bodansky 2001, 2010; Depledge 2005a, 2005b, 2006). Various participants in UN climate conferences have illuminated recent negotiations on post-Kyoto policy. Their first-hand accounts help us understand the enormously complex climate politics with extensive and detailed summaries of issues on the table, positions of main countries, political dynamics, and major decision outcomes (Fry 2008; Chandani 2010; Depledge 2006; Dimitrov 2010; Kulovesi and Gutiérrez 2009; Oberthür 2011; Rajamani 2008, 2010; Sterk et al. 2010). Many studies analyze existing climate agreements and discuss future prospects for cooperation (Clémençon 2008; Watanabe et al. 2008; Ott et al. 2008; Yamin and Depledge 2004; Victor 2001). Others focus on national policies and negotiation positions of actors such as the USA (Depledge 2005a), the EU (Oberthür and Kelly 2008; Vogler and Bretherton 2006; Hovi et al. 2003), China (Harris and Yu 2005), developing countries (Najam et al. 2003), and island states (Betzold 2010). Finally, another important body of literature debates future policy options, offers policy recommendations, and discusses issues of justice and equity (Müller 2011; Hare et al., 2010; Agrawala and Andresen 2001; Bodansky 2004; Adger et al. 2006; Harris 2011; Roberts and Parks 2007).

After 20 rounds of formal negotiations over four years, global climate diplomacy suffered lasting damage in Durban in December 2011. Two weeks of discussions culminated with a three-day marathon of round-the-clock talks between ministers. Eventually, states decided to postpone a global climate treaty for at least nine years. Many regarded this outcome as a disaster. The EU privately considered boycotting the conference and island nations described the outcome as "harakiri" that "places entire nations on death row" (author's recording at Durban conference of the parties, 9 December 2011). Only three countries openly supported this outcome (Australia, Canada, and the United States), while others accepted it in exchange for continuation of the Kyoto Protocol. The collective decision was to continue negotiations with a new deadline of 2015 for reaching an agreement that would apply *after* 2020. This constituted an open admission that the 2007 Bali mandate had failed and turned the famed "post-2012 policy" into a post-2020 possibility. The Kyoto Protocol was extended with a second commitment period until either 2017 or 2020 (to be decided). Notably, "Kyoto 2" relies on voluntary national commitments to be determined by countries domestically. The text merely "invites countries" to report their policy goals. Thus, the original Kyoto Protocol with its binding absolute emissions reductions was replaced with voluntary goals, without even obliging countries to communicate those internationally.

Today the global negotiations have been placed on hold and prospects for change over the next several years are bleak. The outcome appears to obey Arild Underdal's "law of the least ambitious program" that remains foundational in mainstream scholarship. Underdal (1980) observed that negotiations involving multiple actors tend to produce outcomes that reflect the lowest-common denominator. The large number of actors (194 states) makes effective climate agreements difficult. The requirement of global political consensus as a basis for decision-making creates major obstacles to effective multilateralism by giving every actor veto power.

There is striking convergence of academic views on the poor prospects of climate diplomacy. David Victor (2006) and Bruce Bueno de Mesquita (2009) state with certainty that failure of the current global approach is guaranteed, given enormous issue complexity combined with highly diverse national interests. In a thoughtful and extensively researched piece, Røgeberg, Andresen, and Holtsmark (2010) bring charts and numbers to prove that the international community of states cannot solve the climate problem. A veteran diplomat, Richard Smith (2009) considers the climate negotiation process as a manual of how not to negotiate agreements. He worries about the absence of domestic support and national policies in key countries as an important precondition for productive international negotiations.

Academic observers share skepticism on the prospects but disagree on how to improve them. Subject of a cottage industry of academics and think tanks, the proposals for international climate policy are numerous and diverse (Aldy and Stavins 2010; Bodansky 2004). Robert Falkner and his colleagues caution against a decentralized bottom-up approach and advocate a "building-blocks" strategy of negotiating a broad global legal framework with firm binding commitments, in an incremental fashion (Falkner et al. 2010). David Victor (2011) recommends the opposite: negotiating a nonbinding agreement on key issues among a few key players. He advocates replacing the binding model of international law and creating a global oligarchy of powerful countries to provide global climate governance reflecting their national interests and abilities. A moderate variant is offered by Robyn Eckersley (2012) whose vision of "inclusive minilateralism" involves a Global Climate Council of 8 to 23 countries. John Vogler (2010) offers constructivist advice on climate diplomacy and calls for building trust between states by developing shared understanding of the problem and domestic policy actions that signal commitment.

Rethinking the role of environmental diplomacy

The failure of the UN talks to produce a climate treaty is clear but observers draw different conclusions from this outcome. Some expand academic definitions of regimes and argue that the climate regime encompasses multiple institutions and nongovernmental initiatives (Keohane and Victor 2011). Others dismiss the intergovernmental realm as futile and focus on nonstate climate initiatives (Hoffman 2011). Still others maintain the importance of diplomacy and draw a causal connection between "failed" UN negotiations and progress in multilevel climate governance by both state and nonstate actors (Dimitrov 2012).

The disappointment that climate negotiations have failed to produce a treaty is understandable but it need not create skepticism about international negotiations. United Nations talks have succeeded in important ways: discussions have affected state behavior and fostered the development of domestic policies even in the absence of a formal treaty (Dimitrov 2010, 2012).

European arguments during the climate negotiations changed many actors' views on the economic benefits of climate policy. International discussions during the 1990s were dominated by the premise that climate policy is expensive and countries must choose between economic and environmental interests. In the early 2000s, the EU introduced the concept of "win–win solutions" to the climate discourse. Their new argument was contrary to conventional wisdom at the time: climate policy can bring economic *benefits* and there is no juxtaposition between economic and environmental interests. The benefits of emission reductions are multiple: financial savings, increased economic competitiveness, improved energy security, increased political independence from unstable regions such as the Middle East, improved public health – as well as mitigating climate change and its devastating impacts (Dimitrov 2012).

The EU made this argument tirelessly over many years of discussions. Vogler confirms that the British government made efforts to change other countries' perception of the climate problem as well as their economic interests in mitigating it: emission reductions "are now claimed to constitute an economic benefit and a necessary investment, rather than a burden to be borne" (Vogler 2010: 2685–6). European states also backed their words with actions and unilaterally adopted the elaborate and ambitious 2007 "Energy and Climate Package", binding on all 27 member states (Morgera et al. 2010; Oberthür and Pallemaerts 2010).

The "win–win" rationale was embraced by many communities worldwide. Today 90 states including most major emitters have considerable domestic plans for clean energy and emission reductions. Diplomats describe China's new five-year plan (2011–15) as the most progressive legislature toward a low-carbon economy in history. Influenced by European arguments about

the economic benefits of green action, in 2008 South Korea officially embraced a "Green Growth" paradigm of economic development, committed to 30 percent emission cuts by 2020 below business-as-usual and established a Global Green Growth Institute to systematize green growth theory. Norway plans to slash its emissions by 40 percent by 2020 and be carbon neutral by 2030. Japan's decision to cut its emission by 25 percent by 2020 is also remarkable. Countries are establishing new branches of government dedicated to climate policy such as Australia's new Department of Climate Change and Energy.

Conclusion

Global climate governance is dramatically different today compared with the 1990s, being now a vibrant realm of policy development and implementation. Policy changes are not universal but they converge in one direction: a low-carbon economy based on renewable energy and energy efficiency. And while the driving forces behind this Green Shift are likely multiple, the growing belief in the importance of climate policy and the *economic* value of green action cannot be separated from international dialogue over the past 20 years. This conversation has not brought a treaty but has changed perceptions of national interests. In a rich empirical study, Antto Vihma (2010) argues that India's domestic climate discourse as well as decision-making processes have changed as a result of the country's engagement in UN talks. Peter Haas (2002) has argued that an important effect of UN environmental conferences is the growth of global environmental norms. Its shortcomings notwithstanding, "the Kyoto Protocol" is now a household phrase in communities around the world and raises awareness of climate change.

Thus, global discussions have fostered climate governance despite their failure to produce a new treaty. Negotiations scholars need to reconsider the meaning of "outcome" and recognize the diverse impacts of negotiations on state behavior, apart from treaty making. International conversations have helped state and corporate actors recalculate their interests in green policies. In this context, further study of persuasion and argumentation can make valuable contributions to theory and practice. It would enable conclusions on the effectiveness of negotiating strategies that can be useful to practitioners and policy-makers. Second, research on persuasion and policy change would facilitate the development of a theory of interest formation. Argumentation studies can illuminate the role of dialogue in the evolution of policy preferences and help clarify sociological processes of interest creation, reconstitution, and change.

References

Adger, W. Neil, Jouni Paavola, Saleemul Huq, and M. J. Mace, eds. 2006. *Fairness in Adaptation to Climate Change*. Cambridge, MA: MIT Press.

Agrawala, Shardul, and Steinar Andresen. 2001. "Two-Level Games and the Future of the Climate Regime." *Energy and Environment*, 12(2–3): 5–11.

Aldy, Joseph E., and R. N. Stavins, eds. 2010. *Post-Kyoto International Climate Policy: Implementing Architectures for Agreements*. Cambridge: Cambridge University Press.

Andresen, Steinar, and Shardul Agrawala. 2002. "Leaders, Pushers and Laggards in the Making of the Climate Regime." *Global Climate Change*, 12: 41–51.

Ásgeirsdóttir, Áslaug. 2008. *Who Gets What: Domestic Influences on International Negotiations Allocating Shared Resources*. New York: SUNY Press.

Avenhaus, Rudolf, and I. William Zartman. 2007. "Formal Models of, in and for International Negotiations." In *Diplomacy Games: Formal Models and International Negotiations*, edited by Rudolf Avenhaus and I. William Zartman, 1–22. Berlin: Springer.

Barrett, Scott. 1997. "The Strategy of Trade Sanctions in International Environmental Agreements." *Resource and Energy Economics*, 19(4): 345–61.

Barrett, Scott. 1998. "On the Theory and Diplomacy of Environmental Treaty-Making." *Environmental and Resource Economics*, 11(3–4): 317–33.
—— 2003. *Environment and Statecraft: The Strategy of Environmental Treaty-Making*. Oxford: Oxford University Press.
Benedick, Richard Elliot. 1998. *Ozone Diplomacy: New Directions in Safeguarding the Planet*. Cambridge, MA: Harvard University Press.
Bernstein, Steven. 2001. *The Compromise of Liberal Environmentalism*. New York: Columbia University Press.
Betsill, Michele M., and Elisabeth Corell. 2001. "NGO Influence in International Environmental Negotiations." *Global Environmental Politics* 1(4): 65–85.
Betzold, Carola. 2010. "Borrowing Power to Influence International Negotiations: AOSIS in the Climate Change Regime." *Politics* 30(3): 131–48.
Bodansky, Daniel. 2001. "The History of the Global Climate Change Regime." In *International Relations and Global Climate Change*, edited by Urs Luterbacher and Detlef F. Sprinz, 23–40. Cambridge, MA: MIT Press.
—— 2004. *International Efforts on Climate Change Beyond 2012: A Survey of Approaches*. Arlington, VA: Pew Center on Global Climate Change.
—— 2010. "The Copenhagen Climate Change Conference: A Postmortem." *American Journal of International Law*, 104(2): 230–40.
Carraro, Carlo ed. 1997. *International Environmental Negotiations: Strategic Policy Issues*. Cheltenham: Edward Elgar.
Chandani, Achala. 2010. "Expectations, Reality and Future: A Negotiator's Reflections on COP15." *Climate Law* 1(1): 207–25.
Chasek, Pamela S. 2001. *Earth Negotiations: Analyzing Thirty Years of Environmental Diplomacy*. Tokyo: United Nations University Press.
Chasek, Pamela S., and Lynn M. Wagner, eds. 2012. *The Roads from Rio: Lessons Learned from Twenty Years of Multilateral Environmental Negotiations*. New York: Routledge.
Clémençon, Raymond. 2008. "The Bali Road Map: A First Step on the Difficult Journey to a Post-Kyoto Protocol Agreement." *Journal of Environment and Development*, 17(1): 70–94.
Davenport, Deborah. 2005. "An Alternative Explanation of the Failure of the UNCED Forestry Negotiations." *Global Environmental Politics*, 5(1): 105–30.
Deitelhoff, Nicole, and Harald Müller. 2005. "Theoretical Paradise – Empirically Lost? Arguing with Habermas." *Review of International Studies*, 31: 167–79.
De Mesquita, Bruce. 2009. "Recipe for Failure." *Foreign Policy*, 175 (Nov./Dec.): 76–88.
Depledge, Joanna. 2005a. "Against the Grain: The United States and the Global Climate Change Regime." *Global Change, Peace and Security*, 17(1): 11–27.
—— 2005b. *The Organization of Global Negotiations: Constructing the Climate Change Regime*. London: Earthscan.
—— 2006. "The Opposite of Learning: Ossification in the Climate Change Regime." *Global Environmental Politics*, 6(1): 1–22.
DeSombre, Elizabeth R. 2000. *Domestic Sources of International Environmental Policy: Industry, Environmentalists and US Power*. Cambridge, MA: MIT Press.
Dimitrov, Radoslav S. 2005. "Hostage to Norms: States, Institutions and Global Forest Politics." *Global Environmental Politics*, 5(4): 1–24.
—— 2010. "Inside UN Climate Change Negotiations." *Review of Policy Research*, 27(6): 795–821.
—— 2012. "Persuasion in World Politics: The UN Climate Change Negotiations." In *Handbook of Global Environmental Politics*, edited by Peter Dauvergne and Jennifer Clapp, 72–86. Cambridge, MA: MIT Press.
Earnest, David C. 2008. "Coordination in Large Numbers: An Agent-Based Model of International Negotiations." *International Studies Quarterly* 52: 363–82.
Eckersley, Robyn. 2012. "Moving Forward in the Climate Negotiations: Multilateralism or Minilateralism?" *Global Environmental Politics*, 12(2): 24–42.
Falkner, Robert. 2000. "Regulating Biotech Trade: The Cartagena Protocol on Biosafety." *International Affairs*, 76(2): 299–313.
—— 2005. "American Hegemony and the Global Environment." *International Studies Review*, 7(4): 585–99.
—— 2007. "The Political Economy of 'Normative Power' Europe: EU Environmental Leadership in International Biotechnology Regulation." *Journal of European Public Policy*, 14(4): 507–26.

Falkner, Robert, Hannes Stephan, and John Vogler. 2010. "International Climate Policy after Copenhagen: Towards a 'Building Blocks' Strategy." *Global Policy*, 1(3): 252–62.
Fisher, Dana R. 2010. "COP-15 in Copenhagen: How the Merging of Movements Left Civil Society out in the Cold." *Global Environmental Politics*, 10(2): 11–17.
Fry, Ian. 2008. "Reducing Emissions from Deforestation and Forest Degradation: Opportunities and Pitfalls in Developing a New Legal Regime." *Review of European Community and International Environmental Law*, 17(2): 166–82.
Goldstein, Judith, Miles Kahler, Robert O. Keohane, and Ann-Marie Slaughter. 2000. "Legalization and World Politics." *International Organization*, 54(3): 385–99.
Grobe, Christian. 2010. "The Power of Words: Argumentative Persuasion in International Negotiations." *European Journal of International Relations*, 16(1): 5–29.
Gulbrandsen, Lars H., and Steinar Andresen. 2004. "NGO Influence in the Implementation of the Kyoto Protocol." *Global Environmental Politics*, 4(4): 54–75.
Gupta, Joyeeta, and Michael Grubb. 2000. *Climate Change and European Leadership: A Sustainable Role for Europe?* Berlin: Springer.
Haas, Peter M. 2002. "UN Conferences and Constructivist Governance of the Environment." *Global Governance*, 8(1): 73–91.
Haas, Peter M., Robert O. Keohane, and Marc A. Levy, eds. 1993. *Institutions for the Earth: Sources of Effective International Environmental Protection*. Cambridge, MA: MIT Press.
Hare, William, Claire Stockwell, Christian Flachsland, and Sebastian Oberthür. 2010. "The Architecture of the Global Climate Regime: A Top-Down Perspective." *Climate Policy*, 10: 600–14.
Harris, Paul G., ed. 2007. *Europe and Global Climate Change: Politics, Foreign Policy and Regional Cooperation*. Cheltenham: Edward Edgar.
——ed. 2011. *China's Responsibility for Climate Change: Ethics, Fairness and Environmental Policy*. Bristol: Policy Press.
Harris, Paul G., and Hongyuan Yu. 2005. "Environmental Change and the Asia-Pacific: China Responds to Global Warming." *Global Change, Peace and Security*, 17(1): 45–58.
Hasenclever, Andreas, Peter Mayer, and Volker Rittberger. 1997. *Theories of International Regimes*. Cambridge: Cambridge University Press.
Hoffman, Matthew. 2011. *Climate Governance at the Crossroads: Experimenting with a Global Response after Kyoto*. Oxford: Oxford University Press.
Hovi, Jon, Tora Skodvin, and Steinar Andresen. 2003. "The Persistence of the Kyoto Protocol: Why Annex I Countries Move on without the United States." *Global Environmental Politics*, 3(4): 1–23.
Humphreys, David. 2004. "Redefining the Issues: NGO Influence on International Forest Negotiations." *Global Environmental Politics*, 4(2): 51–74.
Jinnah, Sikina. 2011. "Climate Change Bandwagoning: The Impacts of Strategic Linkages on Regime Design, Maintenance, and Death." *Global Environmental Politics*, 11(3): 1–9.
Jinnah, Sikina, Douglas Bushey, Miquel Muñoz, and Kati Kulovesi. 2009. "Tripping Points: Barriers and Bargaining Chips on the Road to Copenhagen." *Environmental Research Letters*, 4(3): 1–6.
Jönsson, Christer. 2002. "Diplomacy, Bargaining and Negotiation." In *Handbook of International Relations*, edited by Walter Carlsnaes, Thomas Risse, and Beth A. Simmons, 212–34. London: Sage Publications.
Kanie, Norichika. 2003. "Leadership in Multilateral Negotiation and Domestic Policy: The Netherlands at the Kyoto Protocol." *International Negotiation*, 8(2): 339–65.
Karlsson, Christer, Charles Parker, Matthias Hjerpe, and Björn-Ola Linn. 2011. "Looking for Leaders: Perceptions of Climate Change Leadership among Climate Change Participants." *Global Environmental Politics*, 11(1): 89–107.
Keohane, Robert O., and David G. Victor. 2011. "The Regime Complex for Climate Change." *Perspectives on Politics*, 9(1): 7–23.
Kilian, Bertil, and Ole Elgström. 2010. "Still a Green Leader? The European Union's Role in International Climate Negotiations." *Cooperation and Conflict*, 45(3): 255–73.
Krämer, L. 2004. "The Roots of Divergence: A European Perspective." In *Green Giants? Environmental Policies of the United States and the European Union*, edited by Norman J. Vig and Michael G. Faure, 53–72. Cambridge, MA: MIT Press.
Kulovesi, Kati, and Maria Gutiérrez. 2009. "Climate Change Negotiations Update: Process and Prospects for a Copenhagen Agreed Outcome." *Review of European Community and International Environmental Law*, 18(3): 229–43.
Levy, David. L., and Daniel Egan. 2003. "A Neo-Gramscian Approach to Corporate Political Strategy: Conflict and Accommodation in the Climate Change Negotiations." *Politics and Society*, 26(3): 337–61.

Levy, Marc A., Oran R. Young, and Michael Zürn. 1995. "The Study of International Regimes." *European Journal of International Relations*, 1: 267–330.

Litfin, Karen T. 1994. *Ozone Discourses: Science and Politics in Global Environmental Cooperation*. New York: Columbia University Press.

McLean, Elena V., and Randall W. Stone. 2012. "The Kyoto Protocol: Two-Level Bargaining and European Integration." *International Studies Quarterly*, 56: 1–15.

Manners, I. 2002. "Normative Power Europe: A Contradiction in Terms?" *Journal of Common Market Studies*, 40(2): 235–58.

Mecking, Jonas. 2011. "The Globalization of Carbon Trading: Transnational Business Coalitions in Climate Politics." *Global Environmental Politics*, 11(2): 26–50.

Mitchell, Ronald. 2003. "International Environmental Agreements: A Survey of their Features, Formation and Effects." *Annual Review of Environment and Resources*, 28: 429–61.

Morgera, Elisa, Kati Kulovesi, and Miquel Muños. 2010. "The EU's Climate and Energy Package: Environmental Integration and International Dimensions." *Edinburgh Europa Paper*. Available HTTP: <http://ssrn.com/abstract=1711395> (Accessed April 15, 2011).

Müller, Benito. 2011. "UNFCCC – The Future of the Process." *Climate Strategies Paper*. HTTP: <www.climatestrategies.org> (Accessed April 15, 2011).

Müller, Harald. 2004. "Arguing, Bargaining and All That: Communicative Action, Rationalist Theory and the Logic of Appropriateness in International Relations." *European Journal of International Relations*, 10(3): 395–435.

Muñoz, Miquel, Rachel Thrasher, and Adil Najam. 2009. "Measuring the Negotiation Burden of Multilateral Environmental Agreements." *Global Environmental Politics*, 9(4): 1–13.

Najam, Adil, Saleemul Huq, and Youba Sokona. 2003. "Climate Negotiations Beyond Kyoto: Developing Countries' Concerns and Interests." *Climate Policy*, 3: 221–31.

Oberthür, Sebastian. 2011. "Global Climate Governance after Cancun: Options for EU Leadership." *International Spectator*, 46(1): 5–13.

Oberthür, Sebastian, and Claire Roche Kelly. 2008. "EU Leadership in International Climate Policy: Achievements and Challenges." *International Spectator*, 43(3): 35–50.

Oberthür, Sebastian, and Marc Pallemaerts. 2010. *The New Climate Policies of the European Union: Internal Legislation and Climate Diplomacy*. Brussels: Brussels University Press.

Ott, Herman E., Wolfgang Sterk, and Rie Watanabe. 2008. "The Bali Roadmap: New Horizons for Global Climate Policy." *Climate Policy*, 8: 91–5.

Putnam, Robert D. 1988. "Diplomacy and Domestic Politics: The Logic of Two-Level Games." *International Organization*, 42(3): 427–60.

Rajamani, Lavanya. 2008. "From Berlin to Bali: Killing Kyoto Softly." *International and Comparative Law Quarterly*, 57(4): 909–39.

—— 2010. "The Making and Unmaking of the Copenhagen Accord." *International and Comparative Law Quarterly*, 59(3): 824–43.

Raustiala, Kal. 2002. "States, NGOs and International Environmental Institutions." *International Studies Quarterly*, 41(4): 719–40.

Risse, Thomas. 2000. "Let's Argue! Communicative Action in World Politics." *International Organization*, 54(1): 1–39.

Rittberger, V. 1998. "International Conference Diplomacy: A Conspectus." In *Multilateral Diplomacy: The United Nations System at Geneva*, edited by M. A. Boisard and E. M. Chossudovsky. The Hague: Kluwer.

Roberts, J. Timmons, and Bradley C. Parks. 2007. *A Climate of Injustice: Global Inequality, North–South Politics and Climate Policy*. Cambridge, MA: MIT Press.

Røgeberg, Ole, Steinar Andresen, and Bjart Holtsmark. 2010. "International Climate Treaties: The Case for Pessimism." *Climate Law*, 1(1): 177–97.

Schreurs, Miranda A., and Yves Tiberghien. 2007. "Multi-Level Reinforcement: Explaining European Union Leadership in Climate Change Mitigation." *Global Environmental Politics*, 7(4): 19–46.

Smith, Richard J. 2009. *Negotiating Environment and Science: An Insider's View of International Agreements, from Driftnets to the Space Station*. Washington, DC: Resources for the Future.

Sprinz, Detlef, and Tapani Vaahtoranta. 1994. "The Interest-Based Explanation of International Environmental Policy." *International Organization*, 48(1): 77–105.

Stein, Janice Gross. 1988. "International Negotiation: A Multidisciplinary Perspective." *Negotiation Journal*, 4(3): 221–31.

Sterk, Wolfgang, Christof Arens, Sylvia Borbonus, Urda Eichhorst, Dagmar Kiyar, Florian Mersmann et al. 2010. "Something was Rotten in the State of Denmark – Cop-out in Copenhagen." Policy paper, Munich: Wuppertal Institute for Climate, Environment and Energy.

Underdal, Arild. 1980. *The Politics of International Fisheries Management: The Case of the Northeast Atlantic*. New York: Columbia University Press.

—— 1994. "Leadership Theory: Rediscovering the Art of Management." In *International Multilateral Negotiations: Approaches to the Management of Complexity*, edited by I. William Zartman, 178–200. San Francisco, CA: Jossey-Bass.

Victor, David G. 2001. *The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming*. Princeton, NJ: Princeton University Press.

—— 2006. "Toward Effective International Cooperation on Climate Change: Numbers, Interests and Institutions." *Global Environmental Politics*, 6(3): 90–103.

—— 2011. *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*. Cambridge: Cambridge University Press.

Vihma, Antto. 2010. "Elephant in the Room: The New G-77 and China Dynamics in Climate Talks." Finnish Institute of International Affairs. Available HTTP: <www.upi-fiia.fi/en/publication/118/elephant_in_the_room> (Accessed April 15, 2011).

Vogler, John. 2005. "The European Contribution to Global Environmental Governance." *International Affairs*, 81: 835–50.

—— 2010. "The Institutionalisation of Trust in the International Climate Regime." *Energy Policy*, 38: 2681–7.

Vogler, John, and Charlotte Bretherton. 2006. "The European Union as a Protagonist to the United States on Climate Change." *International Studies Perspectives*, 7(1): 1–22.

Vormedal, Irja. 2009. "The Influence of Business and Industry NGOs in the Negotiation of the Kyoto Mechanisms." *Global Environmental Politics*, 8(4): 36–65.

Wagner, Lynn. 2007. "North–South Divisions in Multilateral Environmental Agreements: Negotiating the Private Sector's Role in Three Rio Agreements." *International Negotiation*, 12: 83–109.

Wapner, Paul. 2011. "The Challenges of Planetary Bandwaggoning." *Global Environmental Politics*, 11(3): 137–44.

Ward, Hugh. 1993. "Game Theory and the Politics of the Global Commons." *Journal of Conflict Resolution*, 37(2): 203–35.

Ward, Hugh, Frank Grundig, and Ethan R. Zorick. 2001. "Marching at the Pace of the Slowest: A Model of International Climate-Change Negotiations." *Political Studies*, 49(3): 438–61.

Watanabe, Rie, Christof Arens, Florian Mersmann, Hermann E. Ott, and Wolfgang Sterk. 2008. "The Bali Roadmap for Global Climate Policy – New Horizons and Old Pitfalls." *Journal of European Environmental and Planning Law*, 5(2): 139–58.

Yamin, Farhana, and Joanna Depledge. 2004. *The International Climate Change Regime: A Guide to Rules, Institutions and Procedures*. Cambridge: Cambridge University Press.

Young, Oran R. 1991. "Political Leadership and Regime Formation: On the Development of Institutions in International Society." *International Organization*, 45(3): 281–308.

—— 1994. *International Governance. Protecting the Environment in a Stateless Society*. Ithaca, NY: Cornell University Press.

—— 1998. *Creating Regimes: Arctic Accords and International Governance*. Ithaca, NY: Cornell University Press.

—— 2002. *The Institutional Dimensions of Environmental Change: Fit, Interplay, and Scale*. Cambridge, MA: MIT Press.

Young, Oran R., and Gail Osherenko, eds. 1993 *Polar Politics: Creating International Environmental Regimes*. Ithaca, NY: Cornell University Press.

Zartman, I. William. 2002. "What I Want to Know about Negotiations." *International Negotiation*, 7(1): 5–15.

21

North–South relations

Colonialism, empire and international order

Shangrila Joshi

Conflicts between the Global North – the world's economically developed industrialized countries – and the South – the world's economically underdeveloped and developing countries – have been one of the mainstays of global environmental politics. These conflicts result from pervasive differences between North and South over interests, power and socioeconomic conditions. Even as some scholars question the validity of a North–South dichotomy in examining global environmental changes and responses to them, international negotiations to mitigate climate change (Chapter 28) and to address other environmental problems are impeded by apparently irreconcilable differences between North and South. This chapter addresses the origins of North–South conflicts in global politics, their evolution in the context of global environmental change, and theoretical debates over the validity of this frame of reference for understanding global environmental politics.

Origins of North–South conflict and calls for a new world order

During the Cold War (1945–90), the dominant binary frame of reference in world politics was East and West, representing the two opposed blocs – the United States and its allies on one side, the Soviet Union and its allies on the other. A group of newly decolonized states that first emerged in Asia and then in Africa were keen on establishing themselves as independent of these major power blocs. The 1955 Bandung conference in Indonesia is typically seen as the moment that congealed this "non-aligned" movement, representing the political position of a coalition of the so-called Third World (i.e., developing) countries. Key aspects of this position included a rejection of colonialism, advancing a security agenda of peace over conflict, and emphasizing the importance of economic growth for the Third World (Lundestad 2005). The first and third points are crucial for understanding present-day North–South environmental politics (discussed further in the next section).

Some terminology merits attention. Literature that refers to North–South politics is typically marked by a rather conspicuous absence of efforts to define North and South. The North usually refers to the core group of developed or industrialized countries, also referred to as Western countries, namely the United States, Western European countries, Australia, Japan and Canada. These countries were the colonial powers that dominated the international economic system in past centuries. The term Global South – often used interchangeably with the terms Third World,

periphery or developing countries – refers most commonly to countries that have been controlled and exploited by colonial powers (Anand 2004; Isbister 2006). As such, they are marked by a distinct power differential in global economic affairs, a result of lingering effects of colonialism even after colonial rule formally ended. To a greater or lesser extent, the formerly colonized countries and their colonizers have inherited the legacies left behind by colonization. Although postcolonial countries have experienced varying degrees of success in recovering from past exploitative relations, they find themselves entangled in a global political economy fundamentally shaped and structured by this system (see Chapter 22).

Three qualifications are necessary here. One is that these categories – North, South, First World, Third World and the West – do not necessarily represent neatly defined geographic regions. These are more accurately understood as geographic imaginaries or political constructs that have formed as a result of both ideational and material factors (see Chapter 4). Second, not all countries are easily encompassed within these categories, especially when evolving socioeconomic conditions are taken into consideration. Several scholars have therefore critiqued these categories. It does not help that the Third World or Global South is a self-defined coalition of countries seeking to advance certain norms and interests in world politics (Williams 2005). This is an issue that is evolving into one of the emerging areas of North–South environmental politics (Joshi 2013). Third, the North–South distinction often refers to economic differences between countries. As such, some scholars have pointed out that it is too state-centric, thereby failing to capture economic differences within countries. Such problematization of the North–South frame of reference will be discussed in greater detail later in the chapter.

As the non-aligned movement, led by the formerly colonized countries, emphasized decolonization and economic development, its members began to demand a new economic world order (Lundestad 2005). It was in the context of trying to create this New International Economic Order (NIEO) that the North–South frame of reference was brought into focus (Jha 1982). The NIEO was designed to challenge the unfair terms of trade between the North and the South by demanding changes that would enable the South to achieve self-sustaining economic growth and industrialization (Bhagwati 1977; Najam 2004). The legacy of colonialism was such that even after decolonization, the power differentials and exploitative relationship prevailed between the former colonizers and the colonized. Economic systems, such as export-oriented agriculture established during colonization (see Chapter 40), and a sustained significant presence of expatriates from the mother country in former colonies, are examples of this legacy (Lundestad 2005). Some scholars have in fact argued that the unequal global system of capitalism benefits the North (core) at the expense of the South (periphery) (see Chapter 22). Capitalism thus intersects with colonialism to ensure continued prosperity for the North while keeping the South in a perpetual state of dependency and underdevelopment (Blaut 1993).

Many scholars see the core–periphery dynamic in the form of North–South imperialism, where the United States is seen as the hegemonic power commanding the global economic system (Power 2006; Slater 2006). This structuralist view tends to be dismissed in liberalist thinking that continues to be optimistic about the prospects for economic development of the South via humanitarian intervention and good governance within the prevailing economic system and order (Lundestad 2005). Yet research has produced evidence that shows how these systems and structures, such as the World Trade Organization – although conspicuously designed to strengthen developing countries' economies through incorporation in the global system of trade – have consistently favored countries of the North that dominate these structures (O'Brien and Leichenko 2003; see Chapter 22).

The impetus of demands for a NIEO were rooted in fears of the economic stagnation of the South if such unequal terms of trade were not overturned. However, they were not rooted in

structuralist thinking to the extent that they considered it imperative that the South break away from the North-dominated capitalist system altogether in order for a genuinely new world order to be possible. Development assistance – unpredictable as it was – was not seen as enough to overcome the setbacks left behind by colonization. Among the demands were introduction of a range of enabling conditions for developing countries to thrive in international trade, such as removing trade tariffs for exports but not for imports, stabilization of commodity prices, stepping up loan opportunities and economic development assistance, and regulating the activities of multinational corporations operating in the South (see Chapter 13). Most of these demands, and consequently proposals for a NIEO, were rejected in the United Nations, in large part due to the reluctance of the USA to accept changing the rules of the game. On the part of the South, countries were forced to abandon desires for long-term reform in light of meeting immediate needs because their negotiating position with the North was consistently too weak. Demands for a new economic order consequently fell by the wayside.

Emergence of North–South environmental politics

The prospect of unprecedented levels of global environmental change has brought about two major changes in North–South politics. First, it has transformed the negotiating power of the South in global politics, and second, it has called into question the single-minded focus the South has had on pursuing economic growth and development following the wave of decolonization in the 1940s. This became very clear in 1992, when global concern over the environmental crisis culminated in the UN Conference on Environment and Development in Brazil, the "Earth Summit." Two decades prior, in 1972, the international community had gathered in Stockholm for the UN Conference on the Human Environment. Following the seminal publication *Limits to Growth* by the Club of Rome, the key concern of the North at Stockholm was to prevent a drain on global resources that would be inevitable if the thirst for economic growth from rapidly growing and industrializing countries did not somehow subside. Although the explicit discourse was that the world should put the brakes on pursuit of unlimited economic growth, the South believed that the unspoken and perhaps unintended desire was to put the brakes on its economic growth. Intellectuals from the South naturally saw this as unfair and a convenient way to maintain the unequal status quo between North and South. Western environmentalism in this guise was therefore seen as a tool for the continued subjugation of the formerly colonized (Castro 1972; Agarwal and Narain 1990).

Whereas industrialization was seen by the newly decolonized states as a valid goal to pursue, it was being portrayed by many as undesirable due to its inevitable ecological consequences. Continued aspirations for development and industrialization were dismissed as something belonging only to the South's elites. The South's underdevelopment was therefore not an unfortunate outcome of the North's development, but rather a necessity to prevent global ecological catastrophe: "In the name of the survival of mankind developing countries should continue in a state of underdevelopment because if the evils of industrialization were to reach them, life on the planet would be placed in jeopardy" (Castro 1972: 33). Many Southern activists and intellectuals have perceived this as an unfair burden placed on the already disadvantaged South.

Dismissing the neocolonialist overtones of Western environmental prescriptions, the South's position has long emphasized the need to prioritize socioeconomic development goals alongside the establishment of ambitious environmental policies. This is evident in the discourses of all major global environmental negotiations and was made explicit by naming the Rio Earth Summit the UN Conference on Environment *and* Development. The importance of development and economic growth for the South, and differential obligations for North and South,

were also institutionalized at the Earth Summit in the UN Framework Convention on Climate Change (DeSombre 2002; Williams 2005; see Chapter 28). The emphasis on development in such a global environmental agreement really means that developing countries should not be expected to enact costly environmental policies that would divert limited resources from competing development priorities. Moreover, following the "polluter-pays principle" the responsibility for environmental action is seen to fall squarely on the shoulders of the North, which has made more significant contributions over time to ecological degradation at a global scale.

While many environmental scholars and activists from the South hold this view, it is also acknowledged by some scholars in the North who approach global environmental affairs from ethical perspectives (see Chapter 25). For example, in the context of climate change, Shue articulates the North's historical responsibility as "the acceptance of accountability for the full consequences of industrialization that relied on fossil fuels" by the countries "that have controlled the process of industrialization, and have benefitted the most from industrialization" (Shue 2009: 1). Thus, not only is the North seen as obligated to take responsibility for collectively creating ecological harm, but many scholars also claim it owes an ecological debt to the South due to unfair appropriation of ecological space (e.g., Agarwal and Narain 1990; Anand 2004; Goeminne and Paredis 2010; Martinez-Alier 2002). This idea of ecological space originates from the "limits to growth" discourse, departing from it by emphasizing equity in sharing limited space for growth (FOEI 2005). The North is therefore obligated to do two things to correct this historical and ongoing geographical imbalance: to retreat from the ecological space it has wrongfully occupied to create space for newcomers to development, and to help the South use the space in an ecologically sustainable way (Agarwal and Narain 1990). To create more ecological space, the North is expected to make adjustments to its economy and industry to lessen its ecological footprint. To help the South advance sustainably, it is expected to provide substantial financial and technological support.

The idea of ecological debt is a call for justice in the form of reparations owed collectively by industrialized countries that benefited mostly from colonialism and continue to benefit from neocolonialism and imperialism. The demands for reparations are due to past and continuing disproportionate encroachment on ecological space without payment and without recognition of other countries' entitlements to that space. This appropriation of ecological space can be conceptualized in part as the unidirectional flow of natural resources from the South to the North during the colonial era, which persists in various forms today. This appropriation has a material basis in uneven power in international relations as this has enabled "ecological aggression," or the undeterred exploitation of resources by some states and its corresponding ecological consequences (Bosselmann 2004; Goeminne and Paredis 2010; Martinez-Alier 2002; Srinivasan et al. 2008).

The institutionalization of North–South environmental politics

In global environmental politics, the Group of 77 plus China (G77) is the negotiating entity representing the Third World or Global South (Vihma 2010; Williams 2005). The G77 has been referred to as representing a "new regionalism" in global politics wherein its aim is not only to influence the North's environmental and political agenda but also to demand that the "North confront its responsibilities to the wider world" (Dodds 1998: 729). Scholars have identified a number of specific interests that countries of the South articulate in global environmental negotiations: a concern for explicitly linking environmental concerns to development concerns, seeking additional financial resources and technological assistance for environmental programs, capacity-building for negotiation and implementation of environmental agreements,

increased time for implementing new regulations, and pushing the North to accept responsibility for the environmental harms it has caused (Dodds 1998; Miller 1995; Najam 2004; Williams 2005). The institutionalization of these interests and their underlying norms of sustainable development and "common but differentiated responsibility" has contributed to the maintenance of the idea of difference between the North and the South (Williams 2005).

These differences have been institutionalized through global negotiations at various points in time. The 1972 Stockholm conference created the conditions that led to substantial discord along North–South lines. The Brundtland Commission's 1987 publication of *Our Common Future* significantly substantiated the North–South discourse in the context of differences in wealth and environmental responsibility. The 1992 UN Conference on Environment and Development (UNCED) further solidified the North–South divide in the context of establishing linkages between environmental and development issues, and articulating differentiated obligations of developing and developed countries. The international environmental treaties that followed have included significant provisions for realizing North–South equity (DeSombre 2002). Even before UNCED, the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (see Chapter 29) created a precedent for differentiated treatment of developing countries in the context of negotiations over the atmospheric commons (Rajan 1997). It instituted a financial transfer mechanism, the Multilateral Fund, which developed countries contributed to, and included a time lag to allow large and rapidly industrializing developing countries such as China and India much more time to use ozone-destroying chemicals. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (see Chapter 33) also created a space for a North–South frame for debates and negotiations where Third World states articulated a common position despite their heterogeneity in levels of development (Miller 1995).

The 1997 United Nations Framework Convention on Climate Change (UNFCCC; see Chapter 28) has provided the space for a distinctly North–South environmental politics. The UNFCCC articulated several principles to guide the attainment of its overarching objective of greenhouse gas stabilization. These allude to ideas of equity, sustainable economic development for developing country parties, common but differentiated responsibilities and respective capabilities. The texts of the UNFCCC and the Kyoto Protocol make two things clear: a clear demarcation between the responsibilities of developed and developing country parties, and the prioritization of economic growth and sustainable development for the latter. Such articulation of differentiated responsibilities and capabilities is compatible with concepts such as ecological debt, as well as other concepts specific to the context of climate change (Chapter 28), such as contraction and convergence (GCI 1996) and climate injustice (Roberts and Parks 2007) based on disparities at the level of states (see Chapter 23).

The increased salience of global environmental concerns such as climate change (Chapter 28), and the role that some countries of the South play in alleviating them – or alternately, their "'power to destroy' a resource" – has allowed the traditionally less powerful South relatively more leverage in international environmental negotiations (Anand 2004; DeSombre 2002: 15; Therien 1999). Consequently, demands made by the South, such as for mechanisms to transfer financial and technological resources to developing countries, as well as those for a lag time for developing countries in the implementation of environmental regulations, have been acknowledged, at least in theory. Many of the promises made to the South have apparently not been fulfilled, leading to a deficit of trust on the part of the South that continues to compromise ongoing negotiations (Dubash 2009; Roberts and Parks 2007). Yet the increased bargaining power of the South, coupled with the validation of North–South difference through institutionalization in international agreements and frameworks, has enabled the South to articulate its claims for justice in increasingly radical terms, as evidenced by the normalization of discourses of ecological debt.

Debates on the validity of the North–South frame of reference

While North–South politics are inherently about challenging the status quo of the current world order, a number of critiques have been leveled at the legitimacy of such a politics. A variety of such critiques exist. They fall into two broad categories. Scholars falling into one category of critiques have questioned the validity of referencing global inequality on the basis of countries that belong to North or South by way of problematizing the meaning of the terms North and South, with more criticism leveled at the latter. Since the South is seen to originate from and is closely associated with the Third World, the perceived loss of relevance of the Third World as a political project carries over to a corresponding lack of confidence in the relevance of a North–South divide (Berger 2004; Escobar 2004; Isbister 2006; Slater 2006; Therien 1999). The Third World is deemed to have lost its meaning due in part to the ending of the Cold War, and because its radical intent is perceived to be all but lost, coopted by the very powers it sought to challenge, so much so that it is considered "intellectually and conceptually bankrupt" (Berger 2004: 31).

A second approach to questioning the validity of a North–South divide is based on transformations of the global economy, thus rendering both North and South more heterogeneous than the binary term implies (Eckl and Weber 2007). The understanding is that widespread neo-liberalization of formerly colonized and developing countries has increased the economic differentiation and fragmentation of the Global South, thus destabilizing the traditional core–periphery or North–South configuration of the world (Therien 1999; Williams 2005). There are a number of interpretations of this explanation: the gaps between the North and the South are narrowing, countries are graduating from the South to the North (Broad and Landi 1996), and the South is no longer as poor or as dependent on the North, particularly with reference to the stellar economic performance of countries in East Asia (Therien 1999).

Scholars have also pointed out that the North–South divide is too state-centric and rooted in obsolete core–periphery depictions to accurately represent global inequalities. Very often the argument centers on the need to conceptualize global inequality by class rather than on the basis of the development status of countries (Barnett 2007; Newell 2005). Gerard Toal, the so-called father of critical geopolitics, prominently declared that "a critical geopolitics is one that refuses the spatial topography of First World and Third World, North and South, state and state," and that the task of the subdiscipline was to highlight "the precariousness of these perspectival identities" (Toal 1994: 231). This approach has been adopted by some scholars examining climate change. Barnett (2007), for example, argued that the geopolitics of climate change has been severely constrained by what John Agnew (1994) called the "territorial trap" – an inaccurate representation of the world as spatially and politically distinct states (Barnett 2007; see Chapter 28). Therefore, not only has there been a "Third Worldization of certain regions in the developed world" (Toal 1994: 231), and a formation of various Third Worlds representing different sets of collective needs (Escobar 2004), there has also been a rapid burgeoning of a "planetary middle class" that belies the traditional divisions of North and South (Conca 2001: 68; Harris 2010). Scholars have therefore called for the articulation of newer geographies of wealth and poverty (McFarlane 2006).

From a postcolonial perspective, the North–South referent is seen by some to perpetuate colonial traditions of "us" and "them" that are predicated on conscious or unconscious forms of Western exceptionalism and superiority (Doty 1996; Nash 2004; Said 1994). With the South representing the developing world and the North the developed world, the binary is seen to connote a teleological relationship where the South is expected to catch up to the North, thus reifying the unequal relationship between North and South through the implicit acceptance of the

Western view of the South as well as of itself representing the development model to follow. Such notions are held responsible for obscuring the role of Western imperialism in subjugating the Third World by naturalizing the superiority and the success of the West over the rest of the world (Sidaway 2000). In this mode of thought, international agreements that take on a North–South dimension only serve to institutionalize the North's paternalistic and interventionist role towards developing countries (Eckl and Weber 2007). Meanwhile the subsequent modernization of the South is blamed for the cooptation of the formerly radical Third World agenda (Berger 2004; Escobar 2004). Escobar (2004) therefore sees self-organizing social movements (see Chapter 14) as the only hope for effectively challenging the US-based imperial globality and global coloniality. One of the key contributions of postcolonialism has thus reportedly been to challenge categories that homogenize colonizing and colonized groups through binary representations such as First World/Third World, North/South, developed/developing and core/periphery (Nash 2004).

It has been argued that postcolonial theory should attempt to shed light on the various ways in which the impact of colonialism lingers on in new forms in the formerly colonized countries, such as via internal colonialism or ultra-imperialism (Blunt and McEwan 2002; Sidaway 2000; see Chapter 4). Viewed in this way, the North–South dimension is not the only way of conceptualizing global inequality. Much like the argument for a class-based (rather than a state-based) approach to inequality and oppression, such a postcolonial approach seeks to uncover newer relationships of domination and disenfranchisement that feed off older colonial patterns. In this reading of difference, the middle and upper class elites of formerly colonized countries are just as culpable of perpetuating global inequality as former colonial rulers or present-day imperial powers, if not more so. In fact, the "ideological posturing" of Southern elites has been one of the critiques of the North–South framing, with scholars arguing that Third Worldism is a pursuit of Third World elites who stand to gain from North–South politics (Berger 2004; Newell 2005). Here the implication is that identification with Third World solidarity is rhetorical, a charge others argue has yet to be verified (Roberts and Parks 2007; Williams 2005).

In the context of global environmental politics, the Global South's claims on increased transfers of financial and technological resources from the North and a time lag for accepting stronger environmental regulations might be seen to benefit industrialists, officials employed in environmental agencies, and other elites in the Global South (see Chapter 12). These middle/upper class members of the Global South – typically educated in the West (or North) or in Westernized systems of education – are also understood to be assisting in perpetuating the legacies of colonialism and imperialism in a postcolonial world (Goldman 2004; Sluyter 2002). Their geographical residence might be in countries of the Global South, but they operate within and perpetuate the worldviews of the North, and they are armed with imperial tools of Western science or funding from Western institutions (see Chapter 17). Seen in this respect, these members of the Global South may very well be complicit with the unintentional implications of colonial and imperial power. It is the members of the meta-industrial classes – peasants, indigenous communities, and women – who are the absolute victims of colonialism and imperialism (Salleh 2011). Resistance movements led by these groups are seen to be the only valid challenges to colonialism and imperialism (Escobar 2004). These subaltern groups spread over the world comprise the true Global South in this mode of thinking.

Despite these critiques of the North–South frame of reference, it has been a dominant form of representing global inequality, serving as a reminder of the linkages between geopolitics and development, as well as a reminder of abiding core–periphery dynamics and imperialism that are reminiscent of past colonizer–colonized relationships for many scholars (Ould-Mey 2003; Power 2006; Said 1994; Slater 2004, 2006). In response to the issue of heterogeneity, Lundestad (2005) remarked that given the large number of diverging actors and interests, cohesion particularly

for the non-aligned movement has been impressive, especially relative to Western countries. The movement also constitutes the second most extensive organization in the world after the United Nations and its subordinate entities. Other scholars argue that the South or the Third World should be seen not as a monolith, but rather as a diverse entity that fluctuates between acting in unity and maintaining plurality according to the geopolitical context (Broad and Landi 1996; Williams 2005).

While some countries of the South may be perceived to have graduated to the North, some caution that such graduation is only partial – usually economic (Hansen 1980) – and that self-identification of nations as members of the South is owing to "a sense of shared vulnerability and a shared distrust of the prevailing world order rather than a common ordeal of poverty" (Najam 2004: 128). For some, the similarities within the North and South outweigh their internal differences. For example, for Anand (2004) the South represents the common experiences of people who have been victimized by a colonial and imperial past. This legacy has not only left countries of the South economically weaker and more vulnerable to the vagaries of a globalized capitalist economy (Williams 2005; see Chapter 22), but ensured its continued subjugation through an unequal international system where the South's voice wields less influence (O'Brien and Leichenko 2003; Therien 1999). Following Benedict Anderson, Williams (2005: 53) argued that the Third World or Global South represented an "imagined community of the powerless and vulnerable." The Southern bloc or the Third World coalition therefore makes sense when seen in the context of the dominance of industrialized states in global diplomacy and politics because the coalition allows developing countries with relatively marginal influence increased leverage in global negotiations (Hansen 1980; Williams 2005; see Chapter 20). In spite of internal differences on a number of issues, therefore, the countries of the Global South seem to have similar interests, particularly in the context of global environmental politics.

While the dominant approach in postcolonial theory has been to follow Said's lead to dismiss the North–South frame as colonial binaries, from another perspective one could take the view that this framing takes advantage of the imaginary of the Global South in order to serve the purpose of strategic essentialism (Spivak 1993). Similarly, a Bhabhain approach enables a scholar to consider legitimate the so-called perspectival identity of the Global South, particularly when this is advanced by self-proclaimed members of the Global South. Dismissing such self-identification as posturing by elites in the Global South might well be a product of a largely Euro-American–centric worldview (Dodds 1998: 78). Such dismissal contributes to silencing voices and forms of resistance emanating from people of formerly colonized countries – even if they might be categorized as the elite – and interestingly functions as a means to preserve or legitimize the North–South status quo.

Even though the diffuse nature of neocolonialism and imperialism, as well as the transnational character of global environmental change, has challenged scholars to question the state-centric nature of analyses of global inequality, methodologically it is difficult to escape using this unit of analysis because states and their representatives are the actors that negotiate international environmental treaties and are held accountable to them (see Chapters 5 and 7). These challenges, however, have pushed scholars to revisit traditional concepts of sovereignty and national security as they are connected to environmental change (DeSombre 2002; see Chapter 19).

Contestations of the South's right to development

Another set of arguments challenging the North–South framing of global environmental politics centers on the problematization of one of the key demands of the South, namely the right to pursue development and economic growth. The rationale for this critique is based in part on

ecological concerns arising from economic growth, particularly from aspirations of the populous and emerging economies, most prominently India and China, and in part on concerns about neocolonialism and neoimperialism arising from the past trajectory of Western development intervention. Responding to the argument about the South's right to environmental space, Sachs has argued that it is a moot concept given the reality of diminishing environmental space, especially if development is measured in terms of material progress. He has argued that the focus should be on the North occupying less space than it has (Sachs 2002). While in theory this is an appealing concept, for Southern intellectuals this translates into perpetuating "the ostensive imbalance between responsibility for the damage and obligation for repair" (Castro 1972: 35) because cutting down on the North's disproportionately high ecological footprint is easier said than done. Such arguments are therefore perceived to contribute to freezing the unequal status quo between North and South by invalidating the South's efforts to gain a stronger footing in the international political economy through industrialization and economic growth.

Sachs' critique of the South's right to development is rooted in a fundamental critique of "modernization as development" that has served as a tool for Western imperialism and neocolonialism, promulgated primarily through Western institutions such as the World Bank and the US Agency for International Development (Escobar 2004; Isbister 2006; Norberg-Hodge 2008; Slater 1997; Sluyter 2002). Indeed, under the umbrella of post-development or anti-development, a body of work has formed, in response to the hegemony of modernization as development (Simon 2007). Yet, scholars caution that to dismiss development as passé might be premature. Suspicious of portrayals of development as a "hegemonic discourse of the West," Rangan (2004: 374) described it instead as a dynamic, complex and contested concept, drawing attention to the diverse ways in which it is transformed by local agents and circumstances. She argued that social movements that are represented as pursuits for alternatives to development are, in fact, struggles for rightful access to resources and power. Bebbington (2004) makes a similar argument, suggesting that it is possible for modernization to help indigenous and other traditional groups meet their cultural and survival needs. These understandings of development and social movements contradict those of other scholars, such as Sachs and Norberg-Hodge, who argue that development aspirations are imposed upon subaltern groups by multinational corporations from the North (see Chapters 13 and 22). These scholars seem to believe that, left to their own devices and not encouraged by Northern interests or Southern elites, these groups would opt for less energy-intensive, more sustainable alternatives to development.

Since critiques of the South's right to development can fall victim to romanticized portrayals of social movements and indigenous alternatives to development, there has not really been a strong enough critique of the argument made by Castro (1972, cited earlier). The "one worldism" of Western environmentalism that Castro (1972) and Agarwal and Narain (1990) lamented continues to persist almost unapologetically in the rhetoric of Sachs (2002) and Norberg-Hodge (2008) decades later. Sachs (2002: 30) strongly advocated for a decoupling of justice from development, claiming that "the demand for justice and dignity on behalf of Southern countries threatens to accelerate the rush towards biospherical disruption, as long as the idea of justice is firmly linked to the idea of development." Yet, claims for justice have for the most part continued to be tied to the notion of development (see Chapter 24). As mentioned earlier, the older demands of the Third World for a New International Economic Order are reemerging in the context of global environmental politics because now the South has greater bargaining power. These demands have a reformist rather than a radical approach, as lamented by those deploring the demise of the Third World as a political project because there is no alternative effort to challenge the current international political economy based on a Western-dominated capitalist system (Berger 2004; Escobar 2004; see Chapter 22).

Conclusion

Debates over the validity of North–South environmental politics seem to be enmeshed in three distinct competing and potentially conflicting interests. One is a normative desire for greater equality among states in terms of economic and material well-being. The North–South imaginary is a reminder of the absence of, as well as desire for, such equality. Second is a concern for justice that addresses global inequality in a more general sense and transcends concerns at the level of the state (see Chapters 23 and 24). The two need not contradict each other, but the way in which scholars debate North–South politics assumes that they do. The third interest is to prevent or minimize environmental catastrophe – a normative desire for ecological sustainability (see Chapter 15). The ways in which these three interests intersect are complicated, not least in part due to the multiple ways in which their pursuit can be envisioned and articulated. Structuralist analyses tend to see capitalism and neoliberal growth and development as counter-intuitive to all three goals, and as tools to perpetuate neoimperialism and neocolonialism. Demands for a new global order usually take place in a state-centric context and within the confines of current economic structures (see Chapter 7). From a structuralist perspective, these demands are not seen to be fruitful: Global North and Global South should be class-based categories rather than state-based, and indigenous social movements that seek to overthrow capitalist structures are seen as the only hope for abolishing North–South differences and moving towards a sustainable world.

Challenges to transform the international economic order emanate within neoliberal and state-centric contexts. These efforts take advantage of the strategic power that formerly marginalized states now have due to the global nature of environmental problems. But it is doubtful whether these efforts are compatible with the goal of enabling ecological sustainability because the only known path to international economic equality seems to be industrialization-based economic growth accompanied by deleterious environmental and social consequences. This therefore leads to several questions, including whether states are capable of effectively addressing environmental problems, whether equality among states is a prerequisite for addressing class-based economic differences, and to what extent it is feasible for politically independent states to pursue development policies that are disconnected from industrialization and economic growth (see Chapter 7).

The answer depends on which constellation of interests we are talking about. We must remember that while countries such as China and India are making strides in bridging the state-centric North–South divide, aided in part by their bargaining power in environmental negotiations, not all countries of the Global South are able to challenge their unequal status relative to the North, or even relative to more powerful countries of the South. That said, it does seem possible that a transformation of the international world order, in which the West is no longer hegemonic, is possible. Whether and to what extent such a transformation occurs in ways that are free from the vestiges of colonialism and imperialism remains an unanswered question. Further, while it is clear that the environment serves as an enabler for challenging the unequal North–South status quo, it is unclear how the changes in this structure will in turn affect the environment.

References

Agarwal, A. and S. Narain (1990). *Global Warming in an Unequal World: A Case of Environmental Colonialism*. New Delhi: Centre for Science and Environment.

Agnew, J. (1994). "The territorial trap: the geographical assumptions of international relations theory." *Review of International Political Economy* 1(1): 53–80.

Anand, R. (2004). *International Environmental Justice: A North–South Dimension*. Burlington, VT: Ashgate.
Barnett, J. (2007). "The geopolitics of climate change." *Geography Compass* 1(6): 1361–75.
Bebbington, A. (2004). "Movements and modernizations, markets and municipalities: indigenous federations in rural Ecuador." In R. Peet and Michael Watts (eds) *Liberation Ecologies*, 2nd edn. New York: Routledge.
Berger, M. T. (2004). "After the Third World? History, destiny and the fate of Third Worldism." *Third World Quarterly* 25(1): 9–39.
Bhagwati, J. N. (ed.) (1977). *The New International Economic Order: The North–South Debate*. Cambridge, MA: MIT Press.
Blaut, J. M. (1993). *The Colonizer's Model of the World: Geographical Diffusionism and Eurocentric History*. New York: Guilford Press.
Blunt, A. and Cheryl McEwan (2002). "Introduction." In A. Blunt and Cheryl McEwan (eds) *Postcolonial Geographies*. London: Continuum.
Bosselmann, K. (2004). "In search of global law: the significance of the Earth Charter." *Worldviews: Environment Culture Religion* 8(1): 62–75.
Broad, R. and C. M. Landi (1996). "Whither the North–South gap?" *Third World Quarterly* 17(1): 7–17.
Castro, J. A. de A. (1972). "Environment and development: the case of developing countries." In K. Conca and G. D. Dabelko (eds) *Green Planet Blues: Four Decades of Global Environmental Politics*. Boulder, CO: Westview Press.
Conca, K. (2001). "Consumption and environment in a global economy." *Global Environmental Politics* 1(3): 53–71.
DeSombre, E. R. (2002). *The Global Environment and World Politics*. London: Continuum.
Dodds, K. (1998). "The geopolitics of regionalism: the Valdivia Group and southern hemispheric environmental co-operation." *Third World Quarterly* 19(4): 725–43.
Doty, R. L. (1996). *Imperial Encounters: The Politics of Representation in North–South Relations*. Minneapolis: University of Minnesota Press.
Dubash, N. K. (2009). "Toward a progressive Indian and global climate politics." Working Paper (September). New Delhi: Centre for Policy Research
Eckl, J. and J. Weber (2007). "North–South? Pitfalls of dividing the world by words." *Third World Quarterly* 28(1): 3–23.
Escobar, A. (2004). "Beyond the Third World: imperial globality, global coloniality and anti-globalisation social movements." *Third World Quarterly* 25(1): 207–30.
Friends of the Earth International (FOEI) (2005) "Climate debt: making historical responsibility part of the solution." Discussion Paper. Available HTTP: <http://www.foei.org/en/resources/publications/climate-justice-and-energy/2000-2007/climatedebt.pdf/view> (Accessed April 5, 2013).
GCI (1996). "Contraction and convergence: climate justice without vengeance." Available HTTP: <http://www.gci.org.uk> (Accessed May 16, 2011).
Goeminne, G. and Erik Paredis (2010). "The concept of ecological debt: some steps towards an enriched sustainability paradigm." *Environment, Development, Sustainability* 12: 691–712.
Goldman, M. (2004). Imperial science, imperial nature: environmental knowledge for the World (Bank)." In S. Jasanoff and M. L. Martello (eds) *Earthly Politics*. Cambridge, MA: MIT Press: 55–80.
Hansen, R. D. (1980). "North–South Policy – What's the problem?" *Foreign Affairs* 58(5): 1104–28.
Harris, P. G. (2010) *World Ethics and Climate Change: From International to Global Justice*. Edinburgh: Edinburgh University Press.
Isbister, J. (2006). *Promises Not Kept: Poverty and the Betrayal of Third World Development*. Bloomfield, CT: Kumarian Press.
Jha, L. K. (1982). *North–South Debate*. Delhi: Chanakya Publications.
Joshi, S. (2013). "Understanding India's representation of North–South climate politics." *Global Environmental Politics* 13(2): 130–49.
Lundestad, G. (2005). *East, West, North, South: Major Developments in International Relations since 1945*. London: Sage Publications.
McFarlane, C. (2006). "Crossing borders: development, learning and the North–South divide." *Third World Quarterly* 27(8): 1413–37.
Martinez-Alier, J. (2002). "Ecological debt and property rights on carbon sinks and reservoirs." *Capitalism, Nature, Socialism* 13(1): 115–19.
Miller, M. (1995). *The Third World in Global Environmental Politics*. Buckingham: Open University Press.

Najam, A. (2004). "Dynamics of the Southern collective: developing countries in desertification negotiations." *Global Environmental Politics* 4(3): 128–54.
Nash, C. (2004). "Postcolonial geographies: spatial narratives of inequality and interconnection." In P. Cloke, Philip Crang and Mark Goodwin (eds) *Envisioning Human Geographies*. London: Arnold.
Newell, P. (2005). "Race, class and the global politics of environmental inequality." *Global Environmental Politics* 5(3): 70–94.
Norberg-Hodge, H. (2008). "The North–South divide." *Ecologist* 38(2): 14–15.
O'Brien, K. L. and R. M. Leichenko (2003). "Winners and losers in the context of global change." *Annals of the Association of American Geographers* 93(1): 89–103.
Ould-Mey, M. (2003). "Currency devaluation and resource transfer from the South to the North." *Annals of the Association of American Geographers* 93(2): 463–84.
Power, M. (2006). "Anti-racism, deconstruction and 'overdevelopment'." *Progress in Development Studies* 6(1): 24–39.
Rajan, M. (1997). *Global Environmental Politics: India and the North–South Politics of Global Environmental Issues*. New Delhi: Oxford University Press.
Rangan, H. (2004). "From Chipko to Uttaranchal: the environment of protest and development in the Indian Himalaya." In R. Peet and Michael Watts (eds) *Liberation Ecologies*, 2nd edn. New York: Routledge.
Roberts, J. T. and B. C. Parks (2007). *A Climate of Injustice: Global Inequality, North–South Politics, and Climate Policy*. Cambridge, MA: MIT Press.
Sachs, W. (2002). "Ecology, justice, and the end of development." In J. Byrne, L. Glover and C. Martinez (eds) *Environmental Justice: Discourses in International Political Economy*. New Brunswick, NJ: Transaction Publishers: 19–36.
Said, E. W. (1994). *Culture and Imperialism*. New York: Vintage Books.
Salleh, A. (2011). "Cancun and after: a sociology of climate change." *Arena* 110: 4.
Shue, H. (2009). "Historical responsibility." Technical Briefing on Historical Responsibility as a Guide to Future Action to Address Climate Change. Meeting of the Ad Hoc Working Group on Long Term Cooperative Action, UNFCCC. Available HTTP: <http://unfccc.int/bodies/awg-lca/items/4891.php> (Accessed April 5, 2013).
Sidaway, J. (2000). "Postcolonial geographies: an exploratory essay." *Progress in Human Geography* 24(4): 591–612.
Simon, D. (2007). "Beyond antidevelopment: discourses, convergences, practices." *Singapore Journal of Tropical Geography* 28: 205–18.
Slater, D. (1997). "Geopolitical imaginations across the North–South divide: issues of difference, development and power." *Political Geography* 16(8): 631–53.
—— (2004). *Geopolitics and the Post-Colonial: Rethinking North–South Relations*. Oxford: Blackwell Publishing.
—— (2006). "Imperial powers and democratic imaginations." *Third World Quarterly* 27(8): 1369–86.
Sluyter, A. (2002). *Colonialism and Landscape: Postcolonial Theory and Applications*. Lanham, MD: Rowman & Littlefield.
Spivak, G. C. (1993). *Outside in the Teaching Machine*. London: Routledge.
Srinivasan, U., S. Carey, E. Hallstein, P. Higgins, A. Kerr, L. Koteen, A. et al. (2008). "The debt of nations and the distribution of ecological impacts from human activities." *Proceedings of the National Academy of Sciences (PNAS)* 105(5): 6.
Therien, J.-P. (1999). "Beyond the North–South divide: the two tales of world poverty." *Third World Quarterly* 20(4): 723–42.
Toal, G. Ó. (1994). "Critical geopolitics and development theory: intensifying the dialogue." *Transactions of the Institute of British Geographers* 19(2): 228–33.
Vihma, A. (2010). "Elephant in the room: the new G77 and China dynamics in climate talks." Briefing Paper 9. Helsinki: Finnish Institute of International Affairs.
Williams, M. (2005). "The Third World and global environmental negotiations: interests, institutions and ideas." *Global Environmental Politics* 5(3): 48–69.

22

Globalization and the environment

Markets, finance, and trade

Lada V. Kochtcheeva

In the past several decades the advancement of globalization has sharpened many contentious arguments that arise regarding the intensified flows of international trade and investment, on one hand, and the character of environmental transformation, on the other; the balance between economic development and environmental quality; and the linkages between global markets and domestic environmental rights and obligations. Has globalization become a driving force of economic growth, increased wealth, policy innovation, and environmental solutions? Or is it a vehicle of increasing economic inequality, environmental degradation, and inadequate policies? There are no perceptions of the linkages between globalization and the environment that can be completely unambiguous, unbiased, and everlasting. Therefore, this chapter reveals the many complexities of the globalization-environment interface. It demonstrates that economic globalization accelerates market, structural, institutional, and societal change, thus altering the industrial and policy structure of countries, resource use patterns, and policy responses at the domestic and international levels.

The spread of globalization

Recently the world has seen an unprecedented integration of the global economy through trade and financial mechanisms, which have had catalytic impacts on a range of economic benefits. Nonetheless, not everyone has benefited from economic globalization, and not all national economies benefited evenly (Das 2010). The diversity of domestic reactions to economic globalization is abundant around the world. Economic liberalization, technological advance, and regional integration in some societies are counterbalanced by severe competition, setbacks, and resentment to global interdependence in others. Globalization is a worldwide phenomenon, which produces not only a "brighter world" but also conflicts and hierarchies of power, exchanges and costs in "our already anxiety-ridden world" (Dasgupta 2004: 20).

Quantitatively the process of economic globalization is reflected in the dynamics of production and growth rates of international exchange of goods, labor, services, and capital. The qualitative aspect of the growing internationalization is the strengthening of the linkages and interdependencies among national and regional economies. The rapid growth in the volume and diversity of world economic relations, accompanied by increasing economic interdependence of

countries, is the essence of the globalization process. As a result a relatively integrated economic system is being formed, which influences domestic economic systems and at times dictates its own rules of the game to the national economies, societies, and polities. The extent and nature of such an impact and the inclusion of a country into global economic relations, especially into international trade, are determined by a number of factors, including the magnitude of its economic capacity, its state of technological development, and its endowment with natural resources.

In addition to direct or indirect impacts on the economic and socio-political spheres, globalization affects the state of the natural environment. Humanly changed ecosystems, rampant urbanization, pollution, climate change, resource exhaustion, species extinction, demographic shifts, and many other problems are attributed to globalization in general and increased economic pressures that inevitably leave an eco-footprint in particular. The United Nations Millennium Ecosystem Assessment report demonstrates that in the past several decades humans have changed the face of the Earth faster and deeper than in any previous period. The economic gains come into conflict with environmental sustainability. Abstaining from globalization, however, is not generally considered an answer (Gillespie and Leflaive 2007). Technological breakthroughs, policy innovation, trade, investment, and the emergence of new markets are believed to promote more efficient use of resources and spread of knowledge and awareness (Gallagher 2009). Moreover, it is hard to impossible for individual countries to establish rules for development independently from what is happening in other countries. Similarly, due to the fact that the natural environment does not recognize socially created national borders individual countries cannot solve many environmental problems independently. They have to cooperate and create policies at the supra-national and international levels to address environmental concerns and promote sustainability.

Indeed, many serious attempts at global environmental governance emerged during the 1980s and 1990s, paralleling the rise of international economic management and the World Trade Organization (WTO) (Speth 2003). The magnitude of the world economy as well as international trade and cross-country pollution continued to grow and developed into global challenges demanding international cooperation. As a result, various bi-national and multinational environmental agreements now address the problems of air and water quality (Chapters 30 and 34), biodiversity and threatened species (Chapter 37), world fisheries (Chapter 36), transportation of waste (Chapter 33), ozone layer depletion (Chapter 29), climate change (Chapter 28), and many other problems. Depending on the level of domestic development, international environmental policies usually assign different responsibilities for environmental protection to different countries, according to the principle of common but differentiated responsibility (see Chapters 9 and 10). Still, many of the developing and newly emerging economies view environmental efforts as a major obstacle to competitiveness and well-being, while experiencing some of the worst environmental problems in the world. Therefore, one of the biggest challenges is to make this differentiated responsibility truly common among countries without significantly hurting their developmental potential. As such, economic globalization may stimulate a new trend, where eco-efficiency is the main principle and where environmental protection is seen not as an obstacle but rather as an opportunity.

In short, as the world has been transitioning into a global marketplace, financial flows, production, technology, and politics become more interconnected. This internationalization is leading to an increased transfer of goods and services across borders, increased communication throughout the world, an increased importance of trade and technology in the economy, and an increase in international policies. Globalization has expanded beyond its economic roots and has proliferated into many facets of human interactions and very importantly the natural

environment. This has resulted in a critical shift of policy-making prerogatives from individual states to a range of new, higher-level political institutions and processes. To unfold the above arguments, this chapter defines globalization, presents a scholarly debate on the relationship between globalization and the environment, discusses the effects of globalization on trade, economics, the natural environment, and environmental policy, reveals the importance of the phenomenon for global environmental politics, and provides concluding remarks.

Globalization and the environment: the debate

Globalization is usually understood as the increased interconnectedness and cross-border relations, which are accelerating in their speed and reach, resulting in interdependence of economic, political, social, and cultural spheres (Stearns 2003). While literature presents numerous other definitions of the phenomenon, several prominent features of globalization are easily discernible. They include modernization (Giddens 1990, 2003; Albrow 1996; Friedman 1999), transformation of spatio-temporal and organizational features of the human condition (Held et al. 1999; Held and McGrew 2003; Scholte 2000), internationalization (Hirst and Thompson 1996), Westernization and liberalization (Robins and Webster 1999; Schaeffer 2003; Fukuyama 1992), unification (Perraton 2003), intensification of communications and technology transfer (Schaeffer 2003; Barber 1995; Huntington 1996), omnipresence (Wiarda 2007), and integration (Gallagher 2009). As such, the very notion of globalization sparks extensive debate on the nature and driving forces of global processes, and on the costs and benefits of an integrated, globalized world driven by economic development, technology breakthroughs, political shifts, cultural influences, and communication boost. The only tenet of the globalization argument where most scholars find common ground is that globalization is an unavoidable catalyst of change (Kellner 2002; Das 2010). From that common outlook, several lines of the debate can be detected. One division, which revolves round whether the change associated with globalization yields positive or negative impacts on the environment, frames the whole globalization and environment debate (Dauvergne 2004; Esty and Ivanova 2004). Another issue is the emphasis on political economy at the expense of the social, cultural, and environmental consequences of globalization (Kütting 2004). Similarly, more research is needed on the linkages between economic integration and population growth, consumption and technological change, human mobility and security (Gallagher 2009). Still other concerns encompass different ways by which globalization affects various domestic realms, including economy, politics, and culture, as well as domestic environmental responses to globalization, including markets, policies, institutions, and ideas.

In general, proponents of globalization perceive this phenomenon, and the associated economic advancements that set conditions for environmental progress, as interconnected and mutually reinforcing. Accordingly, globalization increases wealth and economic growth, spawns development, and results in rising incomes, all of which are essential elements to allow governments to generate funds for environmental protection and enact sound policies to abate pollution and conserve natural resources (Panayotou 2000). To effectively address environmental issues, states must first address their basic needs and accumulate sufficient economic capacity to relieve the environment from the burden of development. Economic growth, increased prosperity, and the rising incomes associated with globalization in this case assist in reducing dependence and poverty, raising the standard of living for citizens, allowing governments the ability to focus on the environment, and enabling individuals to be more active in maintaining their rights to a favorable environment.

Globalization proponents emphasize that increased government revenue from international trade, investment, and open economies increases tax bases, providing funding for domestic

environmental policies, programs, and establishments. Globalization releases economic forces including enhancement in productivity of domestic firms. It eliminates price distortions and promotes efficient resource allocation in the domestic economy (Das 2010; Arnold et al. 2007). Advocates claim that the environmental benefits of globalization go beyond economics. The intensified interconnectivity and interdependency facilitate the diffusion of technology that assists less-developed nations to become more environmentally aware and responsible. Enhanced international cooperation in a globalized world aids the assimilation of positive environmental protection standards and norms across the globe (Dauvergne 2004; Clapp and Dauvergne 2011). Such expanded cooperation is the basis of any environmental governance aimed at a global solution to environmental issues. Environmental problems transcend political borders and the interdependence and cooperation associated with globalization are necessary in order to confront environmental problems internationally. The collaboration among states due to globalization brings states closer together and is essential in coordinating a global approach to the environment, chartering effective international environmental institutions and regimes, and establishing any binding global environmental policy and law. Globalization provides the driving force to facilitate such actions that are necessary to protect the environment.

On the other hand, the critics of globalization perceive it as a destructive force driven by capitalism and its associated consumerism that exponentially increases economic growth at the expense of natural resources and the environment (see Chapter 16). Globalization-fueled consumption exhausts natural resources and, in turn, limits achievable economic growth without intervention and adequate controls (Najam et al. 2007). Economic growth associated with globalization increases "ecological footprints," the hectares of land and sea required annually to support one person's consumption, and "ecological shadows," areas outside of a country harmed by its increasing patterns of trade, finance, and consumption (Dauvergne 2004). Globalization could also result in the marginalization of economies, sectors, and peoples, and produce poverty-related resource depletion and environmental degradation. For instance, globalization has given a boost and convenience of improved transportation. A decrease in transportation costs has triggered business to garner greater profits by factory relocation and concentrating production in one sector or in one location, where inequalities exist, both economic and environmental.

Globalization may exaggerate market failures that spread and exacerbate environmental damage. It may also create demands for reform as policies previously perceived as exclusively domestic attract international interest (Panayotou 2000). Yet, negative associations tied to globalization also include the internationalization of decisions made in faraway locations that increasingly impact societies, and the "restructuring of social space" (Patomaki and Teivainen 2002: 40) as a result of technological changes. In many cases, poorer countries are more likely to suffer the negative environmental effects of globalization than the richer nations that gain from its associated economic growth. In fact, the triumph of free markets, economic openness, and the spread of liberal principles are not longed-for or even viable in many places in the world. As Robert Schaeffer (2003: 4) argues, "most of the people around the world have little money to save or invest in global financial markets." The critics stress that the imposition of free markets produces social dislocation, political and economic instability, and environmental degradation (Gray 1998). The negative effects of globalization are not limited to the level of the state; they also affect individual people and communities (see Chapter 24). As a result, the poor are least likely to benefit from any economic or environmental benefits of globalization, which aggravates existing income disparities and hampers the ability of people to rise to a position from which they can afford environmental concern.

The debate on globalization and the environment reveals that there are both positive and negative environmental consequences of globalization. States must have the willingness, the

capacity, the funds, and the technology to protect the environment and the international community requires increased state cooperation in order to address environmental issues that eclipse political borders (see Chapters 7 and 8). At the same time, unrestrained consumption, pollution associated with increased economic growth, and the potential disproportionate impact on the poor requires that globalization be sustainable and presents sustainable development as a potential point of embarkation in the quest for a balance between globalization and the environment (see Chapter 15).

Global economic forces and the natural environment: the effects

By advancing division of labor and competition, facilitating foreign direct investment and technology transfer as well as promoting an efficient use of factors of production, globalization becomes a powerful source of welfare improvement around the world. As economic integration becomes more extensive and intensive it triggers an increase in efficiency of resource and input utilization in the global economy as countries and regions produce goods and services in line with their comparative advantage and at their lowest opportunity costs (Das 2010). Between 1985 and 2005, the number of the world's poorest living on less than a $1 a day was halved. Multilateral trade flows have expanded dramatically since the mid-1990s. Between 1995 and 2006, global merchandise trade more than doubled, increasing from $5.17 trillion to $11.98 trillion. Merchandise trade increased further to $13.57 trillion in 2007 (WTO 2008). In general, trade as a percentage of world GDP grew to more than 50 percent in 2005, denoting that more than half of all economic activity was traded (Gallagher 2009). Moreover, world trade recorded its largest-ever annual increase in 2010 as merchandise exports surged 14.5 percent (WTO 2011). Since 1990, the volume of cross-border financial flows has also soared nine times (Das 2010).

Additionally, information and communication technology influences the global production pattern and economic development, most significantly providing the opportunity for a group of developing economies to diversify production activity and become a part of the global value networks. The best-known illustration of economic benefits and tangible gains of globalization is the rise of the East Asian economies, followed by rapid growth and integration of Southeast Asian economies and recently by India's and especially China's rise as emerging economic powers. Sustained GDP growth of this sub-group of economies was achieved simultaneously with noteworthy stability. The year 2010 demonstrates significant GDP growth in Asia (8.8 percent) as well, with China and India revealing strong increases of 10.3 percent and 9.7 percent, respectively (WTO 2011). In 2010, China also became the third largest economy, the world's largest exporter, the second-largest producer of electricity and chemical textiles, and the largest consumer of fertilizer (CIA 2011). Influenced by the global economic crisis the developing economies in general registered faster growth than developed countries did. Industrialized countries are, however, pursuing economic integration with greater fervor than ever. South and Central America also attained robust growth of 5.8 percent, driven by Brazil's 7.5 percent advance. Africa had the fastest average rate of GDP growth (4.7 percent) of any region over the past five years (WTO 2011). Unquestionably, the magnitude and speed of trade and financial integration varies for different economies and regions, but the common feature is that trade in goods and services and financial flows continue to progressively integrate national economies with the global economy.

Such integration, unfortunately, has not only been uneven, but also produced sharper inequalities and distress around the world. While millions have made it out of poverty and have access to improved services, including sanitation and medical care, there are still more than one billion poor people in the world (UNEP 2007). Three-quarters of the poorest families live in rural areas

and depend in large measure on natural resources for their existence. The one billion people who live in wealthy industrialized countries consume over half of global income, while 3.5 billion people in less-developed low-income countries receive less that one-fifth of the global income (Clapp and Dauvergne 2011). The richest 20 percent of the population also consume 45 percent of fish and meat. Yet, over one billion people suffer from malnutrition, which contributes to 60 percent of all childhood deaths. There is also growing uneven distribution of environmental burdens within countries and their correlation with disparities in political power (Boyce 2004). The use of the Internet, which is the key communication vehicle of globalization, is also sharply uneven. While in the United States and Europe almost 80 percent and 60 percent of the population respectively has access to the Internet, in Africa and Asia the Internet reaches around 12 percent and 24 percent of the population respectively (Internetworldstats 2011). The inequality that has accompanied economic globalization not only influences social conditions but also affects environmental quality. The dramatic economic rise over the past several decades has been offset by the environmental degradation.

Globalization has an astounding effect on the natural environment and on the policies related to environmental protection. The need for growth and competitive presence leads to extensive air and water pollution as manufacturing and transportation patterns increase to support the economy (Najam et al. 2007). Many developing countries demonstrate enormous hunger for resources to fuel their economies, develop consumption-oriented societies, and undergo urbanization and tremendous social change (Wiarda 2007). The United Nations Environment Programme (UNEP), Executive Director Achim Steiner states in the 2010 UNEP Annual Report that: "global indicators demonstrate that the world is still heading in the wrong direction for sustainable development" (UNEP 2011: 6). The Global Environmental Outlook, GEO 4, a UNEP report as well as other authoritative sources give evidence that there is "unprecedented environmental change at global and regional level" (UNEP 2007). Due to population growth, the amount of land available to each person on the planet has been decreasing since 1900, from 7.91 ha then to 2.02 ha in 2005 and is projected to further drop to 1.63 ha by 2050 (UNEP 2007). About 70 percent of commercial marine fish stocks are exhausted. Increasing water consumption has contributed to the proliferation of dams, canals, and diversions, which disrupt about 60 percent of the world's largest rivers (Clapp and Dauvergne 2011). Changing climate affects land and water resources, biodiversity, forest cover, and food security. Outdoor and indoor air pollution takes the lives of more than 2 million people annually. Unsustainable land use drives soil erosion, water scarcity, and nutrient depletion. The per capita availability of fresh water is declining globally, while the lack of sanitation causes disease and death around the world. The decline in water quality and quantity affects aquatic ecosystems and their services. More than 16,000 species have been identified as threatened with extinction (UNEP 2007). The list of environmental problems continues to grow and the problems themselves become more complex, especially in the developing world and emerging economies (see Part IV of this volume).

Indeed, some of the major beneficiaries of economic globalization, the emerging world powers, such as China and India, are suffering from severe environmental problems. Environmental degradation is costing China 8 percent of its GDP annually (Wilson Center 2011). The country was also ranked 129th out of the 142 countries that were evaluated for environmental sustainability (Liu and Diamond 2005). Agricultural land degradation and deforestation are among the most serious environmental concerns facing India going into the future. The country is ranked third for water pollution, while increasing competition for water among various sectors, including industry, agriculture, energy generation, and others, is causing water shortages and pollution (*Hindustan Times* 2011). Some more modest globalizees pay a large

environmental price as well. Africa holds at least 50,000 tonnes of obsolete pesticides which endanger both people and the environment. Poor water and urban air quality still cause substantial problems in some parts of Eastern and Southern Europe. Even the globalizers are not immune to environmental costs. Excessive groundwater withdrawal and nutrient run-off present the USA a challenge. Increasing demands for domestic energy use may result in emerging threats, including air pollution, the potential for additional releases of oil into the environment, and the fragmentation of landscapes, with impacts on biodiversity (UNEP 2007).

On a positive note, there is some progress in the environmental realm, and not without the role of globalization and international efforts. An agenda of the fundamental far-reaching environmental concerns has been delineated; there has been a tremendous rise in global conferences, negotiations, treaties, and action plans (see Chapters 8 and 9); there has been an outpouring of significant scientific research (see Chapter 17); national governments and international organizations have created policies and institutions to address environmental challenges (see Chapter 12); and a network of nongovernmental organizations has started multiple environmental projects (see Chapter 14). By 2010, 22 countries had been integrating the environment into development planning with the assistance of UNEP and the United Nations Development Programme (UNDP). A network of over 40 National Cleaner Production Centres is supported by the UN agencies to promote resource efficiency in small enterprises. UNEP is also supporting a strategic approach to International Chemical Management with 117 projects undertaken by 97 governments and 12 civil society organizations involving activities in 95 countries, with donations of over $30 million. Some 77 countries are successfully phasing out leaded gasoline (UNEP 2011). Also in 2010, for the first time, global aggregate installed capacity from wind turbines, biomass, solar power, and other alternative energy sources surpassed installed nuclear capacity, with total investment in renewable energy technologies being $243 billion in that year (World Watch Institute 2011). UNEP is coordinating and strengthening the process to establish the Intergovernmental Panel on Biodiversity and Ecosystem Services (see Chapter 37). The organization's work on Sustainable Consumption and Production is highlighted at the Commission of Sustainable Development. UNEP is restructuring itself to become a more results-focused and effective organization as well (UNEP 2011).

There is also an expanding trend at local and national levels to generate environmental innovations and stimulate the development of "Green Economies." For instance, notwithstanding the struggles of the formal climate change negotiations, many countries, regional and local governments, firms, and societal groups are introducing and implementing policies and programs to reduce greenhouse gas emissions and promote alternative energy sources. Globally, the concept of "Green Economy" was one of the key issues during the Rio+20 conference in 2012. Additionally, the UN's Environment Management Group is set to address the move towards a Green Economy through a Joint Issues Management Group involving over 20 UN entities as well as the International Monetary Fund (IMF) and the World Bank. Finally, six UN agencies and the European Commission established a partnership to jointly address conflict risks from natural resources and environmental factors in fragile states (UNEP 2011).

The effects of economic globalization on the environment are anything but uniform and straightforward. Notwithstanding their complexity such effects underscore the need to link economic integration with social and environmental policy at the local, national, and global level. This will, without a doubt, involve overcoming multiple persisting challenges. While domestic environmental challenges tend to be acute, immediate, and rather understandable by the public, the global ones are more distant, long-lasting, and sometimes difficult to appreciate (Speth 2003). Global environmental problems cannot be blamed only on economic integration, expanded trade, and multinational corporations, when national routines and aspirations, policy

failures in the developed and developing countries, and individual mismanagement, among many other factors, are clearly at play. Increasingly, environmental degradation is not a function of something going wrong, but rather it stems from ordinary life of production and consumption. Exactly this business-as-usual attitude is being reconsidered as global interlinkages grow. Innovation in energy, farming, and sanitation, for instance, can help deliver technologies adapted to the circumstances in developing countries, but the fundamental challenge is to better integrate the environment into national development policies, which presents an enormous task that most developing countries cannot tackle due to a lack in basic capacity. Flexible performance-based standards and market-based policy tools in regulation domestically and internationally can supplement the overly legalistic command-and-control oriented approach that tends to be one-dimensional, neglecting useful avenues that may make international regimes perform better. Communication technologies are fostering awareness and creating global norms and standards that may encourage cooperative efforts to solve domestic and international problems. International institutions and organizations that promote and facilitate cooperative exchange and work through the competing national interests need to be more transparent, effective, and democratic. As such, international regimes and global environmental governance have come under increasing scrutiny.

Economic globalization and international environmental governance

Globalization is a multifaceted process, which engages and readjusts national economies, polities, and societies. It is a persistent, vigorous, and intensifying process that increases the linkages between and among actors, as well as structures within which they function, both domestically and internationally (Clapp and Dauvergne 2011). Markets, trade, and finance are now more globally integrated than ever before, as are global organizations and movements. This precipitous advance of economic integration has resulted in interconnected global economic, technological, and financial operations, which in turn demand a degree of harmonization of domestic policies regarding various issues (Esty and Ivanova 2004). International relations mechanisms that reflected the traditional concept of national sovereignty have given way to a concept of global governance with its supranational regimes, institutions, and interests (see Chapter 9). New networks of scientists have developed to provide complex technical information and illuminate emerging problems, which is indispensable for policy-making and norm creation (Biermann 2004; see Chapter 17). Intergovernmental organizations and businesses have taken a more direct and prominent role in international decision-making (see Chapters 8 and 13). As such, globalization points to the importance of the global community with global concerns, and it emphasizes the growing importance of transnational actors, organizations, norms, and ideas.

Globalization is also altering the fundamental mechanism of global environmental transformations and international responses to them. It influences the way governments, firms, communities, and individuals perceive environmental change. Due to the increases in the amount and decreases in the cost of communications, globalization also presents extended access to information and data, new channels for policy influence, and the potential of more sophisticated and effective modes of governance (Esty and Ivanova 2004). The processes of global integration and interaction disseminate the principles, norms, codes of behavior, as well as promote environmental markets and organizations and strengthen international law, which affect global environmental governance.

Global environmental governance is a complex and dynamic process. The outpouring of ideas to protect the global environment dates back more than a century, but ground-breaking books of the past half-century, such as *Silent Spring* (1962), *The Limits to Growth* (1972), *The*

Population Bomb (1968), and *Our Common Future* (1987), all of which coincided with the advance of globalization, shaped modern conceptions of global environmental action and sustainable development. Similarly, international environmental conferences at Stockholm, Rio, and Johannesburg (see Chapter 8); problem-specific meetings and negotiations from biodiversity conservation (Chapter 37), to hazardous waste management (Chapter 33), to climate change (Chapter 28); and local and global activism (Chapter 14), all took place in a larger economic and political context. The spread of environmental risks on the global scale and the corresponding move of environmental policy to the global arena should be seen as important aspects of globalization (see Chapter 18). The actors, structures, norms, and processes of environmental governance are influenced by wider occurrences in the global political economy. Global economic activities, including trade, investment, and distribution, have also played a critical role in molding the development of perspectives not only on the economy, but also on the implications of global economic advance for the natural environment.

While there is a rich history of formal actions by states and the international community to address environmental problems, globalization continues to pose challenges for environmental governance. These include the outpacing of environmental regulations by economic growth, the increasing power of the private sector to shape economic and environmental decisions, the environmental impacts of economic instability, and questions about the transparency and accountability of international institutions. There are significant polarizing trends, due to disparate impacts across locations and disparities in the extent of governance responses (e.g., climate change). Such unequal impacts arise from both circumstantial factors, such as geographic location, and greater vulnerability of certain populations, including those of many developing countries (Boyce 2004). The distribution of causes and effects of environmental problems across space and time contributes to the challenges of identifying those failing to cooperate or resolve such problems, especially in the absence of global authority. Traditional policy remedies, such as standards, taxes, fees, and subsidies, lose their effectiveness in an international structure of sovereign states and fragmented institutions with overlapping responsibilities, relatively small budgets, and lack of enforcement power. Contradictions between regimes and organizations in an atmosphere of incomplete information, fragmented policy arena, and suboptimal transparency exacerbate the situation (Biermann 2004). Additionally, domestic environmental policy failures may have international consequences. In a globalizing world, environmental risks, such as uncontrolled air pollution or an oil spill, at the local or domestic level may result in regional and even global problems, causing contamination of the resources, harmful precipitation, damage to the ecosystems, and health disorders. The inability to avoid or alleviate such spillover effects of transboundary pollution creates a risk for the international economic system of being weighed down by market failures. More often than not it is national environmental underperfomance that necessitates bringing multiple countries together to produce a common response, which in turn represents a much more difficult problem to solve than domestic environmental protection.

In a closely interconnected economy, vast differences in national regulation style, philosophy, and capacity among countries which are linked economically also create strains in relations (see Chapter 12). The more profound economic integration is between countries, the more sensitive these countries become to the policy decisions and regulatory outcomes of their partners. The examples are abundant. The European Union's ban on genetically modified foods, which was lifted after six years in 2004, was attacked by US claims that the ban violated the rules of free trade under WTO regulations. The US import restrictions on tuna caught with methods that killed dolphins were struck down under GATT rules as an illegal barrier to trade by Mexico. Eco-labeling, health standards, food safety requirements, and waste management at the national level influence the flow of international trade (Esty and Ivanova 2004).

The challenge for the domestic and global policy community is to differentiate between the regimes that provide necessary requirements for environmental protection and those regulations that impede economic activity without producing the benefits for the natural environment. The effectiveness and efficiency of global governance cannot be achieved and maintained unless there are clear, consistent, and operational rules that are created and implemented for both the economy and the environment. A network of institutions with enhanced channels for collaboration and capacity to estimate costs, benefits, and policy options that can provide a reliable database for sound decision-making and a means to utilize leverage on resources can improve the chances of success from global programs, protocols, and spending. Yet another challenge for the international environmental system is to overcome the difficulties of dealing satisfactorily with the priorities of both developed, emerging, and developing countries against the background of the proliferation of multinational treaties that place unequal or unfair obligations on different member states. A growing complexity of environmental problems and increasing interdependency of economic actions require a multifaceted approach that recognizes the dynamism of resource use and pollution abatement and the need for tailored responses with a variety of policy instruments (Vogler 2000).

A global framework and international cooperation will nonetheless continue to be beneficial in resolving a range of commonplace regional and local problems, which makes it a point of concern for policy- and decision-makers in many countries of the world. Because all countries struggle with some sort of pollution, land degradation, species extinction, waste disposal, and other common environmental problems, dissemination of successful policy experiments and pilot projects, sharing data and research findings can be helpful in highlighting issues and illustrating best policy and management practices. The international system serves as an arena and a forum for multiple environmental groups and associations, which help initiate dialogues on trade and environment, direct efforts toward the reform of international institutions, and attempt to reach consensus between various communities. Global reporting of scientific and technical analyses, exchange of ideas, and sharpening of awareness for a multiplicity of actors also benefit from the process of globalization and contribute to the strengthening of interconnectedness around the world. As international policy and problem networks adjust to an increasingly complex global policy environment the goal should be to take advantage of the emerging technologies, model institutional responses on relevant existing expertise, examine problems from multiple perspectives, and form new opportunities for cooperation. In the age of globalization, the interaction of states, international organizations, regional institutions, businesses, research centers, and individuals will continue to grow and shape global environmental governance and the debates surrounding it for years to come.

Conclusion

Globalization as an ongoing and accelerating process is altering the natural environment. It is intensifying the interlinkages between economies, policies, institutions, and peoples. This multifaceted and even controversial phenomenon is shaping trade, production, and finance operations, as well as promoting new technologies and inspiring global norms. Economic globalization specifically has redefined the understanding of and relation to ecosystems, broadened the reach of many environmental decisions, and produced variable environmental outcomes. The interconnectedness of the global economy, investment, trade, and environmental policy, and the nature of their linkage are often a function of both domestic and international politics (Gallagher 2009). The scale, complexity, and the connection of economic globalization and environmental change, however, do not mean that individual countries and the international community are

faced with the absolute choice of doing business as usual in the face of complexity (UNEP 2007). The environmental impacts of globalization most importantly depend on how governments and multinational institutions react to the increasing pressure and complexity of economic growth. Environmental globalization requires fundamental changes to empower governments, firms, and peoples to respond effectively to different local and regional environmental situations while simultaneously maintaining a global perspective on their environmental impacts. As such, identifying the global interlinkages offers opportunities for a range of responses at local, regional, and global levels that may abate the disturbing trends that drove action in the first place. Current challenges and needs relating to existing domestic and international institutions and capacities for integrating the environment into development present an arena where the environmental impacts of globalization not only remain to be seen, they remain to be determined and solved (Boyce 2004).

Globalization, while not devoid of conflict and distress, can serve as a balancing act between the national and global in the domain of environmental governance. The capacity and willingness of many actors to seek solutions to problems of the natural environment is increasing. While efforts and outcomes vary significantly among different countries, environmental initiatives expose aspects of transnational relations that will only grow in significance due to the expanding economic technological exchanges and interactions between different jurisdictions, growing linkages between scientific and political communities, the mounting role of non-state actors in producing and disseminating knowledge, and the advent of innovative policy approaches in response to new constellations of actors, institutions, ideas, and events that permeate national boundaries. Globalization and environmental change reinvigorate the conception of human development, but with ever-greater historical scale and urgency to promote growth and well-being in conformity with the laws of nature.

References

Albrow, Martin. 1996. *The global age: State and society beyond modernity*. Cambridge: Polity Press.

Arnold, J.M., B.S. Javorcik, and A. Mattoo. 2007. *Does services liberalization benefit manufacturing firms?* World Bank Policy Research Working Paper No. 4190, World Bank, Washington, DC, January.

Barber, Benjamin. 1995. *Jihad vs. McWorld*. New York: Times Books.

Biermann, Frank. 2004. *Global environmental governance: Conceptualization and examples*. Global Governance Working Paper No. 12. The Global Governance Project. Available HTTP: <Glogov.org>

Boyce, James. 2004. *Green and brown: Globalization and the environment*. Economics Department Working Paper Series. University of Massachusetts-Amherst.

Central Intelligence Agency (CIA). 2011. *The World Factbook: China*. Available HTTP: <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html> (Accessed November 23, 2011).

Clapp, Jennifer and Peter Dauvergne. 2011. *Paths to a green world: The political economy of the global environment*. Cambridge, MA: MIT Press.

Das, Dilip K. 2010. Another perspective on globalization. *Journal of International Trade Law and Policy* 9(1): 46–63.

Dasgupta, Samir. 2004. *The changing face of globalization*. New Delhi: Sage Publications.

Dauvergne, Peter. 2004. Globalization and the environment. Available HTTP: <http://www.politics.ubc.ca/fileadmin/template/main/images/departments/poli_sci/Faculty/dauvergne/15_Cha14.pdf> (Accessed January 2, 2012).

Esty, D. and M. Ivanova. 2004. *Globalization and environmental protection: A global governance perspective*. Working Paper No. 0402. New Haven, CT: Yale Center for Environmental Law and Policy.

Friedman, Thomas. 1999. *The lexus and the olive tree*. New York: Farrar, Straus, Giroux.

Fukuyama, Francis. 1992. *The end of history and the last man*. New York: Free Press.

Gallagher, Kevin P. 2009. Economic globalization and the environment. *Annual Review of Environment and Resources* 34: 279–304.

Giddens, Anthony. 1990. *The consequences of modernity*. Cambridge: Polity Press.

—— 2003. *Runaway world: How globalization is reshaping our lives*. 2nd edn. London: Taylor & Francis.
Gillespie, Brendan and Xavier Leflaive. 2007. *Innovation, globalization and the environment*. OECD Environment Directorate. OECD Observer No. 261.
Gray, John. 1998. *False dawn: The delusions of global capitalism*. London: New Press.
Held, David, and Anthony McGrew. 2003. The great globalization debate: An introduction. In David Held and Anthony McGrew (eds) *The global transformations reader*. Cambridge: Polity Press.
Held, David, A. McGrew, D. Goldblatt, and J. Perraton. 1999. *Global transformations*. Cambridge: Polity Press.
Hindustan Times. 2011. India 7th most environmentally hazardous country: study. January 2011. Available HTTP: <http://www.hindustantimes.com/India-7th-most-environmentally-hazardous-country-study/Article1–648692.aspx> (Accessed August 8, 2011).
Hirst, Paul, and Grahame Thompson. 1996. *Globalization in question*. Cambridge: Polity Press.
Huntington, Samuel P. 1996. *The clash of civilizations and the remaking of world order*. New York: Simon and Schuster.
Internetworldstats. 2011. Internet usage statistics. Available HTTP: <http://www.internetworldstats.com/stats.htm> (Accessed January 30, 2012).
Kellner, Douglas. 2002. Theorizing globalization. *Sociological Theory* 20(3).
Kütting, Gabriela. 2004. *Globalization and the environment: Greening global political economy*. Albany: SUNY Press.
Liu, Jianguo and Jared Diamond. 2005. China's environment in a globalizing world. *Nature* 435(30).
Najam, Adil, David Runnalls, and Mark Halle. 2007. *Environment and globalization: Five propositions*. New York: International Institute for Sustainable Development.
Ostrom, Elinor. 1990. *Governing the commons: The evolution of institutions for collective action*. New York: Cambridge University Press.
Panayotou, Theodore. 2000. *Globalization and environment*. Working Paper N53. Center for International Development at Harvard University.
Patomaki, H. and T. Teivainen. 2002. Critical responses to neoliberal globalization in the Mercosur region: Roads towards cosmopolitan democracy? *Review of International Political Economy* 9(1): 37–71.
Perraton, Jonathan. 2003. The scope and implications of globalization. In Jonathan Michie (ed.) *The handbook of globalization*. Northampton, MA: Edward Elgar.
Robins, Kevin, and Frank Webster. 1999. *Times of the technoculture*. New York: Routledge.
Schaeffer, Robert K. 2003. *Understanding globalization: The social consequences of political, economic, and environmental change*. Lanham, MD: Rowman & Littlefield.
Scholte, Jan Aart. 2000. *Globalization: A critical introduction*. New York: St. Martin's Press.
Speth, James Gustave. 2003. *Worlds apart: Globalization and the environment*. Washington, DC: Island Press.
Stearns, Peter N. 2003. Treating globalization in history surveys. *The History Teacher* 36(2): 153–60.
UNEP. 2007. Global Environmental Outlook, GEO 4, Environment for Development: Summary for Decision-Makers. UNEP.
—— 2011. UNEP 2010 Annual Report. DCP/1354/NA.
Vogler, J. 2000. *The global commons: environmental and technological governance*. Chichester: Wiley.
Wiarda, Howard. 2007. Globalization in its universal and regional dimensions. In Howard Wiarda (ed.) *Globalization: Universal trends, regional implications*. Boston, MA: Northeastern University Press.
Wilson Center. 2011. The Woodrow Wilson International Center for Scholars. Available HTTP: <http://www.wilsoncenter.org/index.cfm?topic_id = 1421&useaction = topics.categoryview&categoryid = EE5586BC-9247-863E-B7C96B9489272423> (Accessed December 13, 2011).
World Watch Institute. 2011. Featured Research. Available HTTP: <http://www.worldwatch.org/research> (Accessed January 31, 2012).
WTO. 2008. World Trade 2007, Prospects for 2008. Press Release P/520/Rev.1, April 17. Geneva: World Trade Organization.
—— 2011. World Trade Report 2011. Available HTTP: <http://www.wto.org/english/res_e/publications_e/wtr11_e.htm> (Accessed January 23, 2012).

23

International justice

Rights and obligations of states

Steve Vanderheiden

Principles of international justice serve as aspirational goals, constraints, and evaluative criteria for the development of the institutions and practices of global environmental politics. In this chapter, these three roles will be considered in terms of the way that each shapes political treatment of international environmental issues. First, the notion of international justice itself will be explored, identifying controversies within the scholarly literature that contest the scope of justice as well as its application to environmental issues. Three conceptions of international justice will be described and briefly explored: an older sense based in post-Westphalian norms of state sovereignty; a newer but weaker sense based in the idea of universal human rights and concerned with providing all the requisite minimum resources or protections for those rights to be respected; and a stronger sense, based around the international extension of distributive justice principles and concerned with providing equitable access to key social and economic resources. These conceptions of justice will then be applied to several issues in global environmental politics to illustrate their scope and explore their implications, including global climate change and international fisheries management. Finally, some reflections on the strengths and limits of justice-based analyses of environmental problems shall be offered.

International justice: contested terrain

A preliminary question to its application concerns whether or not justice can defensibly be extended to relations between states, as the notion of "international justice" supposes that it can be. Philosophers and political theorists have long assumed that some ethical norms govern the conduct of nation-states in international politics, occasionally prescribing limits on state actions beyond those inscribed in law or justifying international responses to transgressions of these norms. Just war theory, for example, posits a set of principled limits on conduct within wars between states, or *jus in bello*, as well as upon the decision to resort to war in the first place, or *jus ad bellum*. First articulated in ancient Rome by Cicero's *De Officiis* and further developed by Thomas Aquinas in the thirteenth century, the notion that ideals of justice between sovereign city states govern their conduct, even during wartime, predates the origin of the nation-state itself by centuries, but anticipates some of the ethical challenges of relations between them. While the concept of justice active in just war theory had yet to acquire the distributive

connotations with which it is currently associated, the term has long served as a regulative moral and political ideal in the arena of what would eventually come to be called international relations.

Alongside the nascent ideals of international justice found in just war theory, principles governing the conduct among independent states during peacetime developed with the rise of the modern state. The 1648 Peace of Westphalia established the principles of state sovereignty and territorial integrity, as the parties to those treaties recognized the prerogative of each prince to determine the religion of his own state, subject to provisions guaranteeing toleration of members of other faiths, and generally for each state to control its own territory and people, prohibiting any state from interfering with the internal affairs of others (see Chapter 7). The Westphalian order that emerged among the European powers respected the sovereignty and territorial integrity of states as a matter of international justice, and affirmed the rights of political self-determination as a key internal value toward which such external constraints are oriented. Early notions of international justice thus prohibited certain kinds of conduct – especially aggressive war or interference in the sovereign affairs of other states – but prescribed little or no positive obligations to states within the international order. Despite affirmed commitments to self-determination, which are now viewed as requiring positive obligations that include development aid as well as negative ones against interference, early views of international justice issued primarily negative injunctions against wrongful interference rather than sanctioning mutually beneficial forms of cooperation. They were also collective and statist in that they governed relations between states, but were silent on obligations of states to the plight of sub-state peoples or individual persons, which contemporary notions of international justice have stressed, often against Westphalian norms.

Starting with the 1949 Universal Declaration of Human Rights, the normative ideal of rights that transcend national boundaries and apply regardless of national residence or citizenship took root, modifying the Westphalian order by implicitly limiting what sovereign states could do within their own borders, thus qualifying the older sovereignty-based conception of international justice with a newer rights-based one. The notion of universal human rights implies not only valid moral claims against states or other actors that violate those rights, even if within national borders and so outside the context of war or international relations, but also a legal claim for a remedy to those rights violations in the first place, perhaps including international intervention within those states found to be violating the human rights of their residents. Human rights discourse thus gave rise to the idea of humanitarian intervention, or the international use of force against states or their governments for the purpose of protecting human rights. This idea was later articulated through the 2005 Responsibility to Protect (or R2P) doctrine, which charges each state with the responsibility to protect its resident populations from serious human rights violations, but charges the international community with secondary responsibilities to enforce rights where states fail to do so, through coercive intervention like economic sanctions or force as a last resort. Weighing against Westphalian commitments is now this liberal internationalist imperative of interstate cooperation in advancement of universal ideals, with justice increasingly identified with the goals of protecting human rights rather than Westphalian protections of states from outside interference. International justice has thus shifted from a negative right of states to non-interference and a justification of status quo power relations to a positive case for proactive interference, in some cases, often on behalf of individual persons or marginalized groups whose rights and interests have been neglected by states, either from incapacity or active malice.

As human rights doctrine has gained wide acceptance, another conception of international justice has emerged, issuing a yet more serious challenge to the conventional Westphalian order.

Theories of distributive social justice of the kind first developed by John Rawls (1971), and once assumed to apply only within and not between societies, have begun to be extended to apply to at least some aspects of distributive inequality among and between nations. Within justice theory, Charles Beitz's (1975) influential challenge to this national limit in scope of the egalitarian Rawlsian difference principle has given rise to a school of ethical cosmopolitanism, which has argued for the international application of distributive justice principles, against the resistance of a range of scholars that has included Rawls himself in a later work (2001). Among scholars who accept egalitarian justice principles as guiding ideals within societies but reject their application to relations between them, or egalitarian nationalists, the resistance to this wider purview for distributive equity originates in what they take to be the proper Humean circumstances of justice, which govern relations between persons within certain kinds of cooperative schemes and social arrangements. Nationalists typically deny that international society entails such circumstances, and often endorse more limited standards of international justice (human rights, for example) while denying that resource distribution among and between nations is a matter of justice.

For those taking international justice to have the properties vested in it by contemporary ethical cosmopolitans, in which justice principles are applied across national boundaries and international institutions are required to be designed to advance the interests of the world's least advantaged, global environmental politics would focus upon promoting equitable access to resource wealth and other environmental goods and services, and halting environmental harm through pollution or resource depletion where this results from activities associated with affluence but adversely affects the poor. Note that neither pollution nor resource depletion would be viewed as unjust in itself, but that the injustice of either would depend upon the pattern by which more advantaged parties cause a problem and less advantaged parties suffer its effects, so that either kind of environmental despoliation would exacerbate existing inequalities between the advantaged and disadvantaged. An alternative formulation of egalitarian justice to be considered below sets aside this condition that the agent causing environmental harm be more advantaged than the one suffering its effects, maintaining instead that justice requires that none be made worse off by the polluting or resource depleting acts of others, requiring compensation in those instances when such acts occur. Environmental damage that harms only those parties that cause it is often imprudent and may be morally bad, but would not be unjust, as the injustice lies in the interpersonal or intergroup effects.

Strong environmental protections might be advocated from the weaker sense of justice that is coextensive with human rights doctrine, although with the somewhat more modest goal of ensuring that all meet some threshold of access to environmental goods and services, or are not put at risks that exceed a similar threshold by the acts of others. Since rights are concerned with minimum thresholds below which rights are violated, rather than equality itself, a rights-based approach to water justice, for example, might argue that all persons have access to some quantity of water that is sufficient to meet their basic needs, whereas a distributive justice-based approach might require a higher burden of proof on inequalities in water access, casting such inequalities as unjust unless to the benefit of the least advantaged even if all were above that basic threshold. From the older Westphalian conception of international justice, some prohibitions against certain kinds of environmental harm would issue, as the principle of territorial integrity would prohibit transboundary pollution that originates in one state but has its deleterious effects in another, at least without the former state compensating the latter for its injury. In general, then, the stronger conceptions of international justice serve to justify stronger levels of environmental protection, or can condemn as unjust a wider range of instances of environmental despoliation, but even the earliest conceptions are relevant to some issues in contemporary global environmental politics.

Many local environmental concerns are thus simply outside the purview of international justice, but considerations of justice do weigh on some regional and nearly all global issues, even under the oldest and weakest conceptions. To illustrate, consider the problem of global climate change (Chapter 28), which shall be examined in more detail below, but which here reveals how international justice in its various senses can be invoked to condemn the status quo and to urge greater levels of climate policy action. The greenhouse gas pollution that causes climate change is not only a kind of transboundary harm in that it crosses one or two national boundaries, as with more local forms of air and water pollution, but it transcends all national boundaries, as its effects are global and are not dependent upon its geographic source. A ton of carbon emitted from anywhere on the earth has the same effect on global climate, and these effects are global, albeit not uniformly or necessarily negative. Hence, all greenhouse pollution violates the terms of international justice established through the Westphalian principle of territorial integrity, insofar as it causes some climate-related harm somewhere outside its territory of origin, requiring compensation to all parties adversely affected by it. Domestic energy, transportation, and environmental policies can affect global climate, so they cannot be viewed as protected from international interference by claims to national self-determination. A similar condemnation of climate change is available through human rights-based conceptions of international justice, as Simon Caney (2008) has shown, since climate change is expected to threaten rights to subsistence, health, and territory. Applying distributive justice principles, as is done in more detail below, yields a more extensive critique against "business as usual" contributions to climate change as well as providing detailed goals and constraints for the design of international climate policy.

Similar observations could be made about other international or global environmental issues, as transboundary pollution externalities or impacts on the human interests protected by human rights invoke Westphalian and rights-based conceptions of justice, which condemn such effects of environmental despoliation as unjust and require as remedy that the effects be curtailed or their harm be compensated for, while interpersonal or intergroup effects invoke distributive conceptions of justice, as well. As should be evident, all tenable views of international justice can be marshaled on behalf of an active international regulatory regime designed to minimize pollution or promote sustainable resource management practices, even if the various conceptions noted above exist along a continuum of more and less ambitious goals for a just international society. Besides noting the differences between them, these three conceptions might all be contrasted with those which deny that international politics is subject to justice ideals of any kind, such as political realism, which seeks to vindicate self-interested behavior by states, either by positing self-interested action as natural or by denying the binding force of justice outside of its context in domestic society, with its shared political culture and social institutions (see Chapter 3). Since some critics of the application of justice principles to international relations cite realist premises or deny that the circumstances of justice apply in this context, further consideration of skeptical views and the challenge they pose is warranted before considering several applied cases.

International justice and sovereignty

In the context of global environmental politics, considerations of international justice may prescribe a variety of rights and obligations to states, depending upon the issue and justice principles being applied. In some cases, however, these prescriptions would be contested, as those issuing from imperatives of justice may conflict with those arising from other international political norms. For example, conventional views of state sovereignty assign full property rights to natural resources found within territorial borders to the governments or peoples of those states,

including rights to use, transfer, and profit from resource harvest or extraction. By this account, the oil found within Saudi Arabian oil fields belongs to the Saudi government or people, and its rate of extraction is to be determined by its owners alone. Governments or residents of other states, including international institutions like the United Nations, are not entitled to control the way those resources are used or to any royalties from their extraction. While other states may have a legitimate interest in controlling transboundary pollution that results from oil extraction, refining, or combustion, they have no right to limit what the Saudis can do with the oil resources within their borders. Conventional views of state sovereignty hold likewise with forest, water, and other mineral resources, granting ownership and management prerogatives to states alone, in potential conflict with international environmental regulatory imperatives that seek to protect such resources against unsustainable use rates or guarantee access to those resources over time.

This conventional view thus entails what might be termed strong national entitlements to natural resource assets, since the property rights they ascribe are not limited by imperatives for sustainable resource management or considerations of distributive equity, and have as a result several consequences for the notion of international justice as well as for global environmental politics. If justice is taken to occasionally require redistribution between nations in accordance with egalitarian principles, this entitlement claim could undermine the force of its imperatives. For if wealthy nations became wealthy as the result of their resource wealth and they are fully entitled to the proceeds from exploiting those resources, then poor countries have no valid claim to transfers based in wealth to which others are entitled. Ethical cosmopolitans like Thomas Pogge (1994), who argue for a portion of such wealth to be redistributed internationally as a matter of justice, contest this strong national entitlement, grounding poverty relief efforts in the common stake that all share in the world's resources. Indeed, a considerable scholarly literature has developed around the question of resource wealth and development, with Rawls remarking in *The Law of Peoples* (2001) that national development results from its political culture and not from its natural resource wealth, affirming a similar claim made by scholars of the so-called resource curse (Wenar 2008), which postulates that resource wealth can sometimes inhibit forms of development by encouraging corruption and state-sponsored violence. Both claims discount the role that inequitable national resource stocks play in development, and thus tacitly endorse strong national resource entitlements by dismissing challenges to them on grounds of justice, with Rawls arguing for an international duty of assistance that calls for political development aid but not redistributive transfers to be dedicated to poor countries. Those embracing strong national entitlements reject egalitarian redistribution of the proceeds of resource wealth, as well as any system of international development aid that is predicated upon the morally arbitrary nature of natural resource distribution. Significantly for environmental politics, then, they would affirm state sovereignty over natural resources as trumping global concerns for biodiversity, resource depletion, or environmental integrity, save for that range of cases in which environmentally harmful acts within one state can be shown to violate the sovereignty of another.

Ethical cosmopolitans, by contrast, typically reject national entitlement claims to natural resource wealth, often by appealing to Lockean postulates that the world is owned by humanity in common or to the morally arbitrary nature of natural resource distribution, which resembles the Rawlsian "natural lottery" of arbitrarily distributed natural talents and confers no entitlement. According to this analysis, first made by Beitz (1975), the logic of Rawlsian distributive justice entails that persons not be disadvantaged as the result of circumstances like nationality or cultural membership, so advantages in the world that are based on such categories ought to be rectified by international transfers. Beitz first argues for a "resource redistribution principle" that would transfer natural resource wealth from rich to poor nations, following the contractarian

analysis of Rawls's original position but supposing that parties are also ignorant of their nationalities, then makes the more expansive case for a fully internationalized difference principle, by which resources would be distributed among all nations and peoples such that inequalities would be justified only insofar as they benefited the most disadvantaged. In making this case for cosmopolitan distributive justice – often referred to as global rather than international justice since applied to individual persons rather than nation-states – Beitz rejects the national resource entitlement premise noted above. It is on this point that Rawls departs from Beitz and other cosmopolitans by insisting that distributive justice applies only within and not among or between nation-states, which are fully entitled to their own resources and thus not obligated to redistribute them in the interest of reducing international inequality, defending instead a set of principles that he terms the "law of peoples" and which includes several basic human rights along with Westphalian commitments to sovereignty and territorial integrity.

The debate between Rawls and Beitz, or more generally between liberal nationalists and those defending global or international justice, has rarely focused upon international regulatory capacity, but the implications of claims concerning control of territory or resources have clear implications for global environmental politics. If land and natural resources are fully owned and controlled by the states in which they are originally located, then international organizations are powerless to promote sustainability imperatives aimed at guarding against resource depletion or environmental degradation that takes place within national territories (see Chapter 8). Besides undermining claims for resource redistribution, the strong nationalist position would prohibit the international imposition of environmental regulations that limit national sovereignty over land or resource use, except where necessary to prevent pollution from crossing national borders. If sovereignty extends to resource use within national borders, international environmental agreements seeking to prevent unsustainable forest management or limit the destruction of species habitat would violate that sovereignty. Only in cases where some kind of transboundary externality arises from internal land management or resource use policies or practices could international regimes trump the authority of national or subnational governments to degrade their environments (see Chapters 9 and 10).

International justice is thus significant in that it posits elements of common concern that transcend national borders and at least occasionally trump national sovereignty, as all members of the international community take on obligations as stewards of their common environment that governments cannot simply annul by invoking sovereign authority. Just as global poverty and human rights are considered to be subjects of international justice, so also can the bases for international justice make possible more extensive international environmental regimes. Once land and resource management decisions are viewed as having myriad external effects, rather than being viewed as properly subject to internal controls alone, the legitimacy of such regimes becomes apparent. Because of its spillover effects on global climate, biodiversity (Chapter 37), and in some cases also international riparian systems (see Chapter 34) and deforestation (see Chapter 38) in Brazil or Indonesia cannot be regarded as strictly an internal matter subject only to the will of the Brazilian or Indonesian governments. Without trumping Westphalian conceptions of international justice, protection of sovereignty can be construed as requiring limits on resource management or pollution policies in some states in order to protect the sovereignty of others against interference, requiring rather than undermining international environmental law designed to protect that sovereignty.

An alternative formulation to distributive justice principles that have developed around the ideal of equity, which lends itself to several problems in global environmental politics, is one that is instead built around the ideal of responsibility (Vanderheiden 2011). While concerned with distribution, responsibility-based conceptions do not necessarily take equal distribution as

a default starting point or focus primarily upon the effects of actions or institutions on the least advantaged, as variations upon the Rawlsian difference principle do. Luck egalitarians, for example, typically define justice in distribution in terms of the goods and bads that one acquires as the result of voluntary choices and those acquired by luck, criticizing departures from equal distribution that result from the latter but not those resulting from the former. By this account, responsibility in its descriptive sense is defined both in terms of voluntary control and in its prescriptive sense in terms of desert or entitlement. By this account, persons can be said to deserve or be entitled to those goods or advantages that result from their voluntary choices, such as hard work or willingness to defer gratification, but not those arising from factors beyond their control, such as circumstances of birth or innate talents. Likewise with bads or disadvantages: each is viewed as just insofar as it results from some voluntary (or culpable) choice, but unjust insofar as arbitrarily suffered or imposed by another. Luck egalitarianism is so-called because it maintains that persons should not do better or worse as the result of luck, or factors beyond their control, though it finds nothing unjust about inequality that results from responsible choices.

The implications for environmental politics follow from this key distinction. As applied to climate change, for example, luck egalitarian analysis concludes that persons have no valid complaint against other parties if they suffer climate-related harm for which they are personally responsible, as for example from having caused it through their greenhouse emissions, so no policy response to self-imposed environmental vulnerability would be needed. But insofar as persons or peoples are made vulnerable to climate-related harm caused by others, as is the case for those expected to bear the brunt of climate-related harm, some kind of remedial response to that vulnerability is required as a matter of justice. This policy response could include actions of mitigation (by which vulnerability is minimized by reducing the anthropogenic drivers of climate change), adaptation (by which vulnerability is reduced by proactive efforts to reduce it in the face of expected climatic changes), or compensation (by which wrongfully imposed vulnerability can at least partially be rectified through transfers in the amount of the expected harm). The key for luck egalitarian conceptions of justice is that none suffer harm or disadvantage as the result of phenomena for which they are not responsible, as often happens with pollution problems.

Notice that responsibility-based conceptions of justice are able to capture the nature of many kinds of environmental harm more effectively than equity-based conceptions can. Since equity-based conceptions typically focus upon actions that exacerbate existing inequalities, they cannot identify anything unjust about one relatively affluent polluter exposing another to hazards related to their pollutants, or degrading land or ecosystem services such that future affluent persons will be worse off than they otherwise might be. Unless it affects the least advantaged for the worse, for example, Rawls's difference principle would be unable to condemn pollution or resource depletion as unjust. Merely imposing harm against the will of a vulnerable party or willfully undermining the ecological capacity of a region or people does not in itself violate the terms of equity-based justice, and may in some cases perversely count as advancing justice if those harmed were among the advantaged at the outset. But responsibility-based conceptions, for reasons suggested above, are better able to capture the injustice of imposing avoidable harm through pollution or resource depletion. According to this view, anyone made worse off by the polluting or degrading acts or policies of others is entitled to some form of injunctive relief to mitigate the harm in question, or some form of compensation for losses suffered or serious risks imposed. Since environmental harm is quintessentially of this kind – the imposition of a kind of externality cost, whether through exposure to pollution or exacerbated scarcity from resource depletion, resulting from unsustainable actions, practices, and policies – this conception of justice can usefully illuminate its injustice, justifying responses from environmental politics.

Justice and global environmental politics

As an aspirational standard for diminishing wide current disparities in opportunity among persons across national boundaries, or as a set of procedural or substantive constraints on the design of international institutions, justice often plays a peripheral role in global environmental politics. Environmental degradation or resource depletion that exacerbates existing global inequities can tenably and constructively be described as unjust, and international regimes that fail to account for the perspectives and interests of the world's disadvantaged can likewise invoke the same criticism, but in such cases justice is only part of the critique that is typically made against either. The former also concerns the sustainability of the activities causing such problems, and the latter the democratic responsiveness and accountability inherent in such regimes (see Chapter 26), with injustice one of several criteria by which bad outcomes can be condemned and justice one ideal toward which good outcomes may aspire. But neither offers a sufficient critique for rendering other normative criteria superfluous, since pollution and resource depletion can be harmful and unsustainable without being unjust, and regimes can follow just procedures but arrive through them at bad outcomes. Justice, that is to say, neither subsumes other ideals as an all-purpose norm nor replaces other criteria for identifying problems – good environmental policies or outcomes should be just, but often must serve other ideals, as well – but justice can nonetheless serve as a valuable concept in critically analyzing several problems toward which political responses are oriented as well as in theorizing remedies to those problems.

Perhaps most notably, justice analyses have been constructively applied to the causes and effects of global climate change in order to highlight its nature as in part a problem of justice, as well as to the design of institutions and policies associated with climate change mitigation and adaptation (Caney 2005; Page 2006; Vanderheiden 2008; Harris 2010). Because the relatively affluent global North is responsible for over half of current greenhouse emissions and for over 70 percent of historical emissions, despite being home to less than 20 percent of global population, climate change has been characterized as resulting from an unjust appropriation of carbon sinks by the world's affluent. At the same time, scientists expect that the world's poor will be most vulnerable to climate-related environmental changes, raising justice concerns in the effects of climate change as well as its causes. Together, critics have aptly cast climate change as both a cause and consequence of global injustice, as wide current disparities in living standards and consumption patterns yield widely disparate national per capita emissions (see Chapter 16), as well as disparities among income groups within all countries, exacerbating the disadvantages of the world's poor by making them most vulnerable to environmental changes toward which they have contributed relatively little. For this reason, "climate justice" has implied a critique against the consumption patterns of the global North and become a rallying cry for stronger action to mitigate the causes and control the effects of climate change, as well as a distributive claim on behalf of the global South in burden-sharing arrangements designed to accomplish those ends.

Norms of international justice are thus violated by climate change, as an environmental externality disproportionately caused by the affluent global North with its costs expected to be borne disproportionately by the poor global South, and those justice norms also oblige states to take action to avoid that outcome. In so doing, it must assign the costs of mitigating climate change justly among various parties. This burden-sharing scheme has been the subject of much work by applied philosophers and political theorists, many of whom have applied various principles of justice to policy problems surrounding mitigation and adaptation. Apart from the Rawlsian difference principle, which is perhaps the most discussed distributive principle in contemporary justice theory and which has been invoked on behalf of equal per capita pollution rights, these have included polluter-pays principles based on current and historical emissions as

well as those turning on strict and fault-based liability, beneficiary-pays principles that assign liability for climate change mitigation to those having benefited most from activities associated with carbon pollution, and capacity-based formulae that assign greater burdens to parties most able to afford them. Each aims to define the fair share of burdens to be assigned to various parties, and each arrives at an at least slightly different cost allocation and justification for what each party is required to contribute toward the collective goal of minimizing climate-related harm. Here, distributive justice is used as a principle for resource sharing if assigning shares of global emissions or burden sharing if assigning shares of economic abatement costs, but in each case invokes international justice in its strong distributive sense.

International justice, then, frames the problem of climate change as one of the equitable allocation of either emissions absorptive capacity itself or the costs of mitigation and adaptation, and has served as a key analytical framework for scholars of the normative dimensions of international climate politics. The injustice of unmitigated climate change requires that action be taken to reduce its causes and control its effects, by this analysis, and the manner in which this action is to be taken must likewise follow the constraints of justice. These constraints include procedural elements, by which policy is made on the basis of open and inclusive processes by which less powerful actors may exercise a meaningful role in shaping outcomes, as well as substantive ones, which guard against burdens being assigned in ways that are unfair to relevant parties. One reason that climate change works so well as a case study in applied justice theory is that the problem to which principles are applied is a genuinely international one: greenhouse gas emissions produce their insidious effects regardless of geographical origin, so the climate system functions as a public good that requires collective management, which in turn suggests principles by which the terms or costs of its management can be assigned among relevant parties. While some scholars have resisted the idea that relations among states in international society amount to circumstances of justice, which include moderate scarcity and limited altruism in a context of shared resources and common fate, and have thus denied that distributive justice principles apply across national boundaries, the phenomenon of climate change appears to satisfy the conditions for justice to apply internationally. Indeed, global climate change has been heralded as perhaps the paradigm case for the application of international justice analysis for these reasons.

Generally, then, considerations of international justice in its weaker sense require states to recognize and adhere to human rights norms, including those associated with environmental harm such as rights to territory and subsistence. Within the context of climate change, scholars have wielded human rights as instruments for motivating action on climate change by appealing to the threats that climate change poses to life and health, through food shortages, increasing and more severe storms and floods, and altered disease vectors, as well as to territory, through sea level rises and land or waterway changes. Insofar as these rights are violated by significant changes in climate, international justice in its weaker sense may require nations to take serious and immediate action to mitigate climate change or to assist in adaptation to its effects, as human rights require international cooperation to ensure that the interests they represent are protected. Human rights-based justice may also suggest a minimal threshold for how much the international community as a whole must do in some combination of greenhouse gas abatement and adaptation financing, in order to prevent such rights violations from occurring, but it cannot prescribe terms by which the obligations of particular states can be set, as international justice in its distributive sense can. Those vulnerable to climate-related harm may, for example, advance human rights claims against the United States as a major emitter and thus culpable party in the violation of their rights, as the 2005 Inuit petition filed through the Inter-American Commission on Human Rights unsuccessfully attempted to do, but the international justice framework upon

which those rights are based could not in itself determine what the USA must do in emissions abatement in order to comply with human rights norms. Prescriptive guidance for the design of international policy action plans on climate change thus invite the application of justice in its stronger sense, which may help resolve several of the burden-sharing issues at the core of current policy debates.

Both rights-based and distributive conceptions of international justice can be applied to other issues in global environmental politics, as well, with the application of principles being most straightforward in cases that most closely resemble climate change in its international scope and reliance upon collective management for the maintenance of an international public good. For example, ocean fisheries management involves a shared resource that is subject to collective action problems, as multiple users threaten to deplete fish stocks, with sustainable management requiring the imposition of catch limits that allocate a scarce resource among competing claimants according to defensible distributive principles (see Chapter 36). While overfishing may not itself raise human rights concerns, it may involve distributive injustice insofar as some parties may currently or in the recent past have taken more than their fair share of existing biomass, and the assignment of individual catch limits certainly suggests a distributive justice analysis in order to ensure that it follow defensible principles. As with climate change, international justice principles can help clarify the nature of the problems as well as prescribe fair solutions to them.

This analysis likewise applies to other common pool resource management issues, where the resource in question lies outside of national territories or is affected by actions that transcend national borders. In such cases, the need to impose access limits in order to sustainably manage the resource over time invites the application of distributive justice principles in order to ensure that burdens associated with collectively managing the resource be fair to all. While scholars have as yet not cast national catch limits in distributive justice terms, primarily because the relevant units of analysis have been boats rather than nation-states and sustainable aggregate catches rather than fair individual shares have been the main focus of management schemes, the application would follow a two-stage analytical sequence similar to that associated with climate change. Justice between generations would require sustainable fisheries management, as overfishing depletes fish stocks to the detriment of future persons, and international justice requires that states with claims to limited fish stocks be assigned defensible shares of them within these parameters. Not all fisheries management issues involve circumstances in which international justice principles can validly be applied, however. Fish habitats may lie largely or wholly within national borders, and so generate no international entitlement claims. Catch limits may be more appropriately allocated according to market forces, as through auctions or fees, rather than being subjected to distributive justice principles. Overfishing and resulting depletion of fish stocks may have no direct and unique impact on the world's disadvantaged. In such cases, prior entitlement claims preempt imperatives for more equitable international access to the resource, or the failure to sustainably manage fisheries is unfortunate but not unjust.

Fisheries management also points to another important limit to justice-based analyses as they apply to global environmental politics, in that justice is typically assumed to be concerned with effects upon human welfare only, and not to govern the human treatment of nonhuman animals or the condition of ecosystems themselves. Although some scholars have proposed notions of ecological justice that apply beyond the human world and are extensions of the sort of principles that are typically found in justice theories (Schlosberg 2007; see Chapter 24), justice is conventionally viewed as an anthropocentric concept that cannot identify unique wrongs in actions that degrade the environment or harm nonhumans unless those result in harm to humans and this harm has the sort of equity effects noted above. As a result, environmental injustice can identify some but not all wrongs or bad outcomes in human actions or policies with respect to

the environment, and other value concepts are needed to fully capture the normativity involved in human relationships with the wider world. It may be wrong but not unjust, for example, to needlessly drive some nonhuman species to extinction or degrade some rare and beautiful landscape, and scholars of environmental ethics have aptly criticized justice for its narrow purview in this regard (see Chapter 25). Since justice as a normative concept requires all other bad effects upon the world to be reduced to equity impacts on human welfare in order to trigger its critiqie, some justice-based analyses of environmental harm are unavailable, and others so instrumentalize the natural world that they become complicit in the mindset of ecological exploitation that they nominally seek to prevent.

Without a regulative ideal that applies across national borders and thus serves to guide and constrain actions and policies that affect the global environment, nation-states operate within an international context that remains dominated by the Westphalian order, with its commitments to strong versions of state sovereignty and territorial integrity. While these principles remain important to many aspects of contemporary international relations, they fail to adequately address the international and occasionally global scope of some contemporary environmental threats. States alone have the right to control the actions of polluters and resource users within their borders under Westphalian norms of international justice, and those with little or no evident concern with maintaining their ecological support systems retain the rights to degrade and even destroy them. While in one sense this use of sovereignty in the service of environmental damage might be viewed as the epitome of national self-determination, which itself has the status of an important if qualified human right, consideration of the limits of this unconstrained state power of environmental degradation reveals its disjuncture from genuine self-determination, and with that its key flaw. Exclusive state authority over territory and resource allows not only for the degradation of future ecological capacity within that state's borders, imperiling its future people and perhaps violating their rights, but it also threatens the global environment, upon which all states and peoples depend, and in which all sovereign territories are nested and with which all remain interdependent. Analyses based in justice, whether from human rights or distributive equity, provide a useful counterpoint to the Westphalian norms that sometimes allow unsustainable state actions to persist, and which often fail to provide goals toward which the international community might aspire in managing its common environmental challenges.

Conclusion

Although contested, the widespread view that at least some conception of justice applies to international relations has significant implications for global environmental politics. Certain outcomes, whether dangerous anthropogenic interference with the climate system or the collapse of fisheries as the result of overfishing, can be understood as unjust, by one of three conceptions of justice surveyed above. Whether in the relatively weak terms of post-Westphalian norms of state sovereignty, the newer and stronger conception of justice based in human rights doctrine, or the newest and strongest conception rooted in cosmopolitan distributive justice, international justice prescribes rights and obligations to states to care for their common environments, albeit of varying strength and in somewhat different circumstances.

References

Beitz, C. (1975) "Justice and International Relations," *Philosophy and Public Affairs* 4:4, 360–89.

Caney, S. (2005) "Cosmopolitan Justice, Responsibility, and Global Climate Change," *Leiden Journal of International Law* 18:4, 747–75.

—— (2008) "Climate Change, Human Rights, and Discounting," *Environmental Politics* 17:4, 536–55.
Harris, P.G. (2010) *World Ethics and Climate Change: From International to Global Justice*, Edinburgh: Edinburgh University Press.
Page, E. (2006) *Climate Change, Justice, and Future Generations*, Cheltenham: Edward Elgar.
Pogge, T. (1994) "An Egalitarian Law of Peoples," *Philosophy and Public Affairs* 23:3, 195–224.
Rawls, J. (1971) *A Theory of Justice*, Cambridge, MA: Belknap Press.
—— (2001) *The Law of Peoples*, Cambridge, MA: Harvard University Press.
Schlosberg, D. (2007) *Defining Environmental Justice: Theories, Movements, and Nature*, New York: Oxford University Press.
Vanderheiden, S. (2008) *Atmospheric Justice: A Political Theory of Climate Change*, New York: Oxford University Press.
—— (2011) "Globalizing Responsibility for Climate Change," *Ethics and International Affairs* 25:1, 65–84.
Wenar, L. (2008) "Property Rights and the Resource Curse," *Philosophy and Public Affairs* 36:1, 2–32.

24

Environmental justice

Pollution, poverty, and marginalized communities

Hollie Nyseth Brehm and David N. Pellow

Environmental hazards affect human lives every day. In many communities, people share their neighborhoods with incinerators and toxic chemical plants. Plastic bottles, discarded electronics, and other wastes are frequently exported across national boundaries to countries that did not produce them. And hazardous pesticides, stored in eroding drums, primarily in the global South, leak toxins into the surrounding ecosystems. This grim reality is exacerbated by the fact that environmental hazards disproportionately affect poor communities, communities of color, and other marginalized communities around the globe. This uneven exposure to environmental risks is variously termed environmental inequality, environmental racism, and environmental injustice. Over the past four decades, a body of scholarship and a social movement have emerged in response, and scholars and activists have rallied around the term *environmental justice* (EJ) – the notion that all people and communities are entitled to equal protection of environmental health laws and regulations (Bullard 1996).

While there are numerous ways to define EJ and the problem of environmental racism/inequality, the most important point is that they are not fundamentally *environmental* issues; they are *social* problems. To frame EJ as an ecological problem runs the risk of missing the point that ecological violence is first and foremost a form of social violence, driven by and legitimated by social structures and discourses. According to standard definitions, EJ is the fair treatment of all people with respect to the development, implementation, and enforcement of *environmental* laws, regulations, and policies. However, if all environmental laws, regulations, and policies were implemented and enforced equally, the globe would still be marked by environmental inequality because the social, political, economic, and cultural forces that produce this problem will not have been addressed (see Chapters 16 and 12).

This chapter explores social science EJ scholarship, which has become prominent in many countries. First, we provide a brief history of the political and intellectual movements for EJ followed by a review of key studies that have documented that environmental injustice exists both in the US and internationally. Next, we review potential causes of environmental inequalities, followed by a consideration of the effects of environmental inequalities and how they interrelate with other social inequalities. Lastly, we examine how social movements, nongovernmental organizations (NGOs), and other key actors respond to the persistence of environmental inequalities.

Origins of environmental justice studies and politics

During the 1970s, several scholars in the US began to explore the relationship between economic status and exposure to polluted air, finding troubling correlations between social class and poor air quality in the US (Freeman 1972; Zupan 1973; Kruvant 1975). But it was not until protests in Warren County, North Carolina, made national news in 1982 that this emerging focus, soon to be known as environmental justice, became well known. Warren County was the poorest county in North Carolina, and 65 percent of its population was African American (Szasz and Meuser 1997). In the early 1980s, the state decided to build a new hazardous waste landfill in the county. Citizens of Warren County organized to protest the proposed landfill and found support from several civil rights organizations (Bullard 2000). These protests were among the first actions that gained national media attention and raised public awareness about the unequal environmental burden that historically marginalized communities confront. The unique combination of ideas promoting civil rights, social justice, and environmental concern, as well as the growing visibility of hazardous waste, set the stage for the emergence of a new way of thinking about the relationship between ecosystems and humanity.

The protests in Warren County triggered several subsequent events that solidified the place of EJ in the US grassroots political imaginary. In 1983, the US General Accounting Office (GAO) conducted a study of the racial composition of communities near four major hazardous waste landfills in the South. The study found that in three of the four cases, the communities around the landfills were predominantly African American; and, in the fourth case, the community was disproportionately African American (GAO 1983). This was followed by a 1987 study by the United Church of Christ (UCC) Commission for Racial Justice, which was the first national-level study of the racial and socioeconomic characteristics of communities living near hazardous waste facilities (UCC 1987). Again, a similar pattern emerged – communities of color were much more likely to host hazardous waste facilities.

While government and community leaders were studying the situation, scholars turned their attention to the phenomenon as well. In 1990, sociologist Robert Bullard published *Dumping in Dixie*, a book in which he argued that African American communities were being targeted for the location of solid waste facilities throughout the US South. Importantly, Bullard also documented widespread community resistance to these inequitable siting patterns. That same year, environmental studies scholars Bunyan Bryant and Paul Mohai organized a national conference that brought together scholars who were studying environmental inequality. After reviewing the body of evidence, they concluded that their studies overwhelmingly supported the earlier findings of the GAO and UCC research (Bryant and Mohai 1992).

While a few studies had explored environmental inequalities before the 1980s, the late 1980s and 1990s saw a flurry of research on environmental injustice. In 1993, sociologist Stella Čapek introduced the EJ frame, which, drawing from Erving Goffman's (1974) idea of framing as a schemata of interpretation, views EJ as a lens that offers a way of constructing meaning for activists. According to Čapek, the EJ frame consists of six key claims, including the right to accurate information from authorities concerning environmental risks; public hearings; democratic participation in decision-making regarding the future of any threatened community; compensation for injured parties from those who inflict harm on them; expressions of solidarity with survivors of environmental injustices; and a call to abolish environmental injustice. Environmental injustice was not just about disproportionate hazards; it was about access to decision-making capabilities, democratic processes, and power. These arguments were later explored by David Schlosberg (2007), who concluded that the EJ literature's focus on justice was limited and that scholars and activists should emphasize the power structures and social systems that give rise to environmental inequalities.

Importantly, the relatively recent development of EJ studies should not be accepted as evidence that this phenomenon is new. European colonization of the New World was accompanied by many environmental injustices, as people and land were exploited for the benefit of colonizers (DuBois 1977; LaDuke 1999; Pellow and Park 2002; Smith 2005). However, while environmental injustice reaches back centuries, the more recent intensification of global industrial and technological production has exacerbated it. That fact, combined with the growth of social justice movements among formerly colonized peoples, influenced the development of the EJ frame and movement during the late 1980s and early 1990s.

Armed with a new lens for viewing environmental injustices, grassroots movements and scholars have worked to document, study, and combat the roots of this social problem. The EJ frame has been extended in numerous ways, and the concept of EJ has spread well beyond the borders of the US to places as diverse as Australia, Canada, Germany, Hungary, India, Western Africa, South Africa, the former Soviet Union, and Mexico (Walker 2009; Agyeman et al. 2010). Hundreds of studies have documented that racial minorities, people of lower socioeconomic status, and other marginalized communities are disproportionately affected by toxic facilities, such as landfills, mines, incinerators, or polluting factories (Mohai and Bryant 1992; Szasz and Meuser 1997; Ringquist 2005). While EJ studies formally originated in and focused on the US, scholars are also documenting environmental inequalities around the globe (Marburg 1995; Yang 2002; Pellow 2007; Roberts and Parks 2007; Schroeder et al. 2008). Despite a number of methodological debates concerning the most appropriate tools for documenting environmental inequalities (see Anderton et al. 1994; Been 1995; Mohai 1995; Saha and Mohai 2005), the vast majority of studies conclude that however one measures the phenomenon, communities of color and working class communities often face disproportionate exposure to environmental hazards (Bullard et al. 2007).

Causes of environmental injustice

As scholars and activists document environmental injustices, they seek to situate this problem within the larger context of capitalist production and inequality. Various theories have examined the roots of these dynamics. Here we group the causes of environmental justice into three categories: economic explanations, socio-political explanations, and racial discrimination. While we consider these concepts separately, in reality it is difficult, if not impossible, to disentangle their effects.

Economic explanations

A common explanation for environmental inequality is that hazardous firms do not intentionally discriminate but instead seek to maximize profits and thus place facilities where land is cheap and where there are available labor pools. Often, marginalized communities already live in these same areas. And, once a hazardous facility is present, those who lack the resources to move out remain living in the vicinity (Been 1994). Similarly, Schnaiberg and Gould (2000) use a model known as the treadmill of production to explain environmental injustice. According to this model, environmental injustices are the byproducts of the routine function of capitalist states and economies. Within treadmill societies, corporations have an ever-growing need to generate goods for sale and make profit (see Chapter 13). This expansion creates wealth but also creates negative byproducts that are not evenly distributed and are disproportionately concentrated among the groups of people with the least ability to resist the location of polluting facilities in their community. Beck (1992, 1995, 1999) adds that modernization contributes to this pernicious cycle. A central aspect of modernity is the application of research to spur economic growth.

Industries seek to be frontrunners of development and maximize profits, so they turn to new technologies even though they often do not understand the risks of those technologies. In turn, these risks disproportionately affect marginalized communities.

Socio-political explanations

Socio-political reasons may also explain environmental inequalities. For example, industries and corporations might seek the path of least resistance. They understand that affluent communities, which are often white, have the resources and social capital to oppose the placement of hazardous facilities in or near their neighborhoods and instead place hazards in locations where they will meet little or no local political resistance. Furthermore, communities that are already marginalized are often excluded from participation in policy-making and urban planning. By contrast, industries, corporations, and similar special interests are often highly involved in these processes (Cole and Foster 2001; see Chapter 13). In addition, marginalized communities are relatively invisible in mainstream environmental movements, which has resulted in insidious unforeseen consequences. For example, Andrew Szasz (1994) illustrated that the way in which the mainstream environmental movement negotiated anti-pollution laws led to the shift of certain industries and toxics into low income and minority communities. Similarly, Pellow (2007) has illustrated that, on a global scale, toxic industries and hazardous waste production were shifted to the global South in part due to regulations supported by the mainstream environmental movement.

Racial discrimination

Many scholars have proposed that racism and institutional discrimination are responsible for environmental inequality. Of course, racial discrimination is also embedded in the socio-political and economic explanations. The evidence of racial divides in environmental policy-making is stark and persistent over time, so there is ample documentation of the effects of racism (Bullard 2000). Racial disparities are also mirrored in myriad other aspects of EJ-relevant US institutions, including education, health care, and criminal justice. Often, however, particular acts of racism and discrimination cannot easily be located and measured, as racism is not a specific *thing* whose effects can be neatly isolated or extracted from social life (Pulido 1996).

Intersections of inequality

While the majority of EJ research is devoted to the intersections between race and environmental harm, there are numerous additional social categories of difference that are of critical importance to developing a comprehensive grasp of environmental inequality. These include but are not limited to inequalities surrounding class, gender, sexuality, physical ability, citizenship, indigeneity, space, and species.

As discussed earlier, class inequalities are deeply pronounced within environmental injustices. Class inequality is actually quite overt because market economies publicly embrace the ideology of wealth accumulation and profit for those who are able to achieve these goals over those who cannot. According to this logic, those who remain at or near the bottom of the economic pecking order – and therefore are more likely to live and work in environmentally hazardous conditions – are there because they simply have not availed themselves of what is theirs for the taking. Political economic perspectives embodied in the work of sociologists like O'Connor, Faber, Foster, and Schnaiberg and Gould focus on the devastating effects of capitalism on socio-ecological dynamics. These studies utilize a Marxist viewpoint: when struggles over the means of

production tend to favor the capitalist classes, they also produce greater ecological damage and mass social suffering (see Chapter 4). Relatedly, some social scientists have demonstrated that general measures of social and political inequality are correlated with and contribute to greater levels of ecological harm (Downey and Strife 2010). For example, James Boyce (1994, 2008) found societies exhibiting higher levels of economic and political inequality are characterized by comparatively higher overall ecological harm. This body of research is of great importance for linking inequality to ecological harm. Even so, much of it is rather narrowly focused on economic or political measures of inequality that fall short of capturing the complex ways in which inequality also functions across categories of difference.

Gender inequalities are also integrally embedded in environmental inequalities. Men tend to exercise control over states and corporations that produce environmental and economic inequalities, thus gaining the material and social benefits of both the financial and political power that results from and is reflected in environmental injustices. Furthermore, men exercise control over national labor and mainstream environmental organizations and enjoy the status and credit for valiantly representing the interests of "the people" in national discourses and campaigns (Seager 1994). Women tend to benefit the least from these struggles, as they are often physically and socially relegated to some of the most toxic residential and occupational spaces in communities and workplaces. In addition, women are less politically visible because they tend to work for smaller, environmental community-based organizations that rarely make headlines and survive on volunteer labor and small grants (Brown and Ferguson 1995; Pellow and Park 2002). Lastly, the very material landscapes being polluted and fought over in EJ struggles are deeply imbued with meanings that are gendered and contained in local and global imaginaries, state policies, corporate practices, and activist resistance campaigns (Adamson et al. 2002; Stein 2004). Several recent studies document the ways women experience and resist discriminatory environmental policies in workplaces, residential communities, and elsewhere (Pellow and Park 2002; Buckingham and Kulcur 2010). Building on these insights, ecofeminist theory links ecological politics to gender, sexuality, race, class, species, and other social categories of difference, calling for "an end to all oppressions, arguing that no attempt to liberate women (or any other oppressed group) will be successful without an equal attempt to liberate nature" (Gaard 1993: 1; see also Warren 1994: 1; Gaard 2004). Ecofeminism and EJ discourses and movements have much common ground, but surprisingly few scholars have explored this terrain (Smith 1997; Sturgeon 1997; Taylor 1997).

Citizenship, immigration, indigeneity, and nation also play significant roles in the production of environmental inequalities. Large-scale studies demonstrate that immigrants in the US are more likely to live in residential communities with high levels of pollution than non-immigrant communities (Hunter 2000; Bullard et al. 2007). Smaller scale ethnographic studies reveal similar dynamics and demonstrate how ideologies of exclusion and nativism support the production and maintenance of such an unequal socioecological terrain (Pellow and Park 2002; Park and Pellow 2011). The role of colonial politics weighs heavily in the way that indigenous peoples fare with regard to environmental outcomes. Specifically, in countries throughout the globe, indigenous peoples are systematically excluded from participation in environmental decision-making, evicted from their lands, disproportionately exposed to pollution, and restricted from using ecological materials within their territories (Smith 2005; Agyeman et al. 2010).

Climate change offers a powerful window into the problem of *global spatial* environmental inequality (see Chapter 28). The European Union, United States, Canada, Australia, and Russia are responsible for 68 percent of global carbon emissions, while sub-Saharan Africa is responsible for only 2 percent (Hoerner and Robinson 2008). Though they contribute less to the causes of climate disruption, people of color, women, indigenous communities, and global South

nations often bear the brunt of climate disruption in terms of ecological, economic, and health burdens – thereby giving rise to the concept of *climate injustice* (Roberts and Parks 2007). These communities are among the first to experience the effects of climate disruption, which can include "natural" disasters, rising levels of respiratory illness and infectious disease, heat-related morbidity and mortality, and large increases in energy costs. Flooding from severe storms, rising sea levels, and melting glaciers affect millions of people in Asia and Latin America, while sub-Saharan Africa is experiencing sustained droughts. If historic responsibility for climate change is taken into account, global North nations have consumed more than three times their share of the atmosphere, while the poorest 10 percent of the world's population has contributed less than 1 percent of carbon emissions. Thus, the struggle for social justice is inseparable from any effort to combat climate disruption.

The international trade in hazardous wastes offers another excellent example of global environmental inequality. Much of the existing research on this topic comes from legal scholars who explore the extent to which domestic regulation and international agreements can control the waste trade (Yang 2002). However, a growing body of research has begun to pay attention to the social and economic driving forces behind the waste trade (Frey 1998). A cursory examination of the states importing waste (legally or illegally) into their borders illustrates that they are states on the geopolitical and economic periphery, nations that have endured colonization, and often nations populated by a majority of people of color. For example, France colonized the African nation of Benin, which remains in debt to France as it attempts to rebuild its economy. French waste traders recently offered to pay Benin large sums of money as compensation for accepting toxic cargo. Benin's motivation to accept such payment stemmed largely from its desire to repay its loans to France – hence, the term "toxic colonialism."

While most EJ scholarship reveals the hardships and suffering associated with environmental inequality and environmental racism, few studies consider the flipside of that reality: *environmental privilege*. Park and Pellow (2011) argue that environmental privilege results from the exercise of economic, political, and cultural power that some groups enjoy, which enables them exclusive access to coveted environmental amenities. While marginalized people living in poor rural towns, in inner cities, and on reservations battle polluting industries and intransigent governments, those living in wealthy enclaves enjoy relatively cleaner air, land, and water and often believe they have earned the right to these privileges. Aspen, the Hamptons, Pebble Beach, and many other exclusive communities are examples of environmental privilege and deserve closer consideration as sites for understanding the roots of EJ struggles (Taylor 2009).

Responding to injustice

As we have illustrated thus far, scholarship has been a key response to environmental injustices. Scholars have offered definitions of EJ and documented the existence of environmental injustices. However, EJ scholarship has also influenced and been influenced by the broader EJ movements. Movement activists use academic studies to support their claims of injustice, and scholars have collaborated with activists on research and policy projects for decades. Movement activists and scholars jointly articulated the EJ frame as well. The emergence of the EJ frame redefined environmental issues as concerns extending beyond wildlife or wilderness preservation (Agyeman 2002). Environmental issues became civil and human rights issues, and the EJ movement combined insights from many causes. As the movement grew, so did its mission, and soon it had developed a broader vision for change centered on the following points: (1) all people have the right to protection from environmental harm; (2) environmental threats should be eliminated before there are adverse human health consequences; (3) corporations, not communities, should be responsible for proving

that a given industrial procedure is safe for people and the environment; and (4) grassroots organizations should challenge environmental inequality through political action (Pellow and Brulle 2005).

This vision has inspired diverse actions, ranging from grassroots efforts to United Nations-sponsored conferences. And, though it finds its roots in the US, the vision has also spread around the globe. While it is difficult to trace the emergence of a global movement, some point to a two-month period in 1984 during which a chemical plant in India and a liquid propane gas plant in Mexico blew up, killing thousands and harming millions (Schroeder et al. 2008). A few years later, press reports of illicit dumping of North American and European toxic waste materials in the global South began surfacing (McKee 1996; see Chapter 33). Soon, the EJ movement spread "horizontally" to other countries as well as "vertically" to encompass issues between countries, such as global waste transfers and climate change as discussed earlier (Walker 2009). Although activists around the world have long been fighting environmental injustices, their activism was later redefined through an EJ frame, which has reached places as diverse as South Africa, the United Kingdom, India, and Ecuador (Khagram 2004; Walker 2009). In each case, frames and ideas that originated in the US are adjusted and recontextualized based on local circumstances, much as research on globalization has illustrated how that phenomenon is negotiated (Lowe and Lloyd 1997; see Chapter 22).

Definitions of justice also vary both locally and globally. When the call for EJ first rang out, movement activism and scholarship focused on distributive justice. In other words, both focused on issues of equity regarding the distribution of environmental injustices (Schlosberg and Carruthers 2010). However, many activists (and some scholars, see Schlosberg 2004) have also argued for a focus on procedural justice. Arising from the idea of participatory democracy, procedural justice shifts the lens from distributive outcomes to decision-making processes. Proponents of procedural justice maintain that a focus on mere distribution is incomplete and argue for a closer examination of group recognition (see Čapek 1993). This issue has particular salience in the global South, where colonial external powers and internal elites have denied citizens the opportunity to participate in decisions regarding environmental impacts that shape their lives. For example, Al Gedicks (2001) has documented how corporations and governments have threatened the land and culture of indigenous peoples around the globe. Gedicks points to many examples, such as Nigeria, where oil operations have wreaked havoc on the lives of the Ogoni people, and West Papua, where the Amungme and Komoro peoples have been subjugated by mining companies.

Specific responses

Critical responses to the problem of environmental injustice come from universities, corporations, governments, and grassroot and transnational movement activists. We review examples of these responses below, though it is important to note that this brief review is not comprehensive, and the actions highlighted are not independent of one another.

Grassroots organizing

Grassroots organizing, driven by small community groups, is at the heart of EJ activism. The Mothers of East Los Angeles (MELA), a group of Latinas who first organized during the 1980s in opposition to a prison, provides one of many examples. In 1987, they learned that a hazardous waste incinerator – deemed the "Vernon incinerator" for its sited location in the community of Vernon – was being proposed by the city. In response, MELA mobilized community members to hit the streets with signs and banners. They planned demonstrations and vigils, and they

developed a list of more than 400 members who could be organized on short notice. They also joined several other organizations to file a lawsuit against the California Department of Health, which had proclaimed the incinerator would not harm public health or the environment. Finally, six years after they started their campaign against the Vernon incinerator, the California Court of Appeals found in the community's favor and required an Environmental Impact Report for the project. When the California Supreme Court refused to overturn this decision, the company decided against placing an incinerator in Vernon (Pardo 1998).

There have also been numerous grassroots responses to the relatively recent problem of transnational waste dumping and trading noted earlier. In 1987, a ship carrying incinerator ash from the city of Philadelphia dumped several tons of toxic incinerator ash on a beach at Gonaives, Haiti. For many observers this was a clear case of environmental racism, as Haiti was the poorest nation in the western hemisphere with a majority population of African descended peoples while the USA was the wealthiest nation in the world. In response, Haitian and Haitian American organizations teamed up with groups in the global North, including Greenpeace, Global Response, and Witness for Peace, to create an international coalition called Project Return to Sender. The coalition's name signaled its goal and a new movement tactic that centered on the logic of accountability: those nations that produced the waste should have to take it back and manage it responsibly. In 2002, after a decade and a half of international activist campaign work, the waste was finally returned to the US. The Philadelphia/Haiti case was arguably the first major conflict that announced the presence of a burgeoning global movement for EJ – a series of interconnected transnational activist networks that today provide support and solidarity when communities are threatened with transboundary waste dumping.

University responses

Numerous studies reviewed in this chapter are a result of university research centers that have institutionalized EJ studies. This is not surprising, as many EJ activists are scholars and many EJ scholars maintain close relationships with activists. EJ issues are also becoming institutionalized in college curricula. Bunyan Bryant and Elaine Hockman noted that, in 2002, there were over 60 EJ courses being offered in the United States (see Pellow and Brulle 2005). This number has surely increased, and courses are being offered in many other countries, such as Ireland, Brazil, Mexico, Hungary, and Spain. Overall, these scholars and educational institutions have contributed to the movement in a variety of ways, from defining the frame to documenting environmental injustices and teaching about them. Furthermore, scholars and research centers have hosted multiple conferences on EJ in order to debate, build consensus, and pressure policy-makers to address these issues at the national and global scales.

Corporate responses

A core tenet of EJ holds that corporations and states, not communities, should be responsible for reducing and preventing negative environmental effects. Yet, most corporate action has been reactionary rather than proactive. In some cases, action has been a result of lawsuits, such as in Diamond, Louisiana. There, a small, African American neighborhood was sandwiched between a Shell Chemicals plant and a Shell/Motiva oil refinery. Many residents experienced headaches, allergies, respiratory problems, and cancers that they believed were due to their proximity to Louisiana's notorious Chemical Corridor. The community was also terrified by several factory explosions; and in 1993, the residents demanded that Shell relocate them. Many allies, including the Deep South Center for Environmental Justice, Earthjustice, Greenpeace, and others,

converged with the community in a grassroots campaign to fight for their case. Eventually, Shell agreed to negotiate. In 2002, Shell agreed to invest $200 million to reduce chemical emissions at its plant, contribute $5 million to a community development fund, and finance relocation for residents of Diamond (Lerner 2005). Thus, the corporation acted, but only after protests and media attention. In addition, while the residents won what they demanded, their community was ultimately disbanded, as they were not able to relocate together.

Government responses

As seen with the US GAO report, governments are also key actors in the response to environmental injustice (in addition to frequently being the source of environmental injustice). They often create their own research commissions to study environmental inequalities, and they hold the power to pass regulatory legislation. For example, US Senator Al Gore and Congressman John Lewis introduced the Environmental Justice Act in 1992, which proposed mandatory studies of toxic health impacts of certain facilities. Though the Act never left the committee stage, the Environmental Protection Agency established the Office of Environmental Equity and the National Environment Justice Advisory Council shortly after the Act was introduced.

Governments are also key actors internationally. In fact, countries are the only entities that can be party to international treaties, several of which have explicitly recognized environmental inequality. Importantly, though they cannot sign or ratify treaties, many other actors, such as NGOs and affected communities, are involved in the creation of international treaties. One key convention – the 1992 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal – currently has 179 parties. Though it first only banned hazardous waste exports to Antarctica, a coalition of global South countries, some European nations, and Greenpeace worked to pass what has become known as the Basel Ban. This 1994 amendment banned hazardous waste exports from 29 wealthy countries of the Organization for Economic Cooperation and Development (OECD) to all non-OECD countries.

The United Nations Framework Convention on Climate Change also recognizes environmental inequality, though less explicitly. Resulting from the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, its main objective is to stabilize greenhouse gas concentrations in the atmosphere. While the Convention did not set explicit goals for reductions in greenhouse gases, the 1997 Kyoto Protocol established legally binding reduction obligations for wealthy countries responsible for the overwhelming majority of carbon emitted into the atmosphere.

The 2007 United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) is another example of government action. Unlike treaties, United Nations Declarations are not legally binding; however, the UNDRIP represents norms that are observed in international law (see Chapter 10). Importantly, the UNDRIP articulates that lands, territories, and resources that indigenous peoples have traditionally owned or occupied are rightfully their property and should be free from hazardous materials. Furthermore, it explicitly states that these territories and lands also must not be slated for "development" by external institutions without informed consent of the indigenous occupants.

Transnational movement organizing

Many of the responses reviewed thus far include transnational elements. However, the growing prevalence and importance of transnational collaboration deserves further consideration, as numerous EJ transnational advocacy networks (TANs) have emerged (see Chapter 14). TANs

comprise actors working internationally on an issue who are bound together by shared values, a common discourse, and dense exchanges of information and services (Keck and Sikkink 1998). In this case, TANs have resulted in multiple alliances, conferences, and transnational efforts. Several international organizations have been formed around specific issues related to EJ (see Chapter 8). The Basel Action Network (BAN), named after the Basel Convention, is an international NGO dedicated to preventing the dumping of toxic waste and promoting sustainable industrial practices through legislation and voluntary agreements (see Chapter 33). BAN promotes the Basel Convention and monitors its compliance. Similarly, GAIA (the Global Alliance for Incinerator Alternatives/Global Anti-Incinerator Alliance) is an alliance of over 650 organizations, NGOs, and individuals who work against incinerators and for safe alternatives. Other groups have formed networks around certain causes, such as the International Campaign for Responsible Technology, a network that promotes government and corporate accountability in the global electronics industry, and the Pesticide Action Network, which works to replace hazardous pesticides with ecologically safe alternatives (see Chapter 32).

The work of these organizations, as well as the work of many grassroots campaigns and academics, is sometimes facilitated through transnational conferences and gatherings (see Chapter 20). Many of the international treaties that focus in part on EJ issues are associated with these conferences. For example, the 2012 United Nations Conference on Sustainable Development included some elements of EJ, and it was accompanied by the People's Summit for Social and Environmental Justice, an event organized by global civil society. Often, these conferences result in a declaration of norms and principles. In 2002, an international coalition of NGOs, with participation of social scientists, drafted the Bali Principles of Climate Justice, which sought to redefine climate change as a human rights and EJ concern. While covering an ambitious range of topics, these Principles made clear that, for many people, climate change is a matter of life and death, and that perhaps the gravest injustice associated with this phenomenon is that those who suffer the greatest harm are the least responsible for contributing to the problem. Many other conferences have touched on EJ, such as the 2001 World Conference Against Racism and the 2011 World People's Conference on Climate Change and the Rights of Mother Earth. In addition to urging policy-makers to embrace EJ norms and principles, these gatherings provide critical opportunities for EJ activist networks to meet, exchange ideas, and build consensus around goals and action plans.

Conclusion

We began this chapter with the argument that EJ policy and politics are fundamentally social problems, rather than strictly environmental problems, and that this framing is critical for advancing both scholarship and policy approaches. EJ studies is primarily concerned with the relationship among race, class, and socioecological harm – specifically, the way that marginalized populations are unevenly affected by industrialization and environmental policy-making. Scholars continue to debate the most effective methods for measuring environmental inequality and have offered numerous competing and complementary explanations for the causal roots of this problem. EJ scholars continue to expand the depth and breadth of their work by: (1) extending the geographic and spatial scope of research beyond the United States to Europe, the former Soviet States, Australia, and the global South; (2) embracing interdisciplinarity through an expansion of scholarship beyond the social sciences into law, the humanities and arts, public health, the sciences, and other fields; and (3) including a broader and more complex set of categories of difference through which environmental injustices operate, such as gender, sexuality, nationality/citizenship, indigeneity, physical ability, and species. Significant and lasting responses to

environmental inequality have come from major stakeholders in government, the corporate sector, academia, and social movements, resulting in documentation of environmental inequality and institutional policy changes to address this issue at all scales. The study of environmental justice is a thriving and growing field of inquiry, and we expect that trend to continue well into the future.

References

Adamson, J., Evans, M.M., and Stein, R. (eds) (2002) *The Environmental Justice Reader: Politics, Poetics, and Pedagogy*. Tucson: University of Arizona Press.

Agyeman, J. (2002) "Constructing Environmental (In)Justice: Transatlantic Tales." *Environmental Politics* 11(3): 31–53.

Agyeman, J., Cole, P., Haluza-DeLay, R., and O'Riley, P. (eds) (2010) *Speaking for Ourselves: Environmental Justice in Canada*. Seattle: University of Washington Press.

Anderton, D.L., Anderson, A.B., Oakes, J.M., and Fraser, M.R. (1994) "Environmental Equity: The Demographics of Dumping." *Demography* 31: 229–48.

Beck, U. (1992) *Risk Society: Towards a New Modernity*. London: Sage.

—— (1995) *Ecological Enlightenment: Essays on the Politics of the Risk Society*. Amherst, NY: Humanity Books.

—— (1999) *World Risk Society*. Cambridge: Polity.

Been, V. (1994) "Locally Undesirable Land Uses in Minority Neighborhoods: Disproportionate Siting or Market Dynamics?" *Yale Law Journal* 103: 1383–422.

—— (1995) "Analyzing Evidence of Environmental Justice." *Journal of Land Use and Environmental Law* 11: 1–36.

Boyce, J.K. (1994) "Inequality as a Cause of Environmental Degradation." *Ecological Economics* 11 (Dec.): 169–78.

—— (2008) "Is Inequality Bad for the Environment?" *Research in Social Problems and Public Policy* 15: 267–88.

Brown, P. and Ferguson, F. (1995) "'Making a Big Stink': Women's Work, Women's Relationships, and Toxic Waste Activism." *Gender & Society* 9: 145–72.

Bryant, B. and Mohai, P. (eds) (1992) *Race and the Incidence of Environmental Hazards: A Time for Discourse*. Boulder, CO: Westview Press.

Buckingham, S. and Kulcur, R. (2010) "Gendered Geographies of Environmental Justice." Chapter 3, *Spaces of Environmental Justice*. ed. by Holifield, R., Porter, M., and Walker, G. Chichester: Wiley-Blackwell.

Bullard, R.D. (1996) "Symposium: The Legacy of American Apartheid and Environmental Racism." *St. John's Journal of Legal Commentary* 9: 445–74.

—— (2000) *Dumping in Dixie: Race, Class, and Environmental Quality*. 3rd edn. Boulder, CO: Westview Press.

Bullard, R., Mohai, P., Saha, R., and Wright, B. (2007) *Toxic Wastes and Race at Twenty, 1987–2007*. New York: United Church of Christ.

Čapek, S. (1993) "The 'Environmental Justice' Frame: A Conceptual Discussion and an Application." *Social Problems* 40(1): 5–24.

Cole, L.W. and Foster, S.R. (2001) *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement*. New York: New York University Press.

Downey, L. and Strife, S. (2010) "Inequality, Democracy, and Environment." *Organization & Environment* 23(2): 155–88.

DuBois, W.E.B. (1977 [1935]) *Black Reconstruction: An Essay Toward a History of the Part which Black Folk Played in the Attempt to Reconstruct Democracy in America, 1860–1880*. New York: Atheneum.

Freeman, A.M. III. (1972) "The Distribution of Environmental Quality." Pp. 243–78 in *Environmental Quality Analysis: Theory and Method in the Social Sciences*. ed. by Kneese, A.V. and Bower, B.T. Baltimore, MD: Johns Hopkins University Press.

Frey, R.S. (1998) "The Export of Hazardous Industries to the Peripheral Zones of the World-System." *Journal of Developing Societies*, 41: 66–81.

Gaard, G. (1993) "Living Interconnections with Animals and Nature." In *Ecofeminism: Women, Animals, and Nature*. ed. by Gaard, G. Philadelphia, PA: Temple University Press.

—— (2004) "Toward a Queer Ecofeminism." Pp. 21–44 in *New Perspectives on Environmental Justice: Gender, Sexuality, and Activism*. ed. by Stein, R. New Brunswick, NJ: Rutgers University Press.

Gedicks, A. (2001) *Resource Rebels: Native Challenges to Mining and Oil Corporations*. Cambridge, MA: South End Press.
Goffman, E. (1974) *Frame Analysis: An Essay on the Organization of Experience*. Cambridge, MA: Harvard University Press.
Hoerner, J.A. and Robinson, N. (2008) *A Climate of Change: African Americans, Global Warming, and a Just Climate Policy*. July. Environmental Justice and Climate Change Initiative. Oakland, California.
Hunter, L. (2000) "The Spatial Association between US Immigrant Residential Concentration and Environmental Hazards." *International Migration Review* 34(2): 460–88.
Keck, M.E. and Sikkink, K. (1998) *Activists Beyond Borders: Advocacy Networks in International Politics*. Ithaca, NY: Cornell University Press.
Khagram, S. (2004) *Dams and Development: Transnational Struggles for Water and Power*. Ithaca, NY: Cornell University Press.
Kruvant, W.J. (1975) "People, Energy, and Pollution." Pp. 125–67 in *The American Energy Consumer*. ed. by Newman, D.K. and Day, D. Cambridge, MA: Ballinger Publishing.
LaDuke, W. (1999) *All Our Relations: Native Struggles for Land and Life*. Cambridge, MA: South End Press.
Lerner, S. (2005) *Diamond: A Struggle for Environmental Justice in Louisiana's Chemical Corridor*. Cambridge, MA: MIT Press.
Lowe, L. and Lloyd, D. (eds) (1997) *The Politics of Culture in the Shadow of Capital*. Durham, NC: Duke University Press.
McKee, D. (1996) "Some Reflections on the International Waste Trade and Emerging Nations." *International Journal of Social Economics* 23(4/5/6): 235–44.
Marburg, H.J. (1995) "Hazardous Waste Exportation: The Global Manifestation of Environmental Racism." *Vanderbilt Journal of Transnational Law* 28: 251–94.
Mohai, P. (1995) "The Demographics of Dumping Revisited: Examining the Impact of Alternate Methodologies in Environmental Justice Research." *Virginia Environmental Law Journal* 14: 615–52.
Mohai, P. and Bryant, B. (1992) "Environmental Racism: Reviewing the Evidence." Pp. 163–76 in *Race and the Incidence of Environmental Hazards: A Time for Discourse*. ed. by Byrant, B. and Mohai, P. Boulder, CO: Westview Press.
Pardo, M.S. (1998) *Mexican American Women Activists: Identity and Resistance in Two Los Angeles Communities*. Philadelphia, PA: Temple University Press.
Park, L.S. and Pellow, D.N. (2011) *The Slums of Aspen: The War on Immigrants in America's Eden*. New York: New York University Press.
Pellow, D.N. (2007) *Resisting Global Toxics: Transnational Movements for Environmental Justice*. Cambridge, MA: MIT Press.
Pellow, D.N. and Brulle, R.J. (eds) (2005) *Power, Justice, and the Environment: A Critical Appraisal of the Environmental Justice Movement*. Cambridge, MA: MIT Press.
Pellow, D.N. and Park, L.S. (2002) *The Silicon Valley of Dreams: Environmental Injustice, Immigrant Workers, and the High-Tech Global Economy*. New York: New York University Press.
Pulido, L. (1996) "A Critical Review of the Methodology of Environmental Racism Research." *Antipode* 28(2): 142–59.
Ringquist, E.J. (2005) "Assessing Evidence of Environmental Inequities: A Meta-Analysis." *Journal of Policy Analysis and Management* 24(2): 223–47.
Roberts, J.T. and Parks, B. (2007) *A Climate of Injustice: Global Inequality, North–South Politics, and Climate Policy*. Cambridge, MA: MIT Press.
Saha, R. and Mohai, P. (2005) "Historical Context and Hazardous Waste Facility Siting: Understanding Temporal Patterns in Michigan." *Social Problems* 52: 618–48.
Schlosberg, D. (2004) "Reconceiving Environmental Justice: Global Movements and Political Theories." *Environmental Politics* 13(3): 517–40.
—— (2007) *Defining Environmental Justice: Theories, Movements and Nature*. Oxford: Oxford University Press.
Schlosberg, D. and Carruthers, D. (2010) "Indigenous Struggles, Environmental Justice, and Community Capabilities." *Global Environmental Politics* 10(4): 12–35.
Schnaiberg, A. and Gould, K. (2000) *Environment and Society: An Enduring Conflict*. West Caldwell, NJ: Blackburn Press.
Schroeder, R., Martin, K., Wilson, B., and Sen, D. (2008) "Third World Environmental Justice." *Society & Natural Resources* 21(7): 547–55.
Seager, J. (1994) *Earth Follies: Coming to Feminist Terms with the Global Environmental Crisis*. London: Routledge.

Smith, A. (1997) "Ecofeminism through an Anticolonial Framework." In *Ecofeminism: Women, Culture, Nature*. ed. by Warren, K.J. Bloomington: Indiana University Press.
—— (2005) *Conquest: Sexual Violence and American Indian Genocide*. Cambridge, MA: South End Press.
Stein, R. (ed.) (2004) *New Perspectives on Environmental Justice: Gender, Sexuality, and Activism*. New Brunswick, NJ: Rutgers University Press.
Sturgeon, N. (1997) *Ecofeminist Natures: Race, Gender, Feminist Theory, and Political Action*. London: Routledge.
Szasz, A. (1994) *Ecopopulism: Toxic Waste and the Movement for Environmental Justice*. Minneapolis: University of Minnesota Press.
Szasz, A. and Meuser, M. (1997) "Environmental Inequalities: Literature Review and Proposal for New Directions in Research and Theory." *Current Sociology* 45(3): 99–120.
Taylor, D. (1997) "Women of Color, Environmental Justice, and Ecofeminism." In *Ecofeminism: Women, Culture, Nature*. ed. by Warren, K.J. Bloomington: Indiana University Press.
—— (2009). *The Environment and the People in American Cities, 1600s–1900s*. Durham, NC: Duke University Press.
United Church of Christ (UCC). (1987) *Toxic Waste and Race in the United States*. New York: Commission for Racial Justice.
United States General Accounting Office (GAO). (1983) *Siting Hazardous Waste Landfills and their Correlation with Racial and Economic Status of Surrounding Communities*. Washington, DC: GAO.
Walker, Gordon. (2009). "Globalizing EJ: The Geography and Politics of Frame Contextualization and Evolution." *Global Social Policy* 9(3): 355–92.
Warren, K.J. (ed.) (1994) *Ecological Feminism*. London: Routledge.
Yang, T. (2002) "International Environmental Protection: Human Rights and the North–South Divide." In *Justice and Natural Resources: Concepts, Strategies, and Applications*. ed. by Mutz, J., Bryner, G., and Kenney, D. San Francisco, CA: Island Press.
Zupan, J.M. (1973) *The Distribution of Air Quality in the New York Region*. Baltimore, MD: Johns Hopkins University.

25

Environmental ethics

Philosophy, ecology and other species

Sofia Guedes Vaz and Olivia Bina

Pressure on the environment has increased in step with economic growth and the mass consumption that fueled rising gross domestic product throughout the twentieth century (see Chapter 16). Both growth and ecological crises have attained a global reach, challenging our established notions of cause and effect, and our framing of problems and solutions. Accordingly, global environmental politics has witnessed major changes and significant "rescaling" in its "locus, agency and scope" (Andonova and Mitchell 2010: 257; see Chapter 2). Both dimensions of global environmental politics – politics and governance, and the ecological problems that are the subject matter of global environmental politics – are being reinterpreted due to increasing complexity, interconnectedness and interdependence. Accordingly, the range of actors and disciplines that inform global environmental politics and contribute to framing global environmental problems is widening, in an acknowledgment of inescapable pluralism (see Part III of this volume).

This chapter builds on this ontological and epistemological change in the nature of the problems studied in global environmental politics and of the worldviews through which environmental problems are perceived and analyzed. It takes its cue from the recognition that the cumulative effects of human behaviors linked to dominant socio-economic systems are both cause and consequence of the complexity of environmental problems (Bina and Vaz 2011). It shows that environmental philosophy and ethics ought to be part of the interdisciplinary renaissance informing and shaping global environmental politics. There has been a virtual absence of metaphysical questions in environmental politics, especially since the late 1970s when influential thinkers like Schumacher (1974) sought development models compatible with nature (for an overview of the "classics," see Vaz 2012). This absence helps explain why environmental problems have been framed primarily in scientific, technological and economic terms (see Chapters 17 and 18). If, on one hand, scientific progress since the 1970s has led to more accurate and comprehensive understanding of the ecosphere, on the other hand, it has impoverished the epistemology underpinning global environmental politics by avoiding engaging with metaphysics, thereby narrowing the way problems and solutions are identified, debated and implemented (for a reflection on the nature and implications of such impoverishment in society and economics see Neiman 2009; Sandel 2012).

Global environmental politics and environmental ethics

It is the very nature and language of the subject matter of global environmental politics – "environmental problems" – which we wish to problematize in this chapter, suggesting that the *problem* is not so much *environmental* but rather one of the nature of the connection and dependence between humans and nature, and of our understanding of such relationships. By separating environment from its context and from all the causes and effects that interact with it, we reinforce a narrow perception of reality. Metaphysics, and in particular environmental philosophy and ethics, help us clarify the fundamental notions and theoretical principles by which we understand the world, the values that shape the relationship between humans and nature, and the dynamics of cause and effect. The exposure of themes in global environmental politics, such as biodiversity (Chapter 37), climate change (Chapter 28) and genetically modified organisms (Chapter 40), to ethical scrutiny can be uncomfortable because it questions how our societies are evolving, what progress is for, and which values are structuring the relationship between humankind and the natural world (for a good illustration, see Pope and Lomborg 2005). But failure to do so may condemn global environmental politics to narrowly defined problems, and to solutions that achieve little more than postponing an irreversible ecological crisis.

Environmental ethics can provide precious insights to global environmental politics literature and its scholars. It seeks to determine what is the wrong or right action in relation to the environment and why; that is, it identifies the foundations that best describe and prescribe the moral relationship of human beings to the environment (see Pope and Lomborg 2005). Environmental ethics originates in the recognition that environmental issues need an ethical conceptual background. The 1960s and 1970s, with their social movements and public acknowledgment of emerging environmental questions and problems (Carson 1962; Meadows et al. 1972; Schumacher 1974), prompted a series of philosophical debates on environment and development. White (1967), Hardin (1968), Routley (1973) and Næss (1973) published cornerstone papers heralding a philosophical concern for the environmental crisis. The most important question was trying to understand the complexity and the deeper causes of the environmental crisis. The ethical conversation was the most lively and dynamic within environmental philosophy, giving rise to environmental ethics, which became an established discipline.

Environmental ethics can therefore contribute to disciplinary pluralism in global environmental politics by engaging with the philosophical landscape that underpins the meta-narratives that shape our ideas of the human connection and dependence on nature. There are at least three related reasons why this is important. First, global environmental politics aims to set norms, rules and structures to guide behavior with respect to the purpose of sustainable development, and there is a need to re-engage with the ethical dimension of sustainable development to "restructure…our relationship with the Earth and its creatures" (Kothari 1994: 228). Second, we need a radical reconceptualization of humanity's place in nature beyond ideas of duality and separation, as well as of human beings as the sole locus of value – a presumption that excludes all other living and nonliving beings and things. Third, global environmental politics sees human behavior as a major part of the problem, thus it is essential that we also turn to the philosophical landscape and the values that shape it. The following sections outline these meta-narratives, chart the evolution of environmental ethics, and link it to the political and policy-making dimension of global environmental politics.

Meta-narratives on the relationship between humankind and nature

Environmental ethics has been investing in identifying and understanding the values that have shaped the relationship humans have with nature, and the roots that determined different types

of relationships, including connection and dependence. The way humans understand nature has practical implications. Depending on the value and rights attributed to nature, human actions towards it may or may not be legitimized. Whether humans feel connected and a part of nature, and whether they value this highly, determines how they plan, execute and judge their own ways of life. The humans–nature relationship is characterized by ideas of separation, power relations, domination and exploitation, and by notions of unity, respect, humility and caution. Investigation of different cultures, philosophies and religions helps us understand the meta-narratives of *separation* and *unity*, as we call them throughout this chapter (see Collingwood 1945; Marshall 1992; Pepper 1996; Jamieson 2001).

Most of the ideas and discussions in global environmental politics have, until recently, been framed largely through Western worldviews (the focus of this chapter), but this is only one side of the story, one that is rapidly changing. The major transformations in science and society that occurred during the sixteenth and seventeenth centuries marked the beginning of a new era in which the relationship between humans and nature changed, largely thanks to the shift "from Copernicus to Newton, from Renaissance natural magic to the mechanical worldview, and from the breakup of feudalism to the rise of mercantile capitalism and the nation-state" (Merchant 2006: 517; see Chapters 7 and 17). Galileo distinguished between what could be measured and what could not, establishing ways of knowing what was objective and pertaining to (early modern) science, and what was subjective and thus not pertaining to science (see Chapter 17). This planted the seed for the separation and dualism that came to dominate modern worldviews, interpreted as a rupture in the humans–nature relationship (see Pepper 1996; Merchant 2006).

Descartes reinforced Galileo's idea of the unreality of what is not measurable, and arguably what became known as Cartesian dualism between mind (*Res cogitans*) and matter (*Res extensa*) has marked humankind's relationship with nature to this day. The presumed superiority of the mind and of thought gave human a privileged position towards nature (Pepper 1996), justifying nature's use and eventually abuse by men, thus failing to heed Schumacher's (1974: 89) warning that man "was given 'dominion', not the right to tyrannize, to ruin and exterminate. It is no use talking about the dignity of man without accepting that noblesse oblige." By the eighteenth century the scientific revolution had all but displaced medieval cosmology. By challenging both medieval theology and science, it opened the way to modernity. This was when the idea of progress became identified with control, domination, manipulation and, thus, loss of respect for nature. Nature existed to serve humankind. Utilitarian and material objectives justified this relation, conceived through empiricist and rationalist perspectives based on assumptions of ontological reductionism. It became natural to think of nature as "something" that is there just for our benefit. We lost fear, then we lost respect, and in recent decades we lost the desire and capacity to connect with nature. Nevertheless, Hansson (2012: 2) notes that, "in our age of globalization and large-scale anthropogenic environmental degradation, the ecological limitations of reductionism are becoming increasingly apparent to both the academic and the global community." For these reasons, the discourse of global environmental politics would benefit from moving away from the vague, and possibly misleading, language of "environmental problems" to one that focuses on the connection and dependence between humans and nature that the narrative of separation has influenced so deeply (exemplified in Pope and Lomborg 2005).

Not everyone had lost the capacity to be fascinated by nature, and thus the narrative of separation was counterposed to one of unity, led by scientists and philosophers who sought and conceived of a positive relationship with nature, respecting, worshipping, loving and admiring it. Hansson explores the early contribution of philosopher Baruch Spinoza (1632–77) who sought to counter the reductionism promoted by Descartes and Bacon, conceiving of nature as an entity

that "subsumes our less inclusive modern-day conception of 'the environment'" (Hansson 2012: 4). Spinoza recognized the contextual interrelation of parts and wholes as key "to properly understand the functional organization of the world," effectively anticipating today's systems thinking (Hansson 2012: 4). Carolus Linnaeus (1707–78), Friedrich von Humboldt (1769–1859), Charles Darwin (1809–82) and Ernst Haeckel (1834–1919) are amongst the scientists who understood the importance of a unified and holistic perspective, one that viewed nature as complex systems, emphasizing the interdependence of all species. Thus the eighteenth and nineteenth centuries witnessed the laying down of modern ecology's foundations and of another view of nature that has yet to permeate Western theory and practice in global environmental politics (see Chapters 3 and 4).

We can therefore see two partially conflicting meta-narratives of separation and unity. In one, science provides an understanding of nature that exposes its holism, complexity and the interdependency and evolution of species (see Chapter 17), which prompts attitudes of respect and admiration. In the other it enhances the dualism between humans and nature as a consequence of the scientific revolution, prompting attitudes of domination and exploitation whose consequences (industrialization, capitalism, progress and technology) are object of analysis in global environmental politics (see Chapters 13, 17, 18 and 22). Environmental ethics was inspired by the first meta-narrative, which is addressed in the following section.

The rise of environmental ethics

The challenge of environmental ethics has been to extend the realm of ethics to future people and ultimately to all living beings, ecosystems, nature. Routley (1973) presented the question of "the last man": "if the last dying man, who barely survived a collapse of the world system, eliminated every living thing, animal or plant – would that be right?" The struggle of environmental ethics to understand the underlying causes of environmental problems pointed to the anthropocentric tradition of the separation meta-narrative explored earlier, enhanced by the power of science and technology, and by an attitude of arrogance towards nature (Carson 1962; see Chapters 17 and 18). A new, non-anthropocentric, ethics was deemed necessary, one that would answer Routley's question negatively, not just for the hypothetical "last man," but also for humanity today. The rationale for a negative answer is that living things have value in themselves, independently of humans. This is why the thought experiment of the "last man" is so important: if it is not right to destroy all living things even if there are no humans, it must be because living things have intrinsic value.

Early environmental ethics concentrated on attributing an intrinsic value to nature, above and beyond the instrumental one that had dominated the previous few centuries. The strategy was to extend ethics to other beings, and an intrinsic value of nature was to be the foundation for non-anthropocentric ethics. This has led to very complex, sometimes cumbersome, discussions around what would be the value-conferring property uniting humans and non-humans (De-Shalit 2000; Ball 2001; Light 2002). Different theories claim different properties for nature, such as interests (Goodpaster 1978), sentience (Singer 1975) or just a good of its own (a *teloi*) that makes it a teleological center of life (Taylor 1986). Environmental philosophers developing these ethical theories believed that the intrinsic value of nature would support a different approach to environmental political decision-making. Environmental ethicists viewed non-anthropocentric ethics as fundamental to a proper re-evaluation of the human–nature relationship and as the main added value for a different and wider view of the environmental crisis (Jamieson 2001). Anthropocentrism was therefore rejected as a possible frame for environmental ethics. As Light (2002: 429) put it, "regardless of the early debates over the terminology, the

assumption that axiologically anthropocentric views are anti-ethical to the agenda of environmentalists, and to the development of environmental ethics, was largely assumed to be the natural starting point for any environmental ethics."

Non-anthropocentric environmental ethics

Discussions on different ways of grounding the intrinsic value of nature have dominated environmental ethics for decades, giving rise to different currents, including animal liberation, deep ecologism, biocentrism, land ethics and ecofeminism. These currents that evolved during the second half of the twentieth century had different preoccupations. In addition to the broad theme of "beyond us," scholars sought to deconstruct the separation between humans and nature, between men and women (with whom nature is often identified), and between reason and emotion as artificially opposed ways of solving "environmental problems." They also complemented existing moral rules concerned with the place of individuals in society with a "land ethic," while some actually sought to move beyond moral rules. Together, these contributions represent an important alternative perspective on the causes of today's global environmental problems, and they provide the means to identify innovative responses. We now discuss some of the most prominent representatives of these schools of thought.

Peter Singer's (1975) *Animal Liberation* was a seminal work inspiring the movement of animal rights and liberation. There is no moral justification for the mistreatment of animals, as Singer believes in the principle of equal consideration of interests, not only for all human beings but also for non-human animals. Sentience, the capacity to suffer or to feel pleasure, which is shared by humans and animals, is used by Singer to justify the equal consideration of interests. This principle of equality also gives ground for Singer to reject and condemn speciesism (non-human species are not valued and have no rights). For Singer, it is speciesism that gives the ethical space and justification for causing pain to or killing of animals, disrespecting their existence.

Another non-anthropocentric current, espoused by John Baird Callicott, is land ethics, inspired by the writings of Aldo Leopold (1887–1948). Leopold is a key reference. His book *A Sand County Almanac* (1949, see Callicott in Vaz 2012) takes the reader through a sequence of concepts that became fundamental for environmental ethics: the extension of ethics; the concept of belonging to an interdependent community; an ecological consciousness that influences what we emphasize intellectually, our loyalties, affections and convictions; the conscience of what it means to use economic and utility arguments to justify the conservation of nature; and the concept of the land pyramid, which makes us understand "the land" not only as soil, but as a fountain of energy flowing through a circuit of soils, plants and animals. All these concepts should make us rethink our attitude towards nature, prompting an evolution from "man the conquerer" to "man the biotic citizen"; from "science [as] the sharpener of his sword" to "science [as] the searchlight on his universe"; and from "land the slave and servant" to "land the collective organism" (Leopold 1981 [1949]: 223).

Leopold proposes that we should give value to land, not in an economic sense, but in a philosophical sense, anticipating the intrinsic value of nature. Leopold asked that philosophy aid our understanding of the whole and how we are part of it. Callicott's work (1987, 1989, 1999) has sought to develop this dimension. Leopold proposed a natural and moral imperative for human beings to consider themselves as part of a community and to respect it. Callicott goes a step further, demanding more from human. He demands an ontological change of the *self*. He constructs the thesis of the continuity between human beings and nature, as a whole, as a new being. For this Callicott (1989) uses the evolution of physics, which went from an understanding of nature as atomistic, dualist and reductionist into the quantum paradigm of holism, energy

flux and uncertainty as an inspiration for land ethics. Another feature developed by Callicott is *holism*, but this notion calls for thoughtful debate since individuals can lose relevance when an enlarged community is the basic entity. Callicott later acknowledged the extremism of his initial writings and concluded that the land ethic did not substitute for human ethics, but complemented them. He proposed a prioritizing of the duties generated by membership in multiple communities to avoid an uncritical holism or eco-fascism (Callicott 2001).

Another current in environmental ethics is deep ecology, initially proposed by Arne Næss. Næss distinguishes two different approaches to environment, the shallow ecology movement, the "[f]ight against pollution and resource depletion. Central objective: the health and affluence of people in the developed countries" (Næss 1973: 95), and the deep ecology movement characterized by seven *normative* points that provide one unified framework for ecosophical systems. The deeper questioning of the environmental crisis led to a deeper questioning of the self, demanding an ontological effort to understand it. Næss proposed "ecosophy" (Næss 1973), believing it should be a broad concept, and later he developed the idea that "ecosophies" should be personal: each person should develop his/her own ecosophy, understood as a philosophy of life oriented to an ecological harmony (Næss 1987, 1989). Næss's own ecosophy is based on the notion of *self-realization*. The selfhood he proposes is based on an active identification with wider and wider circles of being. Self-realization is achieved when this circle of identification is the widest possible. It implies a transition from ego to social self to metaphysical self to ecological self. The upshot is that our self-interest becomes the interest of the rest of life. Næss believed it might also promote a more meaningful life.

What makes deep ecology different is its emphasis in ontology, in a realization of a certain status of the self, expanding it as much as possible. We should not need a morality that tells us to protect nature because it has intrinsic value. Rather, we should protect nature in a natural and effortless way, without appealing to duty or moral pressures. Næss (1987) used Kant's moral act and beautiful act to explain this. The first is motivated by an intention to follow a moral law at whatever cost (even if against our inclination). But if we feel inclination and pleasure to act according to the moral law then this would be a beautiful act. Næss's point is that we should try to influence people towards making beautiful acts, working on their inclinations rather than morals. To be an environmentalist would not or should not be a sacrifice, but rather a pleasure.

Another non-anthropocentric current with many strands is ecofeminism. Generally speaking, ecofeminism has three main prescriptions (following Dobson 1995):

i. Women should seek equality with men as they are generally equal;
ii. Accept the differences between men and women, but seek to re-evaluate the female characteristics that are undervalued in Western/patriarchal societies:
    a. The existence of values and ways of behaving that are primarily feminine (these could be biological or social);
    b. Domination of nature is related to domination of women, but the structures and reasons are similar;
    c. Women are closer than man to nature and therefore potentially in the vanguard as far as developing sustainable ways of relating to the environment are concerned.
iii. Masculinity and femininity should both be rejected and we should develop an alternative culture.

If point (i) was a main issue for feminism, in ecofeminism both (ii) and (iii) have dominated most of the discourse. Dobson (1995) dubs (i) and (ii) as "the difference" and (iii) as the "deconstructive" models. The "difference" model is based on exploring and criticizing the dualisms of human/nature

and men/women, basing the discussion on an essentialist argument for a feminine essence that should be universal and common to all women. This feminine essence should give room for women to discover, celebrate and affirm their real nature, which is intimately related with the natural world.

Val Plumwood (1993, 2002) is the main promoter of the "deconstructive" model. She believes that dualisms hinder true developments in ecofeminism. She argues that women should "move to a further stage in their relations with nature, beyond that of powerless inclusion in nature, beyond that of reaction against their old exclusion from culture, and towards a deliberate and reflective positioning of themselves *with* nature against a destructive and dualising form of culture" (Plumwood 1993: 39). So both men and women should challenge the "dualised conception of human identity and develop an alternative culture which fully recognises *human* identity as continuous with, not alien from, nature" (Plumwood 1993: 36). Plumwood (2002) also criticizes rationalism, arguing that in our inherited Kantian moral framework the essential features of morality are distant from emotion and close to reason. The dualism between reason and emotion has been affecting nature. She criticizes most environmental philosophers who have tried to ground the need for protecting nature on a rational, cognitive way of explaining and understanding the intrinsic value of nature. Plumwood argues that the emotions and care one might feel towards nature do not seem to be considered universal, or rational enough, to ground an extended moral theory, which would account for an approval or disapproval of our actions towards nature.

Even though there are many discussions within ecofeminism, the important thing is that it promotes the idea that new ways of thinking in a nonpatriarchal context are needed, and this involves a reconceptualization of knowledge, reality and ethics. Both the value of connections between particular individuals and the value of nature or environment conceived as both material entities and abstractions need to be recognized (Davion 2001). Above all this approach makes us rethink the relationship of the human being with him/herself and with the world.

Non-anthropocentric arguments are commonly gathered under the umbrella of "ecocentrism," a concept that captures their most relevant themes. Eckersley (1992) provides a summary of the critiques and defenses of ecocentrism:

Critique: it is impossible to perceive the world other than from an anthropocentric perspective since we are, after all, human subjects.

Defence: this critique is dismissed as the "anthropocentric fallacy" because we can remind ourselves that other meanings might exist, and emphatically develop a non-anthropocentric consciousness.

Critique: ecocentrics are insensitive to the needs of the oppressed and poor when they collectively blame the human species.

Defence: this critique is dismissed because non-anthropocentrism does not mean misanthropy and what ecocentrics are against is the ideology of human chauvinism.

Critique: ecocentrism is a passive and quietist perspective that regards humans as no more valuable than ants or the AIDS virus.

Defence: a non-anthropocentric perspective is one that ensures that the interests of non-humans are not ignored in human decision-making, but this does not mean that an extreme non-interference with other life forms is always required.

Critique: nature is interpreted too benignly.

Defence: ecocentrists defend nature for what nature is, and not because it might be benevolent or benign.

Eckersley (1992) concludes that the ecocentric approach promotes rethinking and requires that we proceed with greater caution and humility in our interventions in ecosystems.

Anthropocentric environmental ethics

There are also anthropocentric strands of environmental ethics. These are connected with other social, political and moral questions, such as virtue ethics, environmental pragmatism and communitarianism. These different strands also provide support for radical reconsideration of the themes of connection and dependence between humans and nature. They consider the rising importance of wellbeing within development discourses, linking these to the role of virtue in character building, behavior and lifestyles. Scholars from these perspectives also focus on protecting future generations and the importance of virtue ethics language in policy responses to the ecological crisis. Environmental virtue ethics embraces a perspective of cultivating human character traits that enhance a healthy and harmonious relationship and interaction with nature. Van Wensveen (1999) notices that virtue language is present in one way or another in the work of almost all environmental philosophers. She argues that this enhances our capacity to respond to environmental challenges: "one more language is one more chance." Sandler (2005: 7) makes a similar argument: "virtue language is not only everywhere in the discourse, it is indispensable to the discourse."

Hill (1983) was one of the first philosophers to espouse environmental virtue ethics, proclaiming the limits of utilitarian and deontological ethics in explaining some actions. There are actions that are not immoral, yet raise some sort of discomfort. So, instead of the traditional question of what is the right or wrong action, Hill (1983) says that very often the question that comes into mind is rather "What sort of person would do such a thing?" Environmental virtue ethics has been developed with the assumption that there was space for thinking about character and behavior of people within environmental ethics, and that such considerations were not being addressed by traditional environmental ethics (which is more worried about the intrinsic value of nature). People have traits of character, attitudes, habits and dispositions, and it is people who make laws, promote policies and act towards nature (Sandler 2005). Therefore, it makes sense to identify the potential attitudes that constitute environmental virtues, and the role of character in environmental ethics.

Furthermore, the rediscovery of the themes of wellbeing and happiness in economic, development and sustainability literature is leading to a growing concern with human flourishing, with what promotes it and what contributes to it (Jackson 2009; see Chapter 15). The idea that nature, living with nature and understanding are sources of joy, peace, self-knowledge and a feeling of renewal leads one to acknowledge that promoting this openness and sensitivity to nature might be part of a process of one's own flourishing (Bina and Vaz 2011; Vaz 2012). Promoting lifestyles that enhance a balanced and harmonious relationship with nature has been a perennial objective of environmental ethics. Acknowledging the role of virtues to promote this type of lifestyle has been the specific added value of environmental virtue ethics. Furthermore, as Van Wensveen (1999) observes, ecological virtue discourse, as a distinctive, diverse, dialectical, dynamic and visionary moral language, carries the promise of moral creativity. Such creativity is fundamental for the many problems and dilemmas that environmental ethics is confronted with. For example, questions of the rights of trees, animals or plants might be answered by looking through new moral lenses and by adopting different perspectives. As Van Wensveen (1999) argues, virtue language has pre-modern roots, which is an advantage given that modernity is considered partly responsible for the ecological crisis. We need a new moral language that is independent of such a worldview.

In addition to virtue ethics, anthropocentric ethics embraces environmental pragmatism and communitarianism. Both strands contribute with ideas aimed at bridging the gap between the world of ethics and of policy-making, partly appealing to the problem of "future generations." Light (2002: 443) argues that environmental ethicists should focus on how best to help the

environmental community "to make better ethical arguments in support of the policies on which our views already largely converge." He contends that it is possible to keep the lively philosophical debates and yet be more politically proactive, developing a more public philosophy focused on arguments "that resonate with the moral intuitions that most people carry around with them on an everyday basis" (Light 2002: 444). Light (2002) argues that obligations to future generations are a powerful intuitive reason that most people easily understand.

Questions about future generations prompted discussions within philosophy and entered environmental policy in the late 1980s, mainly due to the promotion of sustainable development as envisioned in the Brundtland Report, *Our Common Future* (WCED 1987). The question of an institutionalized need to care for future generations was posed by environmental hazards (see Chapters 8 and 9). The new reality of a "risk society" (Beck 1995; see Chapter 18), depletion of resources, long-term hazardous wastes and irreversibility of environmental decline force us to look toward ethical and political culture to justify harming future generations. The intelligibility of caring for future generations has made it, in general, an accepted philosophical and political issue. Light (2002) invokes it as a platform of understanding between philosophy and politics. Other authors have theorized caring for future generations, linking this to different political–philosophical theories, such as liberalism, communitarianism, utilitarianism and deontology (Partridge 2001). Deontological views focus on the moral status of future persons and their rights and our duties to non-existent persons. Rawls's theory of justice was one of the first to attempt to amend and extend the liberal theory of rights and justice so as to provide grounding for, and to take into account, the rights of future persons (Rawls 1971).

O'Neill (1993: 26) argues that classical utilitarianism also entails obligations to future generations, as it "holds that the best action is that which maximizes total happiness, characterized hedonistically in terms of pleasure and the absence of pain. This view involves no temporal indexing of the pleasures, and entails that pleasures should be maximized across generations, be this by increasing pleasure or by increasing future populations." He (1993: 38) considers "that there is a temporal myopia that infects modern society" based on a lack of sense of continuity of the present with both past and future. On the other hand, De-Shalit (1995) proposes a communitarian theory of intergenerational justice (see Chapter 23). He argues that we are morally bound to future generations because we share membership in a "community." De-Shalit bases his argument on a conception of human beings that can transcend self-interest because they seek a moral environment. Most environmental problems make it clear that future generations are vulnerable to how we develop our policies and therefore it is an inescapable theme for both environmental ethics and environmental policy.

Green political thought: bridging the gap between ethics and policy

Even though the intergenerational theme seems a good frame for grounding much of green political thought, limiting environmental ethics to this would mean sacrificing a significant body of work that draws mainly on non-anthropocentric schools of thought. Political theorists such as Dobson (1995) and Eckersley (1992) defend ecologism and ecocentrism. Dobson (1995) believes ecologism is a political ideology because it defends two themes not found in liberalism, conservatism, socialism and other ideologies. Those two themes are the belief in the limits to material growth and opposition to anthropocentrism, both crucial to environmental politics at local and global scales. Eckersley (1992: 3) believes that an "ecocentric approach may be seen as a genuinely new constellation of political ideas." Ecocentric political theorists thus defend the need for a radical reconception of humanity's place in nature, and rethinking of our (inflated) sense of human self-importance.

A more critical stance from Barry (1999) labels Dobson's and Eckersley's type of thought as green political ideology rather than green political theory. The latter, he thinks, deserves a more broad approach and he argues that "the normative claims of green political theory do not require the rejection of anthropocentric moral reasoning in favor of a putative non-anthropocentric ecocentrism" (Barry 1999: 3). De-Shalit (2000) also believes that the gap between environmental philosophers and environmental politicians and activists must be bridged; he believes they answer different questions. Only by acknowledging this can "environmental philosophy penetrate environmental policy and provide its rationale" (De-Shalit 2000: 5). Light and Katz (1996: 2) propose environmental pragmatism, "an open-ended inquiry into the specific real-life problems of humanity's relationship with the environment." Their main premises are moral pluralism, diminishing the importance of theoretical debates, and privileging practical issues of political consensus. Environmental pragmatism assumes itself to be not another current within environmental philosophy but rather a platform of understanding between all of them, thereby contributing directly to the resolution of environmental problems.

Conclusion

In recent decades global environmental politics has embraced notions of complexity, interconnectedness and interdependencies, and of pluralism, both in terms of the actors in the realm of politics and in terms of disciplines and epistemology. Scholars of global environmental politics acknowledge multiple and interdependent causes as well as the notion that the many forms of global environmental degradation are linked via chains of causes and consequences. However, environmental philosophy and ethics remain marginal, if noted at all, in most global environmental politics discourses and literature. Not by chance, the separation between "environmental problems," discussed here as "nature," and development issues, which this chapter treats as humankind and society, continues to be understood through the lens of dichotomy and reductionism. There is still some way to go before we can discuss global environmental politics themes through a holistic and unified lens, as Baruch Spinoza challenged us to do in the seventeenth century.

Today's recognition that "ecologically more complex problems" (Andonova and Mitchell 2010: 270) are caused by the combination of various human behaviors requires a more holistic and systemic interpretation of the problems. Deep ecologists, ecofeminists, biocentrists, land ethicists, defenders of animal rights, environmental pragmatists and environmental-virtue ethicists have different ontological and epistemological perspectives on the environmental crisis. Nevertheless, they share the same kind of preoccupation: that the absence on metaphysical questions in environmental politics leads to narrow solutions within global environmental governance. To understand that there is a philosophical landscape behind the way we establish norms, rules, laws and structures that guide our behaviors helps us in the conversation about why we live on one planet as if we had two or three (see Chapters 10 and 16), why we ignore the question of limits, and why we are devoted to such a reductionist understanding of economics (see Chapter 22).

The environmental crisis is linked to the identity crisis of advanced "Western societies," how we relate to ourselves and others near or distant in time and space, and to nature. Environmental philosophy and environmental ethics, in particular, thus have an important role in guiding us to a better relationship between "the other" and ourselves. The currents of environmental ethics have been providing different perspectives aimed at understanding the root causes of the environmental crisis. Both anthropocentric and non-anthropocentric strands defend a need for a radical reconception of humanity's place in nature because there should be

no reason to believe that humans are necessarily the most important beings and the sole locus of value in the world. This is an enormous challenge. Global environmental politics cannot overlook the metaphysical questions that are so intrinsic to the place that humanity has in the world.

Sustainable development is a problem-solving strategy shaping much of global environmental politics and related governance norms and structures. Different conceptions of sustainability (see Chapter 15) still reflect the two meta-narratives of separation and unity discussed above. Thus divided, they continue to undermine solutions in political and governance terms (see Pope and Lomborg 2005). The relevant question is which dimensions are constitutive of sustainability. This chapter has highlighted the potential of the ethical component of sustainability, in line with Kothari's (1994) appeal for a paradigm shift in sustainability policies, towards an ethical imperative and away from technical fixes (see Chapters 15 and 18). This entails discussing sustainability not only in normative terms but also in terms of purpose, thereby allowing the framing of environmental problems at a metaphysical level – as a set of moral arguments that can justify political action and institutional dynamics.

References

Andonova, L.B. and Mitchell, R.B. (2010) The rescaling of global environmental politics. *Annual Review of Environment and Resources*, 35: 255–82.

Ball, T. 2001. New ethics for old? Or, how (not) to think about future generations. *Environmental Politics*, 10(1): 89–110.

Barry, J. 1999. *Rethinking Green Politics*. London: Sage.

Beck, U. 1995. *Ecological Politics in an Age of Risk*. Cambridge: Polity Press (first published in Germany, 1988, Suhrkamp Verlag).

Bina, O. and Vaz, S.G. 2011. Humans, environment and economies: from vicious relationships to virtuous responsibility. *Ecological Economics*, 72: 170–8; Doi: 10.1016/j.ecolecon.2011.09.029.

Callicott, J.B. (ed.). 1987 *Companion to a Sand County Almanac: Interpretive and Critical Essays*. Madison: University of Wisconsin.

—— 1989. *In Defense of the Land Ethic: Essays in Environmental Philosophy*. Albany: SUNY Press.

—— 1999. *Beyond the Land Ethic: More Essays in Environmental Philosophy*. Albany: SUNY Press.

—— 2001. The land ethic. In Jamieson, D. (ed.) *A Companion to Environmental Philosophy*. Malden, MA: Blackwell Publishing.

Carson, R. 1962. *Silent Spring*. Harmondsworth: Penguin Books, 1971.

Collingwood, R.G. 1945. *The Idea of Nature*. Oxford: Oxford University Press, 1978.

Davion, V. 2001. Ecofeminism. In Jamieson, D. (ed.) *A Companion to Environmental Philosophy*. Malden, MA: Blackwell Publishing.

De-Shalit, A. 1995. *Why Posterity Matters. Environmental Policies and Future Generations*. London: Routledge.

—— 2000. *The Environment. Between Theory and Practice*. Oxford: Oxford University Press.

Dobson, A. 1995. *Green Political Thought*. 2nd edition. London: Routledge. First edition published in 1990.

Eckersley, R. 1992. *Environmentalism and Political Theory. Toward an Ecocentric Approach*. London: UCL (University College London) Press.

Goodpaster, K.E. 1978. On being morally considerable. *Journal of Philosophy*, 75: 308–25.

Hansson, D. 2012. Unpacking Spinoza: Sustainability education outside the Cartesian box. *Journal of Sustainability Education*, 3. Available HTTP: <http://susted.com/index.php?sURL=http://www.jsedimensions.org/wordpress/2012-the-geography-of-sustainabilty/>.

Hardin, G. 1968. The tragedy of the Commons. *Science*, 162: 1243–8.

Hill, T. 1983. Ideals of human excellences and preserving natural environments. Reprinted in Sandler, R. and Cafaro, P. (eds) *Environmental Virtue Ethics*. Boulder, CO: Rowman & Littlefield, 2005.

Jackson, T. 2009. *Prosperity without Growth? The Transition to a Sustainable Economy*. Sustainable Development Commission (UK). Available HTTP: <http://www.sd-commission.org.uk/publications.php?id=914>.

Jamieson, D. (ed.) 2001. *A Companion to Environmental Philosophy*. Malden, MA: Blackwell Publishing.

Kothari, R. 1994. Environment, technology, and ethics. In Gruen, L. and Jamieson, D. (eds) *Reflecting on Nature. Readings in Environmental Philosophy*. Oxford: Oxford University Press.

Leopold, A. 1981 [1949]. *A Sand County Almanac. And Sketches Here and There*. Oxford: Oxford University Press.
Light, A. 2002. Contemporary environmental ethics. From metaethics to public philosophy. *Metaphilosophy*, 33(4).
Light, A. and Katz, E. 1996. Introduction. Environmental pragmatism and environmental ethics as contested terrain. In Light, A. and Katz, E. (eds) *Environmental Pragmatism*. London: Routledge.
Marshall, P. 1992. *Nature's Web. An Exploration of Ecological Thinking*. London: Simon and Schuster.
Meadows, D., Meadows, D., Randers, J. and Behrens, W. III. 1972. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: University Books.
Merchant, C. 2006. The scientific revolution and the death of nature. *Isis*, 97: 513–33.
Næss, A. 1973. The shallow and the deep, long-range ecology movement. A summary. *Inquiry*, 16: 95–100.
—— 1987. Self-realization: an ecological approach to being in the world. *The Trumpeter*, 4(3): 35–42.
—— 1989. *Ecology, Community and Lifestyle*. Cambridge: Cambridge University Press.
Neiman, S. 2009. *Moral Clarity. A Guide for Grown-Up Idealists*. Revised Edition. Princeton, NJ: Princeton University Press.
O'Neill, J. 1993. *Ecology, Policy and Politics. Human Well-being and the Natural World*. New York: Routledge.
Partridge, E. 2001. Future generations. In Jamieson, D. (ed.) *A Companion to Environmental Philosophy*. Malden, MA: Blackwell Publishing.
Pepper, D. 1996. *Modern Environmentalism. An Introduction*. New York: Routledge.
Plumwood, V. 1993. *Feminism and the Mastery of Nature*. New York: Routledge.
—— 2002. *Environmental Culture. The Ecological Crisis of Reason*. New York: Routledge.
Pope, C. and Lomborg, B. 2005. Debate: The state of nature. *Foreign Policy*. Available HTTP: <http://www.foreignpolicy.com/articles/2005/07/01/debate_the_state_of_nature?page = full>.
Rawls, J. 1971. *A Theory of Justice*. Oxford: Oxford University Press.
Routley, R. 1973. Is there a need for a new, an environmental, ethic? Reprinted in Zimmerman, M.E., Callicott, J.B., Warren, K.J., Klaver, I.J. and Clark, J. (eds) *Environmental Philosophy. From Animal Rights to Radical Ecology*. 4th edition, 2005, Upper Saddle River, NJ: Pearson Prentice Hall.
Sandel, M.J. 2012. *What Money Can't Buy: The Moral Limits of Markets*. New York: Farrar, Straus and Giroux.
Sandler, R. 2005. Introduction. In Sandler, R. and Cafaro, P. (eds) *Environmental Virtue Ethics*. Boulder, CO: Rowman & Littlefield.
Schumacher, E.F. 1974. *Small is Beautiful – A Study of Economics as if People Mattered*. 2nd edition. London: Abacus.
Singer, P. 1975. *Animal Liberation: A New Ethics for our Treatment of Animals*. New York: Avon Books.
Taylor, P.W. 1986. *Respect for Nature: A Theory of Environmental Ethics*. Princeton, NJ: Princeton University Press.
Van Wensveen, L. 1999 The emergence of ecological virtue language. Reprinted in Sandler, R. and Cafaro, P. (eds) *Environmental Virtue Ethics*. Boulder, CO: Rowman & Littlefield, 2005.
Vaz, S.G. (ed.) 2012. *Environment*: *Why Read the Classics?* Sheffield: Greenleaf Publishing.
White, L. Jr. 1967. The historical roots of our ecological crisis. *Science*, 155(3767): 1203–7.
World Commission on Environment and Development (WCED) 1987. *Our Common Future*. Oxford: Oxford University Press.

26

Participation

Public opinion and environmental action

Sandra T. Marquart-Pyatt

Democracy requires citizens' opinions in the political process and comprises mechanisms through which these can be realized, including participation. Citizens' concerns about environmental issues, conditions, and topics are wide-ranging and varied, according to public opinion research, and intersect in important ways with political structures. Although recent public opinion polls reveal these environmental concerns are extensive, questions remain about their distribution globally, and how they relate to environmental attitudes and behaviors. In this chapter, I review the cross-national literature on public opinion on environmental issues and concerns over the past few decades and emphasize recent work. I then provide a synthesis of research on participation with application to the environment, broadly construed, cross-nationally. Throughout the chapter, the goal is to characterize the multifaceted relations among pluralism, participation, and public opinion and how they intersect with environmental issues.

An overview of cross-national public opinion research

Scholars have tracked public opinion on a number of environmental issues and concerns for over four decades. This scholarship chronicles multiple dimensions of environmental concern – ranging from beliefs about interconnections between the natural environment and humans, trade-offs between economic growth and environmental protection, willingness to pay higher prices for the environment or to give time for environmental causes, including personal involvement in actions like recycling, and engaging in pro-environmental activism, such as signing petitions or being a member of an environmental group. Indeed, in a comprehensive review, Dunlap and Jones define environmental concern as "the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or willingness to contribute personally to their solution" (2002: 485).

In the 1990s, cross-national scholarship began with the presumption or conventional wisdom that environmental concern should be present only in wealthy or advanced industrial countries where citizens had their basic economic and material security needs met (for an excellent discussion, see Dunlap and York 2008). Rather than geographic concentration among citizens in industrialized nations as specified in the proposed conventional wisdom, however, research pointed to its wide dispersion globally (Brechin and Kempton 1994; Dunlap et al. 1993).

Ensuing studies expanded this seeming anomaly from previous research; they can be divided into two main research threads. On the one hand, some research posits that there is a tendency for citizens in wealthier or industrialized countries to express greater degrees of environmental concern based on national material conditions or personally experiencing a baseline of material security (Diekmann and Franzen 1999; Franzen 2003; Inglehart 1995; Kidd and Lee 1997). On the other, a body of scholarship posits the globalization of environmental concern (Brechin 1999; Dunlap et al. 1993; Dunlap and Mertig 1995, 1997; Dunlap and York 2008).

These research streams are united in emphasis on describing the global character of concern for the environment, yet they differ in explaining it. A number of intersecting arguments feature prominently in the literature. In accordance with the aforementioned conventional wisdom, national affluence or prosperity is advanced as a primary influence (Franzen 2003; Inglehart 1995). Other scholars emphasize a measurement framework that articulates the multifaceted, multidimensional features of environmental concern to account for its worldwide reach (Brechin 1999; Diekmann and Franzen 1999; Dunlap and York 2008; Marquart-Pyatt 2007, 2008; Xiao and Dunlap 2007). The objective problems–subjective values thesis seeks to explain that environmental concerns may indeed be global, yet they are driven by different factors rooted in contexts (Brechin 1999; Inglehart 1995). Recent research examining environmental topics and concerns across countries describes attitudes on the one hand (Franzen 2003; Franzen and Meyer 2010; Gelissen 2007; Haller and Hadler 2008; Marquart-Pyatt 2007, 2008; Xiao and Dunlap 2007) and behaviors on the other (Freymeyer and Johnson 2010; Hadler and Haller 2011; Hunter et al. 2004; Marquart-Pyatt 2012; Olofsson and Ohman 2006; Oreg and Katz-Gerro 2006). Questions of cross-national relationships between attitudes and actions remain vexing, particularly (for this chapter) with regard to how pluralism, participation, and public opinion on environmental issues intersect with one another.

Participation and public opinion

Citizen participation is vital in democracies for a variety of aspects of the political process, including the representativeness of political institutions and political equality (Verba 1996; Verba et al. 1971). Participation consists of a variety of actions, such as voting, donating time or money to a campaign, signing petitions or engaging in protest activity. These behaviors can be classified into conventional and unconventional forms of participation. For instance, conventional forms of participation include voting, campaign activities, and donating time or money to a political party or candidate. Unconventional forms of participation include actions like signing petitions, engaging in protests, demonstrations, boycotts, and participating in strikes (Barnes and Kaase 1979). Recent declines have been observed in conventional forms of participation while simultaneously unconventional forms have become more common (Dalton 1996). These have important corollaries in the realm of environmental politics (see Chapter 12).

Public environmental behaviors are an important feature of environmental concern; they are believed to demonstrate a commitment to the environment rooted in institutional structures. These environmental actions involve the realization of individual beliefs, attitudes, and actions as applied in formal channels like democratic political structures. There are many dimensions of environmental behavior, including recycling, water and energy conservation, signing petitions, protesting, and being a member of an environmental group. Following Stern's (2000) definition of environmental activism, organized participation in environmental issues demonstrates that it is environmentally significant behavior rooted in the political realm and also shows how this differs from routine or everyday behaviors like recycling or conservation, the latter of which are individual environmental actions. That is, environmental activism tends to be expressed in specific

activities that are channeled in formal settings and realized through institutional structures like political regimes (Stern 2000). It includes multiple behaviors in the public sphere, such as signing petitions, engaging in protest, and participating in social movements, and comprises one dimension of the broader construct of environmental concern (Dunlap and Jones 2002).

Theoretical frameworks for environmental actions

From previous research, two prominent explanatory frameworks can be identified that seek to explain the determinants of environmental actions. These are the theory of planned behavior (TPB) (Ajzen 1991) and the value–belief–norm (VBN) theory of environmentalism (Stern 2000). Both the TPB and VBN theories specify values, beliefs, and attitudes as important antecedents to behaviors, and further share conceptual frameworks in which they articulate paths through which individual attributes and attitudes work to affect behaviors. Briefly, the TPB articulates that behaviors are a function of individual beliefs, attitudes, and behavioral intentions; VBN theory similarly lays out a causal sequencing of environmental values, beliefs, and personal norms as key factors affecting environmental actions. Both approaches also put forth a key filtering mechanism: behavioral intention and personal norms, respectively, in the TPB and VBN theory.

The TPB (Ajzen 1991) proposes that individuals are rational actors whose behaviors can be best explained using a path model (Ajzen 1991; Armitage and Connor 2001; Bamberg and Moser 2007; Schwenk and Moser 2009). In the TPB, attitudes related to engaging in particular behaviors, perceptions of others regarding the behaviors (i.e., subjective norms), and perceived behavioral control (i.e., efficacy), or how difficult a particular action may be, affect behavioral intentions, which then influence behaviors (Ajzen 1991; Fishbein and Ajzen 2010). Efficacy is important, as it makes the realization of a behavior possible to perform given an individual's perception of potential barriers in his/her surrounding context. The TPB stresses individual self-interest, outlining a series of cost–benefit calculations in which individuals weigh an array of personal and social normative forces, which then work through behavioral intention and result in a particular behavior.

A subset of TPB applications examines environmentally specific actions. Research has explored recycling (Cheung et al. 1999), energy and water conservation (Bamberg 2003; Harland et al. 1999), reduced car driving (Bamberg and Schmidt 2003; Harland et al. 1999), support for natural resource policy (Routhe et al. 2005), and environmental behaviors (Oreg and Katz-Gerro 2006). Previous research demonstrates attitudes and beliefs influencing behavioral intentions related to recycling, conservation, and natural resource policy (Cheung et al. 1999; Harland et al. 1999; Routhe et al. 2005), behavioral intentions influencing conservation and behaviors (Bamberg 2003; Cheung et al. 1999; Oreg and Katz-Gerro 2006), and efficacy influencing environmentally friendly behavioral intentions (Cheung et al. 1999; Oreg and Katz-Gerro 2006) and some behaviors (Harland et al. 1999). Recent meta-analyses confirm the model across environmentally responsible behaviors including general ecological behavior, public transportation use (see Chapter 31), and recycling. In these reviews, behavioral intention mediates the influence of other predictors in the model, and attitudes, behavioral control, and personal moral norms are key variables affecting behavioral intention (Bamberg and Moser 2007; Schwenk and Moser 2009).

VBN theory posits that the antecedents of environmental behaviors are values, worldviews, beliefs, and norms (Stern 2000; Stern et al. 1995, 1999; Stern and Dietz 1994). VBN theory proposes cognitive, attitudinal, and social factors promoting environmental actions. Briefly, environmental behaviors result from a chain of influences including personal environmental

values, beliefs including an ecological worldview, awareness of consequences, assuming personal responsibility, and personal norms linked with environmentally significant behaviors, respectively (Stern 2000). Values and moral norms are central to explaining environmentally relevant behaviors.

Applications of VBN demonstrate effects of norms and values on environmental behaviors. Research demonstrates that values influence individuals' recycling (Guagnano et al. 1995; Milfont et al. 2006; Schultz 2001; Schultz et al. 2005), household conservation behaviors (Black et al. 1985), and some environmental political actions (Stern et al. 1995, 1999). Whereas Steg et al. (2005) show support for VBN theory's causal chain for explaining acceptability of energy policies, Kaiser et al. (2005) demonstrate its significance for conservation behavior. Other research demonstrates personal norms affecting environmental behaviors, with values and attitudes having indirect influences through norms (Nordlund and Garvill 2002, 2003). Support for the role of values and social norms on environmentally significant behaviors is generally confirmed in a meta-analysis (Bamberg and Moser 2007).

Stern (2000) outlines a conceptual framework that posits different sources of environmentally significant behaviors depending on their type, thus anticipating variability in the effects of indicators on particular actions. In other words, the determinants of consumer behavior, environmental citizenship, and policy support are likely different, which was confirmed in previous research on environmental citizenship behaviors compared with other actions (Dietz et al. 1998; on environmental citizenship, see Chapter 27). Environmental activism, as one facet of environmental actions or environmentally significant behavior, is influenced by a distinctive set of predictors. Thus, according to Stern (2000), substantial variation is anticipated based on situations, individuals, and activities for factors affecting environmental actions.

Prior research reveals differences in the performance of the TPB and VBN theories that link with the type of environmental behavior being studied. For instance, studies suggest that attitudes matter for some behaviors but not others, depending on the degree of effort involved in their realization (Bagozzi et al. 1990) and whether they are routine activities (Schultz and Oskamp 1996). Madden et al. (1992) argue that perceived behavioral control is especially important for behaviors in which it is difficult to engage. Research examining VBN theory demonstrates different sets of influential factors depending on the type of environmental behavior considered, where factors affecting contributing to environmental organizations or signing petitions differ from those of consumer behavior and policy support (Dietz et al. 1998; Stern et al. 1999).

Although social–psychological models reveal important pathways to behaviors, they do not account for the role of individual-level characteristics in the same way that other frameworks do. In this regard, it is important to integrate expectations from the literature on political participation. Research on political behavior has consistently shown that individuals of privileged statuses participate more in political activities. While conventional forms of participation (i.e., voting and campaign activity) are essential to democratic regimes, they have waned in popularity in recent years even in countries with established democratic histories. At the same time, citizen activism in unconventional forms of participation, including protests and demonstrations, has increased (Dalton 1996). This activism is essential for the entrenchment of democratic principles. The relationship between privileged status and participation is also important. This model has been extensively studied in the United States (Brady et al. 1995; Verba et al. 1995). This scholarship demonstrates that privileged status, such as possessing greater amounts of time, money, and skills, as reflected in education and income, influence political participation (Verba et al. 1995). Resource-based explanations articulate how socio-economic status or individual attributes like education and income influence certain behaviors. This relationship is a powerful predictor of political behavior across many decades of published research (Barnes and Kaase 1979;

Leighley 1995; Verba et al. 1971, 1995). Socio-demographics and education illustrate individuals' surrounding socio-economic context, which can serve as a constraint on the realization of actions apart from individual efficaciousness and/or values.

Institutional contexts provide a final piece to the puzzle, as they provide a structure within which individual political actions are facilitated or constrained. Countries around the globe differ on a number of structural and institutional dimensions including economic, political, and environmental features and contexts, each of which might affect public opinion on a range of issues, including environmental ones (see Chapter 12). Political structures, including democratic governments and international environmental organizational memberships, illustrate institutional structures supportive of an international system of environmental organizations, actors, and treaties that showcase interdependencies among human societies and surrounding natural environments (Frank 1997; Frank et al. 2000; Schofer and Hironaka 2005). For instance, one relation commonly assumed is that citizens of nations with political features like liberal democracy have greater degrees of environmental concern attitudinally and behaviorally. An emerging line of scholarship offers mixed, yet promising, support for these purported relations (Hadler and Haller 2011; Haller and Hadler 2008).

Cross-national research on environmental action

Environmental behaviors are often divided into two domains: public and private environmental actions (Hadler and Haller 2011; Hunter et al. 2004). This is an important frame, given that signing petitions and participating in demonstrations differ from routine, everyday behaviors like recycling that comprise individual environmental actions or private environmental behavior. Recent cross-national research demonstrates that environmental actions vary widely across nations, even among nations sharing a political regime, and that there is not always a clear correspondence between environmental attitudes and environmentally significant behaviors.

As noted earlier, a subset of recent research examining environmental topics and concerns across countries describes environmental activism. These studies demonstrate some support for social–psychological models like the TPB and VBN theories (Hadler and Haller 2011; Marquart-Pyatt 2012; Olofsson and Ohman 2006; Oreg and Katz-Gerro 2006) and mixed support for socio-demographic or positional factors (Freymeyer and Johnson 2010; Hunter et al. 2004; Marquart-Pyatt 2012). More specifically, environmental attitudes, willingness to sacrifice for the environment, and perceived behavioral control (Oreg and Katz-Gerro 2006) affect environmental political behaviors. For instance, Olofsson and Ohman (2006) reveal stable effects for education and general beliefs, yet they also uncover differences in models predicting environmental concerns among four affluent countries. Comparing within regions, Scandinavian countries (Norway and Sweden) were largely similar to one another, and results for the USA and Canada were more ambiguous – some similarities regarding attitudes and environmental political behavior were uncovered but not with regard to willingness to make financial sacrifices (Olofsson and Ohman 2006). Hunter et al. (2004) demonstrate that women and men are more likely to engage in private environmental behaviors compared with public ones with variability cross-nationally. Marquart-Pyatt (2012) revealed that individual resources, awareness of consequences, and attitudes combined to affect environmental activism.

Results further demonstrate that willingness to contribute affects activism across nations directly, yet it also has an important role in shaping how education and efficacy influence activism. Further, studies reveal some support for contextual explanations (Freymeyer and Johnson 2010; Hadler and Haller 2011). Freymeyer and Johnson (2010) investigate how national contexts affect environmental political engagement, showing that national and individual economic

well-being affect environmental actions. Distinguishing between public and private actions, Hadler and Haller (2011) examine how social context and environmental behaviors are related by identifying global and national dimensions to environmental behaviors. Their results demonstrate that political opportunity structures and resources drive public behaviors similarly across countries, while the determinants of public behaviors differ and are rooted in local or national contexts rather than necessarily driven by global processes. These studies differ in conceptual frameworks, empirical models, analytical techniques, and number of countries explored. For instance, studies have explored a modified version of the TPB (Oreg and Katz-Gerro 2006), beliefs as key influences (Olofsson and Ohman 2006), an integrated path model (Marquart-Pyatt 2012), gender differences (Hunter et al. 2004), and national and global dimensions of environmental behaviors (Hadler and Haller 2011).

Characterizing the multifaceted relations among pluralism, participation, and public opinion, and how they intersect with environmental issues, necessarily entails brief examination of individual-level public opinion data on environmental and political participation. Data in this section are from the *International Social Survey Program (ISSP) 1993 & 2000: Environment* (International Social Survey Program 2003) and the *World Values Survey* (WVS) (Inglehart et al. 2000; World Values Survey 2009). The ISSP surveys contain individual-level information on environmental concerns in about two dozen countries. The WVS is a worldwide survey containing individual-level information on political participation in a range of countries. Across both surveys, sample sizes for individual countries are approximately 1,000 respondents.

Table 26.1 shows data on environmental activism for 22 and 27 countries, respectively, for the 1993 and 2000 waves of the ISSP Environment public opinion survey (ISSP 1996, 2003). It presents the percentage of respondents in each country who had signed a petition related to an environmental issue, given money to an environmental organization, joined environmental groups, engaged in an environmental protest, and recycled in 1993 and 2000. The sample composition of countries included in the two waves of data differs, with the same 18 countries across both. In both the 1993 and 2000 waves, recycling is the activity respondents report engaging in with greatest frequency in most countries. Signing an environmental petition is the most frequent environmental political action that survey respondents report in all but five and six countries, respectively, in the two waves. New Zealand has the largest percentage of the population reporting having signed a petition for both waves, and has the largest percentage of the population who had donated money in 1993. The Netherlands has the largest percentage of the population who had donated money in 2000. New Zealand has the largest percentage of the population who are members of environmental groups in 1993, with Switzerland having the greatest percentage in 2000. Former East and West Germany have the largest percentages of the populations who had engaged in an environmental protest in 1993, and Spain has the largest percentage in 2000. Former state socialist countries are generally low in environmental activism, although reported levels in 1993 are higher in some countries compared with 2000, like Bulgaria and Russia.

Although there is variation both regionally and for specific countries with regard to environmental activism, in general, industrialized countries, especially in Western Europe and North America, are more environmentally active across the forms of activism included here. Thus, regional differences as well as some country-specific differences in activism are shown. This is not entirely unexpected, given previous research and historical legacies like the influence of the former communist regimes in Eastern European countries compared with governmental structures in Western European countries and those in the category including North America and other regions (Hadler and Haller 2011; Marquart-Pyatt 2012). As noted earlier, although these

Table 26.1 Percent of individuals participating in environmental actions, by country

	Environmental behaviors, 1993					*Environmental behaviors, 2000*				
	petition	*money*	*group*	*protest*	*recycle*‡	*petition*	*money*	*group*	*protest*	*recycle*‡
Advanced industrial countries										
Australia	43.6	41.4	9.7	4.6	43.2	..	..	..	..	..
Austria	..	..	..	..	..	29.7	27.8	7.9	..	81.2
Britain	36.6	30.3	5.2	3.1	20.0	30.4	24.2	5.9	3.0	29.6
Canada	44.2	40.8	6.6	6.5	36.5	26.2	22.7	7.3	3.9	54.6
Denmark	..	..	..	..	..	17.4	22.3	10.8	3.3	47.5
Finland	..	..	..	..	..	21.6	23.7	5.4	1.1	52.4
Ireland	20.6	22.7	4.0	4.3	14.4	25.2	19.8	3.7	7.7	26.5
Israel	14.9	7.9	5.7	4.5	8.4	19.0	11.9	6.3	7.7	5.1
Italy	23.8	13.6	4.7	6.7	25.7	..	..	..	..	..
Japan	24.6	10.7	2.2	2.1	43.8	21.7	9.1	1.5	2.1	56.8
Netherlands	23.3	43.9	16.9	4.6	42.4	21.9	44.8	16.3	1.4	50.1
New Zealand	55.1	49.1	17.4	4.3	27.0	45.4	30.1	11.1	4.2	39.7
N Ireland	25.2	31.3	3.8	3.5	10.2	16.3	15.0	2.7	1.8	11.8
Norway	18.5	29.2	3.7	5.1	12.2	14.5	28.4	3.7	2.7	34.6
Portugal	..	..	..	..	..	4.4	2.3	3.1	1.6	22.8
Spain	15.1	10.1	2.4	5.6	30.3	16.1	7.4	1.9	8.1	36.2
Sweden	..	..	..	..	..	25.9	24.2	5.9	3.4	49.6
Switzerland	..	..	..	..	..	41.3	38.7	18.6	6.6	69.5
USA	30.8	..	10.2	2.8	38.1	22.3	22.8	8.7	3.2	32.5
W Germany	31.0	19.2	5.6	8.5	55.6	32.9	20.8	5.3	6.7	74.3
Central/Eastern Europe and Former Soviet Union										
Bulgaria	8.7	3.8	1.9	6.0	2.6	4.9	2.7	1.8	3.5	3.2
Czech Rep	14.5	5.9	3.2	5.8	12.5	14.8	9.3	2.9	2.8	27.9
E Germany	28.6	9.6	3.0	8.8	48.2	29.4	12.6	3.7	3.7	74.0
Hungary	5.3	4.3	3.0	1.5	17.9	..	..	..	..	..

(*Continued*)

Table 26.1 Percent of individuals participating in environmental actions, by country (cont.)

	Environmental behaviors, 1993					*Environmental behaviors, 2000*				
	petition	*money*	*group*	*protest*	*recycle*‡	*petition*	*money*	*group*	*protest*	*recycle*‡
Latvia	..	..	..	..	..	9.9	2.3	1.0	2.9	1.3
Poland	10.1	18.1	3.6	3.7	9.8	..	..	..	..	..
Russia	10.7	10.0	2.4	3.9	3.6	4.4	1.6	0.9	1.3	2.2
Slovenia	10.5	7.8	3.7	2.6	16.9	12.0	10.7	3.7	4.5	19.5
Developing countries										
Chile	..	..	..	..	..	8.3	7.9	3.5	3.9	8.7
Mexico	..	..	..	..	..	12.2	11.6	5.2	8.2	14.5
Philippines	6.3	15.3	11.3	5.0	16.6	3.3	6.8	7.3	2.6	11.2

Sources: International Social Survey Program Environment 1993 and 2000 data (ISSP 1996, 2003).
‡ % responding always for recycling.

measures of activism are individual behaviors that reflect individual efforts, they may be realized differently depending on the larger institutional context within which they are transpiring.

Table 26.2 provides information on political participation by country for two waves of the World Values Survey (Inglehart et al. 2000; World Values Survey 2009). It presents the percentage of respondents in each country who had signed a petition, joined a boycott, or attended a demonstration for both waves, and the percentage who joined an unofficial strike or occupied a building or factory for the 1995–97 wave. The sample of countries included in the two waves of data differs, and data are presented for 41 countries from the 1995–97 wave and 30 countries from the 2005–7 wave. In both waves, signing a petition is the activity respondents report engaging in with greatest frequency in most countries. New Zealand has the largest percentage of the population reporting having signed a petition for both waves, and Sweden has the largest percentage of the population who had joined a boycott in both waves. France has the largest percentage of the population who had attended a demonstration across both waves. France also has the largest percentage of the population reporting having joined an unofficial strike or occupied a building or factory for the 1995–97 wave, although these two types of political activity tend to occur less frequently among individuals than other actions. Thus, it is also important to note that there is some evidence of regional and country-specific variation in political participation.

The regional and country-specific variation shown with regard to both environmental actions and political participation is instructive in model building. It can help future research account for patterns of similarities and differences in describing the extent of participation across different modes and in specifying pathways affecting these actions. Frequencies across both Tables 26.1 and 26.2 suggest some similarities across countries with different political and economic characteristics, raising the question of other possible factors at work. For instance, does a country's classification as an advanced industrialized country or liberal democracy account for a vibrant civil society that allows for the expression of a range of political *and* environmental actions? Do similar levels of activism across these environmental and political actions suggest cultural explanations? How, for instance, can commonalities shown in signing petitions be explained across environmental and political actions? Regional differences could be theorized as offering insights in explaining participation in newly established democracies.

A possible explanation for relatively low percentages who reported engaging in any pro-environmental behaviors or political activities could be explained by the unavailability of such activities or involvement in other activities compared with countries with more entrenched democratic structures. Increasingly, environmental issues are linked with broader concerns like equity and participation (see Chapter 24). Combined with the surge in scholarship on institutional aspects of democratic governance and the role that democratic values play in fostering an active, informed public, a backdrop for examining these interrelations is in place. Pluralism, participation, and public opinion are uniquely poised at the nexus of politics and the environment; despite its importance, however, little research has explored these relations.

Conclusion

The interrelation of pluralism, participation, and public opinion as they intersect with democracy and global environmental politics is a vibrant research area likely to continue its expansion comparatively in temporal and spatial dimensions. Linkages among environmental concerns, especially attitudes and behaviors as they are embedded within particular institutional contexts, are important for social scientific scholarship on global environmental issues, especially given their continued presence in international affairs and increasing links with issues of equity.

Table 26.2 Percent of individuals participating in political activities, by country

	1995/1997					2005		
	petition	*boycott*	*demonstrate*	*strikes*	*occupy*	*petition*	*boycott*	*demonstrate*
Advanced industrial countries								
Australia	78.4	21.5	17.8	8.1	2.0	79.2	15.4	20.1
Austria	56.7	9.8	16.7	2.2	0.7	..	..	..
Britain	79.3	16.7	13.4	9.7	2.2	68.2	17.2	16.6
Canada	73.3	20.5	19.5	7.0	3.1	72.5	23.5	26.3
Finland	39.2	12.2	12.8	5.1	0.5	50.5	16.0	10.3
France	68.3	13.2	39.7	12.6	9.0	66.7	14.1	37.5
Ireland	58.6	8.3	20.7	6.0	2.3	..		
Italy	54.6	10.3	34.8	5.4	8.0	54.0	19.7	36.0
Japan	56.3	8.9	10.9	2.2	0.1	59.9	7.0	10.2
Netherlands	59.1	21.4	31.2	4.3	4.9	45.8	13.6	20.2
New Zealand	90.6	19.1	21.4	5.2	1.2	87.0	17.8	20.7
N Ireland	60.4	13.7	21.9	9.5	2.4	..		
Spain	22.0	5.1	21.5	5.1	1.6	23.4	7.0	35.9
Sweden	71.6	33.1	30.0	4.9	0.8	78.2	28.4	31.4
Switzerland	63.6	12.2	16.9	2.0	1.1	77.6	19.2	28.1
USA	72.6	19.0	15.9	3.6	1.7	70.4	19.7	15.1
W Germany	65.9	18.1	25.7	3.8	2.3	49.9	9.4	30.8
Central/Eastern Europe and Former Soviet Union								
Albania	23.0	9.1	16.1	0.3	0.3	15.2	3.7	19.3
Belarus	9.1	3.3	19.4	2.1	0.3	8.2	3.9	15.5
Bosnia/Herz	22.0	8.8	9.0	5.8	0.7	22.0	6.7	9.2
Bulgaria	7.5	2.8	10.7	5.3	2.4	12.0	2.3	12.4
Croatia	42.7	4.7	6.9	6.6	0.7	..	..	..
Czech Rep	26.0	10.1	10.8	4.9	1.2	..	..	..
E Germany	57.4	11.2	21.9	1.0	1.9	..	..	..

Estonia	13.6	1.8	20.9	2.5	0.6	..	..	..
Hungary	14.7	2.8	4.5	0.8	0.6	..	..	..
Latvia	30.9	7.9	19.8	3.0	0.4	..	..	..
Lithuania	3.1	5.0	16.7	2.6	1.5	..	..	..
Moldova	10.4	1.0	8.3	1.9	0.3	10.6	4.9	18.4
Poland	20.4	5.5	9.8	4.1	2.2	23.5	4.9	10.2
Romania	17.3	3.3	20.0	6.6	1.6	6.1	1.0	6.3
Russia	10.8	2.3	21.1	1.5	0.5	8.3	2.6	15.9
Serbia	19.4	6.7	7.5	4.6	1.2	30.3	16.4	..
Slovakia	35.3	11.3	12.0	5.5	3.1	..	..	..
Slovenia	18.8	5.6	9.2	3.7	0.8	30.8	6.3	12.5
Ukraine	13.5	4.0	18.1	2.4	0.8	7.0	4.4	16.5
Developing countries								
Argentina	28.9	1.3	16.3	5.7	3.0	27.7	3.0	17.5
Chile	16.6	2.3	14.6	5.3	2.2	17.0	2.7	16.9
Mexico	31.6	11.1	11.4	6.6	5.5	20.7	3.1	16.3
Peru	20.6	2.8	12.2	4.1	2.9	24.7	4.9	24.1
Philippines	12.0	6.0	8.0	3.1	1.6	2.7	3.3	6.8

Sources: World Values Survey 1995/1997/1999 and 2000/2005 data.

Recent years have witnessed an expanded array of resources available for addressing these issues including public opinion datasets and analytical techniques. The International Social Survey Program (ISSP) and World Values Survey (WVS) are large-scale, cross-national public opinion surveys. Both have expanded their geographic scope in data-gathering initiatives in recent iterations of their surveys. The ISSP, for instance, gathers data on its 48 member countries, as of 2012, and includes topical modules like government, social inequality, religion, work orientations, and the environment. The World Values Survey, now in its sixth wave of data gathering, has amassed survey data from more than 100 countries since it began in the early 1980s as the European Values Survey. This worldwide survey contains information on tolerance, environmental attitudes, democratic values, political participation, and a variety of social and political topics. Analytical techniques like structural equation modeling with latent variables and multilevel modeling stand to make important contributions to this research. A latent variable approach to environmental and political attitudes and behaviors is vital for future scholarship as it specifies abstract, multidimensional constructs that are not directly observable like environmental concern, democratic values, environmental activism, and political participation. Multilevel modeling is a technique that enables the investigation of individual-level and aggregate-level characteristics across nations, which has important implications for comparative, cross-national research.

Expanding our understanding of the relations among pluralism, participation, and public opinion on environmental and political issues is essential for subsequent research. Three avenues seem particularly germane for future scholarship. Researchers should continue explorations of how political and institutional contexts shape the expression of political and environmental participation. Future scholarship is also charged with expanding research efforts to include more developing/industrializing nations to further elucidate these processes across structural contexts. Finally, it is imperative for future work to continue to investigate the way in which historical contexts, mode of industrial development, and political structures are related to the expression of public opinion on social, political, and environmental issues. Taking into account institutional factors is essential, as factors affecting participation may be context-dependent. Future scholarship should focus on variation both within and across countries to describe the extent of and determinants of multiple modes of participation across the globe.

References

Ajzen, I. (1991) "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, 50: 179–211.

Armitage, C. and M. Connor. (2001) "Efficacy of the theory of planned behavior: a meta-analytic review", *British Journal of Social Psychology*, 40: 471–99.

Bagozzi, R., Y. Li, and J. Baumgartner. (1990) "The level of effort required for behaviour as a moderator of the attitude–behaviour relation", *European Journal of Social Psychology*, 20: 45–59.

Bamberg, S. (2003) "How does environmental concern influence specific environmentally related behaviors? A new answer to an old question", *Journal of Environmental Psychology*, 23: 21–32.

Bamberg, S. and G. Moser. (2007) "Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour", *Journal of Environmental Psychology*, 27: 14–25.

Bamberg, S. and P. Schmidt. (2003) "Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz and Triandis", *Environment and Behavior*, 35(2): 264–85.

Barnes, S. and M. Kaase. (1979) *Political Action: Mass Participation in Five Western Democracies*. Beverly Hills, CA: Sage Publications.

Black, J.S., P. Stern, and J. Elworth. (1985) "Personal and contextual influences on household energy adaptations", *Journal of Applied Psychology*, 70: 3–21.

Brady, H.E., S. Verba, and K.L. Schlozman. (1995) "Beyond SES: a resource model of political participation", *American Political Science Review*, 89: 271–94.

Brechin, S. (1999) "Objective problems, subjective values, and global environmentalism: evaluating the post-materialist argument and challenging a new explanation", *Social Science Quarterly*, 84(4): 793–809.
Brechin, S. and W. Kempton. (1994) "Global environmentalism: a challenge to the postmaterialism thesis?", *Social Science Quarterly*, 75: 245–69.
Cheung, S., D. Chan, and Z. Wong. (1999) "Re-examining the theory of planned behavior in understanding waste paper recycling", *Environment and Behavior*, 31(5): 587–612.
Dalton, R. (1996) *Citizen Politics: Public Opinion and Political Parties in Advanced Industrial Democracies*. 2nd edition. Chatham, NJ: Chatham House Publishers.
Diekmann, A. and A. Franzen. (1999) "The wealth of nations and environmental concern", *Environment and Behavior*, 31(4): 540–9.
Dietz, T. P. Stern, and G. Guagnano. (1998) "Social structural and social psychological bases of environmental concern", *Environment and Behavior*, 30: 450–71.
Dunlap, R. and R. Jones. (2002) "Environmental concern: conceptual and measurement issues", pp. 482–524 in *Handbook of Environmental Sociology*, edited by Riley Dunlap and William Michelson. Westport, CT: Greenwood Press.
Dunlap, R. and A. Mertig. (1995) "Global concern for the environment: is affluence a prerequisite?", *Journal of Social Issues*, 51: 121–37.
—— (1997) "Global environmental concern: an anomaly for postmaterialism?" *Social Science Quarterly*, 78(1): 24–9.
Dunlap, R. and R. York. (2008) "The globalization of environmental concern and the limits of the postmaterialist values explanation: evidence from four multinational surveys", *Sociological Quarterly*, 49(3): 529–63.
Dunlap, R., G. Gallup, and A. Gallup. (1993) "Of global concern: results of the Health of the Planet Survey", *Environment*, 35(9): 7–40.
Fishbein, M. and I. Ajzen. (2010) *Predicting and Changing Behavior: The Reasoned Action Approach*. New York: Psychology Press.
Frank, D. (1997) "Science, nature, and the globalization of the environment, 1870–1990", *Social Forces*, 76(2): 409–35.
Frank, D., A. Hironaka, and E. Schofer. (2000) "The nation state and the natural environment, 1900–1995", *American Sociological Review*, 65: 96–116.
Franzen, A. (2003) "Environmental attitudes in international comparison: an analysis of the ISSP Surveys 1993 and 2000", *Social Science Quarterly*, 83: 297–308.
Franzen, A. and R. Meyer (2010) "Environmental attitudes in cross-national perspective: a multilevel analysis of the ISSP 1993 and 2000", *European Sociological Review*, 26(2): 219–34.
Freymeyer, R. and B. Johnson. (2010) "A cross-cultural investigation of factors influencing environmental actions", *Sociological Spectrum*, 30(2): 184–95.
Gelissen, J. (2007) "Explaining popular support for environmental protection: a multilevel analysis of 50 nations", *Environment and Behavior*, 39(3): 392–415.
Guagnano, G., P. Stern, and T. Dietz. (1995) "Influences on attitude–behavior relationships: a natural experiment with curbside recycling", *Environment and Behavior*, 27: 699–718.
Hadler, M. and M. Haller. (2011) "Global activism and nationally driven recycling: the influence of world society and national contexts on public and private environmental behavior", *International Sociology*, 26: 315–45.
Haller, M. and M. Hadler. (2008) "Dispositions to act in favor of the environment: fatalism and readiness to make sacrifices in cross-national perspective", *Sociological Forum*, 23(2): 281–311.
Harland, P., H. Staats, and H. Wilke. (1999) "Explaining pro-environmental intention and behavior by personal norms and theory of planned behavior", *Journal of Applied Social Psychology*, 29(12): 2505–28.
Hunter, L., A. Hatch, and A. Johnson. (2004) "Cross-national gender variation in environmental behaviors", *Social Science Quarterly*, 85(3): 677–94.
Inglehart, R. (1995) "Public support for environmental protection: the impact of objective problems and subjective values in 43 societies", *PS: Political Science and Politics*, (March): 57–71.
Inglehart, R., et al. (2000) World Values Surveys and European Values Surveys, 1981–84, 1990–93, and 1995–97 [Computer file]. ICPSR version. Ann Arbor: Institute for Social Research [producer] (1999). Ann Arbor: Inter-university Consortium for Political and Social Research [distributor] (2000).
International Social Survey Program (ISSP) (2003) International Social Survey Program (ISSP), 1985–2000 [CD-ROM]. Cologne, Germany: Zentralarchiv fuer Empirische Sozialforschung an der Universitaet zu Koeln [producer], 2003. Cologne, Germany: Zentralarchiv fuer Empirische Sozialforschung/Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributors].

Kaiser, F., G. Hubner, and F. Bogner. (2005) "Contrasting the theory of planned behavior with the value-belief–norm model in explaining conservation behavior", *Journal of Applied Social Psychology*, 35(10): 2150–70.
Kidd, Q. and A. Lee. (1997) "Post materialist values and the environment: a critique and reappraisal", *Social Science Quarterly*, 78(1): 1–15.
Leighley, J. (1995) "Attitudes, opportunities, and incentives: a field essay on political participation", *Political Research Quarterly*, 48: 181–209.
Madden, T., P. Ellen, and I. Ajzen. (1992) "A comparison of the theory of planned behavior and the theory of reasoned action", *Personality and Social Psychology Bulletin*, 18: 3–9.
Marquart-Pyatt, S. (2007) "Concern for the environment among general publics: a cross-national study", *Society and Natural Resources*, 20(10): 883–98.
—— (2008) "Are there similar influences on environmental concern? Comparing industrialized countries", *Social Science Quarterly*, 89(5): 1–24.
—— (2012) "Explaining environmental activism across countries", *Society and Natural Resources*, 25(7): 683–99.
Milfont, T., J. Duckitt, and L. Cameron. (2006) "A cross-cultural study of environmental motive concerns and their implications for proenvironmental behavior", *Environment and Behavior*, 38: 745–67.
Nordlund, A. and J. Garvill. (2002) "Value structures behind proenvironmental behavior", *Environment and Behavior*, 34(6): 740–56.
—— (2003) "Effects of values, problem awareness, and personal norm on willingness to reduce personal car use", *Journal of Environmental Psychology*, 23: 339–47.
Olofsson, A. and S. Ohman. 2006. "General beliefs and environmental concern: transatlantic comparisons", *Environment and Behavior*, 38: 768–90.
Oreg, S. and T. Katz-Gerro. (2006) "Predicting pro-environmental behavior cross-nationally: values, the theory of planned behavior and value–belief–norm theory", *Environment and Behavior*, 38: 462–83.
Routhe, A., R.E. Jones, and D. Feldman. (2005) "Using theory to understand public support for collective actions that impact the environment: alleviating water supply problems in a nonarid biome", *Social Science Quarterly*, 86(4): 874–97.
Schofer, E. and A. Hironaka. (2005) "The effects of world society on environmental protection outcomes", *Social Forces*, 84(1): 25–47.
Schultz, P.W. (2001) "The structure of environmental concern: concern for self, other people, and the biosphere", *Journal of Environmental Psychology*, 21: 327–39.
Schultz, P.W. and S. Oskamp. (1996) "Effort as a moderator of the attitude–behavior relationship: general environmental concern and recycling", *Social Psychology Quarterly*, 59(4): 375–83.
Schultz, P.W., V. Gouveia, L. Cameron, G. Tankha, P. Schmuck, and M. Franek. 2005. "Values and their relationship to environmental concern and conservation behavior", *Journal of Cross-Cultural Psychology*, 36(4): 457–75.
Schwenk, G. and Moser, G. (2009) "Intention and behavior: a Bayesian meta-analysis with focus on the Ajzen–Fishbein Model in the field of environmental behavior", *Quality and Quantity*, 43: 743–55.
Steg, L., L. Dreijerink, and W. Abrahamse. (2005) "Factors influencing the acceptability of energy policies: A test of VBN theory", *Journal of Environmental Psychology*, 25: 415–25.
Stern, P. (2000) "Toward a coherent theory of environmentally significant behavior", *Journal of Social Issues*, 56: 407–24.
Stern, P. and T. Dietz. (1994) "The value basis of environmental concern", *Journal of Social Issues*, 50: 65–84.
Stern, P., T. Dietz, and G. Guagnano. (1995) "The new ecological paradigm in social-psychological context", *Environment and Behavior*, 27: 723–45.
Stern, P., T. Dietz, T. Abel, G. Guagnano, and L. Kalof. (1999) "A value–belief–norm theory of support for social movements: the case of environmentalism", *Research in Human Ecology*, 6(2): 81–97.
Verba, S. (1996) "The citizen as respondent: sample surveys and American democracy", *American Political Science Review*, 90: 1–7.
Verba, S., N. Nie, and J. Kim. (1971) *The Modes of Democratic Participation*. Beverly Hills, CA: Sage.
Verba, S., K.L. Schlozman, and H.E. Brady. (1995) *Voice and Equality: Civic Voluntarism in American Politics*. Cambridge, MA: Harvard University Press.
World Values Survey. 2009. World Values Survey. 2005 Official Data File (v.20090901). World Values Survey Association (www.worldvaluessurvey.org). *Aggregate File Producer*: ASEP/JDS, Madrid.
Xiao, C. and R. Dunlap. (2007) "Validating a comprehensive model of environmental concern cross-nationally: A US–Canadian comparison", *Social Science Quarterly*, 88(2): 471–93.

27

Environmental citizenship

Global, local and individual

Derek Bell

The idea of environmental citizenship has "humble origins in a 1990s Environment Canada publication" (Paehlke 2008: 359). In the past 20 years, it has become a significant practical ideal in global environmental politics. It has been advocated by international organizations, such as the United Nations Environment Programme, as well as national governments and state agencies in countries as different as Canada and Qatar (see Chapters 8 and 12). It has also been promoted by various non-state actors, including the US-based Center for Environmental Citizenship and the Harvard Medical School Center for Health and the Global Environment (see Chapter 14). There is, by now, a basic understanding among those interested in environmental politics, and among some sections of the wider public, of the idea of environmental citizenship. The environmental citizen is someone who "does their bit" for the environment. At a (sceptical) minimum, the environmental citizen recycles and installs energy saving light bulbs. More ambitiously, and more generally, the environmental citizen is concerned about sustainability and, especially, about reducing or limiting their impact on the environment. In other words, talking about environmental citizenship is a popular way of reframing discussions of environmental responsibilities (and, sometimes, environmental rights).

There is a burgeoning literature on environmental citizenship that approaches the idea from various directions. This chapter covers only some of the issues raised in this literature (see also Chapter 26). I divide my discussion of environmental citizenship into four sections: environmental citizenship as a practical ideal; empirical studies of environmental citizenship; environmental citizenship in political theory; and challenges to environmental citizenship. This chapter gives particular attention to the explicitly political aspects of environmental citizenship. However, there are other important issues that I do not discuss here, including education for environmental citizenship (see, e.g., Dobson 2003: ch. 5 and Carlsson and Jensen 2006), environmental citizenship and learning (see, e.g., Gough and Scott 2006), and the psychology of environmental citizenship (see, e.g., Barr 2003).

In the first section I introduce the practical ideal of environmental citizenship. I outline several examples of the use of the idea by various political actors. I suggest that there are three common themes in these examples, which together constitute the practical ideal of environmental citizenship. In the second section, I turn to the academic work that has already been done on environmental citizenship. I begin by examining empirical studies of environmental

citizenship. I distinguish three kinds of empirical study and I illustrate each of them with examples from the literature. In the third section, I turn from the empirical to the normative. I discuss "liberal" and "post-cosmopolitan" defences of the practical ideal of environmental citizenship. In the fourth section, I consider three critical arguments that offer a normative challenge to this practical ideal. The final section is a concluding summary.

Environmental citizenship as a practical ideal

Environmental citizenship has been presented as a practical ideal by a diverse range of actors in environmental politics. For advocates of this ideal, the environmental citizen is to be commended and environmental citizenship is to be promoted. The first use of the term has been attributed to the Canadian environment agency, Environment Canada, in the 1990s (Paehlke 2008: 359; Agyeman and Evans 2006: 199). Environment Canada defines environmental citizenship as "a personal commitment to learning more about the environment and to taking responsible environmental action. Environmental citizenship encourages individuals, communities and organizations to think about the environmental rights and responsibilities we all have as residents of planet Earth. Environmental citizenship means caring for the Earth and caring for Canada" (Environment Canada 2006: 1). Environment Canada has continued to use the idea for almost 20 years, and a search of their website identifies almost 30 uses of the term in a range of documents, including educational materials for young people and international agreements for environmental cooperation with Peru and Chile.

The idea of environmental citizenship has also been used prominently by the United Nations Environment Programme (UNEP) since the early 1990s (UNEP undated). UNEP offers the following account of environmental citizenship:

> Environmental citizenship is an idea that can rally and mobilize the support of people and governments for the environment and sustainable development. It is based on the general principles of national citizenship – on the rights and duties of citizens of a country or nation – but goes beyond the social, economic, and political rights and duties of citizens and beyond the boundaries of national sovereignty. It emphasizes global environmental rights and duties, and considers the duty to conserve the environment, its natural resources and ecosystems as important as the right to use the fruits of the environment or its natural resources, and considers the entire environment of the Earth. It means caring for the environment wherever one is, regardless of one's nationality.
>
> (UNEP undated)

UNEP has produced a *Guidebook on Environmental Citizenship* to "help governments, communities, and civil societies to undertake policies and programs that support environmental sustainability and sustainable development" (UNEP undated). The UN has also funded, through the Global Environment Facility (GEF), a US$6m project called "Global Environmental Citizenship", which aimed to "generate public awareness, increase levels of understanding of global environmental issues and mobilize support in Latin American countries for the objectives of the GEF operational programmes" (GEF undated).

We can also find the idea of environmental citizenship being used in other countries and by an unexpectedly diverse range of state and civil society actors. Consider the following three examples. First, the Qatar Ministry of Environment website reports that one of the ministry's experts, Ahmed Hussein Abdurrahman, told school children on Qatar Environment Day that:

> It is a duty of each individual within society to preserve his environment through participation in cleaning and gardening campaigns … and called for implementation of the true environmental behaviour, which would make our environment permanently clean… Mr. Ahmed also spoke about the sustainable development targeted by the Qatar vision 2030 noting that sustainable development can be achieved through rational use of natural resources, either renewable or non-renewable … Environmental Citizenship requires recognition of living things to have their place in the environmental system and maintaining biodiversity in the environment, which creates sustainability for life.
>
> (Qatar Ministry of Environment undated)

Second, Harvard Medical School's Center for Health and the Global Environment has presented an annual "Global Environmental Citizenship Award" since 2001. The award "recognizes individuals who have made outstanding contributions to furthering knowledge about the global environment and promoting awareness about the urgent need to protect it. The annual award ceremony serves as an inspiration for guests to enhance their own sustainable actions" (Harvard Medical School 2012). Previous winners include Edward O. Wilson, Harrison Ford, Al Gore, HRH The Prince of Wales, Her Majesty Queen Noor, and most recently, Gisele Bündchen and Alec Baldwin. In 2012, tickets for the awards dinner were priced at US$1,000 per person and the money raised went to support the Center's work. Third, the University of Guelph in Canada advertises a "Certificate in Environmental Citizenship", which is "beneficial to those who want to learn more about the global environmental issues facing us today and in the future. Participants gain in-depth knowledge about environmental changes, their global impact, and how one can directly contribute to the environment's sustainability" (University of Guelph 2012).

There are, at least, three common themes in these examples. First, the environmental citizen should be concerned about more than their local environment. In some examples, the focus on the "global" is built into the concept – "*global* environmental citizenship" rather than merely "environmental citizenship". In other examples, environmental citizenship appears to begin with the local and extend to the global (e.g., in the Environment Canada definition or in the Qatari example). Second, environmental citizenship is concerned with environmental duties or responsibilities at least as much as, and probably more than, it is concerned with environmental rights. In some examples, environmental rights and duties are both emphasized (e.g., in the UNEP definition). In other examples, the focus is entirely on our duties (e.g., the Environment Canada and the Qatari examples) or, more generally, on taking action to promote environmental sustainability (e.g., the Harvard and Guelph examples). Third, the environmental citizen should be concerned about his or her individual everyday behaviours and their direct impact on the environment. For the environmental citizen, citizenly action is not confined to collective action in the public sphere, such as campaigning (or even voting) for "green" policies. Instead, the private sphere of everyday life is an arena in which each individual can undertake more or less sustainable actions. The environmental citizen chooses more sustainable actions. In some examples, individual action in the private sphere and collective action in the public sphere are both identified as forms of environmental citizenship action (e.g., UNEP and Harvard). In other examples, the emphasis seems to be primarily on individual action in the private sphere (e.g., Environment Canada and Qatar).

In sum, the practical ideal of the environmental citizen depicts someone who is concerned about the global (and probably the local) environment, acknowledges that he or she has environmental duties (and probably has environmental rights), and is concerned about the environmental impacts of his or her individual everyday behaviour in the private sphere (and possibly his or her role in collective decision-making in the public sphere).

Empirical studies of environmental citizenship

The discursive use of the ideal of environmental citizenship by both state and non-state actors in environmental politics has led to a growing number of empirical studies of environmental citizenship. We might distinguish three types of empirical study. In the first type of study, the researcher attempts to provide a "thick description" of environmental citizens: What do they do? How do they live? What do they believe? What do they value? What are their attitudes? These studies begin from the assumption that there are environmental citizens "out there" in the world and the aim of the research project is to understand them better. In a second type of empirical study, the aim of the research is to discover whether there are any environmental citizens: Do they exist? Where can we find them? Understood in this way, we begin from a theoretical account (or definition) of environmental citizenship and we study a (large or small) group of people to determine whether any of them can be accurately categorized as environmental citizens. In the third type of empirical study, the aim of the research is to consider whether those engaged in a particular practice are environmental citizens. Again, this type of study begins from an account of environmental citizenship and examines the characteristics of the practice and those engaged in it to determine whether it is a practice that is consistent with the values, beliefs and behaviours of the environmental citizen. Of course, some studies do not fall neatly into one "ideal type" because they aim to contribute to our understanding of environmental citizenship in more than one way. Moreover, there are some studies that explicitly distinguish more than one conception of environmental citizenship so that they are looking not for evidence of a singular environmental citizenship but rather for evidence of competing accounts of environmental citizenship. In this section, I present a "taster" of some of the empirical work on environmental citizenship with some examples of each of the three main types of study.

A good example of the first kind of study is Dave Horton's (2006) study of environmental activists as "elite" environmental citizens. Horton (2006: 132) argues that green activists can be understood to be "demonstrating one form of environmental citizenship." Horton's ethnographic study of activists in Lancaster aims to describe the "lifestyles of green activists, examining how these lifestyles are produced and reproduced" (Horton 2006: 133). He argues that the green lifestyles of these "elite" environmental citizens "emerge from a shared green culture", which he characterizes in terms of its "networks, spaces, materialities, and times" (Horton 2006: 127, 133). Horton's environmental citizens/activists participate in "green networks" that are "powerfully productive of green performances" (Horton 2006: 133). They learn green cultural codes and ways of talking through everyday interaction with other environmental activists in particular "green places" (Horton 2006: 136). Horton argues that "specific material objects facilitate the greening of lifestyle", including "bicycles, organic food, and walking boots" as well as Internet and email, while "[other] objects hinder the greening of lifestyle, and so it is their absence that is important", such as "the car and the television" (Horton 2006: 138). Horton argues that the lesson we should learn from his study is that we are unlikely to be able to successfully promote pro-environmental behaviour directly. Instead, "broadening environmental citizenship" is only likely to be possible through the promotion of a "green architecture" or a green culture "from which specific behaviours emerge" (Horton 2006: 145).

A good example of the second kind of study is Sverker Jagers and Simon Matti's attempt to discover whether the "average [Swedish] citizen is a latent ecological citizen, willing to take on a greater pro-environmental responsibility and responsive to a new set of motivational factors" (Jagers and Matti 2010: 1056). Jagers and Matti define "ecological citizenship" with reference to Dobson's account (see below), emphasizing the three features that we saw in our discussion (in the first section above) of the practical ideal of environmental citizenship: the environmental

or ecological citizen's concern extends beyond the local environment; he or she focuses on their environmental duties rather than their rights; and he or she is concerned about their individual acts in the private sphere. Building on this conception of ecological citizenship, they attempt to "operationalize" it by drawing on a value–belief–norm (VBN) model from environmental psychology to present an account of the "basic values", "environmental specific beliefs" and "behavioural readiness" that we might expect from the ecological citizen (Jagers and Matti 2010: 1061–2; see Chapter 26). They examine the data from a survey of 1,207 Swedish households, conducted as part of a Sustainable Households research programme funded by the Swedish Environmental Protection Agency, to see whether they find evidence of values, beliefs and behaviours consistent with ecological citizenship (Jagers and Matti 2010: 1057). They conclude that a "value base consistent with [ecological citizenship], emphasizing non-territorial altruism and the primacy of social justice, already exists among a significant share of Swedes" (Jagers and Matti 2010: 1075). Jagers and Matti's attempt to use large-n survey data to look for evidence of ecological or environmental citizenship has not yet been replicated in other countries (or with a representative sample of Swedes) but there have been (and continue to be) many national and cross-national studies of environmental values, beliefs, attitudes and behaviours, which might be used to test for further evidence of (latent or actual) environmental citizenship.

The use of small-n qualitative studies to look for evidence of environmental citizenship in particular groups has been more common. For example, Johanna Wolf and her colleagues conducted 86 interviews with residents, including 44 "key actors on climate and other environmental or local issues" and 42 people "representing a spectrum of the population at large", in two locations in British Columbia, Canada (Wolf et al. 2009: 508–9). They subsequently had a subset of 38 of those interviewees conduct a Q sort, which required them to rank a series of statements drawn from the interview data in terms of how strongly they agreed or disagreed with those statements (Wolf et al. 2009: 509). Like Jagers and Matti, their analysis is informed by Dobson's account of ecological citizenship and they emphasize the three features of Dobson's account that we also found in our discussion of the practical ideal of environmental citizenship (above in the first section of this chapter). Wolf et al. found evidence of ecological citizenship among their interviewees:

> Ecological citizenship is enacted by participants of this study who perceive a sense of responsibility for their contribution to climate change…acting as a responsible citizen is one of the most important features of participants' responses to climate change. In their understanding, climate change is at least in part caused by individuals' daily activities associated with a northern living standard. To attempt to remedy this, and reduce their perceived contribution to emissions, participants change their behavior.
>
> (Wolf et al. 2009: 518)

Many of the interviewees recognized a ("non-reciprocal") duty to distant strangers (outside Canada) to change their individual everyday behaviour in the private sphere to reduce their greenhouse gas emissions and thereby reduce their contribution to the harms associated with climate change (Wolf et al. 2009: 518; on climate change, see Chapter 28).

Other small-n qualitative studies with different groups of people have found less evidence of environmental citizenship. For example, Rob Flynn and his colleagues carried out nine focus groups with members of the general public in three areas of the UK – Teesside, south-west Wales and London – "to explore people's understandings of energy and environmental issues and their attitudes towards new hydrogen technologies" (Flynn et al. 2008: 772). Flynn et al. looked for evidence of environmental citizenship among the participants in their focus groups but they

found that "Some people indicated that they might try to alter their consumption or approve stricter environmental controls if it was beneficial to their own and their children's health, but their concern for 'global' matters, or even other regions of the country, was more limited or even absent" (Flynn et al. 2008: 780). They found little or no evidence of the research participants' concerns extending beyond the local and little evidence that they recognized a duty or responsibility to change their everyday consumption behaviour. Instead, they found that "attitudes seemed to converge on instrumental and privatized outlooks" rather than concern for the "common good" (Flynn et al. 2008: 781).

It is unsurprising that small-n qualitative studies with very different groups of people find different numbers of environmental citizens. We are more likely to find environmental citizens – or those who share (to some degree) the values, beliefs and behaviours associated with the practical ideal of environmental citizenship – in some places than we are to find them in other places. Small-n qualitative studies can help us understand better the conditions under which environmental citizenship is likely to flourish as well as allowing us to develop a more nuanced understanding of different instantiations or forms that environmental citizenship may take in different places and contexts.

The third type of empirical study of environmental citizenship shifts the focus from looking for evidence of environmental citizenship in a sample of the population of a country or a region to looking for evidence of environmental citizenship among those engaged in a particular practice. For example, Neil Carter and Meg Huby consider whether either individual or institutional ethical investors are "ecological citizens" (Carter and Huby 2005: 262). They also define "ecological citizenship" with reference to Dobson's account – again emphasizing the three features that we identified as common themes in our discussion of environmental citizenship as a practical ideal (Carter and Huby 2005: 262). Carter and Huby draw on data from a large survey of individual ethical investors to argue that individual ethical investors are ecological citizens according to Dobson's definition (Carter and Huby 2005: 262). However, they reject the extension of the notion of ecological citizenship to institutional investors because they have doubts about the idea of "corporate citizenship" and they believe that corporate decisions "tend to be dominated by their fiduciary duties" (Carter and Huby 2005: 264, 268).

Another interesting example of this type of study is Gill Seyfang's discussion of whether sustainable consumption is an act of "ecological citizenship" (Seyfang 2005: 291). On her account, the defining feature of ecological citizenship is the duty "to minimise the size and unsustainable impacts of one's ecological footprints" (Seyfang 2005: 291). She argues that the "mainstream" conception of sustainable consumption as "consumption of more efficiently produced goods" by "green" consumers who "demand sustainably produced goods and exercise consumer choice to send market signals" is not a genuine form of "ecological citizenship" (Seyfang 2005: 294). The ecological citizen's duty to reduce the size of their ecological footprint may "require an absolute reduction in consumption" rather than sustainable consumption (Seyfang 2005: 297). Moreover, it is very unlikely that individual acts of sustainable consumption will have a lasting effect on the practices of transnational corporations (Seyfang 2005: 296–7). However, Seyfang is more optimistic about "new economics" approaches to sustainable consumption, which reject the mainstream commitment to continued economic growth (Seyfang 2005: 299; Seyfang 2009). For example, she suggests that participation in "localised food supply chains" may be an act of ecological citizenship because they "avoid unnecessary global food transportation (cutting 'food miles') and reconnect local communities with farmers and the landscape" (Seyfang 2005: 300; see Chapter 40). Similarly, participation in "non-market exchange mechanisms", such as time banks and Local Exchange Trading Schemes (LETS), is an act of ecological citizenship because

these "community currencies" provide a "space for expressing political vision about economic, social and environmental governance" (Seyfang 2005: 301–2).

We have seen that much of the empirical work on environmental citizenship uses a conception of it that reflects the key features of the practical ideal of environmental citizenship (identified in the first section of this chapter). However, the empirical work also draws explicitly on some of the work in environmental political theory that has tried to provide a theoretical and normative justification for environmental citizenship. In particular, the empirical studies make use of Andrew Dobson's conception of ecological citizenship. In the next section, I briefly review the discussion of environmental citizenship in political theory before, in the final section of the chapter, considering some of the theoretical challenges to environmental citizenship.

Environmental citizenship in political theory

As we might expect, political theorists have offered different accounts of environmental citizenship and different normative justifications or interpretations of those accounts. The most influential theoretical discussion of environmental citizenship is Dobson's book *Citizenship and the Environment* (2003). Dobson distinguishes "environmental citizenship" from "ecological citizenship". He defines "environmental citizenship" as a version of liberal citizenship which "extend[s] the discourse and practice of rights-claiming into the environmental context" (2003: 89). On this account, environmental citizenship simply extends the liberal list of rights beyond civil, political and economic rights to include environmental rights (i.e., rights to environmental goods or to protection from environmental bads). This conception of environmental citizenship is quite different from the notion of environmental citizenship that we saw in our discussion of the practical ideal (in the first section of this chapter). First, it is not global in its scope: the environmental citizen's rights are rights held against his or her own state. Second, it is concerned with rights not duties. Third, because it is not concerned with duties, it does not require individual action in the private sphere (or collective action in the public sphere) to protect the environment.

The "gap" between Dobson's "liberal" version of "environmental citizenship" and the practical ideal of it has encouraged some liberals to argue that Dobson mischaracterizes "liberal environmental citizenship". For example, Simon Hailwood argues that political liberalism (as defended, most notably, by John Rawls) can be extended to defend a notion of "reasonable environmental citizenship", which requires citizens to acknowledge duties (as well as rights) to distant strangers (not just those in their locality) that require changes in their individual everyday behaviour in the private sphere (as well as in the public sphere) (Hailwood 2005: 204). Hailwood's account also has the distinctive additional feature that he seeks to justify citizenship duties to non-human nature on the grounds that liberal "reasonableness" requires respect for the "otherness" of non-human nature as an extension of the respect that political liberals believe is owed to human "others" who do not share their comprehensive metaphysical, moral and religious doctrines (Hailwood 2005: 196). So, for Hailwood, Dobson is wrong to think that a liberal conception of environmental citizenship must be concerned only with rights. Instead, it can be concerned with a broader range of duties than is commonly recognized in the practical ideal of environmental citizenship (or in Dobson's own account of "ecological citizenship").

I have also previously defended an account of "liberal environmental citizenship" that draws on a cosmopolitan version of Rawlsian political liberalism (Bell 2005). My account begins from

the recognition that it is "a common criticism of 'mainstream' liberal conceptions of citizenship that they ignore the fact that members of the political community are embodied individuals living in a physical environment" (2005: 182). However, I argue that this criticism is only partly correct. Contemporary political liberalism does not ignore our embodiment. On the contrary, it is fundamentally (and rightly) concerned with the ability of humans to meet our physical needs for "food, clothing, shelter and health care" (Bell 2005: 182). Moreover, political liberalism does not ignore the fact that we live in a physical environment. However, it does adopt a particular conception of the relationship between humans and the environment: the environment "is conceptualised as property to be owned" by humans (Bell 2005: 182). I argue that this conception of the environment as property is inconsistent with political liberalism's own commitment to the "fact of reasonable pluralism" (Bell 2005: 183):

> For political liberals, the "fact of reasonable pluralism" – the fact that there is a multiplicity of reasonable moral doctrines held by reasonable people – means that it is unreasonable to defend principles of political justice that will govern the basic institutions of society by appealing to controversial moral claims. Therefore, controversial metaphysical and moral claims about the environment and our proper place in it cannot be used to justify principles of political justice.
>
> (Bell 2005: 184 quoting Rawls 2001: 3)

Basing principles of political justice on a "thoroughgoing conception of the environment as property" is inconsistent with liberal pluralism in the same way that basing principles of political justice on a Buddhist, Christian or secular ecocentric conception of the environment would be inconsistent with liberal pluralism (Bell 2005: 184). Instead, I suggest that we should acknowledge that the relationship between humans and the environment is a "subject about which there is reasonable disagreement" while also acknowledging that human survival is dependent on the environment or, in other words, the environment is the "provider of [our] basic needs" (Bell 2005: 184–5).

I argue that we can draw some substantive conclusions about the rights and duties of "liberal environmental citizens" from this account. More specifically, I defend "substantive environmental rights", such as rights to (adequately) clean air and water (Chapter 34), which are necessary to meet our basic needs, as well as procedural rights to defend our substantive environmental rights (Bell 2005: 187). In addition, I argue that liberal environmental citizens will have three kinds of duties: the "duty to obey just [environmental] laws"; the "duty to promote just environmental laws"; and some "non-enforceable…citizens' duties" to undertake individual pro-environmental behaviours in the private sphere (Bell 2005: 189, 191). In sum, I claim to offer a liberal justification of the three key features of the practical ideal of environmental citizenship: the liberal environmental citizen has duties (as well as rights) to protect the environmental rights of distant strangers (as well as those people living in his/her local environment) by changing his or her individual behaviour in the private sphere (as well as actively seeking to promote just environmental laws in the public sphere).

Unsurprisingly, the attempt to construct a cosmopolitan liberal defence of the practical ideal of environmental citizenship is not satisfying for those who are unconvinced by the merits of liberalism. So, for example, John Barry has argued that the civic republican tradition in political theory is a more attractive starting point for an account of environmental citizenship because it is more explicitly concerned with the "common good" and with "active" rather than "passive" forms of citizenship (Barry 2006: 26). Dobson also suggests that the civic republican tradition has more to offer than the liberal tradition but he argues that both traditions provide an inadequate

framework for thinking about citizenship in a "globalizing world" (Dobson 2003: 49). Dobson proposes a new "post-cosmopolitan" account of "ecological citizenship" as an alternative: "At first blush, then, ecological citizenship deals in the currency of non-contractual responsibility, it inhabits the private as well as the public sphere, it refers to the source rather than the nature of responsibility to determine what count as citizenship virtues, it works with the language of virtue, and it is explicitly non-territorial" (2003: 89). Dobson's conception of "ecological citizenship" shares the key features of the practical ideal of environmental citizenship (as identified in the first section of this chapter). However, he offers a novel normative justification of them.

Dobson proposes a "non-contractual" account of responsibility. He claims that "the contractual idiom" is "very common" in discussions of citizenship where "[Citizenship] is regarded as a contract between the citizen and the state", which protects the citizen's rights in return for the payment of taxes (Dobson 2003: 44). He argues that contractual conceptions of citizenship reflect a particular (liberal) "ideological" approach to citizenship (2003: 46). Instead, he proposes that we might have responsibilities that are "*unreciprocated and unilateral* citizenship obligations": obligations or duties that can be owed by a citizen without either the state or any other agent owing anything in return (Dobson 2003: 47). He suggests that the "*source*" of these new obligations of ecological and post-cosmopolitan citizenship is the capacity of the affluent in the global North "to 'always already' act on others" (rather than a contract between a citizen and a state) (Dobson 2003: 48, 50). In a "globalizing world" the "inhabitants of globalizing nations are *always already* acting on others, as when…our use of fossil fuels causes the release of gases that contribute to global warming. It is this recognition that calls forth the virtues and practices of citizenship" (Dobson 2003: 49). The global North's "antecedent action" of "narrowing the South's options" through our overly large "ecological footprints" and our causal contribution to environmental pollution generates "political [or citizenship] obligations of a non-reciprocal and unilateral type" (Dobson 2003: 50).

Dobson's "post-cosmopolitan" argument offers another way of justifying the key features of the practical ideal of environmental citizenship. First, the ecological citizen is concerned with more than the local. However, Dobson's account is not simply global; it is "non-territorial" (Dobson 2003: 89). Traditional conceptions of citizenship are territorial: the citizens of a state share a territory and non-citizens live (or originate) outside that territory. Dobson distinguishes two ways in which a conception of citizenship might be non-territorial. Cosmopolitan (liberal) citizenship is non-territorial because it invokes the idea of a global political community. In contrast, ecological citizenship is non-territorial because the shared political "community" of ecological citizens is "'produced' by the activities of individuals and groups with the capacity to spread and impose themselves in geographical and diachronic space. This produced space has no determinate size [or territory] (it is not a city, or a state, and nor is it even 'universal') since its scope varies with the case" (Dobson 2003: 81). On this account, ecological citizenship is "a citizenship with international and intergenerational dimensions" and, in a context where our acts have global consequences, it is a citizenship with global reach (Dobson 2003: 49).

Second, ecological citizenship is concerned only with "non-reciprocal and unilateral" duties or obligations; it does not pay attention to environmental rights (Dobson 2003: 50). Dobson suggests that the "principal ecological citizenship obligation" is "to ensure that [one's] ecological footprint does not compromise or foreclose the ability of others in present and future generations to pursue options important to them" (Dobson 2003: 91, 92) Third, ecological citizenship "inhabits the private [sphere] as well as the public sphere" (2003: 89). Dobson endorses the "central feminist point", which is that "the private sphere is a site of the exercise of power" and, therefore, we must "politicize the private sphere" (Dobson 2003: 53). On his "post-cosmopolitan" account, "ecological citizenship" also "inhabits" the private sphere because our "private acts have

public implications": if individuals do not "reduce, reuse and recycle in their own homes" or, more generally, reduce the size of their "ecological footprint", their private acts of consumption will causally contribute to the public problem of environmental pollution (Dobson 2003: 56 and 55 quoting Kymlicka and Norman 1994: 360).

Challenges to environmental citizenship

Dobson's defence of "ecological citizenship" has been criticized by liberal cosmopolitans. I have argued elsewhere that his "post-cosmopolitanism" is not a genuine alternative to liberal cosmopolitanism but rather depends on a cosmopolitan theory of justice that claims that everyone on the planet should have a fair share of ecological space (Bell 2003, 2012; see also Hayward 2006). More generally, the practical ideal of environmental citizenship, which all of the accounts discussed in the previous section of this chapter have tried to defend in some form, has been challenged in a number of ways. In this section, I will briefly outline three challenges to the practical ideal of environmental citizenship.

First, there is the "social justice" challenge. Julian Agyeman and Bob Evans have argued that "Environmental citizenship is not, in our view, a particularly useful term on which to base political action…[To] focus on *the environment*…is to underplay the broader social as well as political dimensions implicit in the concept of sustainability or sustainable development. In particular, the key questions of equity…tend to be marginalized" (Agyeman and Evans 2006: 186; original emphasis). They argue that the "narrow" focus on the environment leads us to neglect the connections between environmental, social, political and economic injustices: "Environmental injustice is a result and cause of social, economic and racial inequity" (Agyeman and Evans 2006: 190; see Chapter 24). They argue that "just sustainability", which encompasses these broader concerns, is a better practical ideal than environmental citizenship (Agyeman and Evans 2006: 200). John Barry is less resistant to the notion of "citizenship" but he too draws attention to the importance of a broader concern with "sustainability" (Barry 2006: 24). For him, "sustainability citizenship…is a more ambitious, multifaceted, and challenging mode of green citizenship" because it "focuses on the underlying structural causes of environmental degradation and other infringements of sustainable development such as human rights abuses or social injustice" (Barry 2006: 24).

Second, there is the "de-politicization" challenge. Alex Latta argues that discussion of environmental citizenship in the "existing literature tends to treat ecological citizenship primarily as a normative and institutional tool for promoting a greener future" (Latta 2007: 379). He argues that many accounts of environmental citizenship, including Dobson's ecological citizenship and Bell's liberal environmental citizenship, are concerned with the "ethical or moral realignment of attitudes" (Latta 2007: 379). This is an "instrumentalisation of citizenship for the achievement of sustainable development or some other notion of green ends" (Latta 2007: 385; see also Gabrielson 2008). It de-politicizes both the idea of citizenship and the human–nature relationship by offering a normative account of environmental citizenship attitudes and behaviours that precedes and is independent from *real* political debates between *real* citizens about environmental rights and responsibilities for sustainability. Instead, Latta argues that we should understand environmental citizenship as "an emergent property of *existing* struggles for sustainability and political–ecological rights" (Latta 2007: 388; original emphasis). On this account, the role of the normative theorist is to interpret the claims of *real* political agents (or activist citizens) and to contribute to their struggles by providing theoretical support for their claims. In this context, "normative theorising must remain provisional and fluid, attentive to the emerging spaces and actors of ecological politics" (Latta 2007: 391).

Third, there is the "governmentality" critique of environmental citizenship. Sherilyn MacGregor suggests that the promotion of environmental citizenship, especially through education, can "become a way of disciplining the population to internalize a set of rules for behaviour – to become self-governing – thereby justifying minimal state intervention" (MacGregor 2006: 115; see also Darier 1996). MacGregor, like Latta, is concerned that the practical ideal of environmental citizenship (and its theoretical defence by Dobson and others) de-politicizes the politics of the environment and sustainability. However, she believes that environmental citizenship is "an undesirable ideal for guiding socio-political or ecological movements" because there is a "dangerous dovetail" between environmental citizenship and the dominant neoliberal discourse that seeks to "relieve the duty of government to provide goods and services to the population" (MacGregor 2006: 116, 113, 114). Environmental citizenship "place[s] the onus on individuals…to become more educated about environmental issues, to make the necessary changes to their own outlook and behaviours" (MacGregor 2006: 115). In other words, it privatizes responsibility for environmental problems that can only be tackled through political action that challenges the power of corporate and other vested interests. For MacGregor, environmental citizenship is dangerous because it is "an effective way to 'greenwash' neoliberal resistance to green regulation" (MacGregor 2006: 116).

The critics of environmental citizenship raise important concerns about the practical ideal of environmental citizenship and the theoretical defences that have been offered to support it. However, the advocates of environmental citizenship may be able to address or accommodate some of these concerns. For example, Dobson would reject the claim that he is only concerned about the environment rather than a broader notion of sustainability while Bell explicitly argues for the politicization of discussions of individual responsibility (Dobson 2003, 1998; Bell 2005).

Conclusion

Environmental citizenship has achieved some prominence as a practical ideal advocated by various state and non-state actors involved in global environmental politics. As a result, there are a growing number of empirical studies of environmental citizenship, which aim to discover whether there are any environmental citizens, how environmental citizens live, and what practices are consistent with environmental citizenship. These studies tend to conceptualize environmental citizenship in line with the practical ideal of environmental citizenship familiar from policy and practice. They draw on accounts of environmental citizenship developed by normative political theorists, especially the "post-cosmopolitan" theory of "ecological citizenship" proposed by Andrew Dobson.

There are significant debates between normative theorists about how the practical ideal of environmental citizenship should be defended – and about the precise rights and duties of the environmental citizen. Moreover, there are critics who argue that the practical ideal of environmental citizenship is morally and politically suspect: it focuses too narrowly on the environment and ignores issues of social, political and economic justice; it threatens to de-politicize both the politics of citizenship and the politics of nature; and it is complicit in the neoliberal agenda of privatizing and individualizing responsibility for environmental problems that can only be solved by collective political, and ultimately state, action.

References

Agyeman, J. and Evans, B. (2006) "Justice, Governance and Sustainability: Perspectives on Environmental Citizenship from North America and Europe", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.

Barr, S. (2003) "Strategies for Sustainability: Citizens and Responsible Environmental Behaviour", *Area* 35: 227–40.
Barry, J. (2006) "Resistance is Fertile: From Environmental to Sustainability Citizenship", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.
Bell, D. (2003) "Environmental Citizenship and the Political", paper presented at Citizenship and the Environment workshop, Newcastle, 27 October.
—— (2005) "Liberal Environmental Citizenship", *Environmental Politics* 14: 179–94.
—— (2012) "Climate Change and Cosmopolitan Citizenship", unpublished paper.
Carlsson, M. and Jensen, B. (2006) "Encouraging Environmental Citizenship: The Roles and Challenges for Schools", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.
Carter, N. and Huby, M. (2005) "Ecological Citizenship and Ethical Investment", *Environmental Politics* 14: 255–72.
Darier, E. (1996) "Environmental Governmentality: The Case of Canada's Green Plan", *Environmental Politics* 5: 585–606.
Dobson, A. (1998) *Justice and the Environment: Conceptions of Environmental Sustainability and Dimensions of Social Justice*, Oxford: Oxford University Press.
—— (2003) *Citizenship and the Environment*, Oxford: Oxford University Press.
Environment Canada (2006) *From the Mountains to the Sea: A Journey in Environmental Citizenship*, Ottawa: Environment Canada.
Flynn, R., Bellaby, P. and Ricci, M. (2008) "Environmental Citizenship and Public Attitudes to Hydrogen Energy Technologies", *Environmental Politics* 17: 766–83.
Gabrielson, T. (2008) "Green Citizenship – A Review and Critique", *Citizenship Studies* 12: 429–46.
Global Environment Facility (GEF) (undated) "Global Environmental Citizenship". Available HTTP: <http://gefonline.org/projectDetailsSQL.cfm?projID=464> (accessed 21 April 2012).
Gough, S. and Scott, W. (2006) "Promoting Environmental Citizenship through Learning: Toward a Theory of Change", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.
Hailwood, S. (2005) "Environmental Citizenship as Reasonable Citizenship", *Environmental Politics* 14: 195–210.
Harvard Medical School (2012) "Global Environmental Citizenship Awards". Available HTTP: <http://chge.med.harvard.edu/awards/2001–10-global-environmental-citizen-awards> (accessed 21 April 2012).
Hayward, T. (2006) "Ecological Citizenship: Justice, Rights and the Virtue of Resourcefulness", *Environmental Politics* 15: 435–46.
Horton, D. (2006) "Demonstrating Environmental Citizenship? A Study of Everyday Life among Green Activists", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.
Jagers, S. and Matti, S. (2010) "Ecological Citizens: Identifying Values and Beliefs that Support Individual Environmental Responsibility among Swedes", *Sustainability* 2: 1055–79.
Kymlicka, W. and Norman, W. (1994) "Return of the Citizen", *Ethics* 104: 352–81.
Latta, A. (2007) "Locating Democratic Politics in Ecological Citizenship", *Environmental Politics* 16: 377–93.
MacGregor, S. (2006) "No Sustainability without Justice: A Feminist Critique of Environmental Citizenship", in A. Dobson and D. Bell (eds) *Environmental Citizenship*, Cambridge, MA: MIT Press.
Paehlke, R. (2008) "Book Review: 'Andrew Dobson and Derek Bell (Eds) *Environmental Citizenship*. Cambridge, MA: MIT Press, 2006'", *Organization and Environment* 21: 359–61.
Qatar Ministry of Environment (undated) "Ministry of Environment Organizes Awareness Lecture on Environmental Citizenship for the Students of Tarek Bin Ziyad School". Available HTTP: <http://www.moe.gov.qa/English/News/Local/Pages/Ministry-of-Environment-organizes-awareness-lecture-on-Environmental-Citizenship-for-the-Students-of-Tarek-Bin-Ziyad-School.aspx> (accessed 21 April 2012).
Seyfang, G. (2005) "Shopping for Sustainability: Can Sustainable Consumption Promote Ecological Citizenship?" *Environmental Politics* 14: 290–306.
—— (2009) *The New Economics of Sustainable Consumption: Seeds of Change*, Basingstoke: Palgrave Macmillan.
United Nations Environment Programme (UNEP) (undated) "What is Environmental Citizenship?" Available HTTP: <http://www.unep.or.jp/ietc/publications/integrative/ims5/1.asp> (accessed 21 April 2012).
University of Guelph (2012) "Certificate in Environmental Citizenship". Available HTTP: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c11-certdip-envcit.shtml> (accessed 21 April 2012).
Wolf, J., Brown, K. and Conway, D. (2009) "Ecological Citizenship and Climate Change: Perceptions and Practice", *Environmental Politics* 18: 503–21.

Part IV

Key issues and policies in global environmental politics

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Energy and climate change

Hugh C. Dyer

Energy and climate change have become related issues in recent political discourse, reflecting changes in global politics. The issues are linked, but they have typically been treated separately. This chapter explores the relationship between energy and climate as a strategic pair. This does not imply, however, that they are necessarily complementary policy goals. Each is a challenge for actors with critical roles in setting the global agenda, where incoherence and competing political priorities undermine coordinated, consistent policy. At the same time, there are opportunities for encouraging behavioural modification ("nudging") and social action to support political change toward environmental protection and efficient energy (see Chapter 26). The confluence of energy and climate policy – at the point where carbon is released into the atmosphere from the burning of fossil fuels – may suggest potential benefits of a "win–win" approach by which both policy goals are achieved through "efficiency" and innovation. However, efficiency and innovation alone are not likely to reduce the overall use of carbon-based energy or reduce climate impacts, and there is seldom room in daily politics for energy sufficiency or urgent policies to address climate change. The consequences are uncoordinated tensions rather than coherent solutions, even as climate change and related energy policies become more central to social and political agendas.

Climate change is complex and involves many factors, significant among which is human activity; of particular concern is the emission of carbon dioxide through combustion of fossil fuels. As a key source of energy for economic development, fossil fuels are the chief anthropogenic (human) source of carbon emissions that alter the natural balance of the Earth's carbon cycle and cause global warming (increased average global temperature). In the natural course of events carbon is released into the atmosphere and extracted from the atmosphere in comparable amounts by natural processes, as carbon sources such as plant respiration and geological activity are matched by sinks such as plant photosynthesis and dissolution in water. When humans burn fossil fuels or reduce plant growth, the sources and sinks are thrown out of balance. The additional carbon dioxide in the atmosphere contributes, along with other "greenhouse gases", to what is sometimes referred to as the "greenhouse effect", whereby heat that would otherwise escape the atmosphere is reflected and trapped, which leads to global warming and climate change. The use of fossil fuels releases carbon previously sequestered beneath the Earth's surface into the atmosphere, overstretching the ability of natural sinks to recapture it. Hence the

relationship between fossil fuel energy consumption and climate change is direct; if human activity is not the only factor in determining the climate, it is one that is causing unnatural change.

Recognition of this problem led to a range of policy responses and international agreements, including the 1992 UN Framework Convention on Climate Change (UNFCCC) and its 1997 Kyoto Protocol. The International Panel on Climate Change, established in 1988 by the United Nations Environment Programme and the World Meteorological Organization, provides a scientific consensus to inform climate policy. The current situation is that policies are generally inadequate to the scale of the problem, and continuing international agreement is troubled by a lack of universal commitment. To varying degrees, countries, cities and citizens have taken steps to reduce their "carbon footprint" (that is, to mitigate the climate effects of their behaviours and activities), as well as preparing for inevitable change (that is adapting to climate impacts) (see Chapters 14 and 27). The overall impact of such measures is limited in a world of increasing population and economic growth, with the attendant increase in energy consumption. The only solutions are to develop alternative non-carbon or low-carbon energy sources, or to reduce energy consumption through efficiency or abstinence – that is, to stop burning fossil fuels. As the global economy and human livelihoods are currently heavily dependent on fossil fuels, this is a great economic and social challenge, and thus a significant political issue.

Energy and climate in a political context

Policy debates offer insight into the nature of the "political community" of energy and climate. In the case of climate change, individual and collective responsibility is an important consideration because it extends the scope of political community beyond the current generation and beyond the human agent (see Chapters 14 and 27). While energy and climate have received individual attention, the connection between the two issues has come into focus in recent years. The International Energy Agency relates energy markets to "energy security, environmental protection and economic development", and it analyses related "strategic issues" (International Energy Agency 2012). However, it is focused on energy, and still largely if not exclusively on fossil fuels. The connections between energy, climate and economic development goals are such that "an aggressively single-minded pursuit of energy security will compromise these other goals", with current policy a "hotchpotch of measures unlikely to deliver", which suggests policy incoherence (Oxford High-Level Task Force 2007).

Even as energy and climate change are identified with one another as policy areas, the focus is typically on one or the other without considering the hidden tension between them. There is little discussion of reductions in consumptive lifestyle expectations and declining or altered economic growth. This calls attention to contradictory and complementary aspects of energy provision and climate protection as strategic goals, and the coherence of policy in these areas. Recognition of the strategic importance of energy and climate is illustrated, for example, by the inclusion of these issues in the US–China Strategic and Economic Dialogue, with climate and energy cooperation featuring in the strategic track and supported by a "Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and Environment" (US Department of State 2011; Xinhua 2011). Even in quite recent history such political developments would have seemed unlikely, perhaps unthinkable. An agreement to "enhance cooperation" suggests limited cooperation thus far, and a "memorandum of understanding" suggests limited practical significance, yet that it should be deemed necessary at all is suggestive of strategic developments. The strategic content of the political debates emerges most clearly when the underlying characteristics of energy and climate issues are stripped down to potential consequences in terms of conflict and competition. As Shea (2006) points out, "All modern developed

economies are dependent upon an abundant supply of energy both in terms of guaranteed supplies and stable prices [making] energy security an issue of strategic importance."

The vulnerabilities in this perspective include lines of communication and transportation, energy distribution infrastructures, difficulty of increasing supplies or finding new energy resources to meet rising demand – particularly in rapidly developing economies – loss of overall energy production due to under-investment in development and infrastructure, and a lack of spare energy supply capacity, making even small decreases in supply significant for areas dependent on imported energy. In all of this, the dominant source of energy is fossil fuels. Where the risks and costs of climate change are identified, they struggle to acquire the political significance of energy supply (see Chapter 18). Thus energy and climate issues may be linked, but the economic threats of energy shortage are more immediately obvious in the political domain. If it has now become commonplace to identify energy and its climate corollary as significant strategic issues, they are not yet subject to coordinated planning. Even relatively uncontroversial alternative energy sources are not consistently supported, as evidenced by reductions in solar power feed-in tariffs in several countries, and ongoing objections to wind farm development in some areas. Only two countries, the United Kingdom and Mexico, have legally binding emissions goals to combat climate change (Cavanagh 2012). Delivering on such commitments remains an economic challenge. Other approaches include trading schemes that try and rationalize and normalize reduced carbon emissions in the economy by imposing a cap on overall emissions while allowing individual emitters to choose and plan their allowed emissions (although too much is still allowed).

Longer-term issues, such as environmental degradation, poverty and underdevelopment, and lack of human rights, which do not yet attract a sense of urgency, will be driven to the margins of the agenda (see Chapter 24). How, then, does a combined "energy and climate policy" locate itself in the mix of political orientations, and can it help us to appreciate longer-term issues of importance but little apparent urgency? For example, "peak oil" is the historical point – sometime about now – of the maximum rate of extraction of petroleum, beyond which (according to some experts) production declines as reserves are depleted. Yet, historical and ideological debates about the timing and implications of this peak struggle to define the level of urgency in our relationship to petroleum, with the only consensus being that we inhabit a global petroleum-based economy. Some actors appear to defend privileged interests in neoliberal economic policies based on assumptions of plentiful petroleum, while others purport to defend the interests of those who benefit less from the petroleum economy and have even more to lose if no preparation is made for a "low-carbon economy" – an economy less dependent on fossil fuels and carbon emissions, by energy and climate policy choice – let alone a "post-petroleum economy" – an economy not dependent on fossil fuels and carbon emissions (whether by energy and climate policy choice, or by lack of fuels). In our petroleum-based economy there are direct connections between petroleum and other resource extraction, production and distribution issues, and there is the connection with climate change and its implications in turn for the continued availability of other resources, such as food and water (see Chapters 34 and 40). Consequently, facing up to the importance of energy and climate policy is itself a matter of urgency.

As a commitment to energy and climate issues develops, establishing them as fundamental responsibilities of governance that are related to fundamental rights of individuals and communities, a new version of the social contract arises and brings with it a new political style and content (see Chapters 23 and 24). Both producers and consumers of oil have already begun to coordinate as energy markets themselves become a focus of government policy. For example, Saudi Arabia agreed to increase production in the face of an energy price crisis, but it called on consumers to manage demand as well. A Saudi Minister for Petroleum and Mineral Resources

emphasized the importance to producers of "access into the markets of oil importing countries, the steady share of oil in total energy consumption over the long term, and fair and stable prices that allow for their sustainable development over the lifetime of the resource" (Fattouh and van der Linde 2011: 61). Industrial states are also coordinating energy policy (E3G 2007), but they must do so alongside climate policy, with energy efficiency being the first step (Holmes and Mohanty 2012). Since fossil fuel energy consumption releases carbon dioxide – a chief source of global warming and long-term climate change – more efficient use of such energy would at least reduce the amount of carbon emitted for the same amount of economic activity. Efficiency would not, of course, reduce overall carbon emissions so long as the global economy continues to expand on the basis of fossil fuel consumption, and in the absence of globally agreed and effective emission limits.

Consequently, achieving the reversal of carbon emission trends that is necessary to address climate change is a huge systemic challenge. Furthermore, while addressing energy needs and avoiding climate change is in itself a gigantic task, these are not the only concerns of people and their governments. However, since energy and climate are so central to human existence, these issues together are likely to influence the wider pattern of political relations. This suggests that delivering energy and climate policy may involve the scale of cooperation and planning needed to address earlier systemic issues such as global depression and post-war reconstruction. To appreciate the political significance of energy and climate policy concerns for global environmental politics, it will be useful to expand on the political context in which they have emerged.

Energy

There is little doubt about the centrality of energy in our lives, and yet the implications of this obvious circumstance are perhaps too close to be seen clearly. Kimmins makes the point that all potential solutions to individual energy questions involve a social cost, an ethical dilemma and an impact on the way other problems are resolved. Thus, they can only be looked at within a broader consideration of the functioning of the world system of which energy is but one intimately woven component (Kimmins 2001: 35). This is slightly at odds with the narrow national perspectives of state governments, where energy supply is fundamental to a way of life and national security in that sense. Macfarlane (2007) entitles it, simply, "The Issue of the 21st Century". Kimmins also captures the intergenerational and forward-looking requirements for approaching energy policy in saying that "many ethical issues arise as a result of unequal access to energy and of the environmental repercussions" and this requires "that we consider the consequences for future generations of satisfying the energy needs of the present", while also pointing to the long-term requirement for renewable energy sources: "The only question is how rapidly we should move to such sources and what mix should be used in various parts of the world over time" (Kimmins 2001: 37, 38).

As Shea notes, "tightness in the market has re-ignited the debate over alternative energy supplies such as biofuels or solar power not to mention a renewed interest in nuclear power" (Shea 2006). As we see below biofuels present difficulties, and while there is some political support for the nuclear option it remains very controversial. Nuclear power raises significant issues from both ecological and human perspectives, whatever its short-term appeal as a panacea for addressing the twin challenges of energy and climate (since it provides ample energy and produces no carbon). The negative aspects of nuclear power are amply illustrated by the catastrophic events at Fukushima (and previous nuclear disasters such as Chernobyl) and subsequent policy reactions, such as in Germany, which has now turned away from nuclear energy.

A UNESCO ethics report questioned "whether we could really depoliticize choices about energy", and as "fossil fuel supplies were dwindling and climate change was accepted as a reality, clean renewable energies, like wind energy, geothermal, wave, tidal, hydropower, and photovoltaic were the way of the future" (UNESCO 2007: 5). Already river water supplies about a fifth of all electricity, and over 60 countries meet more than half their electricity requirements from hydropower, but the predictability and long-term future of this energy source is in question as the climate changes (Corley 2010; see Chapter 34). There is also some disparity in exploitation of hydropower potential, with Europe and North America largely developed and Africa hardly tapping this resource at all. In time photovoltaic solar might also generate a fifth of the world's energy (European Photovoltaic Industry Association and Greenpeace 2011). Of course none of these options are without implications, such as land use and demographics, nor do they offer the portability of petroleum fuels for air and sea transport purposes.

Potentially the entire energy system could be renewable in future, and economically beneficial rather than burdensome (Vad Mathiesen et al. 2011). As a practical matter, energy mix depends on "the existing governance and the international sourcing or supply chain of energy" and there is a significant less-developed population which does "not have good access to conventional technology such as electricity and fossil fuels" (UNESCO 2007: 8–9). This perspective challenges any notion that energy is an issue of the future; it is clearly upon some of us now, and will bear more heavily on all of us soon, with human security being "the ultimate goal surrounding the concept of energy equity" (UNESCO 2007: 22–3; see Chapter 19). The perspective of "human security" is usefully linked to energy here, which informs wider debates about human development. Baer et al. identify the basic dilemma in noting that "there is no road to development, however conceived, that does not greatly improve access to energy services" and yet there is "not enough 'environmental space' for the still-poor to develop", thus requiring "a wholesale reinvention of the global energy infrastructure on the basis of low-emission technologies" (Baer et al. 2007: 23, 26). To the extent that this dilemma is now recognized in political debate, there is already evidence of change, with structural implications for global environmental politics.

Climate

Climate represents inequities in respect of both the sources and consequences of change. If climate stability is to be achieved, human communities would experience the benefits or burdens according to their location in the ecological and/or industrial structure. Local vulnerabilities, livelihoods and state roles are linked by Barnett and Adger (2007) in noting that "climate change increasingly undermines human security" (see Chapter 19). Elsewhere Barnett (2001: 118) accepts that dealing with climate issues requires wide and deep structural reform. Climate policy is a significant issue, but it is likely that political actors will "reinforce their own definitions of 'energy security' and 'energy independence'" (Poruban 2008) which will be limited and instrumental. Singer (2006) points out that "climate change is an ethical issue, because it involves the distribution of a scarce resource", and may not even be readily understood from the conventional economic perspective "given some of the important but often implicit assumptions on which it is based" (Toman 2006). The underlying assumptions of our political, moral, economic and social systems (see Chapter 25) do not yet appear to have fully internalized the weight and depth of the issues raised by climate, even as the challenge is appreciated.

The current state of affairs is even worse than previously anticipated, and given consistent reporting from reliable sources there can be little doubt about the trend in the carbon cycle. Recent data indicate carbon dioxide levels up almost 40 percent since the industrial revolution and greenhouse gas levels "continue climbing" (NOAA 2011). There are obviously some limits

to what can be done in a relevant timescale, and the little that can easily be done seems woefully inadequate. Emission levels are now so much worse than expected that reaching existing targets for reduction may be unrealistic, since we're already at the upper end of the possible scenarios (Anderson and Bows 2008). Managing the situation will require energy demand management beyond a mere reduction in increases; only economic contraction would have sufficient impact, in the absence of technological intervention. Allen (2008) suggests that addressing critical carbon levels will require technological approaches, such as SaFE (Sequestered at-time-of Fossil Extraction) carbon which allows for sequestration (carbon capture and storage) at an increasing fraction of emissions to stabilize atmospheric content. More striking are proposals for geoengineering of oceans and atmosphere, by developing biological carbon sinks (see Chapter 38), and by introducing solar radiation management technologies to avert the worst-case scenario of sudden climate change. These proposals raise collective action problems, as well as scientific ones, which require coherent governance (Humphreys 2011). Yet such extreme technological interventions could render climate policy extraordinary or exceptional, rather than normalized in a coherent energy and climate policy.

The Kyoto arrangements, to be overtaken by whatever commitments eventually emerge in a post-Kyoto agreement, represented aspirations that turn out to be based on a limited appreciation of the scale of the challenge, and partial in application by geographic region (Annex 1 countries) and economic sector. Whatever "efficiency" is achieved by technological means, total emissions continue to rise with production and consumption. Jevons's nineteenth-century paradox still applies: efficiency first does not give frugality second, but rather increased consumption; while on the other hand, frugality first can bring efficiency in response to scarcity (Polimeni et al. 2008; see Chapter 16). Furthermore, if climate change will be "visited primarily on the globe's most vulnerable populations" it follows that any "response to climate change that hopes to gain international legitimacy must take equity as a central organizing principle" (Roberts 2007). Sachs argues that equity in regard to fuel access "is about *equality among nations*" while the consequent climate threats suggest that "fundamental rights might be violated" (W. Sachs 2007; see Chapter 23). Baer et al. note the disjointed but overlapping responsibilities of people and nations. In the context of "capacity to mitigate emissions in a global energy regime" they say the main point is obvious: "Recognizing inequality *within* countries is as unavoidable as recognizing inequality *between* countries…If, that is, our goal is a burden-sharing system that actually makes ethical and political sense" (Baer et al. 2007: 31). If "climate equity in this respect is about human rights", then the "need for low-emission economies in the South and the North is therefore far more than a question of an appeal to morality; it is a core demand of cosmopolitan politics" (W. Sachs 2007; see Chapters 21 and 23).

While this seems patently true, it is not so clear if cosmopolitan politics is a shared aspiration, even if planetary survival is. Climate equity is surely a political project, as much as a technical or economic one, and success in all other projects in all places may hinge upon its success. A sign of hope emerged in the earlier Bali negotiations on a post-Kyoto consensus when the USA was embarrassed into joining the consensus by the Papua New Guinea delegate (*Newsvine* 2008) – an indication of how structural opportunities in politics may allow a reversal of power dynamics. On the other hand, subsequent failure to agree at Copenhagen and missed opportunities since (in the context of UNFCCC negotiations) suggests business as usual rather than progressive climate policy.

Garvey (2008) identifies three sources for political stances on climate: (1) historically: "the industrialized world has done the most damage"; (2) presently: "the West currently uses more than its fair share of the carbon sinks"; and (3) in future: sustainability creates a general "obligation to leave a hospitable world" behind. Gardiner notes that climate change involves the convergence

of a set of global, intergenerational and theoretical problems. He argues that climate change is "a perfect moral storm" which "makes us extremely vulnerable to moral corruption" and identifies three characteristics of climate change that lead to this "storm": dispersion of causes and effects; fragmentation of agency; institutional inadequacy (Gardiner 2006: 397, 399–400). This leads him to suggest "there is a problem of corruption in the theoretical, as well as the practical, debate" because a focus on political and technical problems of action by nation-states distracts from intergenerational obligations (Gardiner 2006: 408–9). The link between climate and our energy habits demands "rethinking energy options to address climate change" (McGowan 2007), but these options are likely to be ones we do not find convenient or have not taken seriously yet. There are structural assumptions (and corruptions) in our political, social, economic and ecological field of vision that will have to be addressed because the status quo needs to be directly challenged.

The politics of biofuels

The political tensions and ethical issues raised by the confluence of energy and climate policy can be illustrated by a widespread policy response: biofuels. There is considerable controversy around biofuels as an alternative, climate-friendly energy source. Biofuels have a political dimension. While they have a long and chequered history (as old as the internal combustion engine), it seems clear that renewed enthusiasm for biofuels has been dampened by several realizations, including the net energy and environmental consequences, and the impact on food crops (see Chapter 40). As a result, major actors conceded that "plans to vastly increase the amount of fuels such as bio-ethanol and biodiesel might need to be reconsidered" in Europe (Greenpeace UK 2008). US policy wrestles with political commitments on ethanol production. In 2007 Congress approved a fivefold increase in use of biofuels; in 2011 Senate voted to end tax credits and trade protection for ethanol. Low-blend fuel, ordinary automobile fuel containing 5 percent ethanol (E5), is commonplace everywhere. However, all political actors are facing opposition due to a general awareness of the distortions created by this policy, "with political leaders from poor countries contending that these fuels are driving up food prices and starving poor people" (*New York Times* 2008; see Chapter 40).

There are considerable political stakes involved. The EU Commission had to reject claims that biofuels are a "crime against humanity" (Agence France Press 14 April 2008). The situation prompted such protest even while the relative significance of biofuels in the energy mix is quite limited – "only 1% of transport fuels…Oil is still 40% of the global energy mix because of its domination of the transport sector" (Shea 2006; see Chapter 31). Oddly, given the stakes involved, there has been a surprising lack of consideration for ecology and sustainability (see Chapter 15): "government agencies said nothing about the degradation of the soil, the nutrients that would be required" nor indeed "about the ridiculously low Energy Returned on Energy Invested (EROEI), the heavy use of water and fossil fuels" (*Energy Bulletin* 2008). The broader energy equity issues are thus only illustrated, rather than completely defined, if it is "unacceptable that poor people in developing countries should bear the cost of questionable attempts to cut emissions in Europe" (Squatriglia 2007). Meanwhile, alongside a range of technological initiatives, the US Advanced Research Projects Agency and Department of Energy recently announced biofuels projects encouraging non-food crop oil production, "Plants Engineered to Replace Oil" (Advanced Research Projects Agency 2011).

In the longer term biofuels will figure in the mix of energy alternatives, and "the key to making sense of these suggestions is for policymakers to re-evaluate biofuels through the prism of rural and industrial development rather than simply employing the somewhat populist food/

fuel framework" (Creamer 2008; see Chapter 40). Thus, energy and climate policy cannot be treated in isolation from socio-economic policy, let alone in isolation from one another; a holistic perspective is required to capture the complexity (see Dalby 2002 and Chapter 19). Biofuels can serve a range of purposes from substituting petroleum fuels to encouraging agricultural and rural development (see Chapter 40), but this diminishes the energy and climate strategy implied in such initiatives, and completely undermines it if the net use of energy does not actually reduce petroleum dependency and emissions. There are economic motives here, as even old-fashioned energy efficiency ("negawatts") could be significant for energy and climate alike (though the "rebound" or "takeback" effect of increased access and lower prices for fuel leading to greater consumption could cancel 26–37 percent of any gains [*The Economist* 2008]). The ecological motives seem somewhat distant, and the coherence between energy policy and climate policy is weak. Rather than offering an unproblematic quick fix or "free lunch", contra Commoner's (1971) fourth law of ecology, the biofuels debate illustrates the political dilemmas.

Political–economic structure

There can be little doubt now about the cost implications or the likely impact on economic growth of climate change (Stern 2006), but this could simply lead us to think about the economic opportunities this presents. Any notion of economic change that does not involve growth seems unthinkable given current economic assumptions, but those assumptions could change under the twin pressures of energy and climate crises. It is now common to speak of a "low-carbon economy", or even a "post-petroleum economy", and neither involves the cessation of economic activity; they simply involve change. Yet the balance between states and markets in responses to the energy–climate nexus remains uncertain, often taking the appearance of trade agreements (see Chapter 22). The 2012 Rio+20 summit addresses the prospects for a "green economy", which has been debated since at least Pearce's "Blueprint" suggested that economics is more efficient than traditional "command and control" approaches (Pearce et al. 1989). Market mechanisms involve some element of regulatory intervention to set the boundaries, or to create incentives. The European cap-and-trade system is an interesting example, with controversy and uncertain outcomes around issues of "leaking" emissions outside the system, and total rather than relative emissions (Wråke et al. 2012). Since the policy solutions we seek for energy and climate are so tied up with the cessation of unsustainable practices in both economics and politics it only remains to establish the mechanisms to deliver on that obvious requirement.

There is already considerable cooperative activity around energy and climate policy, but it must cope with predominately structural obstacles. Even in the most developed circumstances of political and economic integration across traditional boundaries (Europe) it is a struggle to establish clear links between climate and energy policy, not least because of a focus on energy supply and markets has distracted from climate issues (Morata and Sandoval 2012). So there is an intellectual, or attitudinal, hurdle to leap at the outset – we'd have to accept that some deeply held assumptions are simply not viable, indeed sustainable, and learn to let them go. A United Nations institutional context illustrates debate about "controversial principles, such as whether to approach from an anthropocentric perspective or from a biocentric approach, or whether the viewpoint was from the individual or community" (UNESCO 2007: 7). There is no progress to be made by thinking that the political significance of energy and climate policy only bears on abstractions. The point is that the underlying principles reflected in political and economic agendas should be flushed out, and the most appropriate ones promoted and acted upon in a pragmatic fashion as political interests. For example, it was noted that "barriers to renewable energy systems were institutional, political, technical and financial", and also that we should be

cautious about a "highly centralized and state-controlled source of energy that did not promote participatory democracy" in contrast to "renewable energies such as solar, wind, small hydro, biomass, geothermal and tidal energy are often decentralized and can be used in remote areas without a solid energy supply system" (UNESCO 2007: 8–9). The relevant political structure should not be assumed any more than the economic one, since much action on climate issues is driven by non-state actors and local politics, in both the developed and developing worlds (Fisher 2012).

A meaningful energy and climate policy will require anticipation of future post-carbon scenarios. In offering a convincing perspective on "the age of petroleum" as merely a recent blip in the long run of human energy supply (until the late nineteenth century provided by biomass and animate labour, and from the twenty-first century by renewables) the Nuclear Energy Agency argues that the "critical path structure" should include "concurrent risk, economic, and environmental impact analyses…for all technologies and proposed actions for the transition to a post-petroleum economy" (Nuclear Energy Agency 2004: 37). While nuclear power remains under consideration, and hydrogen technology emerges as a potential portable fuel (though electricity-intensive in production), there are many more positive solutions to the challenge. The alternatives to fossil fuels exist, but it is claimed that it "will take a new industrial revolution" (Scheer 2002) or an "energy revolution" (Geller 2002) to develop these more widely. Yet the latest *Renewables Global Status Report* indicates that changes in the realm of renewable energy "have been so rapid in recent years that perceptions of the status of renewable energy can lag years behind the reality", with renewables already comprising "one quarter of global power capacity" (REN21 2011). This offers evidence of continued growth in electricity, heat and fuel production from renewable energy sources, including solar electricty, wind power, solar hot water/heating, biofuels, hydropower and geothermal sources. Reflecting the range of opportunities, the Obama administration in the United States has established the White House Office of Energy and Climate Change Policy to promote the president's "all-of-the-above strategy" for the twenty-first century, not surprisingly driven by concern with national security of energy supply (The White House 2012).

Heinberg noted that the twenty-first century ushered in an era of declines, in a number of crucial parameters, and he seeks to address "the cultural, psychological and practical changes we will have to make as nature rapidly dictates our new limits" (Heinberg 2007). If Western industrial societies needed a prompt to respond with energy and climate initiatives, it would have found incentives not only in unsettled international energy markets, but also in China's aggressive investment in renewables and clean technologies (ChinaFAQs 2012).

Decades ago, conventional intergovernmental bureaucracies were addressing what may again seem a novel issue, perhaps because a sense of urgency has re-emerged in the confluence of energy and climate policy (FAO 1982). Both producers and consumers of energy have already taken some steps to reflect concern with energy and climate, by experimenting with different practices (improving efficiency, slowly introducing new technologies, attempting to manage the energy situation collectively, etc.), and yet a remaining element of denial is reflected in a slow pace of change limited to the margins rather than the centre of planning. On the climate side of the equation, geoengineering solutions could be used *in extremis* (Keith 2000), but this would only prolong our carbon addiction and would likely attract the same level of opposition as biofuels, given some elaborate schemes and the risks of unintended consequences (see Chapter 18). Nevertheless, such technological innovation will necessarily be a part of energy and climate policy debates (Brown and Sovacool 2011). Maintaining economic growth while addressing climate change will at the very least require prompt development of new technologies and a regulatory and fiscal environment to support them (J. Sachs 2008). This implies a significant

change in current practices, and it remains to be seen whether currently familiar assumptions about economic growth will survive.

Conclusion

The tandem policy challenges of climate and energy increasingly demand that we make adjustments to our common practices. These will be more than mere instrumental adjustments to meet practical challenges, set within the framework of existing political conceptions and commitments. Our attention should be turned to the systemic and structural implications of this shifting policy area, as it may reflect a substantial underlying change. Furthermore, any opportunity to build on political momentum or economic dynamics that would address the fundamental issues of energy and climate should be identified and capitalized on. This may in turn have an impact on opportunity structures and political–economic institutions. While short-term adjustments may advantage some actors, it is of course necessary to go beyond superficial measures and to appreciate the deeper political significance of the energy–climate scenario. In viewing shifts in the surrounding debates as politically significant, we should hold no fixed assumptions about political, economic or social points of reference: this is new political territory, which demands open-mindedness. As a critical report on biofuels concludes, energy security and climate change demand a new paradigm, following Einstein's view that we "can't solve problems by using the same kind of thinking we used when we created them" (Santa Barbara 2007).

References

Advanced Research Projects Agency (2011) *Plants Engineered to Replace Oil*. Online. Available HTTP: <http://arpa-e.energy.gov/ProgramsProjects/PETRO.aspx> (accessed 15 May 2012).

Agence France Press (2008) "EU defends biofuel goals amid food crises", 14 April. Online. Available HTTP: <http://afp.google.com/article/ALeqM5gp1nkJeC-IhlYkVtsvPfp3u7mOWQ> (accessed 15 May 2012).

Allen, M. (2008) "Energy and climate: the physics of climate change" (lecture). Online. Available HTTP: <http://climateprediction.net/node/155> (accessed 15 May 2012).

Anderson, K.L. and Bows, A. 2008. "Reframing the climate change challenge in light of post-2000 emission trends", *Philosophical Transactions of the Royal Society – A: Mathematical, Physical and Engineering Sciences*, 366: 3863–82.

Baer, P., Athanasiou, T., Kartha, S. and Kemp-Bendict, E. (2007) *The Right to Development in a Climate Constrained World: The Greenhouse Development Rights Framework*, Berlin: Heinrich Böll Foundation, Christian Aid, EcoEquity and the Stockholm Environment Institute. Online. Available HTTP: <http://www.ecoequity.org/docs/TheGDRsFramework.pdf> (accessed 15 May 2012).

Barnett, J. (2001) *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*, New York: Zed Books.

Barnett, J. and Adger, W.N. (2007) "Climate change, human security and violent conflict", *Political Geography*, 26: 639–55.

Brown, M.A. and Sovacool, B.A. (2011) *Climate Change and Global Energy Security: Technology and Policy Options*, Cambridge, MA: MIT Press.

Cavanagh, J. (2012) "Mexico sets legally binding carbon reduction targets". Online. Available HTTP: <http://theenergycollective.com/josephromm/84040/mexico-sets-legally-binding-carbon-reduction-targets> (accessed 16 May 2012).

ChinaFAQs The Network for Climate and Energy Information (Worldwatch Institute) (2012) *Clean Tech's Rise – Two New Issue Briefs from ChinaFAQs*. Online. Available HTTP: <http://www.chinafaqs.org/blog-posts/clean-techs-rise-two-new-issue-briefs-chinafaqs> (accessed 15 May 2012).

Commoner, B. (1971) *The Closing Circle: Nature, Man and Technology*, New York: Alfred Knopf.

Corley, A.-M. (2010) "The future of hydropower", IEEE Spectrum. Online. Available HTTP: <http://spectrum.ieee.org/energy/renewables/future-of-hydropower> (accessed 10 May 2012).

Creamer, T. (2008) "Is the SA biofuels debate properly framed?" Online. Available HTTP: <http://www.engineeringnews.co.za/article/is-the-sa-biofuels-debate-properly-framed-2008-03-28> (accessed 15 May 2012).

Dalby, S. (2002) *Environmental Security*, Minneapolis: University of Minnesota Press.

E3G (2007) *EU Strategic Energy Review*. Online. Available HTTP: <http://www.e3g.org/images/uploads/E3G_EU_Strategic_Energy_Review.pdf> (accessed 15 May 2012).

The Economist (2008) "The elusive negawatt", 8 May. Online. Available HTTP: <http://www.economist.com/node/11326549> (accessed 15 May 2012).

Energy Bulletin (2008) "Food and agriculture", 16 April. Online. Available HTTP: <http://www.energybulletin.net/node/42817> (accessed 15 May 2012).

European Photovoltaic Industry Association and Greenpeace (2011) "Solar Generation 6 – solar photovoltaic electricity empowering the world – 2011". Online. Available HTTP: <http://www.greenpeace.org/international/Global/international/publications/climate/2011/Final%20SolarGeneration%20VI%20full%20report%20lr.pdf> (accessed 15 May 2012).

Fattouh, Bassam and van der Linde, Coby (2011), "The International Energy Forum. Twenty years of producer–consumer dialogue in a changing world". Online. Available HTTP: <http://www.clingendael.nl/publications/2011/2011_IEF_History_of_IEF_Clinde_BFattouh.pdf> (accessed 15August 2012).

Fisher, S. (2012) "Policy storylines in Indian climate politics: opening new political spaces?", *Environment and Planning C: Government and Policy*, 30: 109–27. Online. Available HTTP: <http://www.envplan.com/epc/fulltext/c30/c10186.pdf> (accessed 17 May 2012).

Gardiner, Stephen M. (2006) "A perfect moral storm: climate change, intergenerational ethics and the problem of corruption" *Environmental Values*, 15(3): 397–413. Online. Available HTTP: <http://faculty.washington.edu/smgard/GardinerStorm06.pdf>.

Garvey, James (2008) *The Ethics of Climate Change*, London: Continuum. Online. Available HTTP: <http://nigelwarburton.typepad.com/virtualphilosopher/2008/02/james-garvey-in.html>.

Geller, Howard (2002) *Energy Revolution: Policies for a Sustainable Future*, Washington, DC: Island Press.

Greenpeace UK (2008) "Senior EU and Defra figures agree: we were too hasty on biofuel targets". Online. Available HTTP: <http://www.greenpeace.org.uk/blog/climate/we-were-too-hasty-on-biofuel-targets-20080114> (accessed 15 May 2012).

Heinberg, R. (2007) *Peak Everything: Waking Up to the Century of Declines*, Gabriola Island, BC: New Society Publishers. Available HTTP: <http://www.newsociety.com/Books/P/Peak-Everything2> (accessed 15 May 2012).

Holmes, I. and Mohanty, R. (2012) *The Macroeconomic Benefits of Energy Efficiency: The Case for Public Action*. Online. Available HTTP: <http://www.e3g.org/images/uploads/E3G_The_macroeconomic_case_for_energy_efficiency-Apr_2012.pdf> (accessed 15 May 2012).

Humphreys, D.R. (2011) "Smoke and mirrors: some reflections on the science and politics of geoengineering", *Journal of Environment Development*, 20: 99–120. Online. Available HTTP: <http://jed.sagepub.com/content/20/2/99.full.pdf+html> (accessed 17 May 2012).

International Energy Agency (2012) *World Energy Outlook 2012*. Online. Available HTTP: <http://www.iea.org/weo/> (accessed 17 May 2012).

Keith, D.W. (2000) "Geoengineering the climate: history and prospect", *Annual Review of Energy and the Environment*, 25: 245–84. Online. Available HTTP: < ftp://luna.atmos.washington.edu/pub/breth/PCC/SI2006/readings/Keith_geoengr_AnnRevEnergy_2000.pdf> (accessed 15 May 2012).

Kimmins, J.P. (2001) *The Ethics of Energy: A Framework for Action*, Paris: UNESCO.

Macfarlane, A.M. (2007) "Energy: The issue of the 21st century", *Elements*, 3(3): 165–70.

McGowan, A.H. (2007) "Rethinking energy options to address climate change", *Environment*, 49: 8.

Morata, F. and Sandoval, I.S. (eds) (2012) *European Energy Policy: An Environmental Approach*, Cheltenham: Edward Elgar.

New York Times (2008) "Fuel choices, food crises and finger-pointing", 15 April. Online. Available HTTP: <http://www.nytimes.com/2008/04/15/business/worldbusiness/15food.html> (accessed 15 May 2012).

Newsvine (2008) "Lead or get out of the way! Tension and tears in Bali", Natasha Restrepo, *Style Republic Magazine*. Online. Available HTTP: <http://stylerepublicmagazine.newsvine.com/_news/2008/01/07/1209740-lead-or-get-out-of-the-way-tension-and-tears-in-bali>

NOAA (2011) "NOAA greenhouse gas index continues climbing". Online. Available HTTP <http://www.noaanews.noaa.gov/stories2011/20111109_greenhousegasindex.html> (accessed 1 May 2012).

Nuclear Energy Agency (2004), *Nuclear Production of Hydrogen*, Proceedings of the Second Information Exchange Meeting, Argonne, Illinois, USA, 2–3 October 2003, Paris: OECD.

Oxford High-Level Task Force on UK Energy Security, Climate Change and Development Assistance (2007) *Energy, Politics and Poverty: A Strategy for Energy Security, Climate Change and Development Assistance*, Oxford: University of Oxford.

Pearce, D.W., Markandya, A. and Barbier, E. (1989) *Blueprint for a Green Economy*, London: Earthscan.

Polimeni, J., Mayumi, K., Giampietro, M. and Alcott, B. (2008) *Jevons Paradox and the Myth of Resource Efficiency Improvements*, London: Earthscan.

Poruban, S. (2008) "US presidential politics to brighten spotlight on energy security issue", *Oil & Gas Journal*, 106(1): 24.

REN21 (Renewable Energy Policy Network for the 21st Century) (2011) *Renewables 2011 Global Status Report*, Paris: REN21 Secretariat. Online Available HTTP: <http://www.ren21.net/Portals/97/documents/GSR/REN21_GSR2011.pdf> (accessed 15 May 2012).

Roberts, David (2007) "Climate equity: a conversation – introducing an ongoing series on the most undercovered aspect of climate change", *Gristmill*. Online. Available HTTP: <http://grist.org/article/climate-equity-a-conversation/> (accessed 15 May 2012).

Sachs, J.D. (2008) "Keys to climate protection: dramatic, immediate commitment to nurturing new technologies is essential to averting disastrous global warming", *Scientific American*, March. Online. Available HTTP: <http://www.scientificamerican.com/article.cfm?id=technological-keys-to-climate-protection-extended> (accessed 17 May 2012).

Sachs, W. (2007) "Climate change is about equality among nations and fundamental human rights", in *Climate Equity: A Conversation*, edited by David Roberts, *Gristmill*. Online. Available HTTP: <http://grist.org/climate-energy/climate-equity-wolfgang-sachs/> (accessed 10 May 2012).

Santa Barbara, J. (2007) *The False Promise of Biofuels*, A Special Report from the International Forum on Globalization and the Institute for Policy Studies. Online. Available HTTP: <http://www.ifg.org/pdf/biofuels.pdf> (accessed 10 May 2012).

Scheer, Hermann (2002) *The Solar Economy*, London: Earthscan.

Shea, J. (2006) "Energy security: NATO's potential role", *NATO Review*, 3. Online. Available HTTP: <http://www.nato.int/docu/review/2006/issue3/english/special1.html> (accessed 10 May 2012).

Singer, P. (2006) "Ethics and climate change: a commentary on MacCracken, Toman and Gardiner", *Environmental Values*, 15: 415–22.

Squatriglia, C. (2007) "Biofueling poverty?". Online. Available HTTP: <http://povertynewsblog.blogspot.co.uk/2007/11/biofueling-poverty.html> (accessed 10 May 2012).

Stern, N. (2006) *The Economics of Climate Change ("The Stern Review Report")*, Cambridge: Cambridge University Press.

Toman, Michael (2006) "Values in the economics of climate change", *Environmental Values*, 15: 365–79.

UNESCO (2007) *Report of the launch conference for the project Ethics of Energy Technologies in Asia and the Pacific*, Bangkok: UNESCO, in collaboration with the Ministry of Science and Technology and the Ministry of Energy, Thailand. Online. Available HTTP <http://www.unescobkk.org/fileadmin/user_upload/shs/Energyethics/EnergyEthics2007Report.pdf> (accessed 10 May 2012).

UN Food and Agriculture Organization (FAO) (1982) "Planning for the post-petroleum economy", *Ceres: The FAO Review on Agriculture and Development*, 15(4): 26–32.

US Department of State (2011) *US–China Strategic and Economic Dialogue 2011: Outcomes of the Strategic Track*. Online. Available HTTP: <http://www.state.gov/r/pa/prs/ps/2011/05/162967.htm> (accessed 15 May 2012).

Vad Mathiesen, B., Lund, H. and Karlsson, K. (2011) "100% renewable energy systems, climate mitigation and economic growth", *Applied Energy*, 88: 488–501. Online. Available HTTP: <http://www.sciencedirect.com/science/article/pii/S0306261910000644> (accessed 17 May 2012).

The White House (2012) *Energy, Climate Change and our Environment*. Online. Available HTTP: <http://www.whitehouse.gov/energy> (accessed 15 May 2012).

Wråke, M., Burtraw, D., Löfgren, A. and Zetterberg, L. (2012) "What have we learnt from the European Union's Emissions Trading System?", *Ambio*, 41: 12–22. Online. Available HTTP: <http://www.springerlink.com/content/yu05415551083434/fulltext.pdf> (accessed 17 May 2012).

Xinhua (2011) "Full text of outcomes of strategic track of 2011 China–US Strategic and Economic Dialogue". Online. Available HTTP: <http://news.xinhuanet.com/english2010/china/2011–05/11/c_13868779.htm> (accessed 15 May 2012).

29

Stratospheric ozone depletion

David Downie

Ozone in the Earth's stratosphere protects life from harmful ultraviolet radiation emitted by the sun. In the 1970s, scientists discovered that certain types of man-made chemicals could destroy stratospheric ozone. In 1987, countries adopted the Montreal Protocol on Substances that Deplete the Ozone Layer to address this threat. The Protocol has been strengthened through a series of formal amendments and other agreements. As a result, the production and use of ozone-depleting substances has been reduced significantly, and if progress continues the ozone layer should recover. Many policy-makers and scholars believe the ozone regime to be perhaps the most successful global environmental regime to date (see Chapter 9). At the same time, casual observers sometimes confuse the science of the issue with climate change (see Chapter 28), do not understand the regime's basic history or key achievements, and are unaware of several problems that could prevent full recovery of the ozone layer.

This chapter summarizes international policy to protect stratospheric ozone. It introduces the basic science, examines the creation, expansion and current status of global ozone policy, and outlines the successes of the ozone regime and remaining challenges.

The science of ozone depletion

The science surrounding the ozone layer problem is complex in detail but relatively easy to summarize. Ozone, a molecule of three oxygen atoms (O_3), is rare, accounting for about three of every ten million molecules in the Earth's atmosphere. Ozone is also an unstable and highly reactive molecule and a powerful oxidant, properties that also make ozone toxic. Fortunately, little naturally occurring ozone exists at ground level but human-produced ozone is a dangerous pollutant and key component of urban smog. Long-term exposure to ozone and related pollutants can cause, and increase the risk of death from, certain respiratory and cardiopulmonary problems, including asthma and bronchitis and heart attack. This "bad ozone" in air pollution at ground level, which environmental policy seeks to limit, contrasts with naturally occurring "good ozone" in the upper atmosphere, which the Montreal Protocol seeks to protect.

About 90 percent of naturally occurring ozone exists in the stratosphere, which is the section of the upper atmosphere 10–50 km (6–30 miles) above the Earth. Stratospheric ozone, commonly called the ozone layer despite the sparse concentration of ozone molecules, likely formed

about 400 million years ago and plays a critical role helping to protect the Earth from harmful ultraviolet radiation by absorbing or reflecting certain wavelengths of radiation. Total deterioration of the ozone layer would be disastrous and significant depletion very, very harmful. Significantly increased UV exposure can cause skin cancers, eye cataracts, and weakened immune systems in humans and some animals. Higher UV exposure also causes moderate to very severe damage to many kinds of plants including some food crops, to single-cell organisms and to aquatic ecosystems and also speeds deterioration of certain man-made materials, including plastics (UNEP 2010).

The concern about anthropological impacts on the ozone layer started in 1970 when Paul Crutzen published an article proposing that chlorine atoms released from certain anthropogenic sources could remain intact long enough to reach the stratosphere where they could break down ozone molecules. In 1974, F. Sherwood Rowland and Mario Molina published their now famous article showing how chlorofluorocarbons (CFCs), a group of widely used and commercially important chemicals used primarily as coolants, propellants and solvents, can remain intact after being released into the atmosphere (due to their extremely stable molecular composition) until they reach the stratosphere where they break apart due to the higher levels of radiation from the sun. The decomposition of CFCs releases chlorine atoms that then interact with and break apart ozone molecules (Molina and Rowland 1974). Moreover, each chlorine atom can potentially destroy thousands of ozone molecules because, following its destruction of the ozone molecule, other chemical interactions occur that release the original chlorine atom to start the process all over again. Subsequent research revealed that other chemicals could also release chlorine into the stratosphere while others could release bromine, another atom capable of the catalytic destruction of ozone. In addition to CFCs, other ozone-depleting substances (ODS) include HCFCs (hydrochlorofluorocarbons), which are less ozone damaging CFC-substitutes widely used in air-conditioning and refrigeration; halons, used as fire suppressants; carbon tetrachloride, used primarily as a cleaning agent or solvent; methyl chloroform, used as a cleaning agent; and methyl bromide, a very toxic broad-spectrum pesticide.

Significant scientific debate ensued for years following Rowland and Molina's article. Many doubts were raised but no firm evidence arose disputing the theories. At the same time, while evidence grew in the lab and consensus broadened on the likely validity of the theory, no observable ozone depletion emerged in nature. This changed in the 1980s when reports emerged of an Antarctic "ozone hole", or depletion of stratospheric ozone of as much as 30 to 50 percent above Antarctica during late winter and early spring (Farman et al. 1985). Scientists eventually proved that chlorine atoms released from CFCs were primarily responsible for the ozone hole, although natural causes contributed to its severity. Because the natural chemical reactions that destroy ozone are accelerated in the presence of cold air, in particular polar stratospheric clouds (the ozone layer is naturally "thinner" above the poles and thickest above the equator), ozone depletion from CFCs is most pronounced in the coldest part of the stratosphere, above Antarctic in the winter. In addition, wind patterns isolate the winter air above the Antarctic, preventing atmospheric mixing with more ozone-rich air until the spring. This combination of factors, starting with CFC emission, creates the ozone hole.

Ozone depletion reached a global average of about 5 percent. However, this masks the seriousness of the issue as the average includes very little depletion above the tropics, where most ozone exists. Above Antarctica, depletion often reached 65 percent or higher in spots with significant loss extending to inhabited regions of Argentina, Australia, Chile and Peru. Above the Arctic, early spring ozone depletion reached 30 percent on a regular basis in some areas and depletion levels over high latitude regions over Europe (where less ozone existed to begin with) have measured between 5 and 30 percent (Ozone Secretariat 2012c; WMO et al. 2011).

These conditions would have worsened significantly without the original scientific discoveries and an effective global policy response. In recognition of their path-breaking and historic discoveries, Crutzen, Molina and Rowland received the Nobel Prize for Chemistry in 1995.

Creating ozone policy

The creation and expansion of the ozone regime is an important case study because of its success and its broader influence on global environmental policy. Many articles and books delineate and analyze the development and impact of ozone policy (see Dotto and Schiff 1978; Roan 1989; Haas 1992; Downie 1993; Litfin 1994; Downie 1995b, 1996; Benedick 1998; Anderson and Sarma 2002; Canan and Reichman 2002; Parson 2003; Falkner 2005; Ozone Secretariat 2012b and 2012c; Skjaerseth 2012; Gareau 2012; and Chasek et al. 2013: ch. 3; this section and the next build on Downie 2012). The 1974 discovery that CFCs posed a serious threat to stratospheric ozone set off a series of intense scientific and political debates, especially in the United States (Dotto and Schiff 1978). The economic importance of CFCs made broad controls very difficult to establish. CFCs dominated the markets for coolants in refrigeration and air-conditioning systems, blowing agents for the manufacture of flexible and rigid foam, propellants in aerosol sprays, and other profitable uses. As a result, global production and use of CFCs continued to expand until the late 1980s.

Continuing the environmental leadership it had shown in the early 1970s with the Clean Air and Clean Water Acts, creation of the Environmental Protection Agency (EPA), and other legislation, the United States banned the use of CFCs in many "non-essential" uses, including aerosol spray cans in the late 1970s. Because the USA accounted for more than 40 percent of worldwide CFC production, and the banned uses were more than 40 percent of US CFC use at the time, this represented a meaningful step, one that bought time for the ozone layer, although this was not known at the time. Canada, Finland, Norway, Sweden, Switzerland and a few other countries took similar action (Downie 1993). However, the European Community (EC) refused to take meaningful Community-wide steps, expressing doubt concerning the scientific theory, noting the lack of observed ozone depletion in the atmosphere, and arguing that no substitutes existed or could easily be developed (Downie 2012: 245). EC and corporate opposition combined with the elections of anti-regulatory leaders Margaret Thatcher in the UK in 1979 and Ronald Reagan in the USA in 1980 effectively killed prospects for additional domestic legislation (Downie 1993; see Chapter 13).

The first global discussions occurred when the United Nations Environment Programme's (UNEP) Governing Council considered the issue, without significant result, in 1976. After two small and relatively fruitless international meetings, in 1977 and 1978, the USA and key EC countries did agree that UNEP and the World Meteorological Organization (WMO) could create a Coordinating Committee of the Ozone Layer (CCOL) to periodically discuss and perhaps assess relevant scientific issues. Despite EC skepticism, and the lack of confirmation in nature, the increasing scientific consensus regarding the CFC-ozone theory led to statements by the CCOL in the early 1980s that enough scientific evidence existed to warrant global concern. Proponents of international action used these statements to propose that UNEP's Governing Council authorize global negotiations. The EC eventually agreed because it supported UNEP and did not want to undercut the new international organization and because the mandate for the negotiations expressly stated that discussions would focus on international cooperation to study the ozone layer rather than on potential controls (Downie 1996; see Chapter 8).

The agreement that emerged from these negotiations, the 1985 Vienna Convention for the Protection of the Ozone Layer, affirmed the importance of protecting stratospheric ozone and

called for international cooperation in conducting research and monitoring the ozone layer and potential threats to it. The Convention instructed Parties to protect human health and the environment from human activities that might impact stratosphere ozone but did not specify what these actions might be nor did the Convention even mention CFCs. Critically, however, the agreement did include language obligating Parties to convene negotiations on further measures should definitive threats to the ozone layer be identified. Publication of the discovery of an "ozone hole" (Farman et al. 1985) triggered this provision. Evidence of significant ozone depletion above Antarctica allowed proponents of CFC controls to argue successfully that new negotiations on a control Protocol were needed, despite the lack of firm evidence linking the hole to CFCs. The new negotiations began in 1986 and concluded, relatively quickly in retrospect, with the landmark 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, the centerpiece of global ozone policy.

The Montreal Protocol established binding requirements that industrialized countries reduce their production and use of the five most widely used CFCs by 50 percent from 1986 levels by 2000, and freeze the production of three halons. Developing countries had to take the same actions but with 10-year extensions to allow them to increase their use of CFCs for economic development. The Protocol also included important reporting requirements, prohibition on ODS trade with countries that did not ratify the agreement by a certain date, and a procedure for reviewing the treaty's effectiveness and strengthening its controls on the basis of periodic reports to be issued by Scientific, Environmental Effects, and Technology Assessment Panels. New chemicals could be added and other changes made to the Protocol by a standard amendment procedure, which required formal ratification to take effect. However, the treaty also allowed the Meeting of the Parties (MOP) to "adjust" the control measure for any chemical already regulated under the Protocol without an amendment. Such adjustments would take effect immediately, without the need for ratification by the Parties, and were included to give the Protocol the flexibility to respond quickly to future scientific developments.

Since 1987, Parties have used these mechanisms to strengthen the Protocol significantly in response to new scientific information on the dangers facing the ozone layer and new technological and economic developments regarding the availability of potential substitutes (Downie 1996). The first expansion, agreed to by the second MOP in London in 1990, can be considered a historic agreement on its own. The 1990 London Amendment added eight additional CFCs, as well as methyl chloroform and carbon tetrachloride to the Protocol's control measures. Parties also adjusted the existing controls so that countries, rather than meet a 50 percent cut, now had to phase out by 2000 the production and use of the CFCs and halons listed in the original Protocol. "This represented the first binding global agreement to eliminate specific chemicals that harm the environment" (Downie 2012: 247). The 1990 London agreement also created an essentially unprecedented non-compliance procedure (see below).

A third historic achievement of the 1990 London Amendment was creation of the Multilateral Fund for the Implementation of the Montreal Protocol. The fund assists developing countries implement the Protocol by providing funds for capacity building, planning and, in particular, the cost of switching from ODS to alternative chemicals or processes. The Multilateral Fund was the first major assistance fund established under a global environmental agreement. It predated and likely influenced the 1991 creation of the Global Environment Facility (GEF) and was, along with the later phase-out dates granted developing countries, a concrete manifestation of the principle of common but differentiated responsibilities. Creating the fund was also a political necessity as most large developing countries had refused to ratify the Montreal Protocol unless specific provisions were added to provide financial and technical assistance that would help them access the replacement chemicals (see Chapter 21). In the late 1980s, China and India

were in the process of developing indigenous CFC industries and argued it would be unfair for them to join a global environmental agreement if that meant they would need to pay more for CFC alternatives imported from industrialized countries. Creation of the Multilateral Fund and somewhat vague assurances that HCFC facilities would be built in their countries responded to these concerns (Downie 1996).

The 1992 Copenhagen Amendment and adjustment introduced binding control measures on HCFCs, methyl bromide, and hydrobromofluorocarbons to the Protocol and further accelerated the phase-out of CFCs and halon. The 1997 Montreal Amendment and adjustment accelerated the phase-out of methyl bromide, earmarked specific Multilateral Fund resources for methyl bromide projects (in a deal with developing countries to get them to accept the faster phase-out), and created a new CFC licensing system to combat illegal trade. The 1999 Beijing Amendment and adjustment mandated the immediate phase-out of bromochloromethane, strengthened controls on HCFCs (including introducing production controls and limits on HCFC trade with non-parties), and increased reporting requirements on methyl bromide to limit unauthorized use. In 2007, Parties significantly accelerated the controls on HCFCs, not only to protect the ozone layer more effectively but also to address climate change, as HCFCs are also potent greenhouse gases.

All the major producers and users of ODS, and all the major global economic powers, are Parties to the Protocol and all its amendments. Indeed, the Montreal Protocol is the first global environmental treaty to enjoy universal participation, with 197 states having become Parties to the Vienna Convention, the Montreal Protocol and the 1990 London and 1992 Copenhagen Amendments. In addition, currently 194 countries are Parties to the 1997 Montreal Amendment, and 188 to the 1990 Beijing Amendment.

Provisions of the Montreal Protocol and ozone policy

The main elements of global ozone policy are found in the Montreal Protocol and related agreements and decisions of the Protocol's decision-making body, the Meetings of the Parties (MOP). These are compiled in a single reference document maintained by the Secretariat (Ozone Secretariat 2012a). Industrialized country Parties were or are required to phase out their use and production of ODS, and to restrict trade of ODS with non-parties. Developing countries are allowed more time to begin and complete their phase-out schedules. These differentiated obligations were politically necessary to obtain the participation of some large developing countries and also reflect the understanding by all Parties that the industrialized countries had far larger ODS emissions than developing countries when the Protocol and most of its amendments were negotiated, and that developing countries needed access to most of the chemicals for economic development (see Chapter 21). The control measures include "essential use" exemptions that allow for the production and consumption of CFCs and halon for longer periods, subject to approval by the MOP. A general exemption exists for using very small amounts of ODS in laboratory applications. Perhaps most importantly, there is a large general exemption for the use of methyl bromide for quarantine and pre-shipment applications (e.g., the fumigation of shipping containers and commodities) as well as "critical use" exemptions for using methyl bromide for agricultural purposes. Both of the methyl bromide exemptions are subject to far less review by the MOP than the essential use provisions for other ODS.

The Protocol obligates industrialized countries to provide technical and financial assistance to developing countries and countries with economies in transition (CEITs) to help them fulfill their obligations. The Multilateral Fund is the focus of this activity for developing countries while the GEF assisted CEITs. As of July 2012, the fund had disbursed nearly $2.8 billion since

1991 to support capacity building, technical assistance, training and industrial conversion projects in nearly 150 countries (Multilateral Fund 2012: Annex 1; UNEP 2012b) resulting in the phase-out of nearly all production and most of the use of CFCs, carbon tetrachloride, halon and methyl chloroform in developing countries (UNEP 2012b).

Governance and administration of the ozone regime is similar to that in other environmental treaties. The Meeting of the Parties is the supreme decision-making body and meets annually. An Open-Ended Working Group (OEWG) holds discussions in preparation for the MOP, usually four to six months prior. All countries Party to the Protocol can participate in the MOP and OEWG with full decision-making privileges. While the Protocol does allow for supermajority voting, the strong norm is to take decisions by consensus and to date no official vote has been taken. The MOP can agree to amend the treaty, changing the text of the Protocol, which then requires ratification by individual Parties to take effect. The MOP can also adjust regulations on chemicals already controlled under the Convention as well as take decisions on other policy matters that do not change the wording of the Protocol. Adjustments and other decisions go into effect immediately. Representatives from international organizations, nongovernmental organizations, industry groups and research institutions can attend MOP and OEWG meetings as observers and participate in plenary and some contact-group discussions. The Ozone Secretariat, based at UNEP headquarters in Nairobi, performs standard administrative functions.

Successes and challenges of global ozone policy

As noted by Oran Young, "the concept of effectiveness as applied to environmental regimes is complex and subject to a variety of formulations" (Young 2011: 19854; see Chapter 9). Arguably, the most important measure of an environmental regime's effectiveness or success is its impact on the problem it was created to address (Chasek et al. 2013; Young 2011: 19854). There are many ways to consider this impact but perhaps the most straightforward question is: Has the regime produced measurable change in the environment? In addition, because environmental issues exist as consequences of human activity, for a regime to be successful, it must have impacted, in a measurable way, the human activity that produced the environmental harm (Chasek et al. 2013; Young 2011: 19854). Other measures of success might be relevant as well. For example, measures of state participation, implementation and/or compliance; the strength or quality of regime rules and institutions; cost-effectiveness; the impact of regime norms and principle on actor perceptions of their interests; and its impact on other issue areas (representative discussions include Young 2011; Young et al. 2008; Sprinz 2000; Young 1999; see Chapter 9). Along all these measures, the Montreal Protocol and the broader ozone regime should be seen as very successful; not perfect and not without remaining challenges, but highly successful. (For a contrary view, see Gareau 2012. The following discussion expands on Downie 1996; Ozone Secretariat 2012d; Downie 2012.)

Significant reductions in ODS production, use and emissions

The Montreal Protocol has successfully reduced the production, use and emissions of ODS (WMO et al. 2011). Nearly all of the production and use of new CFCs, halon, carbon tetrachloride and methyl chloroform have been eliminated (UNEP 2011b). Methyl bromide production has declined drastically and HCFC controls are proceeding according to the control schedule. As a result the atmospheric abundance of all major ODS except HCFCs is declining, as is the amount of chlorine and bromine in the stratosphere (WMO et al. 2011). Because Argentina, Brazil, China, the EU, India, Indonesia and Thailand, among many other countries,

did not take meaningful action to reduce CFCs and other ODS until they joined the Montreal Protocol, and because key ODS alternatives were invented or commercialized in response to controls established by the Protocol, these declines must be attributed to the impact of the ozone regime.

As a consequence of these cuts in ODS, ozone depletion has stabilized. Most of the ozone layer will likely return to normal levels near the middle of this century, with recovery of Antarctic ozone following later. Computer simulations show that without the Protocol, ODS emissions would have produced global ozone depletion and solar UV radiation levels far higher than they are now and that much larger levels would have occurred in the future (WMO et al. 2011; Newman and McKenzie 2011).

Impacts on human health and the environment

The Montreal Protocol prevented increases in UV radiation that would have produced large-scale, negative impacts on the environment and human health (UNEP 2010, 2011a: Annex X; Newman and McKenzie 2011). These include the prevention of tens of millions of cases of fatal skin cancer and many more millions of non-fatal skin cancer and eye cataracts (UNEP 2010; van Dijk et al. 2013; US EPA 2010). The EPA estimates that in the United States alone, stratospheric ozone protection prevented approximately 6.3 million additional skin cancer deaths, 299 million non-fatal cases of skin cancer and $4.2 trillion in healthcare costs that would have otherwise occurred between 1990 and 2165 (US EPA 1999: 64; UNEP 2012b). The ozone regime also prevented the very large reductions in plant productivity, including many food crops, and negative impacts on aquatic organisms that would have occurred with higher levels of UV exposure (UNEP 2010, 2011a: Annex X).

Global participation

As noted, the Montreal Protocol is the only environment treaty to achieve universal ratification and its amendments also enjoy near universal ratification. This contrasts with other major environmental treaties, such as the Kyoto Protocol to which Canada and the USA are not Parties; the Rotterdam Convention, to which Angola, Indonesia, Turkey, Tunisia, the USA and others are not Parties; the Stockholm Convention to which Israel, Malaysia, the USA and others are not a Party; and the Basel Convention Ban Amendment and Basel Liability Protocol which have only 75 and 13 Parties, respectively (all numbers as of 12 June 2013).

Most states have met their obligations under the Protocol. This does not mean that all states met all of their phase-out, reporting, financial and other obligations on time. They did not. Many national reports are submitted late. A number of Eastern Europe and developing countries missed some of the CFC phase-out targets. However, overall, "taking into account all parties to the Protocol and all their phase-out commitments, the parties have achieved a compliance rate of over 98 per cent. Further, in the process of phasing-out many countries, both developed and developing, have met their phase-out targets well ahead of schedule" (Ozone Secretariat 2012d).

Strong regime rules and effective institutions

The ozone regime contains strong, clear and binding rules obligating Parties to meet specific obligations to phase-out ODS. Contrast these rules with the weaker provisions of the climate (Chapter 28), biodiversity (Chapter 37) and desertification (Chapter 39) regimes. In addition, the institutions developed under the Protocol, including the Multilateral Fund, Assessment

Panels and Implementation Committee, are seen by Parties as operating effectively, albeit not perfectly or without criticism.

The ozone regime is often cited, appropriately and inappropriately, by global environmental policy-makers as providing models and lessons in how to design, expand or implement effective global environmental policy (based on this author's observations during more than 50 global environmental negotiations on a variety of issues over the past 20 years). While success should be emulated, cogent analysis argues for careful consideration of what aspects of the ozone regime can be successfully transferred to other issue areas versus what aspects were products of circumstances somewhat unique to the ozone issue area or the time during which key aspects were developed (for discussions, see Downie 1995a and DeSombre 2000). At the same time, there is little doubt that experience gained in the ozone regime regarding the design of control measures, reporting requirements, provisions of financial and technical assistance, employment of assessment panels, inclusion of trade provisions, non-compliance procedures, broader participation for NGOs and other issues has positively impacted discussions and developments on other global environmental issues.

Finalizing the methyl bromide and HCFC phase-out

Successes to date do not automatically necessitate continued success. The scientific analysis that predicts that most areas of the ozone layer should return to pre-ODS levels rests on the assumption that all countries will remain willing and able to fulfill all their obligations relevant to eliminating ODS. Global ozone policy faces important challenges that could delay or even prevent full recovery. This includes completing the HCFC and methyl bromide phase-outs, eliminating the use of CFC, halon and methyl bromide exemptions, and preventing black-market ODS production and trade.

Probably the greatest challenge is completing the phase-out of HCFCs in the air-conditioning and refrigeration sectors. HCFCs are efficient, cost-effective, and far less ozone-depleting alternatives to CFCs. They are also less potent greenhouse gases than another key CFC alternative known as HFCs. Many industrialized and developing countries have based some or even most of their post-CFC refrigeration and air-conditioning infrastructure on HCFCs and HCFC production in developing countries has expanded tremendously in the past decade. Thus, it is possible that as the very large HCFC phase-downs arrive in 2020 and beyond, some countries, particular large developing countries with major HCFC production facilities, might decide that although they have implemented significant reductions, complete elimination is not economically justified or requires more assistance from the Multilateral Fund than donor countries are willing to provide (Downie 2012: 255)

Methyl bromide presents a different type of obstacle. Industrialized countries phased out most methyl bromide in 2005 and developing countries must do the same in 2015. However, methyl bromide remains in use in several industrialized countries, especially the United States, under the broad exemptions granted for critical agricultural uses and for quarantine and pre-shipment applications. Many developing countries will utilize these exemptions starting in 2015 and some will require additional financial assistance even to meet the 2015 deadline (UNEP 2012b). The European Union and others believe that effective, economically viable and environmentally friendly alternatives exist for all uses of methyl bromide. Others argue that alternatives are not sufficiently effective or economically viable for all uses in all countries, especially pre-shipment and quarantine application (see, e.g., UNEP 2011a). Unless this deadlock is broken, methyl bromide exemptions could mean it remains in production and use even after the Protocol states it should have been phased-out.

ODS banks

While very little production and use of new CFCs remains, that does not mean that all the CFCs and other ODS produced in the past have already reached the atmosphere and are no longer a threat. "Millions of tons of CFCs remain in old or discarded refrigerators, air-conditioners, insulating foam and other products and wastes, collectively known as 'ODS Banks'" (Downie 2012: 255). Unless they are captured and destroyed, these ODS will eventually reach the atmosphere, delaying recovery of the ozone layer. Indeed, leakage from banks is currently the largest source of ODS when one factors in each gas's ODP or ozone-depleting potential (WMO et al. 2011: Executive Summary). Many governments recognize the seriousness of this issue but coordinated and sustained efforts to rectify it have not yet begun and many developing countries lack the resources to destroy ODS banks in an environmentally sound manner (UNEP 2012a).

Climate impacts

The Montreal Protocol has made large contributions to mitigating climate change by reducing emissions of ODS that are also greenhouse gases. In 2010 alone, ODS reductions under the Montreal Protocol prevented about 10 Gigatonnes of CO_2-equivalent greenhouse gas emissions, which is about five times larger than the annual emissions reduction target for the first commitment period (2008–12) of the Kyoto Protocol (WMO et al. 2011: Executive Summary). Overall, the Montreal Protocol is estimated to have averted greenhouse gas emissions equal to more than 135 billion tons of carbon dioxide (Ozone Secretariat 2012d), far more than has been eliminated to date via the climate regime (Velders et al. 2007).

At the same time, the two most widely used substitutes for CFCs – HCFCs and HFCs – are also potent greenhouse gases, as are some byproducts created during their production. HCFCs are addressed under the Protocol and their climate impact, while significant, will decline and eventually be eliminated if countries fulfill their obligations (something that is not guaranteed). HFCs are not ODS, however, and thus do not naturally fall under the purview of the Montreal Protocol, even though they exist because of the Protocol's restrictions on CFCs and their production is expanding rapidly. Thus, the ozone regime has both assisted efforts to mitigate climate change and made it more difficult.

Canada, the EU, Mexico, Switzerland, Norway, the United States and many small island states support amending the Protocol so it would control HFCs. They argue that the success of the Montreal Protocol, in contrast to the climate regime, offers the best venue to address these high global warming potential (GWP) chemicals, noting that they likely would not exist if not for the ozone regime. HFC projects under the Protocol would also have access to the Multilateral Fund and would allow the world to take concrete steps to address climate change while countries continue to struggle to address CO_2 emissions under the climate regime. This proposal has been blocked by China, India, Iran, Saudi Arabia and other states that argue that the Protocol cannot legally address non-ODS, that addressing HFCs would take resources away from eliminating methyl bromide and HCFCs, and that taking up climate issues under the Protocol would complicate and perhaps delay meaningful progress under the climate regime. (For recent examples of this debate, see UNEP 2011a: paras. 15–17 and 103–19, and UNEP 2012a: paras. 69–77.)

This stalemate is not only a challenge to mitigating climate change. Ozone depletion and climate change are largely distinct issues: ozone depletion does not cause climate change; and most greenhouse gases do not deplete ozone. At the same time, however, research suggests that if climate change continues to cool the upper stratosphere (while warming the troposphere), this

will push back the date that they believe the ozone layer will be healed – and could even yield net decreases in ozone if the stratosphere continues to cool and some ODS emissions continue (WMO et al. 2011; UNEP 2011a: Annex VIII). Thus, controlling HFCs is arguably not only an important challenge to mitigating climate change but also of importance, indirectly, to restoring the ozone layer.

Funding and political will

Success can breed complacency. "Many Parties have found that now that most of the phase-out required under the Protocol has been accomplished, it has become increasingly difficult to get the attention of, or funding from, policy-makers to deal with the remaining phase-out" (Ozone Secretariat 2012e). Developing and donor countries face challenges maintaining the political will to finish the methyl bromide and HCFC phase-outs, to control emissions from halon banks, and potentially to address HFCs. While the political and economic hurdles required for these efforts might be relatively small compared with addressing climate change effectively (see Chapter 28), it is possible that economic difficulties, false confidence that the ozone problem is solved, or broader international political or economic differences could prevent the funding and continued political commitment necessary to ensure recovery of the ozone layer and the prevention of renewed depletion.

Explaining the development and success of the ozone regime

Many factors helped shape the development and extent of the success of the ozone regime. Advancing scientific knowledge played a very important but not a determinative role in the creation and expansion of global ozone policy. (For discussion and analysis of this impact, see Haas 1992; Litfin 1994; Downie 1996; Benedick 1998; Anderson and Sarma 2002; Canan and Reichman 2002; Parson 2003; Downie 2012; and Chasek et al. 2013; and Chapter 17.) Scientific discovery gave rise to the issue in the first place. Advancing scientific knowledge and consensus in the 1980s undercut European opposition to starting negotiations on a framework Convention. The discovery of the ozone hole galvanized public opinion and policy-makers and gave control proponents the platform they needed to restart negotiations aimed at controlling CFCs. Confirmation that chlorine atoms released from CFCs were the ultimate cause of the hole eviscerated arguments that further controls should wait until more evidence was found, helped completely reverse the EU negotiating position and contributed to the strengthening of the ozone regime in London in 1990. Discovery of depletion above the northern hemisphere and the continued worsening of the Antarctic holes contributed to the 1992 Copenhagen Amendment. The 2007 IPPC report and conclusions by the Scientific Assessment Panel that a precautionary approach to protecting the stratospheric ozone layer required further action helped spur the important and surprising decision in Montreal in 2007 to accelerate the HCFC phase-out (Downie 2012: 248).

The complexity of the scientific information also helped a transnational network of experts who supported action, an epistemic community, to influence policy-makers who had come to rely on them to interpret the science (Haas 1992; see Chapter 17). It allowed experts who understood the atmospheric science to shape discourse on the issues, to frame discussions, to introduce precautionary and intergenerational time frames, and to influence other policy-makers (Haas 1992; Litfin 1994; Downie 1996; Canan and Reichman 2002).

From a different perspective, advancing scientific knowledge helped frame the negotiations, constraining and undercutting actors when they supported positions that appeared to go against

the consensus knowledge as set forth in the assessment reports (Downie 1996). In the language of simple game theory, advancing knowledge also helped "alter the payoff structure" and "enhance the shadow of the future" (Oye 1985; see Chapter 3). Cooperation became more likely as countries increased the value they attached to protecting stratospheric ozone (altered payoffs) or came to believe that they would be holding negotiations on the issue for many years (shadow of the future). As the regime grew, scientific information combined with other aspects of the regime to increase the value that actors attached to the ozone regime, further enhancing cooperation (Keohane 1984). As almost all the analyses of the ozone regime point out, however, while the impact of scientific knowledge and consensus was important, even necessary, it was not sufficient on its own to produce the current regime (see Chapter 17). A confirming argument is to examine the development of the climate regime at analogous stages of scientific knowledge and consensus in the form of reports by the IPCC (see Chapter 28).

Another set of important causal factors centers on the economic interests of key actors (Downie 1996, 2012). Perceptions of economic costs, particularly adjustment costs, impacted perceptions of state interests, which in turn impacted their policy preferences (Sprinz and Vaahtoranta 1994; Oye and Maxwell 1994; Downie 1996; Falkner 2005). Not surprisingly, economic interests related to ODS production and use often impeded efforts to create stronger controls. Examples include the lack of CFC regulations in most of Europe prior to the Montreal Protocol; Europe preventing the inclusion of control measures in the Vienna Convention; the 50 percent reduction target set in the Montreal Protocol (which allowed the EU to meet much of their obligation through inexpensive controls on the use of CFCs in aerosol sprays); the inclusion of exemptions, especially the critical use exemption for methyl bromide; and the relatively lengthy phase-out periods for methyl bromide and HCFCs, especially in developing countries.

Similarly, at times during the regime's development, countries on both sides of a particular policy debate pushed for resolutions that would result in low adjustment costs for the relevant industries in their countries, producing policy stalemates. This occurred during creation of the Vienna Convention and the early stages of the Montreal Protocol negotiations when the USA and others advocated banning the use of CFCs in aerosol sprays, which they had already enacted, while EU countries advocated a cap on CFC production capacity, something they had already enacted and knowing that their companies had significant excess capacity while US CFC producers did not (Downie 1996). A similar situation emerged during the initial efforts to strengthen HCFC controls and is now occurring in the debate on HFCs

However, during several crucial periods economic interests greatly assisted efforts to strengthen the ozone regime. First, the regulation of CFCs in the United States and in the Montreal Protocol created economic incentives for companies to develop substitutes (Roan 1989; Downie 1996; Benedick 1998; Falkner 2005). More substantially, the development of effective substitutes, especially for CFCs, altered the economic interests of particular industries, major corporations or governments, lowering the costs associated with eliminating ODS and allowing some actors to profit (Downie 1996; Falkner 2005; see Chapter 13). By the late 1980s, CFCs had become low-margin chemicals facing imminent competition from large production facilities planned in China and India. Once the major CFC producers in Japan, Europe and the USA were certain that they could produce HCFCs and HCFs, they changed their position and began to support a gradual global CFC phase-out as this would create a market for HCFCs and HFCs (Oye and Maxwell 1994; Downie 1996; Falkner 2005). Along with the new scientific information linking CFCs to the ozone hole, and domestic political realities in the UK and Germany, this change in long-term economic interests contributed to a rapid change in EU policy (Downie 1996; see Chapter 12). The Multilateral Fund also impacted economic interests.

Companies that received support from the fund and transitioned away from CFCs also became internal advocates of "stronger domestic action in their own countries as they did not want to get undercut by competitors using less expensive ozone-depleting chemicals" (Downie 2012: 248)

Other causal factors involve the neoliberal institutional observation that international institutions can positively impact the development of collective action (e.g., Keohane 1984; Haas et al. 1993). While the ozone regime might have developed exactly as it did, when it did, it seems likely that the presence and actions of UNEP, WMO and the Vienna Convention and Montreal Protocol themselves greatly assisted efforts by states and other actors seeking effective ozone policy (Downie 1996). UNEP's presence greatly eased the process of initiating international discussions; indeed, the organization was created for that purpose. European actors skeptical or even hostile to the idea of discussing ozone policy had difficulty opposing UNEP's nascent efforts on the issue. Recognition of WMO's function and expertise facilitated creation of the CCOL and the Scientific Assessment Panel. CCOL reports gave greater international weight to the emerging scientific concern, which was still centered in the USA in the early 1980s. If the Vienna Convention had not existed, it likely would have taken far longer to initiate global negotiations on regulating CFCs following discovery of the ozone hole (Downie 1996). In addition, the act of negotiating the Convention and Protocol impacted attitudes in some states, helping raise awareness and concern, and lower perceived costs and build trust.

In addition, during the early stages of the regime's development through creation of the 1990 London Amendment, UNEP played an intentionally active role under its Director Mustafa Tolba. In the late 1970s, UNEP worked to help initiate international action by organizing the first scientific and political meetings focusing on ozone depletion. UNEP then worked to sustain international attention on the issue when interest in ozone depletion waned significantly during the early 1980s. Once substantive negotiations began, UNEP facilitated regime creation by establishing a procedural foundation and reducing transaction costs. Finally, UNEP – through the work of Tolba in particular – actively pushed the Parties toward agreements in Montreal in 1987 and London in 1990. Tolba also actively lobbied developing countries in the 1980s and 1990s to join the regime (Downie 1995b; Benedick 1998).

Finally, the ozone regime could not have strengthened its controls so quickly if Parties had not been able to adjust the control measures on ODS already listed in the Protocol. The controls on CFCs went from requiring a 50 percent cut by 2000 in the original Protocol to a 100 percent phase-out by 2000 in the 1990 London adjustment to a 100 percent phase-out by 1996 in the 1992 Copenhagen adjustment. These updates became binding immediately. If the agreements had required formal amendments and ratification, the process would have taken years longer. This is just one aspect of the ozone regime identified as important to its success. Others include:

- The concise, clear and obviously binding nature of the obligations to reduce and eliminate ODS production and use.
- The fact that the Protocol did not attempt to specify how countries meet these obligations which allowed each country to set policies appropriate for its circumstances (e.g., controls on specific uses, market-wide reductions, taxes, economic incentives, etc.).
- The allowance for exemptions to prevent isolated and relatively small interests from preventing a country from joining the regime while also limiting most exemptions by requiring that countries apply for them annually and receive approval from the MOP.
- Trade restrictions that prohibit Parties from exporting ODS and products containing ODS after a certain date. These provisions acted as a powerful incentive for importing countries, especially smaller countries, to join the regime and acted to discourage countries from leaving the regime.

- The Multilateral Fund, which ensured the participation of large developing countries in the regime, assisted developing countries meet and sometimes exceed the phase-out schedules, and created supporters of ODS control among the actors that received funding and had transitioned to alternatives.
- The stated principle that control measures should be guided by scientific understanding of threats to the ozone layer in a precautionary manner and the general although not absolute observance of this principle.
- Requirements for Parties to report annual data on production, imports and exports of the controlled substances.
- The requirement that the MOP review the adequacy of the control measures on the basis of available scientific, environmental, technical and economic information.
- Creation of assessment panels to provide independent, authoritative information directly to the Parties.
- A robust but facilitative non-compliance procedure focused on identifying instances of non-compliance and working with the Party to seek solutions.

Conclusion

The Montreal Protocol has successfully addressed a critical environmental problem, providing an important example for the study and practice of global environmental politics. If the terms of the regime are fully implemented, the ozone layer should fully recover during this century. However, existing success does not guarantee the future. Full recovery of the ozone layer could be delayed, and ozone depletion could even begin to worsen, if countries do not fully implement their remaining obligations, address ODS banks, control methyl bromide exemptions and prevent new ODS from coming to market. Equally troubling is evidence that climate change could cool the upper stratosphere sufficiently to accelerate ozone destruction from ODS already in the atmosphere or that reach the atmosphere in the future. The next few decades will determine if the ozone regime meets its ultimate objective of permanently safeguarding stratospheric ozone.

References

Anderson, S. and K. Sarma. 2002. *Protecting the Ozone Layer: The United Nations History*, London: Earthscan.

Benedick, R. 1998. *Ozone Diplomacy*, 2nd edn, Cambridge, MA: Harvard University Press.

Canan, Penelope and Nancy Reichman. 2002. *Ozone Connections: Expert Networks in Global Environmental Governance*, Sheffield: Greenleaf Publishing.

Chasek, Pamela S., David L. Downie and Janet Welsh Brown. 2013. *Global Environmental Politics*, 6th edn, Boulder, CO: Westview Press.

DeSombre, Elizabeth. 2000. "The Experience of the Montreal Protocol: Particularly Remarkable and Remarkably Particular," *UCLA Journal of Environmental Law and Policy*, 19(2): 49.

Dotto, Lydia and Harold Schiff. 1978. *The Ozone War*, New York: Doubleday.

Downie, D. 1993. "Comparative Public Policy of Ozone Layer Protection," *Political Science* (NZ) 45(2): 186–97.

—— 1995a. "Road Map or False Trail: Evaluating the Precedence of the Ozone Regime as Model and Strategy for Global Climate Change," *International Environmental Affairs*, 7(4): 321–45.

—— 1995b. "UNEP and the Montreal Protocol: New Roles for International Organizations in Regime Creation and Change," in R. Bartlett, P. Kurian and M. Malik (eds) *International Organizations and Environmental Policy*, Westport, CT: Greenwood Press.

—— 1996. "Understanding International Environmental Regimes: The Origin, Creation and Expansion of the Ozone Regime." Unpublished PhD Dissertation. University of North Carolina at Chapel Hill.

Downie, D. 2012. "The Vienna Convention, Montreal Protocol and Global Policy to Protect Stratospheric Ozone," in P. Wexler, J. van der Kolk, A. Mohapatra and R. Agarwal (eds) *Chemicals, Environment, Health: A Global Management Perspective*, Boca Raton, FL: Taylor & Francis.

Falkner, Robert. 2005. "The Business of Ozone Layer Protection: Corporate Power in Regime Evolution," in David Levy and Peter Newell (eds) *The Business of Global Environmental Governance*, Cambridge, MA: MIT Press.

Farman, Joseph, B. Gardiner and J. Shanklin. 1985. "Large Losses of Total Ozone in Antarctica Reveal Seasonal ClO_x/NO_x Interaction," *Nature*, 315: 207–10.

Gareau, Brian. 2012. *From Precaution to Profit*, New Haven, CT: Yale University Press.

Haas, Peter. 1992. "Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone," *International Organization*, 46(1): 187–224.

Haas, Peter, Robert Keohane and Marc Levy. 1993. *Institutions for the Earth: Sources of Effective International Environmental Protection*, Cambridge, MA: MIT Press.

Keohane, Robert. 1984. *After Hegemony: Cooperation and Discord in the World Political Economy*, Princeton, NJ: Princeton University Press.

Litfin, Karen. 1994. *Ozone Discourses: Science and Politics in Global Environmental Cooperation*, New York: Columbia University Press.

Molina, Mario and F. Sherwood Rowland. 1974. "Stratospheric Sink for Chlorofluoromethanes: Chlorine Atomic Catalyzed Destruction of Ozone," *Nature*, 249: 810–12.

Multilateral Fund. 2012. "Report of the Sixty-Seventh Meeting of the Executive Committee," UN Document UNEP/OzL.Pro/ExCom/67/39 of 21 July.

Newman, Paul and Richard McKenzie. 2011. "UV Impacts Avoided by the Montreal Protocol," *Photochemical & Photobiological Science*, 10(7): 1152–60.

Oye, Kenneth (ed.) 1985. *Cooperation under Anarchy*, Princeton, NJ: Princeton University Press.

Oye, Kenneth and James Maxwell. 1994. "Self-interest and Environmental Management," *Journal of Theoretical Politics*, 64: 599–630.

Ozone Secretariat. 2012a. *Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer*, 9th edn. Nairobi: UNEP.

—— 2012b. *Achievements in Stratospheric Ozone Protection: Progress Report 1987–2012*, Nairobi: UNEP Information Pamphlet.

—— 2012c. *Montreal Protocol on Substances that Deplete the Ozone Layer, 2012: A Success in the Making*, Nairobi: UNEP Information Pamphlet.

—— 2012d. "Key Achievements of the Montreal Protocol to Date," Nairobi: UNEP Information Sheet.

—— 2012e. "Continuing and Future Challenges Facing the Ozone Layer Protection Effort," Nairobi: UNEP Information Sheet.

Parson, Edward. 2003. *Protecting the Ozone Layer: Science and Strategy*, Oxford: Oxford University Press.

Roan, Sharon. 1989. *Ozone Crisis: The 15-Year Evolution of a Sudden Global Emergency*, New York: John Wiley.

Skjaerseth, Jon Birger. 2012. "International Ozone Politics," in Steinar Andresen, Elin Boasson and Geir Hønneland (eds) *International Environmental Agreements: An Introduction*, New York: Routledge.

Sprinz, Detlef. 2000. "Measuring the Effectiveness of International Environmental Regimes," *Journal of Conflict Resolution*, 44: 630–52.

Sprinz, Detlef and Tapani Vaahtoranta. 1994. "The Interest-Based Explanation of International Environmental Policy," *International Organization*, 48(1): 77–105.

UNEP. 2010. *Environmental Effects of Ozone Depletion and its Interactions with Climate Change: 2010 Assessment*, Nairobi: UNEP.

—— 2011a. "Report of the Twenty-Third Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer," UNEP Document UNEP/OzL.Pro.23/11 of December 8.

—— 2011b. "Information Provided by Parties in Accordance with Article 7 of the Montreal Protocol on Substances that Deplete the Ozone Layer," UNEP Document UNEP/OzL.Pro.23/7 of 16 September.

—— 2012a. "Report of the 32nd Meeting of the Open-Ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer," UN Document UNEP/OzL.Pro/WG.1/32/7 of 8 August.

—— 2012b. "Evaluation of the Financial Mechanism of the Montreal Protocol: Executive Summary," UN Document UNEP/OzL.Pro/WG.1/32/4 of 22 May.

US EPA. 1999. *The Benefits and Costs of the Clean Air Act, 1990–2010*. Document no: EPA 4W-R-99-001. Environmental Protection Agency, Office of Air and Radiation.

—— 2010. "Protecting the Ozone Layer Protects Eyesight: A Report on Cataract Incidence in the United States Using the Atmospheric and Health Effects Framework Model." Prepared and peer-reviewed by ICF International for the US EPA. Online. Available HTTP: <http://www.epa.gov/ozone/science/effects/index.html> and <http://www.epa.gov/ozone/science/effects/AHEFCataract Report.pdf> (viewed 24 August 2012).

Van Dijk, A., H. Slaper, P.N. den Outer, O. Morgenstern, P. Braesicke, J.A. Pyle et al. 2013. "Skin Cancer Risks Avoided by the Montreal Protocol – Worldwide Modeling Integrating Coupled Climate-Chemistry Models with a Risk Model for UV," *Photochemistry and Photobiology*, 89(1): 234–46.

Velders, Guus, Stephen Andersen, John Daniel, David Fahey and Mack McFarland. 2007. "The Importance of the Montreal Protocol in Protecting Climate," *PNAS (Proceedings of the National Academy of Sciences of the United States of America)*, 104(12): 4814–19.

WMO (World Meteorological Organization) et al. 2011. *Scientific Assessment of Stratospheric Ozone: 2010*, WMO Global Ozone Research and Monitoring Project, report no. 52. Geneva: WMO.

Young, Oran (ed.) 1999. *The Effectiveness of International Environmental Regimes: Causal Connections and Behavior Mechanisms*, Cambridge, MA: MIT Press.

—— 2011. "Effectiveness of International Environmental Regimes: Existing Knowledge, Cutting-edge Themes, and Research Strategies," *PNAS*, 108(50): 19853–60.

Young, O., L. King and H. Schroeder (eds) 2008. *Institutions and Environmental Change*, Cambridge, MA: MIT Press.

30

Air pollution and acid rain

Loren R. Cass

International negotiations on transboundary air pollution present a long and rich set of case studies within the field of global environmental politics. Scholars have produced an extensive literature addressing the successes and failures of international attempts to address these problems. Transboundary flows of air pollution possess a number of characteristics that make these issues particularly interesting for scholars. For example while smog is clearly visible in urban areas, the most important transboundary air pollutants such as sulfur dioxide, nitrogen oxides, the most dangerous particulate matter, persistent organic pollutants (POPs), and volatile organic compounds (VOCs) are not clearly visible to the naked eye (see Chapter 32). The public is thus unlikely to independently identify these pollutants as problems. Instead, scientists must play a critical role in defining and framing the problems for political debate and policy response (see Chapter 17). The relationships among science, problem framing, and political responses have been a central focus of the international air pollution literature.

The primary sources of air pollution are the burning of fossil fuels for electricity production, transportation, heating, and industrial uses (see Chapter 28). Industrial processes are also a major source of these pollutants. Efforts to address air pollution touch the core of the modern industrial economy and will likely involve substantial costs to those affected by regulations (see Chapter 13). Addressing air pollution will thus be politically divisive and will introduce prominent economic interests into both domestic debates and international negotiations. The high economic costs and politically charged nature of the problem assure that power politics will have a significant effect on the response. The close relationships between international and domestic politics have forced global environmental politics scholars to try to bridge the divide between the fields of international relations and comparative politics (see Chapters 11 and 12).

Air pollution is also a classic "upstream–downstream" problem common to many environmental issues. In upstream–downstream issues, the perpetrators of the environmental harm do not face the full environmental costs associated with their activities. The upstream perpetrators thus frequently do not have a strong incentive to address the problem while the downstream victims typically have limited leverage to force the upstream polluters to alter their behavior. The solution to the problem will typically require some form of regional agreement and frequently the creation of international institutions to coordinate scientific research, to facilitate agreements to reduce emissions, to monitor compliance, and perhaps to support financial

transfers from downstream states to upstream states to induce compliance (see Chapters 8 and 9). Scholars addressing international air pollution have created a substantial literature analyzing the roles of international institutions in promoting cooperation to address air pollution and in monitoring compliance.

There is a range of potential air pollution problems that could be addressed in this chapter, but the primary focus here will be on the problem of acid rain. Acid rain in Europe was one of the first problems to be addressed through international negotiations after the 1972 Stockholm Convention. It was thus among the first to be studied extensively within the emerging field of global environmental politics. The relatively long history involving nearly 40 years of international efforts to address acid rain offers excellent case studies of the evolution of international institutions designed to address a major transboundary environmental problem, and presents an opportunity to explore the effectiveness of these agreements over time.

The chapter provides a brief overview of transboundary air pollution. It traces the origins and political response to acid rain before discussing the global environmental politics literature that has emerged around this issue. Finally, it reviews the evolving international political responses to other forms of air pollution by briefly touching upon particulate matter (PM), volatile organic compounds (VOCs), persistent organic pollutants (POPs), and heavy metals which have been identified more recently as problems deserving international attention. These issues are likely to be the focus of international negotiations in the future.

The problem of transboundary air pollution

Air pollution emerged alongside the processes of urbanization and industrialization. It was thus among the first environmental problems to be acknowledged and addressed with public policy responses. As one of the first countries to experience rapid urbanization and industrialization, it was only natural that England would be the first to identify air pollution as a problem. English royals made various proclamations beginning in 1257 to ban the burning of "sea coal" to address worsening air pollution in London. By the fifteenth century, London's skies were regularly blackened with coal smoke, but its residents recognized the smoky fog or "smog" as more of a local nuisance than a major threat. English diarist John Evelyn published a pamphlet in 1661 entitled "Fumifugium, or the Inconvenience of the Aer and Smoke of London Dissipated" that offered an account of the origins and effects of air pollution on human health and provided a blueprint for improving the air quality of London. However, it would take nearly 300 years before serious domestic efforts would be brought to bear on the problem.

The full extent of the human health and broader ecological effects from exposure to air pollution would not be widely understood and accepted by the public and political leaders until the 1960s, and domestic policies to address the problem were very slow to emerge. The recognition that air pollutant emissions in one country could have ecological implications for other countries would take even longer to be accepted. International air pollution policy thus provides an excellent case study to analyze the forces that shape the identification and framing of a problem for political action at both the domestic and international levels. This is particularly interesting in that the timing of the responses across regions of the world have varied significantly. Acid rain was first identified as a potential cross-national problem in the late 1960s in Europe, but it did not reach the diplomatic agenda of the North American states until the early 1970s, and Asian countries did not begin to address the issue until the mid-1980s (Wilkening 2004: 213). The European response to acid rain and more broadly to air pollution has created the most advanced regional system for addressing air pollution problems. North America and Asia have lagged significantly behind Europe in terms of regional responses, while very little attention has been

devoted to transboundary air pollution across the remainder of the world. European responses to air pollution will thus be the primary focus of this chapter.

There is an array of potential environmental and human health problems associated with air pollution. The understanding of these problems has evolved substantially over time. The first of the issues to be addressed internationally was acid rain. The term acid rain was coined in 1872 by Scottish scientist Robert Angus Smith. The basic chemistry of acid rain was well understood by the turn of the twentieth century, but the larger environmental effects of acid precipitation were not well documented until the 1960s. Acids and alkaline (bases) are measured along a logarithmic potential hydrogen (pH) scale from 1 (acidic) to 14 (alkaline) with 7 being neutral. Normal rainwater is slightly acidic with a pH of 5.6. Acid rain would thus be considered rainfall with a pH of less than 5.6. Acid rain is produced when emissions of sulfur dioxide or nitrogen oxides are released during the burning of fossil fuels, when ammonia is released from animal manure, rice paddies, fertilizers, or other sources, or when a range of volatile organic compounds are released from industrial processes. These substances interact with water either while suspended in the air or after falling to the ground to produce a range of acids such as sulfuric acid, nitric acid, and ammonium.

The acids produce substantial harm to the natural and man-made environment. In the absence of buffering agents such as carbonate in soils, acid rain enters rivers and lakes and progressively increases the acidity levels of the water, which initially creates stress on fish as pH levels fall below 6.5. Most fish species cannot tolerate acidity levels below a pH of 5.0, and lakes can "die" as fish populations collapse at lower pH levels. At the height of the acid rain problem in Europe in the 1970s and 1980s, there were thousands of lakes across Scandinavia that lost fish species.

Beyond the effects on lakes, acid rain can produce substantial harm to plant life and particularly to forests. Acid precipitation can interact with soils to disrupt the nutrient balance that is critical to the health of plants. Acid precipitation will tend to leach critical nutrients such as magnesium and calcium out of the soil and make them unavailable for plant systems, and it can simultaneously add nitrogen to soils, which is a vital nutrient for plant growth and can an act as a fertilizer. However, the plants cannot effectively utilize the nitrogen in the absence of sufficient quantities of magnesium and calcium. Acid precipitation can also release heavy metals in the soil which can affect root structures and prevent the uptake of water. The overall effect can be widespread forest destruction across vast areas as well as extensive damage to the productivity of agricultural lands (see Chapters 38 and 40). Finally, acid rain also has an effect on the built environment. It degrades metal on buildings and transportation infrastructure and gradually damages a wide range of materials from stone to glass, rubber, and ceramics. The costs associated with acid rain can thus be substantial.

While acid rain has been the focus of much of the international response to air pollution, there are many other air pollutants that pose significant environmental and human health risks. While many states have pursued domestic regulation of these problems, international concern has emerged relatively recently (see Chapter 12). For example, airborne particulate matter composed of tiny solid particles and liquid droplets can cause significant problems for human and animal respiratory systems. These particles can be composed of dust, soot, acids, organic chemicals, heavy metals, and other toxic substances. Public health officials particularly worry about particles that are under 10 micrometers with the most dangerous particles being 2.5 micrometers or smaller. These tiny particles can be inhaled deep into the lungs where they can cause respiratory problems, aggravate asthma, produce chronic bronchitis, affect heart function leading to heart attacks, and produce premature death due to heart and/or lung disease. The particles can be carried by winds over long distances and thus have the capacity to cross international borders.

While particulate matter has long been the focus of domestic regulatory efforts, there has been much less attention at the international level.

There are many other air pollution problems that have emerged as the focus of international environmental attention. Volatile organic compounds (VOCs) are substances that evaporate easily at room temperature with the chemicals entering the surrounding air where they can be inhaled. Many chemicals in paints, solvents, dry cleaning chemicals, adhesives, and numerous other substances are VOCs. These substances can cause headaches, nausea, respiratory distress, compromised immune systems, cancer, and nervous system damage. Most of these substances pose their greatest threats through indoor air pollution. However, there is growing evidence that they may pose transboundary problems as well. Persistent organic pollutants (POPs) are another group of chemicals that resist degradation and can thus persist for long periods in the environment (see Chapter 32). POPs have recently been the focus of an international agreement under the 2001 Stockholm Convention on Persistent Organic Pollutants. POPs persist in the environment over long periods of time and can bioaccumulate. The largest sources of POPs are pesticides as well as various industrial chemicals. These substances can travel over vast distances and thus have substantial international implications. POPs have the potential to affect the endocrine, immune, and reproductive systems of humans and animals. Many of the substances are also carcinogens. Finally, heavy metals such as cadmium, lead, and mercury also pose potential cross-border threats. Similar to POPs, these metals persist in the environment and can bioaccumulate. Exposure to these metals is associated with kidney and bone damage, cancer, as well as developmental and neurobehavioral problems. While the basic human health threats posed by particulates, heavy metals, POPs, and VOCs are fairly well documented, the specific relationships between exposure levels and biological effects in an international context are less well understood. International negotiations to address these problems are likely to continue well into the future and will be discussed at the end of the chapter.

Explaining European responses to transboundary air pollution

Analyzing the political response to acid rain requires a theoretical lens through which to analyze the international negotiations. One approach is to focus on national interests and power politics in dictating international agreement. Levy (1993), McCormick (1997), and Boehmer-Christiansen and Skea (1991) highlight the importance of national interests and power politics in the international negotiations to address climate change. However, while state interests and relative power positions explain aspects of the negotiations, these scholars and others would point to other factors that explain aspects of the international negotiations that power politics cannot explain. Dimitrov (2006), Wilkening (2004), Selin (2006), and VanDeveer (2006) highlight the importance of scientific research and learning in international and national responses. National interests can shift in response to new information about the effects of acid rain and its costs. Political leaders and the public can learn and revise their interests in light of new information or new ways of framing a problem. Underdal and Hanf (2000) and Wettestad (1997, 2002) have utilized regime theory to analyze the evolution of European air pollution policy (see Chapter 9). Regimes are defined as social institutions that shape actor expectations and associated behavior in a given issue area. Regimes create opportunities for interaction among states and help promote the diffusion of information, values, and appropriate behavioral norms. In a similar vein, Levy (1993) emphasizes the importance of international institutions in promoting government concern, enhancing the contractual environment for international agreements, and improving the capacity of states to fulfill their commitments. The various theoretical lenses highlight important aspects of the international response to air pollution. There is not sufficient

space here to explore each of these perspectives, but the brief discussion of the evolution of the Convention on Long-Range Transboundary Air Pollution (CLRTAP) below will highlight some of the insights from these scholars and provide a starting point for further exploration of this case.

The first step in the emergence of an environmental problem is the recognition that some process is producing an adverse impact on the environment and/or human health. While scientists had understood since the mid-nineteenth century that acid rain could occur, systematic measurements that could actually quantify the presence of acid precipitation were not in place until the mid-twentieth century. The first large-scale project to measure the chemistry of precipitation was established by Hans Egnér in Sweden in 1948 (Wilkening 2004: 214). This project was eventually expanded to become the European Atmospheric Chemistry Network. It was only in the 1960s that scientists began to piece together a more systematic understanding of the origins and impacts of acid rain in Europe. Swedish scientist Svante Odén provided the first model describing the origins and effects of acid rain (Wilkening 2004: 214–15). Increasingly it became apparent that the predominant European winds were carrying acid precipitation from industrial areas of the UK and Germany north and eastward toward the Scandinavian countries, which due to geological coincidence faced a heavy toll from acid precipitation. Carbonate in soils has the capacity to buffer acidic precipitation and thus reduce acidity levels in runoff. However, Scandinavian soils, similar to soils in the northeast of the United States and large portions of Canada, lack the ability to buffer acidic precipitation and thus face stronger and more immediate effects from acid rain. Because the effects of acid rain were most fully apparent in Sweden, the Swedish government emerged as the primary advocate of international action to address acid rain.

By the late 1960s, acid rain in Europe had been defined as a problem by scientists and was beginning to be addressed domestically in many countries. The next step was for it to become an issue on the international diplomatic agenda. Sweden utilized the 1972 Stockholm United Nations Conference on the Human Environment to raise the problem of acid rain but largely received a skeptical response from the major powers. However, Sweden had some success within the Organization for Economic Cooperation and Development (OECD), which undertook a project to monitor acid deposition in Europe beginning in 1972. In 1977 this research led to the publication of a report that provided substantial evidence of the transboundary transport of acid rain and extensive adverse environmental effects (McCormick 1997: 57). However, the growing scientific evidence that emerged throughout the 1960s and 1970s failed to achieve a significant international impact despite growing calls from scientists and Scandinavian countries to address the problem.

The rise of acid rain to the international diplomatic agenda reflects a fascinating intersection of geopolitics and domestic politics during the 1970s period of Cold War détente between East and West. The success of the 1975 Helsinki Accords to improve relations between the USA and its allies and the Soviet bloc countries produced a renewed effort to find issues on which East and West could make further progress (Darst 2001). The renewed interest in environmental affairs after 1972 made the environment a natural focus for these efforts. The fortuitous presence of the United Nations Economic Commission for Europe (UNECE) provided a forum in which all of the major European countries as well as the USA and Canada were members. The UNECE reviewed a range of possible issues for further negotiation, but air pollution and acid rain emerged as the only issues that diplomats viewed as sufficiently important and had sufficient political backing to launch international negotiations (Levy 1993: 81–3). This was not uncontroversial. Germany, the UK, and a number of industrialized European states feared the potential

costs of reducing emissions of sulfur and nitrogen oxide, and acid rain was a divisive issue domestically in many European countries (Dimitrov 2006: 70).

Negotiations under the UNECE produced the 1979 Convention on Long-Range Transboundary Air Pollution (CLRTAP), which provided the foundation for European efforts to address acid rain and other major transboundary air pollution problems. While CLRTAP did not require any immediate action to reduce emissions, it created a forum for future efforts to address air pollution and established the principle that cross-border flows of acid precipitation should be reduced as much as was economically feasible. Perhaps most importantly, it also established a program to coordinate scientific research programs across Europe to pursue long-term study of the problem of acid rain and air pollution more generally.

CLRTAP was in many ways a lowest common denominator agreement. Germany and the UK among other states did not want to undertake the expensive policy changes that would be necessary to actually reduce transboundary flows of pollutants. The Communist Bloc countries were also largely uninterested in actually reducing transboundary flows, but in their case this was not a major problem since the predominant winds took their pollutants further east and away from the other signatories (Darst 2001). As long as states were required to reduce transborder fluxes and not total emissions, the Communist Bloc countries were willing to go along with such a treaty, and the UK, Germany, and several smaller European states were willing to study the problem further as long as they were not required to take immediate actions to reduce emissions. The outcome was a weak agreement that called for additional study but without any immediate requirements for action. This scientific research would provide the foundation for future agreements to address a range of air pollution problems.

CLRTAP was initially a very weak institution with a primary focus on research. However, as the domestic political situations in the major states of Europe began to shift, the political context within which acid rain was being addressed began to change as well. The Scandinavian countries had sought to include hard targets to force emission reductions of substances producing acid rain in the original CLRTAP agreement or in a protocol to be negotiated immediately after CLRTAP came into force. However, major states such as Germany and the UK opposed this proposal. As evidence of significant adverse effects from acid rain began to accumulate in Germany and later in the UK, the domestic political situations in these countries began to shift. As Germany accepted the need to act, the international politics shifted dramatically as momentum built for a protocol to address sulfur emissions under CLRTAP. Boehmer-Christiansen and Skea (1991) and McCormick (1997) provide good discussions of the shifting domestic political responses across the major states involved in the CLRTAP negotiations. There was a combination of forces at work. Domestic political situations were changing, and the larger structure of CLRTAP permitted new scientific evidence to emerge and influence the international negotiations. Dimitrov (2006: 90–1) emphasizes that the scientific working groups created within CLRTAP were structured thematically around types of environmental damage and not just types of pollutants. This created a structure in which any substance that could be linked to environmental damage was open to investigation by the working groups. The evolution of CLRTAP to draw ever more pollutants into the negotiations is indicative of the role of these working groups and scientific advice in shaping the evolution of the regime.

CLRTAP provided the forum within which the states of Europe were able to negotiate additional agreements to address air pollution problems as new scientific evidence emerged and the political environment permitted agreement. Members of CLRTAP negotiated eight protocols: 1984 protocol to fund long-term air pollution monitoring; 1985 protocol to reduce sulfur emissions or their transboundary fluxes by 30 percent from 1980 levels by 1993; 1988 protocol

to freeze nitrogen oxide emissions at 1987 levels by 1995 (12 West European states committed to reduce nitrogen oxides by 30 percent by 1998); 1991 protocol to reduce VOCs emissions by 30 percent by 1998; 1994 protocol to replace the 1985 sulfur protocol with an "effects based" approach that utilized critical loads to minimize the adverse consequences of sulfur precipitation with emission reductions to be achieved by 2000/2005/2010; 1998 protocol to reduce the emission of cadmium, lead, and mercury below their 1990 levels; 1998 protocol to reduce emissions of 16 POPs; and the 1999 protocol to establish ceilings for emissions of a range of substances (sulfur, nitrogen oxides, VOCs, and ammonia) for 2010 and after. While many countries have pursued domestic policies to address these air pollution problems, European countries have been much more aggressive in their international response. There is not sufficient space here to explore the science and politics surrounding each of these protocols. Wettestad (2002), Levy (1993: 91–100), and Dimitrov (2006: 73–8) provide overviews of the forces shaping the negotiation of the protocols. The evolution of the agreements under CLRTAP illustrates the importance of international institutions in facilitating cooperation and the effects of new scientific evidence on negotiations to address transboundary air pollution. As research emerged regarding the threats posed by various pollutants, the working groups established under CLRTAP placed this information on the political agenda and frequently produced new agreements to expand the scope of CLRTAP.

Wettestad (2006: 290) argues that one of the more interesting examples of the influence of CLRTAP is the development of the "critical loads" concept that became influential in the CLRTAP negotiations leading up to the 1994 protocol on the further reductions of sulfur emissions. The UNECE defines critical loads as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (UNECE 2012). Prior agreements had been premised upon the need to achieve uniform reductions in transborder flows of acid precipitation. The critical loads approach focused on the effects of the emissions and not exclusively on the total emissions. The concept emerged in the scientific work of CLRTAP and then spread into the air pollution policies of states and the EU.

One of the more interesting debates, however, relates to the actual importance of CLRTAP. While there is evidence of the dissemination of science and policy approaches into broader policy-making, was CLRTAP producing major initiatives that propelled states to undertake new initiatives to reduce emissions or was it merely ratifying the positions that states had already adopted domestically? Addressing this question is complicated by the role of the EU. While the EU had been established to promote economic and political integration, environmental regulation and specifically air pollution policy emerged relatively quickly as areas of EU competence. The expanding responsibility of the EU for air pollution regulation and the concomitant territorial expansion of the EU from six states to eventually reach 27 states with several applications pending gradually brought the membership of CLRTAP closer to the membership of the EU. Parallel sets of EU regulations and CLRTAP protocols thus emerged with important connections across them.

Underdal and Hanf (2000), and Wettestad (2002) provide very good accounts of the complex relationships among domestic politics, EU politics, and European acid rain policy during the 1980s and into the 1990s. Global environmental politics scholars have increasingly focused on the diverse forms of governance structures that have emerged across environmental issue areas, and acid rain in Europe provides a particularly rich and nuanced set of regulatory structures to study. Selin and VanDeveer (2003) provide an analysis of the complex institutional governance structures and their linkages in European air pollution policy. This is an area of research that remains quite vibrant. How should we understand the complex governance

structures that span the local to the national to the EU to the broader regional structures under CLRTAP? How do the various levels influence one another? In which directions do the causal arrows flow? To what extent are grassroots demands for addressing air pollution the critical variables in shaping air pollution policy? How important is scientific evidence in the regulatory process? To what extent do international agreements alter domestic policy debates and regulations? These questions have been the focus of the scholars cited above, and remain important questions going forward.

The ultimate question of course is how effective was CLRTAP? This raises a number of definitional problems. How do you define "effectiveness?" One measure might be to determine whether there was full participation by the most important actors in the agreement. By this measure, CLRTAP could be judged a relative success. Most major European states signed and ratified most of the agreements. Such a measure might be useful in understanding participation in the negotiations, but states could easily undertake agreements that they would ultimately fail to fulfill. Perhaps a better measure of success would be to measure compliance with the agreements by the states that ratified the various protocols. Again, compliance with the protocols under CLRTAP has been relatively high (Wettestad 2002: 197–8). Another level of success would relate to whether CLRTAP and its protocols altered state behavior in ways that led to better environmental outcomes than if CLRTAP had not been present. Wettestad (2002) undertook a review of the "effectiveness" of the CLRTAP regime as part of a larger project seeking to measure the effectiveness of international environmental regimes. He concludes the CLRTAP should be viewed as a "mixed success" (2002: 199–204). As noted above, there was strong participation, and most states met their commitments; however, the forces that produced the actual reductions in emissions were driven by domestic factors largely unrelated to CLRTAP. For example, national transitions from coal to natural gas in electricity production produced much of the observed reductions in emissions. States were also undertaking policies for domestic reasons that were consistent with CLRTAP but would likely have been pursued even in the absence of CLRTAP. Dimitrov (2006: 72) concurs in the judgment that CLRTAP was a political success, which resulted in a situation of overall compliance. These conclusions raise important questions about what lessons should be taken from the CLRTAP case and whether these lessons can be generalized to other environmental cases.

Responses to acid rain outside Europe

No other region of the world has the depth and complexity of the EU's institutional structures. Western Europe has a long history of cooperation on regional issues and has ceded substantial sovereign control over environmental policy to the EU. Given this situation, it should not be surprising that other regions would be slower to address air pollution issues. While the USA and Canada both participated in the CLRTAP negotiations and are parties to several of the protocols, the United States remained reluctant to address international acid rain issues with Canada until the 1990s. Asian countries did not begin to discuss regional acid rain problems until the 1980s, and air pollution issues remain low on the agendas of most other regions, though many states are pursuing domestic policies to improve their national air quality.

While the United States and Canada were full participants in the negotiations to create CLRTAP, they lacked the surveillance systems in the 1970s to monitor acid precipitation, and the issue was not perceived as a major problem in the United States until the late 1970s. The United States Atmospheric Deposition Program was only established in 1978 (almost 30 years after a similar program in Europe). By 1980 there was clear evidence of adverse ecological consequence from acid rain in the United States and Canada, but the evidence of widespread

damage was still being documented. Canada emerged as the primary advocate of addressing acid rain in North America. The lack of buffering agents in Canadian soils meant that the acid precipitation originating in the industrial heartland of the United States fell across large areas of eastern Canada. Acid rain emerged as a significant irritant in relations between the United States and Canada during the 1980s, but the USA refused to act to address the problem (Schmandt et al. 1988). While Canada signed and ratified the 1985 sulfur protocol under CLRTAP, the United States refused to sign it. However, growing domestic political pressures surrounding US air pollution problems and evidence of effects of acid rain across the northeast of the United States eventually led to the passage of the 1990 Clean Air Act Amendments. The USA undertook significant policies to reduce sulfur, nitrogen oxide, and VOCs emissions, which had the fortuitous effect of reducing acid rain across the northeast of the United States and in Canada. As a result, the USA and Canada signed a transboundary air pollution treaty in 1991, but the treaty essentially affirmed existing US and Canadian policies without requiring additional actions. While European acid rain negotiations may have heightened public interest in acid rain in North America, North American transboundary air pollution policies were overwhelmingly dictated by domestic political considerations and moved no faster than American domestic politics would permit.

Asian responses to acid rain lagged even further behind European initiatives. Japan did not conduct its first acid rain survey until the mid-1980s. A 1985 report noted that acid deposition was occurring in Japan as a result of emissions in China (Wilkening 2004: 230). The evidence of significant harm from acid precipitation was less apparent, but the fact that China was exporting its pollution to Japan led to more political support within the Japanese government for studying the problem at a time when the government was not particularly interested in studying other environmental problems that could impose additional costs on industry. By the early 1990s, there was growing evidence of major plumes of sulfur dioxide emanating from China and crossing over Japan. By the early 1990s, China, South Korea, and Taiwan had joined Japan in studying the problem of acid deposition and trying to measure the overall effects (Wilkening 2004: 231). The growing interest in acid rain eventually produced a Japanese initiative to create the East Asian Deposition Monitoring Network (EANET) that brought together most states from East and Southeast Asia to monitor acid deposition across the region (Shah 2000). While EANET represents progress in addressing air pollution in East Asia, there are currently no larger international institutional structures in place to support the creation of measures to address the problem. Acid rain in Asia is likely to grow in political salience in the coming years. The OECD (2012: 277) predicts that sulfur dioxide emissions will increase by 90 percent and nitrogen oxides by 50 percent above 2000 levels with most of these increases occurring in Asia unless concerted efforts are made to reduce the emissions.

Other air pollution issues

Beyond acid rain, the international community is only beginning to follow CLRTAP's lead and address some of the other major air pollutants. The United Nations Environment Program (UNEP), as the primary global institution with responsibility for promoting action to address environmental problems, has taken the lead in sponsoring research on other air pollution threats and supporting negotiations to address them. The 2001 Stockholm Convention on Persistent Organic Pollutants represents the leading edge of negotiations to address some of the other pollutants. There has been relatively little published on recent international POPs negotiations. Eckley (2001) provides a good overview of the origins and scientific understanding of POPs along with a discussion of the Stockholm Convention. Canada had sought to raise issues related

to POPs in the Arctic and to push the issue on to the international agenda during the 1990s with little support from other actors. Selin (2010; Selin and Eckley 2003) argues that scientific assessments conducted during the 1990s played a critical role in elevating POPs to the international stage (on science see Chapter 17). She provides a very good review of the origins and politics surrounding the 1998 POPs protocol under CLRTAP and the 2001 Stockholm Convention on Persistent Organic Pollutants. The international POPs agreement represents another issue with a complex governance structure involving policies at the domestic level in countries around the world as well as action through the EU, CLRTAP, and UNEP. CLRTAP clearly played an important role in elevating the stature of POPs and undertaking the scientific assessment to make the case for controlling the chemicals (Selin 2010: 177–80). The Stockholm Convention regulates 12 POPs in three categories: pesticides, industrial chemicals, and unintended by-products. Elements of the agreement remain controversial as farmers in developing countries advocate for the continued use of some of the banned pesticides, and health workers argue that the continued use of DDT in mosquito control programs is essential to address the malaria epidemic. POPs regulation will remain an important issue on the international environmental agenda.

CLRTAP successfully negotiated a protocol in 1998 to regulate emissions of the heavy metals mercury, lead, and cadmium. UNEP has also been promoting global emission reductions of heavy metals. Negotiations to finalize an international agreement to address mercury are scheduled for completion by 2013. UNEP has continued to press for action to address cadmium and lead as well, but there is currently insufficient international support to address these substances at a global level. UNEP has sponsored additional programs to address other potential air pollutants including the Global Chemicals Outlook, which is intended to provide a framework for evaluating the production, trade, and disposal of a range of chemicals, including VOCs. The discussions involving international regulation of other chemicals remain contentious and are likely to continue for many years.

Finally, the dramatic economic growth in China and India poses several problems that will be difficult to address. The problems in Asia extend well beyond acid rain as growing desertification leads to dramatic dust storms spreading from across the interior of China toward Korea, Japan, and even the west coast of the United States. The particulate matter in these dust storms combines with other pollutants from China's poorly regulated industries to produce toxic combinations of dust, heavy metals, POPs, VOCs, and other toxics. The dramatic increase in coal consumption to provide electricity and the continuing growth in heavy industry in China are leading to rapid increases in sulfur, particulate, mercury, and other toxic emissions. The OECD (2012: 276) estimates that by 2050 the number of premature deaths from exposure to particulate matter will double to 3.6 million per year with the vast majority of the increased deaths occurring in India and China. The effects of Chinese air pollution across Asia and the Pacific are likely to increase in political salience in the coming years.

India also poses some difficult challenges. Even as India's economy has grown dramatically with increased electricity and transportation fuel consumption, large parts of the country languish in poverty. Increased reliance on charcoal, wood, and animal dung for fuel is dramatically increasing particulate emissions and worsening air quality across the Indian subcontinent. The incomplete combustion of fossil fuels or biomass produces components of soot referred to as "black carbon." Black carbon combines with other chemicals to form harmful particulate matter and is a precursor to smog. Beyond the human health effects, black carbon has been identified by the Intergovernmental Panel on Climate Change as a significant contributor to climate change (Solomon 2007: 163–4). Black carbon has two major effects. It has a direct warming effect by absorbing more sunlight while it is suspended in the air, and it has a secondary effect

when it is deposited on ice and snow. By darkening the surface of ice and snow, it increases the absorption of sunlight and accelerates melting which contributes to the accelerating decline in glaciers. Because black carbon remains suspended for only a few days before settling out of the air, reducing these emissions could provide significant benefits in slowing the pace of climate change as well as dramatically improving air quality in India and other developing countries that utilize biomass-based cook stoves.

Asia is likely to emerge as the focus of future air pollution negotiations. The issues are complicated because they involve critical sectors of national economies and will impose significant costs on polluters. The situation is further complicated by the lack of regional institutions to support negotiations to address these problems. While Europe and North America have made progress in addressing their air pollution problems, Asia will pose some of the most difficult future challenges.

Conclusion

International efforts to regulate transboundary air pollution flows have offered a number of insights for global environmental politics scholars. The evolution of the international response to acid rain and other air pollutants has demonstrated the critical roles of scientific research and the framing of environmental problems for the public and policy-makers as well as the importance of the larger domestic and international contexts in shaping the political salience of the issues. International institutions have also played important roles in raising awareness, supporting research, and providing forums for international negotiations. However, air pollution negotiations also pose some additional questions that have not been sufficiently addressed. What is the relative importance of international versus domestic forces in shaping air pollution negotiations? Many international agreements merely ratify what states may have done for domestic reasons. How important are the international agreements in propelling more aggressive action and assuring compliance? Do these agreements alter the power positions and material interests of national actors? There is evidence that institutions can facilitate international agreements and promote national implementation, but the degree of influence and the specific conditions under which institutions can significantly affect international agreements are less clear.

The most successful cases of international air pollution regulation are also concentrated in Europe where political and economic integration have created a permissive environment for addressing common problems. To what extent are the European lessons transferable to other regions of the world and to other issue areas? How should we understand the complex governance structures that span the local to the national to the EU to the broader regional structures under CLRTAP? How do the various levels influence one another? Which levels are most important in producing meaningful actions to address transboundary air pollution? These are critical questions because China, India, Brazil, and other rapidly growing countries are producing ever greater volumes of air pollutants with transboundary effects that will undoubtedly be the focus of conflict and negotiation in the years to come. Are there lessons from prior agreements that can facilitate a more rapid and effective response to emerging air pollution problems in other regions? These questions will likely be the focus of future global environmental politics research. In addition, global negotiations to address POPs, VOCs, and heavy metals are likely to continue. The negotiations surrounding these pollutants have been less well documented and will undoubtedly be the focus of research in the future. Scholarship on transboundary air pollution policy remains a rich and promising field for global environmental politics scholars.

References

Boehmer-Christiansen, S. and Skea, J. (1991) *Acid Politics: Environmental and Energy Policies in Britain and Germany*, London: Belhaven Press.

Darst, R.G. (2001) *Smokestack Diplomacy: Cooperation and Conflict in East–West Environmental Politics*, Cambridge, MA: MIT Press.

Dimitrov, R. (2006) *Science and International Environmental Policy: Regimes and Nonregimes in Global Governance*, Lanham, MD: Rowman and Littlefield.

Eckley, N. (2001) "Traveling toxics: the science, policy, and management of persistent organic pollutants", *Environment* 43: 24–36.

Evelyn, J. (1661) "Fumifugium: or the inconvenience of the aer and smoak of London dissipated. Together with some remedies humbly proposed by J.E. Esq; to his Sacred Majestie, and to the Parliament now assembled". Online. Available HTTP: <http://archive.org/stream/fumifugium00eveluoft#page/n9/mode/2up> (accessed 1 June 2012).

Levy, M.A. (1993) "European acid rain: the power of tote-board diplomacy", in P.M. Haas, R.O. Keohane, and M.A. Levy (eds) *Institutions for the Earth: Sources of Effective International Environmental Protection*, Cambridge, MA: MIT Press: 75–132.

McCormick, J. (1997) *Acid Earth: The Politics of Acid Pollution*, 3rd edn, London: Earthscan.

OECD (2012) *OECD Environmental Outlook 2050: The Consequences of Inaction*, Paris: OECD.

Schmandt, J., Clarkson, J., and Hilliard, R. (1988) *Acid Rain and Friendly Neighbors: The Policy Dispute between Canada and the United States*, Durham, NC: Duke University Press.

Selin, H. (2003) "Regional POPs policy: the UNECE/CLRTAP POPs agreement", in D.L. Downie and T. Fenge (eds) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queens University Press: 111–32.

—— (2010) *Global Governance of Hazardous Chemicals: Challenges of Multilevel Management*, Cambridge, MA: MIT Press.

Selin, H. and Eckley, N. (2003) "Science, politics, and persistent organic pollutants: scientific assessments and their role in international environmental negotiations", *International Environmental Agreements: Politics, Law and Economics* 3: 17–42.

Selin, H. and VanDeveer, S. D. (2003) "Mapping institutional linkages in European air pollution politics", *Global Environmental Politics* 3: 14–46.

Selin, N.E. (2006) "Applying assessment lessons to new challenges: from sulfur to POPs", in A.E. Farrell and J. Jäger (eds) *Assessments of Regional and Global Environmental Risks: Designing Processes for the Effective Use of Science in Decisionmaking*, Washington, DC: Resources for the Future: 84–100.

Shah, J. (2000) "Integrated analysis for acid rain in Asia: policy implications and results of RAINS-ASIA model", *Annual Reviews Energy & the Environment* 25: 339–75.

Solomon, S. (2007) *Climate Change 2007: The Physical Science Basis: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press.

Underdal, A. and Hanf, K. (eds) (2000) *International Environmental Agreements and Domestic Politics: The Case of Acid Rain*, Burlington, VT: Ashgate.

United Nations Economic Commission for Europe (UNECE) (2012) "ICP modelling and mapping critical loads and levels approach". Online. Available HTTP: <http://www.unece.org/env/lrtap/workinggroups/wge/definitions.html> (accessed 13 June 2012).

VanDeveer, S.D. (2006) "European politics with a scientific face: framing, asymmetrical participation, and capacity in LRTAP", in A.E. Farrell and J. Jäger (eds) *Assessments of Regional and Global Environmental Risks: Designing Processes for the Effective Use of Science in Decisionmaking*, Washington, DC: Resources for the Future: 25–63.

Wettestad, J. (1997) "Acid lessons? CLRTAP implementation and effectiveness", *Global Environmental Change* 7: 235–49.

—— (2002) *Clearing the Air: European Advances in Tackling Acid Rain and Atmospheric Pollution*, Burlington, VT: Ashgate.

—— (2006) "EU air quality framework directive: shaped and saved by interaction?" in S. Oberthür and T. Gehring (eds) *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*, Cambridge, MA: MIT Press: 285–372.

Wilkening, K.E. (2004) "Localizing universal science: acid rain science and policy in Europe, North America, and East Asia", in N.E. Harrison and G.C. Bryner (eds) *Science and Politics in the International Environment*, New York: Rowman and Littlefield: 209–38.

31

Sustainable transport and infrastructure

Iain Docherty

Good transport and infrastructure provision are acknowledged as vital ingredients for economic success, but they have often important negative environmental consequences. The argument about the impact of the relative quality of transport and other infrastructure networks, such as water, drainage and telecommunications, has been developed across several decades, with an extensive literature now available encompassing diverse theoretical and empirical analyses of the links between infrastructure investment and economic growth. For example, Banister and Berechman (2001) set out evidence for the simple yet important assertion that locations with poor quality transport are at a competitive disadvantage when compared with those with high quality transport infrastructure. This is a rather straightforward finding. Prioritizing infrastructure investment is an attractive, easily understandable policy position to take for those charged with delivering economic development because it is seen to create employment, improve place attractiveness and competitiveness, and stimulate growth.

There are various constraints on the development of infrastructure, however, ranging from the direct environmental impact of construction and subsequent operations, through to the difficulty in financing large schemes with very significant demands on public spending, and on to more technical and institutional considerations, such as the "strategic capacity" of the organizations charged with managing infrastructure and corresponding services effectively (Docherty and Shaw 2011). Given the sheer complexity of the myriad intersecting economic, environmental and social impacts of infrastructure development, formulating a coherent and credible infrastructure strategy is often characterized as being a "wicked problem", one that policymakers consistently find hard to resolve (Conklin 2006; Rittel and Webber 1973).

In order to shine a light on some of the most pressing issues at stake, this chapter focuses on the development of transport infrastructure, especially in cities, for it is there that many of the critical debates have come into the sharpest focus. Many of the reasons for this are long-standing and have their origins in the dominance of the private car in meeting the demand for mobility. The environmental implications of reliance on the car for the scale of urban transport infrastructure necessary to accommodate such a mobility system are enormous. As a consequence, in the developed world a highly contested environmental politics has grown up over several decades around the impact of road building on the local and global environments. There have been signs in recent years that the developed world may have witnessed "peak car" (Goodwin 2011),

with car use levelling off and even falling, and therefore the balance of the debate may be shifting fundamentally. Nevertheless, the explosion of car use in the fast-growing cities of the Pacific Rim and elsewhere in the developing world keeps the issue of the environmental impact of transport infrastructure (especially roads) very much alive (Newman and Kenworthy 1999; Lyons and Loo 2008).

Transport and the reproduction of the space, society and the economy

Transport is perhaps the most critical technological and social phenomenon to shape the spatial organization of human activity. The underlying morphology and structure of our economic and social systems is in large part determined by the transport technologies available to each generation. Each new wave of technological progress brings additional opportunities for enhanced mobility, but at the price the impact of that technology – and the infrastructure that supports it – has on the environment. The most important technological innovation underpinning the environmental politics of infrastructure in recent years remains the automobile. Since its appearance on the streets of early twentieth-century towns and cities, the car has utterly and perhaps irrevocably transformed the spatial organization of the economy and society. Its potential to introduce a step change in the "supply, demand, efficiency, speed and opportunities for movement" (Daniels and Warnes 1980: 4) over what existed before – such as the horse, and later electric tramways, in many Western cities, or the bicycling culture of twentieth-century China – means that the physical structure of most modern cities is constructed in the image of the car.

There is no doubt that the car is a technology that has transformed the quality of life of hundreds of millions of people since its invention. This transformational effect is more than the direct personal advantage (or "user benefit") of being able to choose where and when to travel relatively unhindered: by permitting daily travel over much greater distances than would otherwise be possible, the car enabled many more people to live in their preferred (often suburban) environments than would have been facilitated by rail-based modes alone. In time, the development of a spatially differentiated pattern of land use with increasing separation of homes and workplaces has generated a complex web of daily movement *between* suburbs rather than just to and from the urban core, and kick-started the development of other culturally significant developments that have come to characterize modern life around the world, such as the supermarket and shopping mall (see Chapter 16).

Although mass car ownership undoubtedly facilitated structural adjustments in the labor and housing markets and in other economic domains that stimulated enhanced productivity (Meyer and Gomez-Ibanez 1981; Pucher and Lefevre 1996), the rapid growth in car use in the 1980s and 1990s also brought a range of negative externalities associated with "unrestricted mobility" – especially environmental and social costs – to the fore (see, e.g., Cahill 2010; Sheller and Urry 2006). It is beyond the scope of this chapter to address fully these implications of the rise of the private car, except to note that its negative impacts on the fabric of neighborhood life – primarily local air pollution, noise, threats to pedestrian (especially children's) safety and the sheer level of severance implied by fast-moving traffic in the urban setting – have been fundamental in the story of urban decline ever since Jane Jacobs's (1961) seminal book, *Death and Life of Great American Cities*. More recently, the pinnacle of car-oriented developments, such as the sprawling, low-density business parks and gargantuan shopping centers that line the urban fringe of many cities around the world, continue to undermine the economic and social vibrancy of many places (see, e.g., Gärling and Steg 2007; Haywood and Hebbert 2008; Shaftoe 2008).

At the same time as the first explorations of the social impacts of the car were being understood, transport economists, engineers and planners were beginning to envisage the sheer scale

of infrastructure investment that would be required to capture fully the potential reduction in the friction of distance presented by the car running at full speed. Traffic congestion had been a fact of urban life since the days of the horse and cart, but the explosion of car ownership and use in the 1960s brought the problem to the fore, and new computing technologies revolutionized the process of taking major planning decisions by informing them with detailed economic models. These models suggested that very important economic efficiency gains could be achieved by realigning the built environment to accommodate the huge increases in road traffic forecast over the succeeding decades. Such was the level of improved economic performance – in large part envisaged due to the strong liberalizing force on the labor and housing markets promised by increased car-based accessibility – that governments around the developed world stepped up the pace of planning for a car-based future (see Glaeser 2004; Laird et al. 2005).

In much the same way as Jane Jacobs's *Death and Life* set the terms of the debate about the social implications of a future predicated on unrestrained car use, the publication two years later of *Traffic in Towns* (Ministry of Transport 1963), a report produced for the UK government by Colin Buchanan, a British engineer and planner, lit the touchpaper for a heated discourse on the environmental consequences of road building that was to last for 30 years or more in the UK and beyond. *Traffic in Towns* became internationally famous in large part due to its lavish illustrations of the changes in the physical structure that would be required of British towns and cities if they were to adapt to accommodate unrestricted use of the car. Such was the striking nature of the report's images – one of the most celebrated depicts Tottenham Court Road, a main radial street in central London, transformed into an expressway with segregated bus lanes and stops, with pedestrians relegated to elevated gangways – that the report was often wrongly perceived as a polemic in favor of the car or even the epitome of "motorway madness" (see Starkie 1972).

The report's simple yet controversial message was that the inevitable outcome arising from the scale of road traffic growth envisaged over the next 40 years was one of very severe congestion, and that if this congestion was to be tackled by building new road infrastructure, then the scale of this task, and the impact of such development on the urban environment, would be immense. Buchanan himself was well aware of what was at stake, having previously published a book characterizing the motorcar as a "mixed blessing" (Buchanan 1958). What was critical about the analysis in *Traffic in Towns* was that Buchanan had identified how a "car-owning democracy" had emerged: "It seems futile to deny these things [the advantages of motorcars]. The motor vehicle is a remarkable invention, so desirable that it has wound itself inextricably into a large part of our affairs. There cannot be any going back on it" (Ministry of Transport 1963).

The importance of the concept of the car-owning democracy is that it neatly summarized how the demand for personal car-based mobility was, as far as could be foreseen, likely to be insatiable given the combination of sustained economic growth through the long boom of the postwar years. As more and more people experienced the economically, socially and emotionally transformational effects on their perceptions of wellbeing generated by seemingly unrestricted car travel, car ownership and use would continue to rise for many decades until some kind of saturation point was reached.

Juxtaposing Jacobs's and Buchanan's seminal publications summarizes the environmental politics of road building that has dominated the infrastructure debate for over half a century in many countries. On the one hand, the welfare benefits of infrastructure development are of huge value for some people since the range of economic and social opportunities available to them increase substantially. But for others – often those on low incomes or those who have a disability or limiting illness – no such opportunities arise, so that over time the advantages brought about by infrastructure development increase social polarization and inequality. This is because, over time, employment, healthcare, retailing, leisure and other services have tended to

move to the most car accessible locations, leaving behind impoverished neighborhoods with little or no local service base, and a population dependent on dwindling public transport for its mobility needs. Added to this, the negative externalities of infrastructure development tend also to fall on disadvantaged groups: one of the main critiques of the splurge of urban road building in the middle years of the twentieth century was that new roads enabled the rich to commute further, whilst the roads themselves were built through declining older communities because the land was cheap, and the social infrastructure had already declined sufficiently so that no meaningful opposition movement could become established (see Lucas et al. 2008).

The "environmental turn"

In many countries, the core concern of transport policy, especially for roads, remained that of building as much new infrastructure as possible to (try to) meet demand well into the 1990s. Known colloquially as "predict and provide", the basic premise of this policy approach was that rising standards of living would inevitably generate increased levels of car ownership and use (Goodwin 1999), a trend that was already well established by the time of the wholesale quantification of transport planning and modeling in the 1960s. In the United States, road building was given an additional stimulus from the 1950s onwards by the Eisenhower Program of Interstate Highway building, a policy originally intended to provide the means of dispersing the population quickly from major metropolitan centers should a military conflagration between East and West turn the Cold War hot. In many countries of Western Europe, the density of settlement rendered such a civil defense justification for road building redundant, although the perceived logics of economic growth nonetheless supported a similar program of major inter-urban highway building well into the 1970s.

By the end of the 1980s, however, external conditions were beginning to change. Governments were finding it increasingly difficult to muster the resources to keep pace with their rhetorical commitment to (road) infrastructure development: the UK government's policy document, *Roads to Prosperity* (Department of Transport 1989) – proudly championed by ministers as "the largest road building programme since the Romans" (Department of Transport 1989; see also Hansard 1994) – quickly became something of a hostage to fortune as the policy system's ability to actually deliver this scale of investment was called into question. Yet this was fully ten years after the Organization for Economic Cooperation and Development (OECD), having reviewed similar post-oil crisis investment programs around the world, warned that a strategy focused on road building would be unlikely to solve the transport problem in any meaningful way:

> since further extension of the road infrastructure to meet growing demand for car use is not everywhere possible for urban planning and financial reasons, nor desirable from environmental, energy and often social policy standpoints, the only remaining transport policy option is to swing modal split in favor of public transport by investment and/or pricing policy measures.
>
> (OECD 1979: 149)

At the same time as the financial and other policy practicalities of continued road infrastructure expansion were becoming readily apparent, a number of critical international discourses were emerging to challenge the economic orthodoxy that infrastructure expansion was a stimulus to growth without substantial negative *environmental* externalities. The first such critical turning point was probably the publication in 1987 by the United Nations World Commission on Environment and Development (WCED) of *Our Common Future* (commonly known as the

"Brundtland Report" after the Commission's chair, the former Norwegian Prime Minister Gro Harlem Brundtland). For the first time, this report set out in plain language the scale of the environmental problems that could arise if contemporary socio-economic development trends were left unchecked. It noted – in no uncertain terms – that there was "a growing realization… that it is impossible to separate economic development issues from environment issues…and environmental degradation can undermine economic development" (WCED 1987: 3). The report paid special attention to the question of the rate of depletion of natural resources, especially fossil fuels, and increasing pollution of air (see Chapter 30), water (Chapter 34) and land (Chapter 33). In a now-celebrated passage, the WCED offered a definition of sustainable development that survives to this day: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987; see Chapter 15).

If the "environmental turn" in the politics of transport infrastructure development can be traced to any particular event or point in time, the collective realization of the potential scale of a future environmental crisis, and transport's contribution to it, following the publication of the Brundtland Report is that moment (see Baumol and Oates 1988; Pearce et al. 1989; Ison et al. 2002). It was after this intervention in the global debate that the term "sustainability" became commonplace in the objectives of government policy and more widely in political discourse (Goodwin 1999; see Chapter 15). The implications for the politics of transport and the infrastructure development that supports it were particularly stark, since the task of "satisfying current transport and mobility needs without compromising the ability of future generations to meet these needs" (Black 1996: 151) was especially challenging given the sheer scale of resource consumption associated with the transport sector (see also Greene and Wegener 1997).

In the years following the WCED's report, a number of further key policy events and documents provided momentum for the environmental turn. The 1989 meeting of the European Conference of Ministers of Transport was perhaps the first significant international event to debate the emerging scientific evidence on the role of transport in diminishing environmental sustainability, particularly through the emission of greenhouse gases (see Chapter 28). Further events, most importantly the UN Earth Summit held at Rio de Janeiro in 1992, cemented the policy realization that the construction of new infrastructure to stimulate additional demand for mobility was a critical issue that had to be addressed. For some governments, this juxtaposition of events was not necessarily a bad thing. In the UK, for example, the explosion of environmental awareness that led to the celebrated anti-roads projects campaigns of the 1990s coincided with a sharp reduction in the resources available for new infrastructure development. An unusual alignment of policy and popular objectives therefore emerged, with government articulating quite radical policy prescriptions including a definite swing away from new infrastructure construction as the primary instrument of transport policy, towards increased transport taxes (especially on fuel), and stronger planning policies aimed at reducing the demand for transport in the first place (see, e.g., RCEP 1994).

The contemporary environmental politics of infrastructure development

As the scale of key challenges such as climate change (Chapter 28) and the rate of natural resource depletion (Chapters 35, 36, 37 and 38) has become more apparent, infrastructure development policies have come under increasing pressure to justify themselves by means other than traditional economic cost–benefit models that assume gains from ever-greater consumption of goods such as mobility (see Chapter 16). The difficulty is that the basic environmental politics of the sector remain unchanged. On one side are those actors (in fact a wide variety of individuals,

businesses and other organizations) that stand to gain from a continuation of the status quo in terms of the expansion of infrastructure provision (either by constructing or using it) (see Chapters 13 and 14). On the other side are those who are (relatively) disadvantaged by this process, for example when it causes them to fall behind other locations. Both sides are also open to influence from voices with strident, sometimes normative, positions. The pro-infrastructure development lobby is supported by those seeking direct stimulus in the post-recession economy through boosting the construction sector, and by other interests, especially in the USA, Canada and Australia, who reject the new scientific orthodoxy on climate change and carbon emissions, and for whom any policy response to reduce the importance of creating new infrastructure capacity is misguided as a result (see Chapter 28). Those advocating less focus on infrastructure development and more on reducing demand for energy are often clearly linked to a "deep green" political and philosophical standpoint (see Chapter 25), which risks being accused of being no more than a luddite reaction to modern problems and opportunities.

An example of this clash in approaches can be found in the debates surrounding the introduction of High Speed Rail (HSR) in the USA and UK. Proponents of this very large-scale infrastructure intervention point to its claimed economic returns in terms of creating new agglomeration benefits by bringing firms, their suppliers and customers closer together (see Martin 1997; Gutiérrez 2001; de Rus and Nombela 2007; de Rus 2008). Although some view HSR as an environmentally positive idea in that it abstracts mobility from the car and especially the airplane, many of those against it point to the fact that, whilst potentially "better" than aviation or the car in some key respects such as carbon emissions, these benefits are not as clear-cut as might be imagined, and in any case are dwarfed by the environmental degradation associated with construction (see Janic 2003; Givoni 2006). Perhaps worse, they argue, is that HSR is just the latest multibillion dollar example of applying an expensive, engineering-led sticking plaster to more profound issues of how we structure society and the economy, which needs a much more incisive debate than whether people fly or take the train to business meetings.

Underlying this conflict is the fact that many governments have been relying on the so-called "technological fix" (see Chapter 18), that is the emergence of low-carbon technologies, perhaps most importantly electric vehicles, rather than more politically difficult policy measures aimed at reducing the demand for mobility (or energy, electricity, water etc.) to meet the environmental targets stated in the Kyoto Protocol and subsequent international agreements. Whilst some progress is being made in, for example, the fuel efficiency of conventional internal combustion engines and the development of hybrid vehicles, the widespread adoption of zero-emission (at the point of use) "ecocars" remains some way off (Banister 2000). The unfulfilled promise of electric vehicles highlights the fact that any kind of future-casting for a complex policy area is extremely difficult, but for transport and infrastructure development this is especially so, given the scale of the critical uncertainties at play (see Chapter 18). Moving forward, the environmental politics of transport and infrastructure development seem most likely to revolve around two different potential futures. The first is one in which the "technological fix" becomes a reality, with the widespread "greening" of the current transport system through the wholesale adoption of electric vehicles and other complementary technologies so that the carbon emissions problem with respect to transport is "cracked".

The second future is a much more challenging one in which the greening of the car – which in itself does nothing to address issues of congestion or social externalities, and indeed might be argued to make them worse given one of the policy justifications for car restraint would have vanished – makes way for a different "mobility regime" (see Geels et al. 2011). Such a new regime, rather than conceptualizing the environmental crisis as something to be "solved" through successive waves of technological innovation (leading to renewed economic growth), poses more

fundamental questions about how the economy and society organize themselves in critical domains such as the demand for energy and mobility (see Chapter 28). In this alternative future, environmental politics is about a truly cross-cutting endeavor to reduce the impact of the transport system on the environment in a "first principles" approach firmly rooted in the rhetoric of Brundtland and other key foundation documents (see Anable and Shaw 2007). Such a perspective is about much more than "just" greening the car, envisaging instead a large-scale reorganization of the transport system across all modes and linking into other realms of public policy especially health and wellbeing. Achieving this level of structural change in many of the key processes that govern the economy and society is a huge task, of the same order of magnitude as the changes brought about by the adoption of the automobile itself.

Contested politics

As other chapters in this book demonstrate, the concepts of sustainability and sustainable development (see Chapter 15) are open to substantial criticism, not least because they are often actually rather vague and can be differentially interpreted by different organizations and interests (see, e.g., Pezzoli 1997; Redclift 1987; Williams and Millington 2004). The famous definition of sustainability advanced by *Our Common Future* – development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 8) – is undoubtedly well intentioned, but it can be and has been picked apart without too much difficulty (see Chapter 15). For example, when examining the different definitions of sustainability in the transport domain, Bill Black (1998: 337) made the important point that "there is no limit placed on 'future generations' and nothing is sustainable forever", so the actual value of the Brundtland Report in informing policy decisions might be less than imagined or hoped for.

The contemporary context of a highly uncertain economic future, given the depth and length of the post-2008 global financial crisis, coupled with the apparent lack of real appetite for international coordination of measures designed to limit climate change (brought into stark relief after the failure of the 2009 UN Climate Summit in Copenhagen; see Chapter 28) suggest that the future politics of transport and other infrastructure development will be even more problematic than before. Most governments were struggling to meet the first wave of carbon-reduction targets for the first half of this century put in place in the 2000s (see, e.g., Anable and Shaw 2007; Chapman 2007). This generates an immediate layer of political conflict between those who want to see much swifter progress towards existing targets, with a view to setting even stiffer ones, and others who question the policy system's capacity to deliver the highly complex set of interventions required to decarbonize the economy, or even individual sectors within it such as transport, and those who are simply opposed to mainstream climate science and carbon reduction on ideological grounds (see Chapter 28).

Perhaps the most important issue for the politics of infrastructure investment at the current time arises from debates on whether economic recovery will be robust and resilient enough worldwide to prompt a return to a "business-as-usual" policy approach to growth and competitiveness of which substantial investment in infrastructure is a key part. Indeed, in many countries, there is now a strong political argument for increased investment in infrastructure as a means to *recreate* previous conditions of economic growth; such arguments were central to elections in 2012 in the United States and the Netherlands, for example.

If we assume that the impacts of the financial crisis and post-2008 recession are sufficiently deep and long-standing so that the rate of growth in developed economies remains modest over the medium term, then a number of critical policy questions for infrastructure development arise.

First is that the conventional economic case to invest in upgraded and expanded infrastructure becomes substantially weaker under conditions of reduced future demand. For several decades, the increasing demand for transport has been very closely tied to the underlying rate of economic growth. Therefore, with low or zero growth, we might expect the demand for mobility to remain relatively static; indeed it has actually fallen in several countries across the world during the post-2008 recession. More than this, the lack of a growth "problem" to "solve" through the construction of new infrastructure capacity calls into question one of the main policy factors for the justification of such investment over the past two decades or so, namely that city and regional "competitiveness" is dependent on increasing the scale of key infrastructure assets to attract and accommodate growth. With widespread low-growth conditions, these assumptions might have to be rewritten, perhaps to focus more on the resilience and quality of existing infrastructure instead of capacity expansion (Curtis and James 2004).

More broadly still, the depth of the financial crisis has prompted at least the beginnings of a debate about how the (urban) economy might be organized in future, and to what extent future wealth creation will depend on particular kinds of transport and other infrastructure. Even if governments have the finance available to maintain infrastructure investment or, indeed, have actively prioritized such spending in an attempt to stimulate the economy, the pace of socio-technical change means that it is by no means certain that the envisaged economic returns on such investment will be realized. Consider, for example, a new road project in the UK completed in 2008, based on a standard 60-year economic forecast of steadily increasing demand for car traffic, but which has for the first five years of its existence seen *falling* traffic levels.

In many ways, this is a contemporary version of the debates over the practical definition of sustainability outlined above. Crucial here is whether the very notion of "sustainability" itself will be reconfigured so that the roles of socio-technical systems dependent on substantial infrastructure, such as transport, change significantly. As we have seen, "sustainability" is a slippery term (see Chapter 15), and has often been used by different interests in environmental politics to mean quite different things. This is because, as Wackernagel and Rees (1995: 64) argue, the "deliberate vagueness" associated with the narrative of sustainability is "a reflection of power politics and political bargaining". This perhaps explains why many governments and especially business interests have been able to construct powerful narratives around potentially highly contradictory ideas such as "sustainable economic growth", even to the extent of arguing for increased investment in aviation, which is one of the most polluting forms of transport and heavily dependent on the very large infrastructure requirements of airports and their associated surface access systems (see Chapter 13).

At the other end of the environmental–political spectrum, the so-called "deep green" standpoint, which elevates the protection of the environment above all other public policy priorities, is not without its philosophical and practical problems (see Chapter 25). There is something intuitively powerful in the public's minds about the notion that, as Black put it, "nothing is sustainable for ever" (Black 1998: 337). At a more immediate and practical level, implementing the kinds of taxation and regulatory policies that would deliver profound changes in behavior, from large rises in fuel tax to reducing aviation capacity and even general carbon rationing, on which many deep green positions depend, would seem almost impossible in a democratic society. Mainstream politicians have for decades been highly skeptical; even to propose such radical policy changes would be electoral suicide given public doubts over the need for them in the first place, and the extent of the real and immediate impact on lifestyles that their implementation would entail.

As with most political debates, those of environmental politics as they relate to transport and infrastructure are likely to be fought out in some kind of "center ground"; that is, in terms of

those policies designed to deliver better sustainability but which are acceptable to mainstream opinion in practice. Given that transport is perhaps the one sector that is proving the most difficult to decarbonize (in the developed world at least), the scale of this challenge should not be underestimated. As long as conventional definitions of increased prosperity based on rising gross domestic product and the increase of production and consumption associated with economic "growth" are promoted, there will be significant political pressure from business and supporters of the free market to further expand infrastructure provision (see Chapters 13 and 16). Whilst some of the individual strategy and project choices might be different in future under this scenario – a focus on high speed rail rather than aviation for inter-urban transport, for example – it is very difficult to see how the overall environmental impact of the transport system would be reduced substantially, if at all.

Although the apparent scale of the challenge might suggest that transport's status as a "wicked problem" is well deserved, this is not to say that the politics of transport and infrastructure cannot be oriented towards a more environmentally sensitive set of objectives. Indeed, it may turn out to be the austerity policies of many countries facing medium- to long-term constraints on the availability of public resources for major infrastructure investment that bring about this change in direction. When resources are tight, decisions over the investment of public funds are placed under more scrutiny than ever, and there is increased scope to challenge orthodox assumptions on the value of certain large infrastructure investments – roads or railways, for example – versus alternative transport opportunities such as better provision for walking and cycling.

In many ways, we have been here before. In the 1990s, a similar juxtaposition of increased environmental awareness following critical events, such as the 1992 Rio Earth Summit, with recession and reduced infrastructure investment capacity occurred in many Western countries. Under these circumstances, the development of a more "balanced" approach to transport policy and the role of infrastructure development began to emerge. Often known as the "New Realism" (Goodwin et al. 1991), this approach argued that, in cities at least, the primary benefit of the car, that is its "go anywhere, anytime" flexibility, was beginning to be substantially eroded by the problem of traffic congestion and the consequent delays to and unreliability of journeys. Against this backdrop, the conventional policy response of trying to add more infrastructure capacity to meet demand was at best futile – research increasingly demonstrated that additional capacity simply filled up with formerly suppressed demand – and at worst highly damaging given the local environmental cost of infrastructure construction, which destroyed historic urban places and/or areas of green space in the city. Alternative policy prescriptions were therefore required, which comprised both a shift away from infrastructure-intensive modes of transport (especially the car) and also the introduction of pricing mechanisms such as congestion charging so that demand could be actively managed.

Conclusion

Twenty years on from the New Realism, the core challenge for the environmental politics of transport and infrastructure remains that of how to maintain the important economic and social benefits of the systems that have developed on the back of decades of investment in infrastructure, such as mobility. It is now increasingly clear that the "boom" conditions of much of the 1990s and 2000s obviated the need for a deep (re)analysis of this domain of environmental politics. The ready supply of money for capital investment meant that, for many countries across the world, prioritizing transport infrastructure was an easy choice, whether part of a comprehensive growth plan as in China or a shift towards a more "sustainable" distribution of resources

by the targeting of (even) more money towards urban metro and transit networks in Europe and North America. In the latter case, policies pursuing such high technology solutions to the transport "problem" were doubly attractive given the environmental imperative to offer an alternative to the car, and to demonstrate the "competitiveness" of cities in a context where locations across the world were actively aiming to out-do each other on the attractiveness of their infrastructure "offer".

But as the post-2008 recession dragged on, the ground rules for the politics of infrastructure were changing. The Pacific Rim has seen an unprecedented level of investment in infrastructure in an attempt to "catch up" with the developed West. But as the rate of growth in China and elsewhere in the region moderates over time, such investment may be harder to sustain. In the West itself, if the recession transforms into an extended period of real austerity, fundamental changes in the political debate may occur. Limited resources for the development of new infrastructure make the prospect of pricing more attractive, whilst at the same time consumers will demand that if no increase in supply is possible, then at least the quality and reliability of the existing networks should be improved.

In future there may be a more radical reassessment of the politics of infrastructure whereby the dependence of socio-economic systems on expensive and fragile infrastructure networks is reappraised. It is not too hard to imagine a scenario in which a few critical shifts in key variables, such as the price of oil or in energy security more generally (see Chapters 28 and 19), begin to radically alter behavior patterns to the extent that they no longer match our infrastructure inheritance. Under these conditions, it will take a very "sophisticated policy mix" (Eddington 2006: 6) to sustain the kind of expansionist infrastructure policies to which modern societies have become accustomed.

References

Anable, J. and Shaw, J. (2007) "Priorities, policies and (time)scales: the delivery of emissions reductions in the UK transport sector", *Area* 39(4): 443–57.

Banister, D. (2000) "Sustainable urban development and transport – a Eurovision for 2020", *Transport Reviews* 20(1): 113–30.

Banister, D. and Berechman, J. (2001) "Transport investment and the promotion of economic growth", *Journal of Transport Geography* 9(3): 209–18.

Baumol, W. and Oates, W. (1988) *The theory of environmental policy*, Cambridge: Cambridge University Press.

Black, W. (1996) "Sustainable transportation: a US perspective", *Journal of Transport Geography* 4(3): 151–9.

—— (1998) "Sustainability of transport", in Hoyle, B. and Knowles, R. (eds) *Modern transport geography*, 2nd revised edn, Chichester: Wiley, 337–51.

Buchanan, C. (1958) *Mixed blessing: the motor in Britain*, London: Leonard Hill.

Cahill, M. (2010) *Transport, environment and society*, Maidenhead: Open University Press.

Chapman, L. (2007) "Transport and climate change: a review", *Journal of Transport Geography* 15(5): 354–67.

Conklin, E. (2006) *Dialogue mapping: building shared understanding of wicked problems*, Chichester: Wiley.

Curtis, C. and James, B. (2004) "An institutional model for land use and transport integration", *Urban Policy and Research* 22(3): 277–97.

Daniels, P. and Warnes, A. (1980) *Movement in cities*, London: Methuen.

de Rus, G. (2008) "The economic effects of high speed rail investment", *OECD/ITF Joint Transport Research Centre Discussion Papers* 2008/16, Paris: OCED.

de Rus, G. and Nombela, G. (2007) "Is investment in high speed rail socially profitable?", *Journal of Transport Economics and Policy* 41(1): 3–23.

Department of Transport (1989) *Roads for prosperity*, London: HMSO.

Docherty, I. and Shaw, J. (2011) "The transformation of transport policy in Great Britain? 'New Realism' and New Labour's decade of displacement activity", *Environment and Planning A* 43(1): 224–51.

Eddington, R. (2006) *The Eddington transport study: the case for action. Sir Rod Eddington's advice to the government*, London: TSO.

Gärling, T. and Steg, L. (2007) *Threats from car traffic to the quality of urban life: problems, causes, and solutions*, Oxford: Elsevier.
Geels, F., Kemp, R., Dudley, G. and Lyons, G. (2011) *Automobility in transition? A socio-technical analysis of sustainable transport*, Abingdon: Routledge.
Givoni, M (2006) "Development and impact of the modern high speed train: a review", *Transport Reviews* 26(5): 593–611.
Glaeser, E. (2004) *Four challenges for Scotland's cities*, Glasgow: University of Strathclyde Allander Series.
Goodwin, P. (1999) "Transformation of transport policy in Great Britain", *Transportation Research Part A: Policy and Practice*, 33(7–8): 655–69.
—— (2011) "Three views on 'peak car'", *World Transport Policy & Practice* 17(4:) 8–17.
Goodwin, P., Hallett, S., Kenny, P. and Stokes, G. (1991) *Transport: the new realism*, Oxford: Transport Studies Unit, University of Oxford.
Greene, D. and Wegener, M. (1997) "Sustainable transport", *Journal of Transport Geography* 5(3): 177–90.
Gutiérrez, J. (2001) "Location, economic potential and daily accessibility: an analysis of the accessibility impact of the high-speed line Madrid–Barcelona–French border", *Journal of Transport Geography* 9(4): 229–42.
Hansard (1994) "Trunk roads (review)", HC Deb. 30 March. Online. Available HTTP: <http://hansard.millbanksystems.com/commons/1994/mar/30/trunk-roads-review>.
Haywood, R. and Hebbert, M. (2008) "Integrating rail and land use development", *Planning Practice and Research* 23(3): 281–4.
Ison, S., Peake, S. and Wall, S. (2002) *Environmental issues and policies*, Harlow: FT Prentice Hall.
Jacobs, J. (1961) *The death and life of great American cities*, New York: Random House.
Janic, M. (2003) "Multicriteria evaluation of high-speed rail, transrapid Maglev and air passenger transport in Europe", *Transport Planning and Technology* 26(6): 491–512.
Laird, J., Nellthorp, J. and Mackie, P. (2005) "Network effects and total economic impact in transport appraisal", *Transport Policy* 12(6): 537–44.
Lucas, K., Tyler, S. and Christodoulou, G. (2008) *The value of new transport in deprived areas*, York: Joseph Rowntree Foundation.
Lyons, G. and Loo, B. (2008) "Transport directions to the future", in Knowles, R., Shaw, J. and Docherty, I. (eds) *Transport geographies: mobilities, flows and spaces*, Oxford: Blackwell, 215–26.
Martin, F. (1997) "Justifying a high speed rail project: social value vs. regional growth", *Annals of Regional Science* 31(2): 155–74.
Meyer, J. and Gomez-Ibanez, J. (1981) *Autos, transit and cities*, Cambridge, MA: Harvard University Press.
Ministry of Transport (1963) *Traffic in towns – a study of the long term problems of traffic in urban areas – reports of the steering group and working group appointed by the minister of transport*, London: HMSO.
Newman, P. and Kenworthy, J. (1999) *Sustainability and cities: overcoming automobile dependence*, Washington, DC: Island Press.
Organization for Economic Development and Cooperation (OECD) (1979) *Report of the seminar on urban transport and the environment*, Paris: OECD.
Pearce, D., Markandya, A. and Barbier, E. (1989) *Blueprint for a green economy*, London: Earthscan.
Pezzoli, K. (1997) "Sustainable development: a transdisciplinary review of the literature", *Journal of Environmental Planning and Management* 40(5): 549–74.
Pucher, J. and Lefevre, C. (1996) *The urban transport crisis in Europe and North America*, London: Macmillan.
Redclift, D. (1987) *Sustainable development: exploring the contradictions*, London: Methuen.
Rittel, H. and Webber, M. (1973) "Dilemmas in a general theory of planning", *Policy Sciences* 4: 155–69.
Royal Commission on Environmental Pollution (RCEP) (1994) *Eighteenth report. Transport and the environment*, London: HMSO.
Shaftoe, H. (2008) *Convivial urban spaces: creating effective public places*, London: Earthscan.
Sheller, M. and Urry, J. (2006) "The new mobilities paradigm", *Environment and Planning A* 38(2): 207–26.
Starkie, D. (1972) *The motorway age*, Oxford: Pergamon.
Wackernagel, M. and Rees, W. (1995) *One ecological footprint: reducing human impact on the earth*, Gabriola Island, BC: New Society Publishers.
Williams, C. and Millington, A. (2004) "The diverse and contested meanings of sustainable development", *Geographical Journal* 170(2): 99–104.
World Commission on Environment and Development (WCED) (1987) *Our common future*, Oxford: Oxford University Press.

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Persistent organic pollutants

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As many as 70,000 chemicals have been widely used in agriculture, industry, and consumer products since the Second World War (Chasek et al. 2010: 140). Many of these chemicals are both extremely useful and harmless; others are less benign. In the early 1970s, governments in many industrialized countries began enacting national legislation to regulate the production and use of certain pesticides and industrial chemicals, with most starting with DDT and PCBs. Few developing countries followed suit, however, and as production and use expanded globally in the 1970s and 1980s, concern increased that no country acting alone could effectively address the issue.

In response to these concerns, over the past 40 years governments have pursued a series of increasingly ambitious international initiatives to address the negative impacts of toxic chemicals (Lönngren 1992; Downie and Fenge 2003; Selin 2010). These efforts have included consensus statements at major global environmental meetings; new international organizations and programs, such as the Intergovernmental Forum on Chemical Safety and the United Nations Environment Programme (UNEP) Chemicals Branch; voluntary global guidelines, such as the International Code of Conduct on the Distribution and Use of Pesticides; regional treaties, including Protocols adopted under the Convention on Long-Range Transboundary Air Pollution (CLRTAP, see Chapter 30); and, perhaps most importantly, several legally binding global treaties, including the 1989 Basel Convention on Hazardous Wastes (Chapter 33), the 1998 Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the 2001 Stockholm Convention on Persistent Organic Pollutants (POPs). (The 1987 Montreal Protocol addresses chemicals that deplete stratospheric ozone, and while several are also toxic to human health, the Protocol is usually considered to be an atmospheric treaty, not part of the chemicals and waste cluster. See Chapter 29.)

This chapter examines the most recent of these developments: the Stockholm Convention on POPs. This agreement is particularly important not only because of the dangerous chemicals it addresses, but also because it is the first global, legally binding treaty that specifically seeks to eliminate the production and use of chemicals that are directly toxic to the environment and human health. As such, the Convention plays an important role in global environmental politics. This chapter provides an overview of the environmental dangers posed by persistent organic

pollutants (POPs), the creation and content of the Stockholm Convention, the success of the Convention, and some very significant challenges that remain.

Persistent organic pollutants: global threats to the environment and human health

POPs possess four key, measurable characteristics that distinguish them from other harmful substances, prioritizing them for international action. POPs are: toxic, persistent, bioaccumulative, and capable of traveling long distances from their emission sources. POPs are significantly toxic to humans and wildlife. While impacts vary, exposure to these chemicals is associated with diseases, cancer, birth defects, developmental impairment, reproductive difficulties, autoimmune problems, and other significant consequences in a range of species, including mammals, fish, birds, and humans. POPs are persistent. Once released into the environment, they remain intact and toxic for extended periods. While all POPs have relatively long half-lives, some are amazingly persistent, and may resist degradation for decades, or longer. For example, perfluorooctane sulfonic acid (PFOS), used in firefighting foams, upholstery, cleaning products, and other applications, degrades only in high-temperature incineration.

POPs are lipophilic, which means they are attracted to and absorbed by the fatty tissues in humans and other animals. Combined with their persistence, this allows POPs to bioaccumulate, or increase in concentration, within individual animals and as they pass through food webs. Concentrations in animals and people can be thousands of times greater than the levels found in their local environment. Humans and animals can also absorb high concentrations of POPs quickly if they eat multiple organisms in which POPs have already accumulated. Thus, POPs are found in high concentrations in top predators, such as seals and polar bears, as well as humans who rely on certain animals, such as seals or whales, for food (Hillman 1999; Dewailly and Furgal 2003). Mammals can then pass POPs to their offspring during prenatal development and through lipid-rich breast milk.

Finally, POPs can travel thousands of kilometers from their emission sources via migratory species and water and air currents. This crucial characteristic, referred to as long-range environmental transport, means that POPs pose risks even to humans and wildlife living far from where the substances are produced or used. POPs tend to travel northward, where colder temperatures cause them to fall to the Earth. Some of the world's highest concentrations of POPs are found in countries bordering the Arctic Circle (AMAP 1998).

The international dangers posed by POPs, produced by the combination of the toxicity, persistence, bioaccumulation, and especially long-range transport, came to light in the mid-1980s when Canadian government researchers discovered surprisingly high concentrations of PCBs in territory near the Arctic Circle (for discussion see Downie and Fenge 2003). Because industrial chemicals are neither produced nor widely used in the Arctic, scientists had planned to use the area as a pristine reference standard against which they could compare data from other areas known to be contaminated. The discovery led to further research that revealed how POPs were affecting a variety of species including fish, birds, seals, and bears.

The research also revealed the impact of POPs on people living in the region. In particular, tests of the umbilical cord blood of newborns, the blood of infants, and mothers' milk in areas near the Arctic were found to contain many times the amount of POPs found in the blood of babies born in more southern regions (Hillman 1999; Downie and Fenge 2003). The diets of indigenous Arctic people tend to rely heavily on fish, mammals, and birds, species with particularly high levels of POPs in their fatty tissues due to the persistence, bioaccumulation, and long-range transport of POPs.

The discovery of substantial contamination throughout the Arctic led to growing recognition among scientists and policy-makers, particularly in Canada and northern Europe, of the need for international action to control POPs (Downie and Fenge 2003; Selin 2010). During the 1990s concern also grew in the southern hemisphere about local health and environmental risks from the unregulated use of certain pesticides and other hazardous substances (Kohler and Ashton 2010). This created additional interest in the possibility of a global agreement that would eliminate some of these substances and provide technical and financial assistance to manage others.

From science to negotiations

Reaction to the presence of POPs in the Arctic and to other scientific discoveries led governments to discuss POPs during some preparatory sessions for the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, but without significant results (on science generally, see Chapter 17). Following Rio, concern grew in response to expanding evidence regarding POPs' potential for bioaccumulation and long-range transport. Particular attention was paid to the risks faced by sensitive groups such as small children, pregnant women, and indigenous peoples. Canada and Sweden were instrumental in supporting this research and pushing the issue on to the international agenda. (This section and subsequent discussion draw on previous writings by the authors, including Downie 2003; Downie and Fenge 2003; Downie et al. 2005; Chasek et al. 2010; Templeton 2009; Allan et al. 2011; and Templeton 2011; as well as direct observations by the authors during negotiation of the Stockholm Convention and subsequent meetings of the Conference of Parties.)

Awareness of the need for international action was also reinforced by scientific assessments conducted by the regional CLRTAP Task Force on POPs. The Task Force played a crucial role in defining POPs both scientifically and politically. It agreed on the general physical and chemical characteristics of POPs, and divided POPs into three categories: industrial chemicals, pesticides, and unintentionally produced by-products created as a result of other industrial processes, such as waste incineration (Selin 2003 and 2010). These assessments not only informed the development of a regional POPs Protocol under CLRTAP, but also greatly assisted calls to consider formal global negotiations.

In May 1995, these efforts led UNEP's Governing Council to request that the Intergovernmental Forum on Chemical Safety (IFCS) and the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), two international programs created by governments to address chemicals, conduct a global scientific assessment of 12 POPs known as the dirty dozen: eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene); two industrial chemicals (PCBs and hexachlorobenzene); and two unintentional by-products (dioxins and furans). These substances were chosen both for the dangers they posed and because they were already subject to significant regulation, and in some cases outright bans, in many industrialized countries.

In response to the Governing Council request, the IOMC summarized the scientific literature on POPs, consolidating the available information on their chemistry, toxicity, environmental dispersion, and other relevant properties, and IFCS established an ad hoc Working Group on POPs to conduct the assessment. In June 1996, IFCS concluded that sufficient evidence existed to warrant significant international action to reduce the risks posed by POPs. In February 1997, UNEP's Governing Council (in decision 19/13c) endorsed the IFCS report and formally authorized UNEP to convene negotiations with a mandate to draft a global legally binding agreement that would address the dirty dozen and include procedures for identifying, reviewing, and listing additional POPs in the future.

Meanwhile, Canada and Western European governments were concluding their negotiations on a regional POPs agreement under CLRTAP. The Aarhus Protocol on Persistent Organic Pollutants, which seeks to eliminate or reduce releases of 16 POPs, was signed in June 1998. Covering Europe, Russia, Canada, and the USA (although not ratified by the USA or Russia), the agreement provided diplomatic momentum to the global effort, established additional scientific justification, and supplied certain templates that assisted development of a global convention (Selin 2003; Eckley and Selin 2003).

Formal negotiations on a global POPs treaty began in June 1998. Despite the Montreal Protocol, Aarhus Protocol, and Rotterdam PIC Convention serving as successful models, and extensive preparations by UNEP (including a series of regional awareness-raising and pre-negotiation workshops), governments had a difficult time resolving a number of issues including the control measures, how to add new POPs to the treaty in future, and provisions on financial and technical assistance. Governments adopted the Stockholm Convention in May 2001. Seeking speedy implementation, UNEP, the Global Environment Facility (GEF), other intergovernmental organizations, and many governments agreed to begin implementing the treaty even before it entered into force in May 2004.

The Stockholm Convention

The 2001 Stockholm Convention seeks to protect human health and the environment from POPs (Article 1) by: eliminating or reducing the production, use, release, and trade of specific POPs listed in the treaty; establishing specific criteria and procedures for placing controls on additional POPs; providing financial and technical assistance to developing countries to support their implementation of the Convention; facilitating information sharing on POPs and their alternatives; requiring countries to plan and report their implementation activities; and providing for reviews of the treaty's effectiveness and opportunities to adjust the treaty to make it more effective. A Conference of Parties (COP), made up of all states that have ratified the Convention, is the supreme decision-making body and meets every two years. This section summarizes four critical parts of the treaty.

Control measures

Countries faced two broad questions with regard to the control measures: what POPs to include in the Convention, and how to structure the controls. No country objected to placing significant restrictions on the dozen POPs that had received attention during the agenda-setting phase, except for DDT, which several countries insisted was necessary for use against malaria and other vector-borne diseases. Some delegations, including Canada, Norway, Switzerland, and the EU, expressed initial support for considering additional POPs (e.g., those addressed in the regional Aarhus Protocol), but this position never gained significant traction, particularly given the consensus that the Convention would include criteria and procedures for adding chemicals in the future. Thus, once plenary agreed that use of DDT for disease vector control would receive a blanket exemption, the debate about which chemicals to include largely ended.

Questions about the design of the control measures proved more intriguing. Different opinions existed regarding the most effective way to reduce the production, use, and emissions of POPs; what type of controls would allow the flexibility that some countries required to join the Convention; and what design features would allow new POPs to be added to the treaty with the fewest legal and procedural complications.

In the end, negotiators created a multi-tiered set of control measures. POPs regulated by the Stockholm Convention are divided into three annexes, depending on their source and the control measures placed on them. New POPs can be added to each annex by amending the annex and without amending the main body of the text. In summary, the key control measures of the Stockholm Convention require that all Parties:

Prohibit the production and use of POPs listed in Annex A. The Convention initially listed nine POPs in Annex A: the pesticides aldrin, chlordane, dieldrin, endrin, heptachlor, mirex, and toxaphene; and the industrial chemicals PCBs and hexachlorobenzene (hexachlorobenzene is also a pesticide). To date, since the agreement's entry into force, Parties have added ten new chemicals to Annex A, including chlordecone, endosulfan, and lindane.

Restrict the production and use of POPs listed in Annex B. Annex B currently includes DDT and PFOS. Parties can continue to produce and use DDT only for disease vector control, especially against malarial mosquitoes, and only when "locally safe, effective and affordable alternatives are not available" (Annex B, Part II, paragraph 2). PFOS, added to the Convention in 2009, can still be used in a number of medical devices and other products.

Minimize, and where feasible eliminate, releases of the POPs listed in Annex C. While Annex A and B list POPs intentionally produced for use as pesticides or in industry, the POPs listed in Annex C are unintentionally created by-products of waste incineration, chlorine production, pulp bleaching, metallurgy, and other industrial processes. In some cases, eliminating their production is physically impossible; hence their placement in Annex C, which currently lists dioxins, furans and pentachlorobenzene.

Take efforts to prevent the commercial development of new POPs.

Ban the import or export of POPs controlled under the Convention, except for narrowly defined purposes or environmentally sound disposal.

Reduce or eliminate releases of POPs from existing POP stockpiles or wastes containing POPs.

Promote the adoption and use of the best available technologies (BAT) and best environmental practices (BEP) for reducing emissions of POPs, managing and disposing of POP wastes, and replacing POPs with alternatives. Detailed annexes to the Convention, as well as subsequent decisions by the Conference of Parties, delineate BAT and BEP guidelines with respect to different POPs and different activities, including limiting emissions of dioxins and furans.

Exemptions

Despite broad consensus regarding the need to control the dirty dozen, many countries argued for provisions that would allow continued use of certain POPs. Such demands created the challenge of how to overcome this "lowest-common-denominator problem" (Chasek et al. 2010: 279) without sacrificing the long-term effectiveness of the regime. In the end, negotiators agreed on a system of general and specific exemptions that allow for the continued use of specified POPs, for specified purposes, for limited time periods. Thus, general exemptions were granted for certain uses of DDT and, later, for PFOS (and thus their placement in Annex B), but these exemptions are subject to review and reporting requirements. Another general exemption allows countries to use and maintain existing equipment containing PCBs until 2025, which allows gradual replacement of the hundreds of thousands of tons of existing equipment that contain PCBs.

Parties are also allowed "country-specific exemptions" that permit five years of continued use of a POP for specific uses listed in a *Register of Specific Exemptions*. Parties must tell the

Secretariat, which maintains the *Register*, if they intend to use a particular exemption, and must reapply every five years to the COP to keep using the exemption. Once no Party is using a particular exemption, it is removed from the Register, allowing no future use. Thus, over time, fewer Parties will use these loopholes and certain exemptions will disappear. Of course, when the COP agrees to list additional POPs, it also usually needs to include exemptions as part of the agreement. Negotiations on exemptions can be difficult and may create large loopholes, but their availability provides the flexibility necessary to ensure broad participation in the Convention.

Adding new chemicals

From the beginning, negotiators understood that the Convention would include criteria and procedures for considering the addition of new POPs to Annexes A, B, and C. The Governing Council's mandate for the negotiations called for such provisions, and proponents of a strong regime, including Canada, the EU, Norway, and Switzerland, considered creation of a robust system critical given that the Convention would initially cover only the dirty dozen and would likely include exemptions. However, creating an agreement required balancing the views of governments that preferred an active approach based on the precautionary principle in which delegated rule making would allow substances to be added relatively quickly on the basis of advancing scientific knowledge (e.g., the EU) with the views of governments that preferred an approach based on extensive evidence of existing harm, procedures that emphasize sovereign control over decision-making (e.g., Australia, China, and the United States), and full consideration of the socioeconomic impacts of banning particular substances (e.g., many developing countries). In the end, delegates reached a reasonable compromise.

Any Party can nominate a substance to add to the Convention. Nominated chemicals are reviewed by the POPs Review Committee (POPRC), a subsidiary scientific advisory body composed of 31 scientists affiliated with Parties to the Convention. POPRC's review process is divided into three stages. First, POPRC reviews a nominated substance to determine whether it meets basic screening criteria (i.e., certain levels of toxicity, persistence, bioaccumulation, and potential for long-range environmental transport) indicating that the substance is a POP. In the second stage, POPRC members and observers gather more information, which is compiled in a risk profile. If POPRC decides the evidence indicates that a substance meets the thresholds for listing in the Convention, it drafts a risk management evaluation, which identifies some of the socioeconomic issues associated with possible listing, and forwards this document to the COP, along with its recommendation whether to place controls on the chemical by listing it in one or more annexes to the Convention. Each stage in the POPRC review process (criteria, risk profile, risk management evaluation) is subjected to review by the COP. Each stage typically takes one year, but some chemicals may progress more slowly if POPRC requires additional time to gather and review relevant data (as is currently the case with short-chain chlorinated paraffins, or SCCPs).

The COP, which meets every two years, reviews POPRC's recommendation, considers socioeconomic issues associated with potential listing, and makes the final decision regarding controls and exemptions. Thus, the Convention is structured to create a clear demarcation between science and politics. POPRC creates a science-based foundation for action and then the governments that comprise the COP make the final policy decision.

Once adopted by the COP, the decision to add a chemical to Annex A, B, or C represents an amendment to the relevant annex. During negotiations, many governments argued that such amendments should take effect immediately, similar to "adjustments" under the Montreal

Protocol (see Chapter 29), so that the Convention could respond quickly to new threats. Others argued that adding chemicals represents a substantive amendment that requires formal ratification before a Party could be required to comply. In the end, neither view was conceded. The final compromise, remarkably, allowed for Parties to choose, when ratifying the Convention, which rule would apply to them in the future. Thus some Parties, including countries in the EU, must comply with additions to Annexes A, B, and C immediately unless they formally "opt-out" by a specified time. Other countries, like Australia, Canada, China, and India, are not bound by an amendment to Annex A, B, or C unless they "opt-in" by formally ratifying the amendment. This dual structure is rare for multilateral environmental agreements (MEAs) and international treaties in general.

Financial and technical assistance

Following negotiation of the 1990 London Amendment to the Montreal Protocol (see Chapter 29), global environmental agreements are widely expected to include mechanisms to provide financial and technical assistance to help developing countries in implementing their obligations. Such assistance is seen by developing countries as an operational manifestation of the principle of common but differentiated responsibilities.

The Governing Council's mandate for the POPs negotiations recognized this, but reaching agreement on a financial mechanism proved difficult (Downie 2003: 141–2). Developing countries strongly supported creation of a stand-alone financial mechanism for POPs, similar to the Montreal Protocol's Multilateral Fund. Developed countries opposed the creation of a new dedicated institution, arguing instead for utilizing the GEF and mobilizing additional bilateral, multilateral, and private sector activity. They argued that the GEF would provide important economies of scale, expertise, and opportunities to leverage co-financing while eliminating the operational expenses associated with a new institution. Developing countries argued that such a system would not provide sufficient and guaranteed financial resources and that the GEF would not respond to the needs of the Convention, or wishes of the COP, in the same way as a dedicated fund. These arguments echoed each side's position in previous MEA negotiations and were made again in the recent negotiations that created the Minamata Convention on mercury (authors' observations of the mercury negotiations).

In the final compromise, which favored the donor countries, the Convention states that developed country Parties will provide new and additional financial resources to enable developing country Parties, and Parties with economies in transition, to fulfill their obligations under the treaty. The GEF was designated as the principal entity of the financing mechanism, although officially only on an interim basis, and with provisions for the COP to review its effectiveness at regular intervals. After Parties agreed upon terms, the GEF created an official funding window for POPs, and donors included consideration of POPs in their collective funding of the GEF. However, the amount of financial assistance to be provided under the Convention remains unspecified, and disagreement remains about whether developing country obligations should be contingent upon provision of sufficient funds.

General obligations

The Stockholm Convention includes many other provisions relevant to its implementation, review, and operation. Most of these follow standard patterns established in previous MEAs, including the Montreal Protocol, Rotterdam Convention, and Basel Convention. These include the obligation on all Parties to report regularly on their production and use of POPs,

imports and exports of POPs, use of exemptions, implementation of the Convention, and other issues. Parties must develop national implementation plans (NIPs) detailing their strategy and plans for implementing the Convention. Parties must also share information and raise public awareness concerning the emission of POPs, threats posed by exposure, substitutes and alternatives, and other issues relevant to the Convention. Additionally, Parties must collectively establish systems to monitor POPs in the environment and to evaluate the effectiveness of the Convention on a regular basis.

Successes and challenges

The Stockholm Convention has had a successful start. To date, 179 countries have ratified the Convention. Twenty-three POPs are now subject to binding global controls aimed at eliminating or significantly restricting their production, use, and emission. Over 110 Parties have developed NIPs and submitted them to the COP for review. The GEF created a funding window for POPs and is distributing funds to assist Parties in implementing POPs-related projects. POPs stockpiles in many developing countries are being identified and steps taken for their environmentally sound management or disposal. The COP designated regional centers to provide technical assistance to developing countries, and created the PCBs Elimination Network and the DDT Global Alliance to speed transitions to POP-free alternatives. Although, as with the Basel and Rotterdam conventions, the US Senate has not ratified Stockholm, the USA has a robust set of complementary domestic chemicals controls and supports the global POPs regime financially and diplomatically.

These and other successes demonstrate the value of the Convention and the potential to achieve its long-term goals. At the same time, significant challenges exist, including some long-standing divisions among Parties, which could impede the effectiveness of the Convention and the broader international agenda on chemicals.

The dirty dozen

Even though most of the original dirty dozen POPs were no longer intentionally produced by the time the Stockholm Convention was signed, listing these substances represented a significant step toward protecting human health and the environment because it created a treaty framework to address their remaining uses, the deterioration of products containing them (e.g., PCBs in transformers and capacitors), and poor management of POP stockpiles and wastes. For example, in accordance with the Convention, in 2005 the COP established a committee to identify and promote a variety of best available techniques (BAT) and best environmental practices (BEP) to help governments control dioxin and furan emissions, address POPs wastes, replace current-use POPs with safer substances, and prevent development of new POPs. The work of the BAT/BEP committee shows how Convention rules help Parties gather and transfer knowledge from the global community to individual nations seeking to address specific POPs-related issues.

In 2009, the COP established the Global Alliance to help coordinate international action to develop and deploy cost-effective alternatives to DDT for use in combating malarial mosquitoes. The Global Alliance seeks to identify gaps in existing initiatives, improve coordination among groups working to deploy alternatives, catalyze new action, and take advantage of the global scale of the Stockholm Convention for awareness-raising and information-sharing on best practices. Also in 2009, the COP established the PCB Elimination Network (PEN) to facilitate information exchange on the environmentally sound management of PCBs, help

stakeholders cooperate, and promote development of improved techniques for managing PCBs, particularly in developing countries. While the Global Alliance and PEN are comparatively recent developments, and their long-term impacts are unknown, both demonstrate how global agreements can go beyond control measures and be used to develop initiatives that coordinate and support multi-sector action among governments, corporations, nongovernmental organizations (NGOs), and other stakeholders to achieve common goals.

Adding new chemicals

Parties have added 11 new chemicals to the annexes of the Convention since the treaty entered into force (as of June 2013). More chemicals are under review in POPRC, and could be added in the future. This demonstrates that the process established by the treaty to review and add new chemicals works, and that the Stockholm Convention can remain relevant beyond the relatively easy decisions to control the dirty dozen.

Equally important, the decisions to list some of the new chemicals marked a critical shift in the regime's focus from addressing largely "dead chemicals," or substances no longer widely produced or used, to tackling "live chemicals," which continue to be of socioeconomic importance in many parts of the world. Addressing live POPs is obviously more difficult, as evidenced by the contentious discussions on endosulfan, an agricultural chemical in widespread use during its review (Kohler et. al 2008; Templeton 2009). The listing of several live substances and the ongoing consideration of more within POPRC represent major successes.

To address the need for information about possible risks associated with POP alternatives, the COP has asked POPRC to assess chemical and non-chemical alternatives to some listed substances, including DDT and endosulfan. This request expands POPRC's mandate and demonstrates the potential for the Convention to develop a mechanism to evaluate alternatives, much like TEAP does under the Montreal Protocol. If this trend continues, it might also make it easier to list additional live chemicals, if POPRC is able to determine that effective and non-toxic alternatives are available.

At the same time, considering controls on additional chemicals and expanding POPRC's mandate also introduce significant challenges. The shift to live chemicals will inevitably introduce even more economic considerations into COP debates, making listing chemicals more difficult. Socioeconomic concerns could also begin to intrude earlier and more prominently into POPRC deliberations, threatening the intended independence and scientific focus of the body. Indeed, this has already started to occur. It will also be necessary to ensure that the alternatives introduced for the banned chemicals do not create other, equally significant environmental problems.

Similarly, while expanding POPRC's mandate could speed acceptance of DDT and PFOS alternatives, the expanded workload might detract from POPRC's core mission of examining other POPs. It could also undermine POPRC if members draw conclusions on issues outside their areas of expertise or are seen as unfairly favoring one commercial alternative over another. Indeed, some observers have questioned the technical ability of POPRC to assess environmental hazards that differ substantially from those the committee must consider in evaluating POPs (Allan et al. 2011).

Adding new chemicals could also create implementation and even legal challenges. Some "opt-in" Parties might decide not to ratify an amendment (addition) to an annex. This could lead to uneven implementation of the Convention, as some Parties would be bound by the controls on a new substance while others were not. These disparities could then serve as a disincentive for the COP to list more live substances, as doing so could put some countries at a

competitive disadvantage. Uneven patterns of ratification could also create legal uncertainties in cases in which some countries have banned the use of a particular POP while other countries wish to include products made with or containing that POP in international trade.

On the other hand, the decision to list the pesticide endosulfan suggests that the regime may be able to negotiate agreement on chemicals that are of significant economic value to some Parties. Endosulfan was widely used in some countries, particularly India, in both domestic and export-related applications. The Indian government negotiated for many years to prevent its addition to the control measures (Ashton et al. 2011). However, the final COP decision to list endosulfan, albeit with exemptions won by India, contributed to domestic pressure within India (from both environmentalists and manufacturers of alternatives) to eliminate the production and use of this pesticide, as well as to a decision by the Indian Supreme Court to ban its production, use, and sale. Although several chemicals currently under review in POPRC, including SCCPs, present even more challenging tests of the COP's ability to reach agreement to control live substances and of opt-in Parties' willingness to ratify such listings, the endosulfan case suggests that these challenges are surmountable and that the Stockholm Convention can play an important agenda-setting role that can help influence domestic decision-making even in the presence of particular economic interests.

Managing exemptions

As noted above, allowing exemptions creates the flexibility necessary to reach agreement on listing some chemicals. Without them, some Parties might block a listing or not participate by refusing to ratify the amendment to the annex. However, the success of the exemption system rests on Parties' willingness to transition to alternatives. This requires domestic motivation, possibly financial and technical assistance, and, arguably, the expectation that the COP will not blithely renew exemptions indefinitely every five years. However, the review of such exemptions represents a significant challenge for the COP. It is possible that countries will find it difficult to stand in opposition to renewal of another's exemption if they themselves are hoping to find support for continuing an exemption. This problem is magnified for the very broad exemptions, like those granted to DDT and PFOS, or for live chemicals with significant commercial applications. The long-term effectiveness of the Convention requires closing individual exemptions in a reasonable time frame, and we do not yet know if this will be the norm.

Technical and financial assistance

The effectiveness of the Convention, in both the short and long term, requires provision of sufficient financial support for developing countries, or at least certain developing countries, to build capacity, regulate chemicals, transition to specific alternatives, manage stockpiles of obsolete substances, raise awareness about risks, and implement other obligations. Important initial successes in providing financial assistance have been achieved. The GEF provided funding to over 100 developing country Parties to prepare national implementation plans (NIPs), the first step for countries in meeting their obligations. The GEF took the critical step of establishing a formal focal area for POPs funding and developed a memorandum of understanding with the COP to guide its activities. The most recent replenishment of GEF resources by donor countries (GEF-5) included a 25 percent increase in funding for the POPs focal area.

However, many developing countries have expressed frustration with their inability to secure funding for projects specified in their NIPs. Many countries find it difficult to meet co-financing requirements, and to navigate the complex bureaucratic process required to access GEF funds.

As a consequence some implementation actions have slowed, especially in small-island developing states and least-developed countries, due to lack of funds (Kohler and Ashton 2010).

The addition of new POPs to the Convention has exacerbated concerns about the availability of project funding. Without adequate technical and financial assistance to help implement regulatory action and to find and deploy affordable and effective alternatives, the listing of new chemicals in the Convention becomes a largely aspirational exercise for some Parties. Moreover, many developing countries, including some with sufficient resources, have stated in regime negotiations that it will become increasingly difficult for them to agree to list additional chemicals without confidence that implementation funds will be available. Thus, the transition of the financial mechanism from one that successfully supported NIP development to one that has predictable and adequate levels of funding to support implementation projects represents a critical practical and political challenge for the Convention and for global chemicals policy in general.

Supporters of the Consultative Process on Financing Options for Chemicals and Wastes, begun in 2009, hope the initiative will help resolve these issues. The objective of the process is to identify, coordinate, access, and accelerate deployment of existing and new resources for implementation of obligations under the major chemicals and wastes conventions and related international initiatives. Ideally, this process will enable Parties to the conventions to streamline and link funding for related chemicals and wastes projects, thereby increasing the efficiency and availability of funds to support developing country implementation. As of this writing, the Consultative Process has produced a policy paper outlining the possible benefits of such an approach, but concrete action has yet to be taken to decide whether and how it might be implemented.

Compliance mechanism

The tensions associated with provision of financial assistance have also been reflected in the unsuccessful discussions to establish a compliance mechanism for the Stockholm Convention. Article 17 requires the COP to develop procedures to identify and determine appropriate responses to Parties found to be in non-compliance. However, the text provides no firm deadline, and the COP has made little progress beyond a general consensus that the mechanism should focus on identifying and addressing obstacles to compliance rather than on judging and punishing individual countries for being in non-compliance. Some developing countries argue that financial and technical assistance must be increased before a compliance mechanism is created, especially as countries struggle to keep pace with the addition of new chemicals to the Convention. They also argue that provision of specific amounts of financial and technical assistance should be a central compliance requirement for developed countries. Meanwhile, some developed countries insist that because a compliance mechanism would not be punitive, there is no reason to link the issues.

The lack of a compliance mechanism potentially undermines the COP's ability to monitor the global effectiveness of the agreement. A compliance mechanism that reviews whether and how Parties meet their commitments under the Convention could help identify domestic or regional problems and facilitate action to help parties respond to implementation challenges. However, while many countries see this as a positive mechanism to increase the effectiveness of the Convention, as has been the case under the Montreal Protocol, others perceive the potential mechanism as a threat to national sovereignty.

Synergies

Two other major initiatives are underway that impact the Stockholm Convention: the "synergies" initiative and the Strategic Approach to International Chemicals Management (SAICM).

Both seek to coordinate and streamline different aspects of international chemicals and hazardous waste management to enhance national implementation of global agreements and to achieve, as an ultimate goal, the environmentally sound management of chemicals during all stages of their life cycles in all regions of the world.

The synergies process is a UNEP-led effort to enhance cooperation and coordination among the Stockholm, Basel, and Rotterdam conventions in areas where the conventions overlap or complement each other. The COPs of each Convention have held joint meetings and taken important decisions to initiate this process which is intended, over the long term, to reduce administrative costs by integrating certain Secretariat functions, improve implementation via joint activities such as designating regional centers to provide technical assistance for all three conventions, and augment effectiveness by coordinating overlapping actions such as reporting requirements and certain implementation activities. Each Convention maintains individual legal autonomy over its activities. Supporters of the process believe it will substantially improve the efficiency and effectiveness of all three conventions, and allow Parties, the Secretariat, the financial mechanism, and international organizations to enhance information exchange, direct more resources to implementation activities, and achieve advantageous synergies unavailable if the three processes remain entirely distinct.

SAICM is a broader policy initiative. Initiated by governments at the International Conference on Chemicals Management in 2006, SAICM seeks to achieve a multi-stakeholder, multi-sector policy framework for the global, sound management of chemicals throughout their entire life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse effects to human health and the environment. SAICM's more specific objectives are grouped into five themes: risk reduction, knowledge and information, governance, capacity building and technical cooperation, and illegal international traffic. SAICM is structured to engage a range of actors involved in different aspects of chemicals production, use, and disposal, including civil society, industry, national and local governments, and intergovernmental agencies. Thus, the initiative has been particularly welcomed by actors who support multi-stakeholder engagement and recognize the importance of focusing on managing the entire life cycle of chemicals.

Achieving the goals of these initiatives would represent huge successes, but it will not be easy. Their pursuit also carries some risks, particularly in the form of opportunity costs should the initiatives produce more bureaucratic wrangling and conference discussion than actual integration. The International POPs Elimination Network (IPEN), an umbrella organization representing public health and environmental advocacy groups, has also expressed concern that critical and unique elements of the Basel, Rotterdam, and Stockholm conventions not be sacrificed in the synergies process. For example, decision-making under the Stockholm Convention has incorporated the precautionary principle in a more prominent role than in the Rotterdam and Basel conventions, and advocates of broader application of this principle do not want to see the synergies process reduce its importance. IPEN has also raised concerns that integration under the synergies initiative could reduce resources available for capacity building related to unique obligations under each agreement (IPEN 2010). Thus, the challenge of the synergies and SAICM initiatives is to ensure that integration and coordination do not inadvertently undermine key strengths of individual agreements or take time and money away from important implementation activities.

The role of NGOs

The Stockholm Convention's extant development provides examples of the valuable role that different types of NGOs can play in global environmental issues. Advocacy groups played a key

agenda-setting role in framing the proposed regime as an essential tool for protecting human health, especially the health of indigenous peoples living near the Arctic Circle (Fenge 2003; Downie and Fenge 2003). NGO experts currently play an active role in the work of the Convention, participating in the work of the COP and POPRC both during meetings and as part of intersessional working groups responsible for conducting work on a range of issues. On broad policy issues, IPEN and other civil society groups advocate for aggressive precautionary action to protect human health and the environment from POPs, providing data and first-hand experiences of the impact of chemicals on vulnerable populations. Industry associations such as CropLife International, which represents manufacturers of pesticides, play what they consider to be a "watchdog" role, ensuring that implementation of the Convention is legally rigorous (Templeton 2011). As producers and users of some of the chemicals and pesticides reviewed under the Convention, industry observers also contribute data and technical expertise regarding both chemicals under review and the efficacy of possible substitutes and alternatives.

The Stockholm Convention is a distinctively inclusive forum in which nongovernmental delegates make substantial contributions to many aspects of the POPs regime, although not formal decision-making, to a degree not found in many other MEAs. This participation is not required or mandated by the Convention text, however, and could be undermined by increasingly difficult negotiations to regulate live, economically valuable substances.

Lessons learned

The 2001 Stockholm Convention provides an effective framework to reduce threats to human health and the environment posed by persistent organic pollutants. The control measures, procedure for adding new chemicals, provisions for providing financial and technical assistance, reporting requirements, and mandates for effectiveness evaluations demonstrate that governments can create well-designed agreements to address global environmental problems. Furthermore, activities during the regime's first decade, including work on the original dirty dozen, agreements to add ten new chemicals, initial funding activity by the GEF, creation of national implementation plans, designation of regional centers, and planning for review of the financial mechanism, show that governments are capable of implementing the agreements they create.

More broadly, the positive impact of UNEP's activities prior to the negotiations, especially the series of regional workshops, illustrates how effective action by international organizations during the agenda-setting phase can pave the way for successful negotiations by catalyzing and sustaining action, raising concern, augmenting capacity, and improving the contractual environment (Downie 1995; Haas et al. 1993; Chasek et al. 2010: 276, 295, 299–300). The role played by the combination of advancing scientific knowledge and an epistemic network of scientists and aligned policy-makers confirms arguments regarding how, in some situations, these factors can enhance (but certainly not guarantee) prospects for successful agenda-setting and reaching an initial agreement (Haas 1990; Downie 1996; Downie and Fenge 2003). The initial success of POPRC, the use of exemptions to overcome lowest common denominator problems and ensure participation, and the development of national implementation plans, confirm that "regime design matters" (Mitchell 1994), in that each of these treaty components was at some point configured differently (and likely less effectively) during negotiation of the Convention. The relatively speedy negotiations that produced the Convention, which included heavy reliance on productive textual and organizational precedents set in the ozone, CLRTAP, and Rotterdam Convention negotiations, demonstrate how cumulative knowledge and experience in creating effective MEAs can positively influence outcomes (Downie 1996; Downie and Fenge 2003).

The development and extent of the success of the Stockholm Convention also speaks to the importance of multilayered governance systems. The governance of toxic chemicals involves global, regional, and domestic initiatives, formal and informal governance systems, and a range of actors that address different aspects of chemicals production, use, and disposal; these include IFCS, UNEP Chemicals, SAICM, voluntary initiatives and guidelines developed under UNEP and FAO, the Basel and Rotterdam conventions, environmental NGOs, industry groups and guidelines, domestic laws, among many others. The development, composition, impact, and effectiveness of multilayered governance systems deserve more attention in the study of global environmental politics.

At the same time, the long-term success of the Convention faces major challenges. For example, will exemptions decline at a reasonable pace so that the Convention does in fact eliminate the use of the original dirty dozen and the ten new chemicals? Will countries actually implement BAT and BEP guidelines to control POPs emissions, especially of dioxins and furans? Will Parties be able to add more live POPs? Will the effectiveness of new listings be compromised by extensive exemptions? Will key Parties choose not to "opt-in" to the controls on new chemicals, creating de facto POPs havens? Will POPRC avoid the politicization of its work as attention shifts to live chemicals? Will the GEF perform effectively as the regime's financial mechanism? Will sufficient funds be available, via the GEF or the "consultative process," to meet the implementation needs or political demands of developing countries? Will funding uncertainties keep key countries from agreeing to list additional chemicals? Will the ongoing shifts within the developing country coalition between the interests of the fastest growing economies of Brazil, China, India, and South Africa and those of the least developed countries hinder development of an effective, politically acceptable, and economically viable financial mechanism? Will ongoing global financial difficulties retard regime implementation and expansion? Will the USA ratify the Convention and, if not, how will this impact its effectiveness over time? Will the synergies process reduce operational costs and augment effectiveness or produce opportunity costs and new bureaucratic inefficiencies? Will policy disputes in other issue areas, such as climate, help or hurt regime developments related to chemicals? These are critical questions for the Convention's future, and perhaps for global environmental politics.

Conclusion

Although the ozone (Chapter 29), CLRTAP (Chapter 30), and CITES (Chapter 37) regimes continue to perform effectively, many other aspects of global environmental politics appear dysfunctional. The continuing failures of the climate negotiations despite increasing scientific evidence of accelerating change, the inherent weaknesses within many of the biodiversity agreements, and the absence of meaningful global agreements on forests or ocean fish stocks, are clear examples of how despite knowing what needs to be done, and having successful models of how to do it, the global community fails to address critical environmental challenges successfully. Continuing the implementation and expansion of the Stockholm Convention and developing effective synergies within the chemicals and waste conventions represent opportunities for near-term success on issues of global importance. Such success could enhance, if only by providing positive examples, the prospects for better policy on other issues.

The Stockholm Convention is the only global treaty designed to eliminate substances directly toxic to human health and the environment. The challenges facing the Convention magnify this importance because of their relation to, and potential impact on, other aspects of global environmental politics. How events unfold over the next decade could have a significant impact on

how the world regulates toxic chemicals, and perhaps on the study and practice of global environmental politics.

References

Allan, J., Kohler, P., and Templeton, J. (2011) "Summary of the Seventh Meeting of the Persistent Organic Pollutants Review Committee of the Stockholm Convention: 10–14 October 2011," *Earth Negotiations Bulletin*, 15: 189. Available HTTP: <http://www.iisd.ca/download/pdf/enb15189e.pdf> (Accessed 10 June 2012).

AMAP (Arctic Monitoring and Assessment Programme) (1998) *AMAP Assessment Report: Arctic Pollution Issues*, Oslo: AMAP.

Ashton, M. et al. (2011) "Summary of the Fifth Meeting of the Conference of Parties to the Stockholm Convention on Persistent Organic Pollutants: 25–29 April 2011," *Earth Negotiations Bulletin*, 15: 182. Available HTTP: <www.iisd.ca/chemical/pops/cop5/> (Accessed 6 June 2012).

Chasek, P., Downie, D., and Brown, J.W. (2010) *Global Environmental Politics*, 5th edn, Boulder, CO: Westview Press.

Dewailly, E. and Furgal, C. (2003) "POPs, the Environment, and Public Health," in D.L. Downie and T. Fenge (eds) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queen's University Press.

Downie, D. (1995). "UNEP and the Montreal Protocol: New Roles for International Organizations in Regime Creation and Change," in R. Bartlett, P. Kurian, and M. Malik (eds) *International Organizations and Environmental Policy*, Westport, CT: Greenwood Press.

—— (1996). "Understanding International Environmental Regimes: The Origin, Creation and Expansion of the Ozone Regime." Unpublished PhD Dissertation. University of North Carolina at Chapel Hill.

—— (2003) "Global POPs Policy: The 2001 Stockholm Convention on Persistent Organic Pollutants," in D. Downie and T. Fenge (eds) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queens University Press.

Downie, D. and Fenge, T. (eds) (2003) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queens University Press.

Downie, D., Krueger, J., and Selin, H. (2005) "Global Policy for Toxic Chemicals," in R. Axelrod, D. Downie, and N. Vig (eds) *The Global Environment: Institutions, Law and Policy*, 2nd edn, Washington, DC: CQ Press.

Eckley, N. and Selin, H. (2003) "Science, Politics, and Persistent Organic Pollutants: Scientific Assessments and their Role in International Environmental Negotiations," *International Environmental Agreements: Politics, Law and Economics*, 3(1): 17–42.

Fenge, T. (2003) "POPs and Inuit: Influencing the Global Agenda," in D. Downie and T. Fenge (eds) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queen's University Press.

Haas, P. (1990). "Obtaining International Environmental Protection through Epistemic Consensus," *Millennium*, 19: 347–64.

Haas, P., Keohane, R., and Levy, M. (1993) *Institutions for the Earth: Sources of Effective International Environmental Protection*, Cambridge, MA: MIT Press.

Hillman, K. (1999) "International Control of Persistent Organic Pollutants: The UN Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution, and Beyond," *RECIEL*, 8(2): 105–12.

IPEN (2010) "An NGO View on Synergies and the ExCOPs." Prepared by Dr. Mariann Lloyd-Smith. Available HTTP: <http://ntn.org.au/wp/wp-content/uploads/2010/04/synergy_excops.pdf> (Accessed 14 June 2012).

Kohler, P. and Ashton, M. (2010) "Paying for POPs: Negotiating the Implementation of the Stockholm Convention in Developing Countries," *International Negotiation*, 15: 459–84.

Kohler, P., Roemer-Mahler, A., and Templeton, J. (2008) "Summary of the Fourth Meeting of the Persistent Organic Pollutants Review Committee of the Stockholm Convention: 13–17 October 2008," *Earth Negotiations Bulletin*, 15: 161. Available HTTP: <www.iisd.ca/chemical/pops/poprc4/> (Accessed 6 June 2012).

Lönngren, R. (1992) *International Approaches to Chemicals Control: A Historical Overview*, Stockholm: National Chemicals Inspectorate/KemI.

Mitchell, R. (1994) "Regime Design Matters: International Oil Pollution and Treaty Compliance," *International Organization*, 48(3): 425–58.

Selin, H. (2003) "Regional POPs Policy: The UNECE/CLRTAP POPs Agreement," in D. Downie and T. Fenge (eds) *Northern Lights against POPs: Combating Toxic Threats in the Arctic*, Montreal: McGill-Queens University Press.

—— (2010) *Global Governance of Hazardous Chemicals: Challenges of Multilevel Management*, Cambridge, MA: MIT Press.

Templeton, J. (2009) "Briefing Note on the 5th Meeting of POPRC," International Institute for Sustainable Development (IISD). Available HTTP: <http://www.iisd.ca/chemical/pops/poprc5/> (Accessed 6 June 2012).

—— (2011) "Framing Elite Policy Discourse: Scientists and the Stockholm Convention on Persistent Organic Pollutants." Unpublished PhD Dissertation, London School of Economics and Political Science. Available HTTP: <http://etheses.lse.ac.uk/361/1/Templeton_Framing%20elite%20policy%20discourse.pdf>.

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Hazardous wastes

Henrik Selin

Ground-breaking scientific discoveries and revolutionary technological advances over the past two hundred years have provided humans with the ability to impact the natural environment as never before. Since the beginning of industrialization in Europe and North America in the early 1800s, the world's population has also increased from one billion to seven billion people. Many estimate that soon nine billion people will live on planet Earth. The human population has grown fourfold since the beginning of the twentieth century, but per capita use of resources has increased much more. Humans today consume about 50 percent more natural resources than only 30 years ago (VanDeveer 2010). At the same time, the world is a very unequal place: approximately one billion people live on less than $1 a day, while over five billion people survive on less than $10 a day. Consequently, some people consume many more natural resources than others during their (greatly varying) lifetimes.

Globally uneven – but steadily growing – consumption has not only resulted in a tremendous increase in the use of natural resources (both renewable and non-renewable), but also led to a sharp growth in waste levels and subsequent problems dealing with different kinds of wastes. Consumption and waste generation will continue to further increase with the global population (see Chapter 16). A basic commodity chain consists of the series of connections or processes through which the provision of raw material leads to a final product and purchase. During different stages of the commodity chain as well as at the end of a product's use, waste is generated. Generally, a waste is an unwanted by-product of industrial and household activity. However, it is difficult to come up with a simple definition of what constitutes a waste. Any definition is shaped by a combination of political, economic, social, and cultural factors: what is in one era or society regarded as a waste can be seen as a resource somewhere else (O'Neill 2000).

Contemporary societies produce many different categories of wastes, but both levels and kinds vary greatly across countries. Of course, some forms of wastes pose much greater environmental and human health problems than others, and some waste types are also more difficult to safely manage than others. For example, a banana peel poses less of a management problem than spent nuclear fuel. Thus, while overall growing waste levels are problematic from a sustainable development perspective, hazardous wastes pose particular management problems. Like waste in general, there is no clear, universal definition of a hazardous waste. However, much domestic legislation defines hazardous waste as wastes that in varying ways are dangerous or potentially

harmful to human health or the environment. Hazardous wastes can come in the forms of liquids, solids, or gases. Examples of specific waste categories often classified as hazardous range from used oils and small electronic goods to old ships.

This chapter provides an overview of global politics and management of hazardous wastes, which is an important part of global environmental governance. It starts with a basic introduction to the waste issue including its international dimensions. This is continued by a discussion of the historical development of major legal and political efforts to prevent ocean pollution and dumping, including the creation of the 1973 International Convention for the Prevention of Pollution from Ships and the 1972 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter. This is followed by an examination of policy efforts to regulate the international trade in hazardous wastes, focusing on the establishment and implementation of the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The final section highlights continuing policy issues and efforts to further improve waste management.

The problem of hazardous wastes

Countries all over the world struggle to design environmentally safe systems for managing growing waste levels. High production and consumption societies produce more waste per capita (including many different kinds of hazardous wastes) than less technologically advanced and poorer countries. There are, however, no comprehensive data on global waste levels. This is due to several practical and methodological factors. Importantly, most countries simply lack reliable information on annual domestic waste generation. Countries also apply somewhat varying definitions of wastes and often classify specific wastes into different categories (including having separate definitions of what constitutes a hazardous waste under national legislation). For all of these reasons, it is very difficult to make national comparisons and compile estimates of the full scope of the global waste problem (Basel Convention 2010; Kummer 1995).

Even if information on global waste is largely missing, relatively comprehensive – but still imperfect – official data from the European Union (EU) give an indication of the situation in many industrialized countries (Eurostat 2011). In 2008, the then 27 EU member states generated a total of 2.62 billion tonnes of waste; 98 million tonnes of this (or 3.7 percent) were classified as hazardous by EU law. The four sectors that produced the most wastes were construction (32.9 percent), mining (27.8 percent), manufacturing industry (13.1 percent), and households (8.5 percent). If the amount of waste generated in 2008 is divided by the 500 million people living in the EU, this means that 5.2 tonnes of waste per capita (of which 196 kilograms were hazardous) were generated annually. In the EU and elsewhere, decoupling economic growth and consumption from increases in waste generation remains a critical and largely unresolved sustainable development issue.

Early domestic public policies and management systems, in some cases dating back to the 1800s, focused primarily on creating basic infrastructures for waste collection and disposal. Typically, these were developed at the local level, as most waste management and sanitation issues fall under the responsibility of municipal authorities. However, for some kinds of hazardous wastes, countries have also established national and international standards and rules for their handling. Many early local approaches to waste management involved open burning or dumping trash into landfills. However, both unregulated incineration and use of landfills (still common practices in many developing countries) create major environmental and human health problems. As a result, societies are seeking to develop new management approaches designed to both reduce waste levels and better manage the different kinds of wastes that are still generated.

From the perspective of changing approaches to handling waste problems, the three basic guiding principles of EU waste policy are illustrative of much contemporary thinking around how to improve waste management.

First, *promote waste prevention*: If the overall amount of waste is reduced and the hazardousness of the remaining wastes also reduced by limiting the presence of dangerous substances in products, then waste disposal becomes easier. Related efforts involve greening manufacturing methods and encouraging consumers to demand greener products and less packaging.

Second, *encourage recycling and reuse*: During production and after final use of a product, as much material as possible should be recovered, ideally through recycling or composting.

Third, *improve final disposal and monitoring*: Waste that cannot be recycled or reused should be safely incinerated or placed into landfills as a last resort.

Effective waste management is an issue of both technical capacity and geographical location. It requires education and protective equipment for workers who handle wastes, secure means for storing and transport, and sophisticated technology for recycling and clean destruction. Furthermore, the classic Not-In-My-Back-Yard (NIMBY) syndrome where local communities oppose the location of waste management facilities has led to problems in countries all over the world in building new facilities for dealing with wastes. Increasingly, the EU and national governments in other countries have shifted responsibilities from the public sector to the private sector as they introduce principles of expanded producer responsibility for greener design and waste management. This includes voluntary and mandatory schemes under which consumers return discarded products (including many electrical and electronic goods) to the producers who are responsible for their recycling, reprocessing, and safe disposal.

Even if many waste issues and responsibilities remain local, waste management has also become an important international political and economic issue for several reasons. First, as domestic waste levels increased during the 1900s and shipping expanded, both land-based and sea-based pollution and dumping in the open sea increased (including dumping of nuclear and other kinds of hazardous wastes). This created a global commons problem demanding collective action, resulting in countries negotiating several multilateral agreements restricting and banning such activities. Second, while most wastes are treated nationally, there is also extensive international trade in many different kinds of wastes. Some of this trade is legal, while other shipments violate both national and international law (see Chapter 10). As a result, countries have adopted standards and agreements to regulate permitted transboundary transports and to combat illegal trade.

Third, many developing countries in particular struggle to find necessary financial, technological, and human resources for safe waste handling and disposal. Even if there is also frequent mishandling of wastes in industrialized countries, much international collaboration has focused on assisting developing countries through technology transfer and capacity building both to prevent imports of unwanted wastes and to improve domestic management systems. Fourth, as countries are taking regulatory steps to ban a growing number of substances in products and expand producer responsibilities for managing discarded goods, the waste issue has become an important standards and market issue. Product and waste-related policies enacted by the EU and other jurisdictions increasingly affect production and consumption in other places through mechanisms of policy diffusion, trade, and economic globalization (see Chapter 22).

Addressing ocean pollution and dumping

One of the first waste issues to attract international attention involved pollution and dumping at sea (see Chapter 35). These concerns date back to the first half of the twentieth century. Some ocean pollution came from land-based sources as industrial facilities disposed of their by-products by discarding them directly into coastal waters. As international shipping increased, there were also growing problems with ships discarding their wastes (used oils, etc.) at sea. Furthermore, as countries were faced with growing domestic waste volumes, they were looking for new and relatively cheap ways to get rid of them, including sinking them at sea. When these were national activities and affected only territorial waters, they fell under national jurisdictions. However, many pollution and dumping issues involved foreign ships, crossed territorial waters, or impacted the open seas, which were designated part of the "common heritage of mankind" by the United Nations General Assembly (see Chapter 35). As a result, much early international cooperation and policy-making on hazardous wastes was taken in response to concerns over land-based and marine pollution as well as dumping of hazardous materials.

In 1926, the United States convened the first international conference to address the growing problem of waste oil discharges from ships. While the United States favored a ban, other major shipping nations did not support this. Instead, countries agreed to limitations within 50-mile coastal zones, with no restrictions beyond these zones. However, this standard was never formalized in a treaty. In 1948, countries established the International Maritime Organization (originally named the Inter-Governmental Maritime Consultative Organization) under which many subsequent agreements have been established. Meanwhile, maritime pollution increased: in the early 1950s, ships intentionally discharged 300,000 tonnes of oil every year into the ocean (Mitchell 1994a). In 1954, the British government hosted another conference, resulting in the adoption of the International Convention for the Prevention of Pollution of the Sea by Oil. This convention also applied the 50-mile coastal zone approach to set quantitative limits for oil discharges (Mitchell 1994a; Caldwell 1996; Carlin 2002). The two United Nations Conferences on the Law of the Sea in 1958 and 1960 further addressed maritime issues, issuing pollution prevention recommendations but setting no legal controls.

The International Convention for the Prevention of Pollution of the Sea by Oil was amended in 1962, 1969, and 1971. These amendments introduced new technical standards, but did little to improve the convention's effectiveness, as environmental conditions in many areas worsened considerably. By the 1970s, annual intentional oil discharges at sea were estimated to have reached one million tonnes (Mitchell 1994b). The 1973 International Convention for the Prevention of Pollution from Ships (MARPOL) introduced a more comprehensive set of regulations on discharges and technical equipment standards on ships. MARPOL sets the objective of eliminating intentional pollution of the marine environment and minimizing of accidental discharges. Amended in 1978 and 1997, the convention not only covers oil discharges, but also sets limits on releases of other hazardous substances, including greenhouse gases, ozone-depleting substances, sulfur dioxide, nitrous oxide, and particulate matter. MARPOL remains the main agreement covering marine pollution and dumping, and its standards have been strengthened over time. As of 2012, 151 countries constituting 99 percent of the gross tonnage of the world's merchant fleet had ratified MARPOL (International Maritime Organization 2012).

In addition to global cooperation and standard-setting under MARPOL, countries in different regions of the world have adopted multilateral agreements on oceans, regional seas, lakes, and rivers that regulate pollution and control the dumping of hazardous substances and wastes (Selin 2010). Several of these policy developments have taken place under the Regional Seas Programme, which is overseen by the United Nations Environment Programme. Currently, more than 143 countries

cooperate under 13 different action plans created under the auspices of the Regional Seas Programme. Other major regional agreements developed outside the UNEP-led efforts include the 1972 Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention), the 1974 Convention for the Prevention of Marine Pollution from Land-based Sources (Paris Convention), the 1974 Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention), the 1976 Convention on the Protection of the Rhine against Chemical Pollution, and the 1978 Great Lakes Water Quality Agreement.

A somewhat separate issue is the management of radioactive wastes. Beginning in 1946, major nuclear countries including the United Kingdom, the United States, the Netherlands, Switzerland, and Japan regularly dumped low-level radioactive waste at sea to avoid on-land disposal. Low-level radioactive wastes are discarded products containing small amounts of relatively short-lived radioactivity. They are generated in research institutions, hospitals, and industry and include items such as clothing, tools, filters, etc. Other forms of more radioactive wastes (including spent nuclear fuel) have not been systematically dumped into oceans. Much of the low-level radioactive waste was mixed with concrete in containers and sunk to the bottom of the ocean, where the concrete dissolved and the radioactive material dispersed. While the total amount of dumped radioactive material was only a small fraction of what was added as a result of atmospheric testing of nuclear weapons (1954 to 1962), and also small compared with the levels of radioactivity existing naturally in oceans, this practice drew early criticism from environmental advocacy groups such as Greenpeace as well as many island states (Bewers and Garrett 1987; Ringius 2001; on environmental groups, see Chapter 14).

In 1972, countries adopted the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (London Convention), controlling the disposal of radioactive wastes at sea (Ringius 2001). This agreement banned dumping of high-level radioactive wastes, but allowed continued disposal of low-level radioactive wastes. After the adoption of the London Convention, countries such as Japan, France, the United Kingdom, and the United States supported continued dumping. Due to growing public and political opposition (see Chapter 26), a voluntary moratorium in 1983 halted dumping of low-level radioactive wastes. This moratorium was formalized in a 1993 ban on all marine disposal of radioactive waste under the London Convention. A 1996 Protocol further developed the convention. While the original agreement listed materials that could not be dumped, leaving all non-listed items unregulated, the protocol prohibits all dumping except for acceptable wastes specified in an annex. As of 2012, 87 countries accounting for 66 percent of the gross tonnage of the world's merchant fleet had ratified the 1972 convention; 44 countries representing 34 percent of the gross tonnage of the world's merchant fleet were parties to the 1996 protocol (International Maritime Organization 2012).

Currently, many countries manage their low-level radioactive waste in specific disposal facilities. However, countries with nuclear power plants and weapons continue to struggle to find long-term solutions to manage high-level radioactive wastes. Each year, nuclear power plants globally produce approximately 200,000 cubic meters of low- and intermediate-level radioactive wastes and 10,000 cubic meters of high-level radioactive wastes (International Atomic Energy Agency 2012). There are three main options for dealing with highly radioactive material: (i) direct and final disposal; (ii) storage and postponed decision about final disposal; and (iii) reprocessing and recycling (International Atomic Energy Agency 2008). Many countries initially favored reprocessing, but in the past few decades some have turned primarily to the other options involving some kind of storage. This is due to a combination of factors, including national political controversy and high economic costs of building reprocessing plants, as well as security concerns about nuclear proliferation resulting from the trade in radioactive materials (on environmental security, see Chapter 20).

Shortly after the beginning of the nuclear era, countries discussed a wide range of options for disposing of high-level radioactive wastes, including storing them in polar ice sheets, burying them deep into the seabed, or launching them into space. Today, most scientists and policy-makers believe that the only viable option is land-based geological disposal. While some countries such as Finland and Sweden have taken steps to identify and develop permanent storage sites, many other nuclear countries, including France, the United Kingdom, and the United States, have failed to reach national agreements and/or elected to postpone such a decision for decades. Despite significant security and environmental concerns about the international transfer of high-level radioactive wastes, several countries have engaged in such trade based on bilateral agreements. This includes Japan, France, Russia, and the United Kingdom. Such trade can be highly profitable; Russian authorities estimate that accepting spent fuel from other countries over a ten-year period could generate payments of as much as $20 billion (Radio Free Europe 2010).

Regulating the waste trade

Spent nuclear fuel is not the only kind of hazardous waste subject to trade. In fact, most such trade involves other types than radioactive materials. The first officially recognized shipment of hazardous wastes took place in the 1970s, but undocumented shipments across national borders most likely happened much earlier (O'Neill 2000). An increase in the trade in hazardous wastes stemmed from a combination of factors including growing generation of hazardous wastes, increasing waste management costs, local NIMBY opposition to building new management and disposal facilities, and the realization by private firms that there was much money to be made in trade (Krueger 1999; Clapp 2001). The large majority of hazardous wastes are treated domestically, but there has been a continuing increase in transboundary movements over the past few decades. Most of the traded waste is intended for reuse, recovery, or recycling. At present, it is primarily relatively wealthy countries such as the members of the Organization for Economic Cooperation and Development (OECD) that allow significant amounts of hazardous wastes to be imported for final disposal (Basel Convention 2010).

The rapidly increasing generation of hazardous wastes in industrialized countries and the growing waste trade among these countries prompted the OECD Council in 1976 to issue a Recommendation on the development of comprehensive domestic waste management policies in all member countries (Kummer 1995; Brikell 2000). Continued OECD work in the early 1980s led to the development of voluntary guidelines for managing transnational movements of hazardous wastes within the OECD area. Importantly, these guidelines included the principle of prior informed consent (PIC). The PIC mechanism furthermore was applicable also to transactions with non-OECD countries. Under this PIC principle, the importing country must explicitly consent to importing a waste shipment before it can leave the exporting country. In the mid-1980s, the OECD began drafting a legally binding agreement on the control of transnational movements of hazardous wastes between OECD states. This work was suspended in early 1989 as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was concluded that same year, but the OECD efforts and the PIC procedure fed into the drafting of the convention text (Selin 2010).

Although most hazardous wastes trade occurred between industrialized countries located within the same geographical region (e.g., Europe or North America), it was the largely unregulated movements from industrialized to developing countries that prompted the development of global standards and regulations (Clapp 2001). Much of this trade involved efforts to avoid costly disposal in industrialized countries. In many cases, wastes were dumped in developing

countries without their governments' knowledge and against their will. One study from the late 1980s estimated the average disposal cost for hazardous waste in industrialized countries was between $100 and $2,000 per tonne, while the corresponding costs in many African countries were between $2.50 and $50 (Kummer 1995). Several cases of hazardous wastes that originated in North America and Europe and that were dumped in countries throughout Asia and Africa in the mid- to late 1980s attracted much political and public attention. This kind of unwanted dumping also caused developing countries to call for stringent trade controls.

During the same time period as the OECD was expanding its activities, UNEP coordinated work on hazardous waste cooperation between industrialized and developing countries (Kummer 1995; Krueger 1999; Brikell 2000). The UNEP Governing Council in 1982 created a working group to develop new technical guidelines and policy recommendations on the improved management of hazardous wastes for the purpose of better human health and environmental protection. These efforts resulted in the approval by the UNEP Governing Council in 1987 of the first global standards on the transnational transport of hazardous wastes, the Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes. Among other things, the Cairo Guidelines – which like the guidelines developed around the same time by the OECD were merely voluntary – introduced a PIC scheme for all transnational transport of hazardous wastes. This global PIC scheme operated in a way similar to the OECD regulations on trade in hazardous wastes as well as a separate mechanism for trade in commercial chemicals that was also developed in the 1980s (Selin 2010).

A small but growing group of countries and environmental advocacy groups, however, did not think that the Cairo Guidelines were stringent enough, and pushed for the creation of legally binding regulations to protect developing countries. The Organization of African Unity and Greenpeace in particular advocated a complete trade ban as a way to protect developing countries, a proposal that gained some support from the Scandinavian countries. In contrast, most industrialized countries and participating industry organizations would only accept a PIC procedure similar to the one developed under the OECD and included in the Cairo Guidelines. The world's largest exporters of hazardous wastes at the time were West Germany, Belgium, the Netherlands, Switzerland, and the United States (Kempel 1993). Led by the United States, this coalition argued that continued waste trade was both economically and environmentally desirable, as shipping wastes to other countries at times allowed for their environmentally sound disposal at a lower cost. Due to the strong political opposition from several major industrialized countries, those seeking a trade ban had to settle for making the voluntary PIC procedure mandatory.

The Basel Convention emerged from the compromise between those countries seeking and opposing a trade ban. The Basel Convention is the main global environmental agreement governing the trade and management of hazardous wastes. Main categories of hazardous wastes covered by the agreement include industrial wastes, agrochemical wastes, medical wastes, and household wastes (nuclear waste is generally excluded). By 2012, 177 countries and the EU were parties to the Basel Convention. The United States is the only major industrialized country that has not ratified this treaty. The Basel Convention focuses on the following three objectives: (i) the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes; (ii) the restriction of transboundary movements of hazardous wastes except where they are in accordance with the principles of environmentally sound management; and (iii) the establishment of a system for regulating permissible transboundary movements of hazardous wastes.

The Basel Convention relies on domestic legislation to define "waste," which typically includes substances or objects intended or required to be disposed of by law. That is, exactly

what is and is not a waste is not determined by the convention. However, the difference between exporting hazardous wastes and used goods is not clear-cut, which can create important enforcement problems. In general, the Basel Convention designates wastes as hazardous if they come from certain waste streams (e.g., wood preserving chemicals and organic solvents), belong to certain categories (e.g., mercury compounds and copper compounds), or exhibit certain characteristics (e.g., are poisonous, toxic, or corrosive). A party cannot export hazardous wastes to another party without first receiving the explicit consent of the importing state to proceed with the transfer. Waste exports to non-parties are prohibited unless they are subject to an agreement between the exporter and importer that is at least as stringent as the requirements under the Basel Convention. Exports of hazardous wastes are furthermore prohibited to Antarctica and to parties that have taken domestic measures to ban such imports.

In part reacting to the lack of a Basel Convention trade ban, developing countries negotiated several regional agreements (Selin 2010). African countries concluded the 1991 Convention on the Ban of the Import into Africa and the Control of Transboundary Movements and Management of Hazardous Wastes within Africa (Bamako Convention), which seeks to prevent dumping of hazardous wastes in Africa by banning their import from any non-African country. Similar measures were also initiated outside Africa. The 1991 Lomé IV Convention bans the trade in hazardous wastes between members of the EU and former colonies in Asia, the Caribbean, and the Pacific. The 1995 Waigani Convention bans the import of hazardous and radioactive wastes to the island countries in the South Pacific region. In addition, the 1996 Protocol on the Transboundary Transport of Hazardous Wastes under the Barcelona Convention requires countries around the Mediterranean Sea to prevent and eliminate pollution caused by cross-border movements and disposal of hazardous wastes. Other regional pollution-focused agreements covering shared seas, lakes, and rivers also contain provisions on the shipping and management of hazardous wastes.

When the Basel Convention was adopted, the trade compromise satisfied few countries: only 33 countries signed the agreement at the diplomatic conference in 1989. All African countries present at the meeting refused to sign. The Basel Convention entered into force three years after its creation, in 1992, with only 20 required ratifications. The strong criticism from the pro-ban coalition heavily influenced subsequent policy-making during the first few conferences of the parties (COPs). At the first COP, in 1992, most African countries and the Nordic countries, together with Greenpeace and other environmental advocacy groups, reiterated many of their earlier demands from the convention negotiations in support of (at least) a North–South trade ban (Kummer 1995; Brikell 2000; see Chapter 21). Although, this coalition was still unable to persuade other countries to accept a trade ban, it successfully pushed for the adoption of Decision I/22. This decision, which was a small victory for those countries and advocacy groups that sought expanded trade controls, requested that industrialized countries refrain from exporting hazardous wastes to developing countries for disposal.

At COP-2 in 1994, those supporting expanded controls continued to argue for a mandatory export ban to developing countries. In another small victory, the Group of 77 and the Nordic states spearheaded a proposal that resulted in a decision to ban the export of all hazardous wastes from OECD countries to non-OECD countries for final disposal immediately, and to ban by the end of 1997 the export of hazardous wastes intended for recycling (Decision II/12). Responding to growing criticism that Decision II/12 was not stringent enough, parties at COP-3 adopted the Basel Convention Ban Amendment despite strong opposition from, among others, the United States, South Korea, Australia, Canada, and major industry organizations. The Ban Amendment, which was formally added to the Basel Convention, prohibits the export of hazardous wastes for final disposal and recycling from countries that are members of the

OECD and the EU as well as Liechtenstein (listed in Annex VII) to all other parties (i.e., developing countries). The Annex VII countries remain free to continue trading amongst themselves.

In support of the Ban Amendment, the Basel Action Network involving several leading advocacy groups launched a "Hall of Shame" campaign to draw attention to countries and organizations that the network believed were actively working to undermine the entry into force of the amendment. In addition to the United States, noted members of the Hall of Shame included parties like Australia, Canada, and New Zealand, and industry organizations such as the International Chamber of Commerce and the International Council on Metals and Mining. In contrast, the EU adopted regional and national regulations implementing the ban on export to developing countries in the 1990s. There were also legal and political uncertainties concerning the requirement for entry into force (Selin 2010). Article 17(5) states that any amendment shall enter into force when "at least three-fourths" of the parties have ratified. Parties, however, were fiercely divided over how this requirement should be interpreted and exactly how many ratifications (and by whom) were needed for entry into force.

By COP-9 in 2008, 63 parties had ratified the Ban Amendment. One group of countries argued that the three-fourths threshold should be calculated based on the latest number of parties (three-fourths of 170 parties by COP-9, but where the total number of parties could continue to increase). In contrast, a second group of countries believed that the three-fourths threshold should be calculated based on the number of parties when the Ban Amendment was adopted (82 parties by COP-3). Based on this, one sub-camp of parties believed that the criteria for entry into force had already been met as 63 out of 82 is more than three-fourths (62 needed). However, many states that have ratified the Ban Amendment were not among the 82 parties by COP-3, but joined the Basel Convention after 1995. As such, a second sub-camp argued that it has to be three-fourths of the 82 parties by COP-3 that have to ratify the Ban Amendment. Among those that were parties by COP-3, only 44 had ratified by COP-9. At COP-10 in 2011, the parties finally reached an agreement that Article 17(5) should be interpreted to mean three-quarters of those 82 who were parties when the Ban Amendment was adopted (Earth Negotiations Bulletin 2011).

In addition to focusing on expanded trade controls, parties have also addressed several other important issues including those related to liability (Selin 2010). Many developing countries have long complained that continued dumping of hazardous wastes was made worse by the unwillingness of industrialized countries and firms to repatriate illegally dumped wastes and pay for necessary clean-up and handling. In response, parties at COP-5 in 1999 adopted the Basel Protocol on Liability and Compensation. This protocol identifies who is financially responsible in the event of an incident during the transport of hazardous wastes. Each phase of often long and complicated transport chains – from the point at which the wastes are originally loaded on their first means of transport through their export, international transit, import, and up until their final disposal – is covered. The protocol, however, has not yet entered into force, even though it only requires 20 ratifications: there were only 10 parties by mid-2012. This indicates that many countries are reluctant to accept formal liability for environmental and human health damages resulting from the international trade in hazardous wastes.

Related to the effort to expand regulations and liability, the parties in 2002 established a compliance mechanism. However, because many countries continue to resist interference in domestic (waste management) decisions and practices, the compliance mechanism is primarily intended only to create a more permanent structure for gathering data and monitoring the generation and transnational transport of hazardous wastes. The overall effectiveness of the compliance mechanism remains largely unproven (Selin 2010). Over the years, the parties have also worked to clarify which kinds of wastes are and are not covered under the Basel Convention

and developed technical guidelines on environmentally sound management. Furthermore the parties at COP-4 in 1997 identified priority waste streams via two new annexes, specifying the scope and priories of the Basel Convention. Annex VIII lists specific wastes characterized as hazardous under the Basel Convention. Annex IX lists wastes not covered by the agreement. A third list, which is not kept in an annex but managed by the Basel Secretariat, contains wastes awaiting classification and possible listing under either Annex VIII or Annex IX.

In addition, the parties have established regional centers to work on capacity building and technology transfer issues. These operate alongside other treaty-specific bodies, including the secretariat and the COPs. By 2012, there were 14 regional centers located all over the world: Buenos Aires, Argentina; Beijing, China; Cairo, Egypt; San Salvador, El Salvador; Jakarta, Indonesia; Tehran, Iran; Ibadan, Nigeria; Dakar, Senegal; Bratislava, Slovakia; Moscow, Russia; Apia, Samoa; Pretoria, South Africa; Port of Spain, Trinidad & Tobago; and Montevideo, Uruguay. The regional centers carry out activities in three broad areas: raising awareness, strengthening administrative ability, and diffusing scientific and technical assistance and information (Selin 2012a). However, many developing countries argue that the regional centers are chronically short of financial and human resources. Thus, discussions about the regional centers are intimately tied to larger funding debates, during which industrialized countries have rejected calls from developing countries for mandatory contributions. As a result, financial contributions remain largely voluntary.

Conclusion

The global and regional multilateral agreements on hazardous wastes establish an important international legal framework for political, technical, and scientific cooperation. The fact that countries face continuing domestic problems with hazardous waste management raises important questions about how societies can more effectively deal with production and consumption issues as part of a broader transition to sustainable development. There is a need to both expand current management efforts and better enforce existing regulations targeting waste-related pollution, dumping, and trade. There is no current evidence of significant and systematic exports of hazardous wastes from industrialized to developing countries (Basel Convention 2010). Yet, illegal trade continues to be a problem in many regions of the world. Similarly, illegal marine pollution and dumping remain difficult problems. This highlights the importance of compliance, capacity building, technology transfer, and funding issues. These are also perennial and controversial topics under the main conventions focusing on waste management.

While countries tighten many international waste-related rules and seek to better detect and prevent illegal shipments and dumping, the trade in electronic goods and other products for reuse and/or recycling attracts growing attention. Many people in developing countries involved in the recovery business are exposed to a large number of hazardous substances and other risks. Thus, trade in both wastes and used products involve important environmental justice aspects (Pellow 2007; see Chapters 23 and 24). In addition, nuclear countries face critical choices. In the United States alone, over 75,000 tons of spent nuclear fuel is stored in 122 temporary sites located in 39 states. The 104 domestic commercial reactors generate an additional 2,000 tons of spent nuclear fuel each year. In 2010, the Obama administration rejected plans to create a permanent repository in Yucca Mountain. It remains unclear in the United States (and most other nuclear countries) how to deal with long-term storage (Clayton 2011). Further, any increased trade in high-level radioactive material for reprocessing and/or storage gives rise to concerns about nuclear proliferation.

Increasingly, efforts to improve waste management involve important changes in producer responsibility and product standards. On several of these issues, the EU has taken on a regional and global leadership role (Selin and VanDeveer 2006; Selin 2012b). The EU first passed directives covering waste electrical and electronic equipment (WEEE) and the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) in 2002. These have since been updated and expanded. In 2007, the EU also passed the regulation on the registration, evaluation, and authorization and restriction of chemicals (REACH). The WEEE directive makes producers responsible for safe handling and disposal of discarded electronic goods. The RoHS directive limits the use of hazardous substances commonly found in electronic goods, currently four heavy metals and two chemicals. The REACH regulation aims to improve environmental and health protection through better risk assessment and earlier identification of hazardous chemicals based on their intrinsic properties, and taking quicker and more comprehensive regulatory action.

Implications of WEEE, RoHS, and REACH are felt not just in Europe, but all around the world. Firms operating in multiple markets prefer to produce their products to as few different regulatory standards as possible. To have access to as many markets as possible, they often identify and follow the highest standard, which in many cases is set in the EU. Thus both EU and non-EU firms that want to sell their products on the common European market – and many do because of its economic size – have to comply with EU standards. The EU is also actively diffusing regulatory developments outside Europe and uploading standards to international forums. Some countries, including China, Japan, and South Korea, have made recent changes to national laws building on the new EU standards (Selin 2012b). Thus, international market connections and forces of economic globalization can be important factors influencing national production and consumption decisions, alongside policy-making under multilateral agreements (see Chapter 22). In all these ways, global politics and management of hazardous waste will continue to develop.

References

Basel Convention. 2010. *Waste without Frontiers: Global Trends in Generation and Transboundary Movements of Hazardous Wastes and Other Wastes*. Geneva: Secretariat of the Basel Convention.

Bewers, J.M. and C.J.R. Garrett. 1987. Analysis of Issues Related to Sea Dumping of Radioactive Wastes. *Marine Policy* 11(2): 105–24.

Brikell, Berndt H. 2000. Negotiating the International Waste Trade: A Discourse Analysis. PhD Dissertation, Örebro University, Sweden.

Caldwell, Lynton Keith. 1996. *International Environmental Policy: From the Twentieth to the Twenty-First Century*. 3rd edn. Durham, NC: Duke University Press.

Carlin, Elaine. M. 2002. Oil Pollution from Ships at Sea: The Ability of Nations to Protect a Blue Planet. In Edward L. Miles, Aril Underdal, Steinar Andresen, Jørgen Wettestad, Jon Birger Skærseth, and Elaine M. Carlin (eds) *Environmental Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press.

Clapp, Jennifer. 2001. *Toxic Exports: The Transfer of Hazardous Wastes from Rich to Poor Countries*. Ithaca, NY: Cornell University Press.

Clayton, Mark. 2011. How to Store Nuclear Waste? Panel Slams US and Urges New Approach. *Christian Science Monitor*, July 29. Available HTTP: <http://www.csmonitor.com/USA/2011/0729/How-to-store-nuclear-waste-Panel-slams-US-and-urges-new-approach>.

Earth Negotiations Bulletin. 2011. *Summary of the Tenth Meeting of the Conference of the Parties to the Basel Convention: 17–21 October 2011*. New York: International Institute for Sustainable Development.

Eurostat. 2011. *Waste Statistics*. Available HTTP: <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Waste_statistics>.

International Atomic Energy Agency. 2008. *Spent Fuel Reprocessing Options*. Vienna: International Atomic Energy Agency.

International Atomic Energy Agency. 2012. *Managing Radioactive Waste*. Online Fact Sheet. Available HTTP: <http://www.iaea.org/Publications/Factsheets/English/manradwa.html>.

International Maritime Organization. 2012. *Status of Multilateral Conventions and Instruments in Respect of Which the International Maritime Organization or Its Secretary-General Performs Depositary of Other Functions as at 30 April 2012*. London: International Maritime Organization. Available HTTP: <http://www.imo.org/About/Conventions/StatusOfConventions/Documents/Status%20-%202012.pdf>.

Kempel, Willy. 1993. Transboundary Movements in Hazardous Wastes. In G. Sjöstedt (ed.) *International Environmental Negotiations*, 48–62. Newbury Park, CA: Sage Publications.

Krueger, Jonathan. 1999. *International Trade and the Basel Convention*. London: Royal Institute for International Affairs.

Kummer, Katharina. 1995. *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules*. Oxford: Clarendon Press.

Mitchell, Ronald B. 1994a. *Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance*. Cambridge, MA: MIT Press.

—— 1994b. Regime Design Matters: Intentional Oil Pollution and Treaty Compliance. *International Organization* 48(3): 425–58.

O'Neill, Kate. 2000. *Waste Trading among Rich Nations: Building a New Theory of Environmental Regulation*. Cambridge, MA: MIT Press.

Pellow, David Naguib. 2007. *Resisting Global Toxics: Transnational Movements for Environmental Justice*. Cambridge, MA: MIT Press.

Radio Free Europe. 2010. *Environmentalists Fear Nuclear Waste Treaty Could Turn Russia into Nuclear Wasteland*. December 4. Available HTTP: <http://oilprice.com/Alternative-Energy/Nuclear-Power/Environmentalists-Fear-Nuclear-Waste-Treaty-Could-Turn-Russia-Into-A-Nuclear-Wasteland.html>.

Ringius, Lasse. 2001. *Radioactive Disposal at Sea: Public Ideas, Transnational Policy Entrepreneurs, and Environmental Regimes*. Cambridge, MA: MIT Press.

Selin, Henrik. 2010. *Global Governance of Hazardous Chemicals: Challenges of Multilevel Management*. Cambridge, MA: MIT Press.

—— 2012a. Global Environmental Governance and Regional Centers. *Global Environmental Politics* 12(3): 18–37.

—— 2012b. Minervian Politics and International Chemicals Policy. In Y. Tiberghien (ed.) *Leadership in Global Institution Building: Minerva's Rule*. New York: Palgrave Macmillan.

Selin, Henrik and Stacy D. VanDeveer. 2006. Raising Global Standards: Hazardous Substances and E-Waste Management in the European Union. *Environment* 48(10): 6–18.

VanDeveer, Stacy D. 2010. Consumption, Commodity Chains, and the Global Environment. In Regina Axelrod, Stacy D. VanDeveer, and David Leonard Downie (eds) *The Global Environment: Institutions, Law, and Policy*, 311–32. Washington, DC: CQ Press.

34

Water, rivers and wetlands

Jens Newig and Edward Challies

Water is vital to the life-supporting capacity of planet Earth. As a natural resource, water is essential to human activity across a number of sectors. Agriculture, energy generation, industrial production, and municipal supply and waste disposal, for example, are highly reliant on water. At an even more fundamental level, numerous ecosystem services essential to human collective well-being depend on clean water and the integrity and continuity of the hydrological cycle (Falkenmark 1997; UNEP 2009). Without the sustainable management and protection of water resources and associated ecosystems there can be no sustainable development or economic growth within ecological limits. However, surface water bodies, aquifer systems, and the hydrological cycle itself are increasingly under pressure as a result of human activity (IPCC 2007: ch. 3; MEA 2005: ch. 7).

A variety of anthropogenic processes and factors, including demographic, social, economic, technological, and climatic change, combine to exert pressure on freshwater resources and the ecosystems that sustain them (MEA 2005; WWAP 2012). These underlying drivers of change both arise from and impinge upon the various sectors in different ways. Growing recognition of the centrality of water to all human activity, and the complexity of interacting drivers of change, which often escape the reach of local or national governing institutions, has led increasingly to calls for integrated management and multilevel governance of water resources (Pahl-Wostl et al. 2008; WWAP 2012).

This chapter examines policy and governance institutions related to the pressing water issues facing the world. It describes major paradigms of water governance before looking at international expert networks, key actors, formal agreements, and the substance of policy and governance.

Paradigms of water governance

Ideas on how to collectively govern water have been crystallizing in what have become known as major paradigms of water governance. Informed by debates on sustainability, democracy, and development, labels such as "Integrated Water Resources Management", "Water Security", and "Adaptive Water Governance" have served to channel the often-conflictual discourses and to form guiding principles of water policy and management (for a detailed account of more specific discourses on water governance see Gupta 2009: 43–9). The respective paradigms simultaneously

imply a particular problem framing, and advocate a particular corresponding set of solutions. As such, they have served as important agenda-setters for political action on diverse levels of governance – and continue to do so. Paradigms thus function as symbolic, "normative–cognitive ideas" and as focal points for joint action (Goldstein and Keohane 1993, cited in Blatter and Ingram 2000: 471). The diffusion of such ideas may even explain the enactment of certain local policies better than functional necessity or strategic considerations of the involved parties (Blatter and Ingram 2000).

Arguably the most influential, global paradigm in water governance has been Integrated Water Resources Management (IWRM), defined by the Global Water Partnership as "the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (GWP-TAC 2000). From the IWRM perspective, it is fragmented and disjointed management of water in "sectors" that is the primary barrier to sustainable water governance. As such, IWRM implies consideration of underlying social and environmental drivers of change in planning across key interconnected water-interdependent sectors, including agriculture, energy, industry, and municipal supply, as well as ecosystems. As a normative concept, IWRM is based on the "Dublin principles" of water and sustainable development. These emerged out of the International Conference on Water and the Environment in Dublin in 1992, which was held in preparation for the UN Conference on Environment and Development in Rio de Janeiro. The Dublin principles acknowledge the importance and vulnerability of fresh water, its economic value, the role of women in water provision and management, and the need to base water development and management on a participatory approach (WMO 1992).

Recognizing the recurrent failure of isolated and technology-oriented "solutions" to imminent issues of water governance, IWRM pursues a more holistic approach to governing fresh water. Rivers are to be understood "as elements of broader and more complex socioecological systems", producing spillovers across space and sectors (Conca 2006). IWRM thus aims to integrate the management of ground and surface water; to pursue integrated, cross-sectoral planning involving agricultural, industrial, municipal, and in-stream (ecosystemic) demands; and to consider multiple scales and levels of government in the sense of local, regional, national, and transnational institutions (Conca 2006). More generally, IWRM incorporates the principles of equity (social sustainability; see Chapter 24), efficiency (economic sustainability), and (environmental) sustainability (Butterworth et al. 2010; see Chapter 15).

Meanwhile, IWRM is said to have "become *the* discursive framework of international water policy – the reference point to which all other arguments end up appealing". Like the concept of sustainability, "IWRM combines intuitive reasonableness, an appeal to technical authority, and an all-encompassing character of such great flexibility that it approaches vagueness" (Conca 2006: 126–7). In the latter sense, IWRM has been called a "nirvana concept" (Molle 2008). As is often the case with such symbolic politics (Newig 2007), the IWRM concept is indeed the result of a complex and ongoing political power struggle (Mollinga 2008). Unresolved conflicts revolve around issues of public versus private governance (Bakker 2010), water as an economic good versus a basic (human) right (cf. Tremblay (2011) on the clash between IWRM and the Human-Rights-Based Approach). Notwithstanding its ambiguities, there have been numerous attempts to implement IWRM. Its impact on water management, however, has been reported to have "at best been marginal" (Biswas 2004), and in a 2005 survey by the Global Water Partnership, only 20 out of 95 countries reported formal implementation of IWRM principles (GWP 2006).

For about a decade, adaptive water management has been increasingly promoted as a new paradigm of water governance. Adaptive management (AM) was developed in the context of

ecosystem management (Holling 1978; Walters 1986) in response to limited understanding of the complex dynamics of these systems (Lee 1999) on the one hand, and obvious widespread degradation of ecosystems on the other. A key strategy is to implement policies as systematic experiments whose outcomes are monitored and analyzed for unanticipated side-effects, and fed back into the policy system ("learning while doing", Lee 1999). An adaptive approach thereby arguably maximizes institutional capacity to respond to future demographic, technological, cultural, political, and economic change (Grunwald 2007). AM has been applied in several cases worldwide (Holling 1978; Lee 1995). The majority of these schemes were implemented and led by governments (Lee 1995). More recently, AM has been applied to water governance in the face of imminent uncertainties such as climate change (Bruch 2009; Mysiak et al. 2010; Pahl-Wostl 2007; see Chapter 28), figuring prominently in the United Nations World Water Development Report 4 on "managing water under uncertainty and risk" (WWAP 2012; see Chapter 18). Adaptive water management has been defined as "a systematic process for continually improving management policies and practices by learning from the outcomes of implemented management strategies" (Pahl-Wostl and Sendzimir 2005: 7). Unlike IWRM, adaptive water management has been developed in a research context. "[I]t is concerned with organizational learning, whereas IWRM is concerned with transforming governance arrangements" (Medema et al. 2008). Extending from the core ideas of AM (especially systematic policy experimentation), adaptive water governance essentially adds public participation, polycentric governance arrangements, and the river basin approach (Huitema et al. 2009).

Although water *security* has been an issue for at least as long as IWRM, it has only recently come to be viewed as an "emerging paradigm" (Cook and Bakker 2012, see also Bogardi et al. 2012; Vörösmarty et al. 2010; UNEP 2009; on environmental security, see Chapter 19), concerned primarily with the social and economic consequences of water resource depletion and degradation. Water security was introduced prominently at the Second World Water Forum in The Hague with the aim of "ensuring freshwater, coastal and related ecosystems are protected and improved; that sustainable development and political stability are promoted; that every person has access to enough safe water at an affordable cost to lead a healthy and productive life; and that the vulnerable are protected from the risks of water-related hazards". This essentially mirrors the aims of IWRM. However, a shift towards a more "neoliberal" as opposed to a more "social-democratic" political model (Mollinga 2008) has been observed. In some contexts, water security appears to be used as a "non-legal, destructively elastic, and indeterminate concept" (Mekonnen 2010: 422).

All of these paradigms have of course been subject to criticism. In general critics have warned that adherence to any one paradigm of water governance risks promoting "universal remedies", which are bound to fail in real (local) settings (Ingram 2008). Calls are therefore made for context-tailored, perhaps "messy" solutions (Ingram 2008; Butterworth et al. 2010).

Actors and networks of experts

Actors in (global) politics of fresh water comprise international organizations such as the World Bank and United Nations (UN) organizations, nation-states (national governments), subnational governments and agencies, (transnational) corporations, nongovernmental organizations (NGOs), scientific experts, professional associations, and a wide range of other, partly intermediary actors (see chapters in Part II of this volume). In the case of transboundary, international, or even global political issues, nation-states have traditionally been the primary point of reference. Sovereign states represent the interests of their domestic territory in international relations. In the field of water politics, bilateral or multilateral agreements on transboundary

surface waters are commonplace (De Stefano et al. 2010), whereas truly international regimes are largely non-existent (as discussed below; on regimes, see Chapter 9). The principal actors in water politics are therefore not necessarily unitary states, but rather corporate actors, (sub-national) agencies, river basin organizations, NGOs, firms, or scientific communities, such that policy-making is a "complex web of interactions…without a central actor or arena for decision-making processes" (Blatter and Ingram 2000: 470).

On the global level, there is no actor with primary responsibility for fresh water. Rather, water-related claims and competencies range across a multitude of international bodies. According to Conca (2006), more than 20 UN and related sub-organizations claim authority in freshwater matters, including the World Health Organization, the Food and Agriculture Organization, the World Meteorological Organization, and the UN Development and Environment Programmes, each with a different focus.

Arguably, the most influential players in global water politics and policy in a development context are the large donor organizations, first and foremost the World Bank (Goldman 2007). It has funded major infrastructure projects in developing countries (e.g., in hydropower and irrigation), a large number of these on international watercourses. World Bank lending on "water, sanitation and flood protection" has nearly tripled from USD 1.7 billion in 2006, to 4.6 billion in 2011, and increased from 7 to 11 percent of total lending over the same period. By means of loan conditionality, the World Bank has effectively been issuing water policy for over 50 years, starting with its 1956 policy for "Projects on International Inland Waterways" (Salman 2011: 596). In general, the World Bank has pushed privatization as a precondition for lending, most recently in its 2003 water policy, which urges privatization in rural areas. It thus clearly subscribes to the "water as an economic good" rather than the "water as public good/human right" approach. This approach has been criticized extensively in the literature (cf. Bakker 2010). Moreover, the World Bank has been pushing institutional reforms on participation. Most notably, water user associations have been mandated, for instance in Mexico, India, and China (Chuan and Chaoyun 2010; Wang et al. 2010). Other important donor organizations influencing water policy include the Asian Development Bank through its "Water Financing Program" (Tecco 2008) and the European Union through its "EU Water Initiative" (Partzsch 2009).

More recently, scholarly attention has turned to the role of intermediaries (Moss et al. 2009) as well as water policy and social entrepreneurs (Partzsch and Ziegler 2011; Meijerink and Huitema 2009), again arguing that a myriad of different actor types testify agency beyond the nation-state. Actors and their roles are related to the institutional environment. As units of governance shift from the nation-state (e.g., to basin-wide governance or supranational structures, as is the case with the EU), new actors emerge, and extant actors adapt their "scalar" strategies to a restructured multilevel governance landscape (Moss and Newig 2010).

Policy and politics on the sustainable management of fresh water have to a considerable degree been shaped by international expert networks, perhaps more so than through intergovernmental collaboration and codified regimes (Conca 2006; Dobner 2010; see Chapter 17). Such networks on water policy formed at a time when ecological concerns were of less importance and debates were dominated by issues of safe drinking water, sanitation, and irrigation (Conca 2006). Following the 1977 UN Water Conference in Mar del Plata, Argentina, which for the first time assembled representatives of more than 100 countries, development banks, UN agencies, intergovernmental organizations, international river commissions, and NGOs, a global network of water experts developed that has since gradually brought increasing attention to issues of (surface) water quality and biodiversity of water-related habitats.

Global expert networking has been institutionalized in essentially two different ways: routinization of global water-related conferences, and organization-building, thus moving from

uncoordinated interactions ("anarchic field") to "associations" or "organizations" (see Scharpf 1997). Much of this professional networking activity has been related to the development, rise, and consolidation of the IWRM concept (Conca 2006).

Influential fora for the global exchange of technical expertise have been the International Commission on Large Dams (ICOLD) and the International Commission on Irrigation and Drainage (ICID). Founded in 1928, ICOLD addresses issues of dam construction and safety, but increasingly also environmental impacts of large dams. It holds triennial international congresses and other workshops. With a similar mission but focusing on irrigation, ICID was founded in 1950. Initially dedicated to promoting large-scale irrigation, ICID now has a broader focus on sustainable irrigated agriculture, including flood management, economics, and ecological and social sciences (Conca 2006: 85; see Chapter 40). Ahead of these earlier professional bodies, the International Water Resources Association (IWRA) has, since its foundation in 1971, taken an integrated perspective on water issues, including ecological, social, and economic aspects. The IWRA is a non-profit NGO that aims to improve water resource decision-making and the sustainable use of the world's water resources.

On the initiative of the IWRA, the World Water Council (WWC) was founded in 1996, following an initial call in the 1992 Dublin Declaration for a forum to unite "private institutions, regional and non-governmental organizations along with all interested governments" (WMO 1992). Legally a French NGO, the WWC is widely seen as "*the* international think tank for water politics" (Dobner 2010: 300), and it has played a key role in structuring the field of global water politics. The WWC is the organizer of the World Water Forum, it comprises 321 member organizations, including ministries, international organizations, private enterprises, and professional networks, and it publishes the journal *Water Policy*. Its mission is to provide an "umbrella organization to raise the profile of freshwater issues globally, provide expertise and authoritative recommendations, and undertake periodic assessments of the world water situation" (Conca 2006: 146).

Also in 1996, the Global Water Partnership (GWP) was founded in Stockholm by the World Bank, the UNDP, and the Swedish International Development Agency. It seeks to promote the Dublin principles, in particular "to help countries to apply integrated water resources management in a participatory manner". Along with activities in global water politics, the GWP engages in field projects through a number of regional partnerships in developing countries (Dobner 2010). In 2002, the GWP was split into a GWP *network* and a GWP *organization*. In a 2004 joint memorandum of understanding, the GWP and WWC committed themselves to promoting governance of global water issues, with private sector participation, privatization, and cost recovery as important principles (Morgan 2004 cited in Dobner 2010: 306).

These associations, the GPW and the WWC in particular, have contributed to institutionalizing global water conferences as fora for expert and political exchange. Notably, the WWC initiated the World Water Forum (WWF), triennial conferences, which began in 1997 in Marrakech (see Conca 2006: 134–9 for a comprehensive overview of global water-related events). These conferences attract increasing numbers of participants, with more than 30,000 attendees in Istanbul (2009) and Marseille (2012). Another notable regular event is the World Water Week that has been held annually in Stockholm since 1991, attracting around 2,000 experts. It is not easy to assess what these mega-events have actually accomplished. Clearly, they have facilitated an exchange of ideas among experts, but also between experts, policy-makers, and civil society (Dobner 2010). They have also served to express shared views on freshwater governance via accompanying ministerial declarations. For instance, the view that fresh water is part of, sustains, and is being sustained by ecosystems is relatively prominent in the WWF declarations from Istanbul and Marseille. Moreover, these fora can be said to have served to legitimize

the work of expert networks. However, the sheer size of the events does not imply that they are representative (Dobner 2010). In fact the WWF is paralleled by an Alternative World Water Forum, organized by social movements, trade unions, NGOs, indigenous groups, citizens, and elected representatives, in opposition to what is seen as hegemonic and industry-dominated global water governance (Bakker 2007; Maganda 2010).

A notable episode in global expert networking was the creation, work, and outcomes of the World Commission on Dams (WCD). In response to increasing criticism of large dam-building projects, it was founded in 1998 by the World Bank and the International Union for Conservation of Nature (IUCN), and in 2000 produced a widely received (critical) report on large dams. It consisted of representatives from the scientific community, civil society, the private sector, government agencies, and river basin authorities (WCD 2000). However, its recommendations have hardly been followed (Briscoe 2010) and were in part outright rejected, for example by China (Conca 2006: 199; Gleick 2012: ch. 6).

International networks of experts on water management have played a complex role in water politics. As epistemic communities or "social learning networks" (Conca 2006: 125–6; Newig et al. 2010) they have contributed to a shared understanding in moving from a technocratic paradigm of water diversion, damming, and irrigation projects, towards a more comprehensive, integrated, and process-oriented approach to governing water. On the level of paradigms, these networks have been important in agenda-setting and diffusing concepts around IWRM into political arenas. However, the actual implementation of these concepts, and thus improvements in water management on the ground, have been limited (Conca 2006; Partzsch 2007). Water expert networks as "institutionalized site[s] of normative struggle" (Conca 2006: 160) would require a certain political legitimacy in order to continually and effectively impact on political agendas. Although these networks are unlikely to attain full democratic legitimacy, they could attain a degree of legitimacy if they were to fairly represent relevant stakeholders (input-oriented legitimacy) and achieve consensus and/or effectively contribute to problem-solving (output-oriented legitimacy). These criteria, however, are only partly achieved; participation of a broader public and non-technical stakeholders remains a desideratum (Dobner 2010). Nor are opportunities to participate always accepted; in the case of the EU Water Initiative, for instance, some NGOs refused to participate because they rejected the very mandate of the negotiations – to devise viable forms of utility privatization – on normative grounds (Partzsch 2007).

Transnational and international collaboration: water law and formal agreements

Formal rules on water – water law – are almost as old as human civilization itself. Indigenous peoples have long employed sustainable forms of water resources management, often integrated within holistic belief systems, customary law, and traditions of environmental stewardship. Ancient civilizations emerged in part because they were able to tame floods and manage irrigation through centralized bureaucracies – the "hydraulic state" (Wittfogel 1957). Water law has mainly developed within territorial states, with occasional policy transfers or "exports" to other countries. Whereas formal transboundary collaboration has a long tradition, global water law in terms of international agreements is almost non-existent (on international environmental law, see Chapter 10). The EU, however, has developed a consolidated supranational water governance regime.

Dellapenna and Gupta (2008) have identified five major trends in national water law.

> National water law systems (1) have long histories and are contextual in nature…; (2) are more coherent and integrated in developed countries and more pluralistic in developing

> countries; (3) cover similar subjects; (4) have increasingly integrated environmental issues since 1972; and (5) have gradually welcomed stakeholder participation as well as private sector participation since the 1980s.
>
> (Dellapenna and Gupta 2008: 440)

Furthermore, water law is generally more elaborate in arid regions than in water-abundant ones (Dellapenna and Gupta 2008: 439).

National water laws do not in all cases develop independently of each other. Transfer or diffusion of regulatory concepts is not uncommon. On the one hand, national water law can incorporate broad concepts such as IWRM. (Cf. the above-cited 2005 survey of the Global Water Partnership.) On the other hand, (elements of) water law may be exported either by force (colonization) or through collaboration or active demand on the part of the "importer". For the importing country, such "legal transplants" have the advantage that they are already coherent regulations, saving perhaps years of legal development. On the other hand, the problem of institutional "fit" arises (Moss 2004): "implementation deficit for exported water laws is often high because some of these concepts are not tailored to the contexts to which they are transferred" (Dellapenna and Gupta 2008: 438).

Transboundary collaboration includes common rules through bilateral and regional negotiations, joint river basin institutions, and multilateral law. Worldwide, some 260 major international rivers exist (Wolf et al. 2002). A database of transboundary freshwater treaties lists a total of 506 agreements, covering 109 of the 260 international river basins by the end of 2002. More than half of these had some form of international basin organization (Dombrowsky 2008). Of the 86 international river basin organizations studied by Dombrowsky (2008), more than 40 percent regulate both water quality and quantity, one-third deal with hydropower and ecological issues, and around 20 percent address flood control, navigation, or irrigation. Notable examples of transboundary river basin collaboration include the Great Lakes Regime, the Great Lakes–St. Lawrence River Basin Water Resources Compact (Schulte 2012), the International Commission for the Protection of the Rhine (e.g., Mostert 2009) and the Mekong River Commission (Dore and Lebel 2010; Suhardiman et al. 2012). Transboundary collaboration, it has been observed, is increasingly the result of network governance, involving sub-national agencies and non-state actors, rather than unitary states (Blatter and Ingram 2000, 2001).

As to the effects of transboundary collaboration, Bernauer and Moser (1996), studying the Rhine River regime, found that the strongest effect on pollution reduction actually results from information sharing and the strengthening of government agencies, and the anticipation of regulation by polluters, rather than from direct impacts of transboundary measures. Bernauer and Kuhn (2010) studied collaboration around issues of upstream–downstream water pollution, testing whether democracies bound by international treaties are less likely to harm each other environmentally. While they found international treaties to have some positive influence, they concluded that "state behaviour in this area remains characterized by free-riding incentives; the forces of democracy, trade and national and international regulation and institutions do not easily produce decent international behaviour" (p. 80).

Global and international law in general certainly has had important impacts on national water law and transboundary agreements (Dellapenna and Gupta 2008), but global or international law on water is largely missing. One notable exception is the Ramsar Convention on Wetlands (1975), which promotes "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (www.ramsar.org). The convention covers multiple types of wetland, including inland waters such as lakes and rivers, swamps and marshes, wet grasslands and peatlands and oases, and coastal zone wetlands. Across 161 signatory states, some

2,000 wetlands have been formally identified as "Ramsar sites". Furthermore, states undertake to collaborate in the management of transboundary wetlands and shared species.

One attempt at a global water regime is the United Nations Watercourses Convention of 1997, which is not yet in force (Dellapenna and Gupta 2008; Rieu-Clarke and Loures 2009). As the first piece of global water law, it is rather "conservative" and hardly considers ecological issues, but rather reiterates the 1996 "Helsinki Rules" on the Uses of the Waters of International Rivers (Dellapenna and Gupta 2008). In this context, the International Law Commission (ILC) has played a key role, in that it drafted the 1997 convention. It also produced the 2006 draft rules on groundwater. Despite their paramount importance to water provision and ecosystems, transboundary aquifers have hardly been treated by international law. In the absence of a global framework for sustainable water governance, the International Law Association (an international NGO) drafted the "Berlin Rules on Water Resources" in 2004. "The Berlin Rules are comprehensive, covering all freshwater and related resources (the aquatic environment) and integrating domestic with international water law. The Berlin Rules also involve the first comprehensive attempt to address the distinct characteristics of groundwater" (Dellapenna and Gupta 2008: 448). The key ingredient in (attempts at) codified international water law – in the Watercourses Convention, the Helsinki Rules, and the Berlin Rules – is the "equitable use principle", maintaining that international natural (water) resources be shared equally, and that the rights of riparian states to a share of the water resource be respected.

Whereas many argue in favor of a stronger global legal framework (Pahl-Wostl et al. 2008; Hoekstra et al. 2011), others are critical of a global approach to water governance. While acknowledging global fluxes of water through teleconnections and flows of virtual water, Gawel and Bernsen (2011) question the notion of water as a "global public good", "since the scope of its benefits and externalities is still mostly local or regional" (Gawel and Bernsen 2011: 213), arguing that global trade-flow regulations will only result in losses of wealth (p. 214), and important problems of "fit" would result.

A prominent example of a "regime-like" structure is the EU supranational water policy. The EU Water Framework Directive (WFD) was passed and entered into force in late 2000. This major piece of legislation introduces a Europe-wide ecological goal of good water status, governance principles of river basin management and participation, and economic principles of pricing and cost recovery. European member states are obliged to produce river basin management plans and programs of measures, which are to be updated every six years. "Good water status" should be achieved by 2015. Given the heterogeneity of its member states, implementation of the WFD has varied considerably across the EU (Kanakoudis and Tsitsifli 2010; Liefferink et al. 2011). In order to achieve coherent WFD implementation, a EU-wide "Common Implementation Strategy" has been established, which, with the participation of national administrations and non-state organizations, produced dozens of "guidance documents" (DG Environment 2006; Newig et al. 2005). Given the scope and coverage of the WFD, its governance innovations such as river basin management, participation, and economic principles are likely to lead to an unprecedented policy transition (see, e.g., Page and Kaika 2003; Newig et al. 2005; Gouldson et al. 2008). Attempts are even being made to transfer elements of the WFD to other contexts such as China (Ravesteijn et al. 2009; Griffiths and Andersen 2009) (see above on policy transfer).

Principles: the substance of policy and governance

Facing issues of water depletion and degradation, and the impairment of water-related ecosystems, political programs are expected to respond effectively. On the substantive level, the following strategies and instruments are being employed:

Review of baselines, and monitoring. Recent policies (such as the WFD) demand a review of the status of waters and the extent to which they are at risk; the assessment of ecosystem water requirements; and the monitoring of improvements (or deteriorations). Such strategies are typically employed in developed countries with well-functioning public administrations and the technical means for gathering the respective data.

Pollution control. In the early years of environmental policy, industrialized countries mostly employed an *emissions*-control approach, addressing pollution at the source. This was effective for point sources such as industrial discharges to rivers and lakes. Likewise, wastewater treatment plants were built and/or upgraded. Increasingly, the emissions-based approach has been complemented with an *immission*- or quality-based approach, focusing on the actual status of water bodies, and taking into consideration possible antagonistic effects of multiple polluters.

River and wetland restoration. Increasingly, the ecological value of waters is recognized (CBD 2010; MEA 2005). While in many modern industrialized countries, water quality has much improved in the past decades, many rivers remain in a highly modified state, so river restoration – and also wetland restoration – is an important issue (Nilsson et al. 2005). Where water quantity is an issue, a variety of *water saving* strategies are pursued, mostly through realizing efficiency gains in industry, private households, or agriculture.

Economic instruments. These include water pricing, pollution taxes, and water quality trading. The first two are common practice in many countries. However, water pricing in the sense of full recovery of all costs related to water purification and wastewater treatment is still not common practice. As water is so undervalued in many places, metering of household consumption is also not common yet. Water quality trading is a relatively new development. Promoted in particular by the United States Environmental Protection Agency, it has expanded considerably since the late 1990s (Morgan and Wolverton 2008; Woodward and Kaiser 2002), alongside related instruments like wetland mitigation banking (Kalpowitz and Lupi 2010).

Planning instruments. These provide the opportunity for a broader consideration of freshwater resources within a geographic area, possibly in conjunction with other sectoral demands (as per IWRM). Land-use planning regarding agriculture or settlements (e.g., use of water for irrigation, draining of wetlands, deforestation; see Chapter 38), energy (e.g., dam construction), and navigation (canal and river regulations) has enormous impacts on water resources and related ecosystems.

Governance principles relate to the way in which, and the scalar level at which, substantive policy decisions are taken. They include:

River basin planning and management. The river drainage basin, along with hydrological subunits such as watersheds and catchments, has long been advocated as the optimal spatial unit by which to govern water. The main rationale is that cross-border pollution spillovers – upstream–downstream in particular – can best be addressed if water management decisions are jointly taken by those who inhabit the basin. This has been described as institutional "fit" between the natural (hydrological) scale and the governance scale (Moss 2004; Moss and Newig 2010). Collaboration across borders within basins is a particularly important issue (Sabatier et al. 2005; Lubell et al. 2009). However, the principle of river basin management has also been challenged, because for some of the most pressing problems of diffuse (groundwater) pollution, hydromorphological issues, or wetland quality, the concept of drainage basin is not necessarily relevant (Ingram 2008; Benson and Jordan 2010).

Decentralization. Whereas river basin management implies a spatial governance unit large enough to integrate possible pollution spillovers, decentralization calls for smaller, more local units of governance. This is assumed to increase ownership by local stakeholders, thereby allowing for local self-governance (e.g., in water user associations), and more flexible technical infrastructure such as decentralized wastewater treatment (WWAP 2012). More abstractly, the concept of polycentric governance (Ostrom et al. 1961; Andersson and Ostrom 2008) values both the self-government aspect and the benefits of institutional diversity that more centralized governance systems are lacking. On the downside, there may be dispersed responsibilities and a lack of problem-solving capacity at higher levels.

Public participation. Closely linked to many aspects of decentralization is the principle of involving non-state actors – organized groups or the broad public – in freshwater governance. The claimed benefits include better informed decisions through (local) stakeholder input; education of the lay public; enhanced legitimacy of decisions; and thus more widely accepted decisions and more effective delivery (Mostert 2003; Newig et al. 2005; in international watershed management see Bruch et al. 2005). The effects of participation are, however, still disputed, as decision-making may be ineffective and delayed, and decisions may favor depletion of water resources due to the more effective participation of powerful, development-oriented groups.

Privatization. This mostly refers to putting water services in the hands of private companies in order to achieve more efficient water service provision. Privatization has been strongly advocated by the World Bank and private companies (Bakker 2010; Finger 2005). As a prerequisite, privatization also involves water pricing (see above). The effects of privatization have been much discussed and much criticized, partly from more general anti-capitalist and anti-globalization perspectives (see Chapter 22), partly from empirical evidence that private companies have not succeeded in more efficient and equitable water provision, especially in developing countries where the concept has been most strongly promoted (Page 2005; Partzsch 2009; Bakker 2010).

Conclusion

Bogardi and colleagues have noted that "the global 'water crisis' is ultimately a 'governance crisis' extending from the local to the planetary scale" (Bogardi et al. 2012). Clearly, the status of the world's ground and surface waters crucially depends on the way governance institutions are crafted and implemented, as well as the processes that lead to the creation of these institutions. National water laws have matured to a large extent, in many places now incorporating ecological and sustainability aspects of water management. Transboundary collaboration on shared surface waters and wetlands is now commonplace. However, the development and implementation of such institutions in global comparison largely depends on the cultural and economic context. Moreover, global law on fresh water is still in its infancy with the Ramsar Convention on wetlands as yet the only codified example of an international agreement.

Over the years, a multitude of guiding principles for (transboundary) water management and governance has been proposed, originating typically from research and expert networks. The crucial question, though, is whether IWRM, adaptive water governance, privatization, decentralization, and participation actually live up to the promise they hold. The promotion of generic panaceas or "universal remedies" (Ingram 2008) has drawn criticism from many sides, and prompted calls for more context-tailored governance solutions that "fit" the respective local context (Moss 2004; Conca 2006). Yet knowledge of how to tailor to local contexts is sparse as well. Often enough, we simply do not know which are the key contextual factors that impact on success or failure of water governance institutions. Well-designed comparative research on

the shaping and implementation of transboundary, multi-, supra-, and international freshwater governance could yield important insights on the boundary conditions under which advocated governance principles work. Biswas and Tortajada (2010) highlight the need for case study research to inform a community of best practices around good water governance. Increasing the number of cases, studying "non-successful" cases, using meta-analytic techniques such as the case-survey method (Larsson 1993; Newig and Fritsch 2009) as well as field experimentation, could further improve the knowledge base to support evidence-based policy-making, and protect and improve freshwater resources and ecosystems around the globe.

References

Andersson, K.P. and E. Ostrom (2008) "Analyzing decentralized resource regimes from a polycentric perspective." *Policy Sciences* 41: 71–93.

Bakker, K. (2007). "The 'commons' versus the 'commodity': alter-globalization, anti-privatization and the human right to water in the global South." *Antipode* 39(3): 430–55.

—— (2010) *Privatizing Water: Governance Failure and the World's Urban Water Crisis*. Ithaca, NY: Cornell University Press.

Benson, D. and A. Jordan (2010) "The scaling of water governance tasks: a comparative federal analysis of the European Union and Australia." *Environmental Management* 46(1): 7–16.

Bernauer, T. and P. Kuhn (2010) "Is there an environmental version of the Kantian peace? Insights from water pollution in Europe." *European Journal of International Relations* 16(1): 77–102.

Bernauer, T. and P. Moser (1996) "Reducing pollution of the River Rhine: the influence of international cooperation." *Journal of Environment and Development* 5(4): 389–415.

Biswas, A.K. (2004). "Integrated water resources management: a reassessment – a water forum contribution." *Water International* 29(2): 248–56.

Biswas, A.K. and Tortajada, C. (2010) "Future water governance: problems and perspective." *International Journal of Water Resources Development* 26(2): 129–39.

Blatter, J. and H. Ingram (2000) "States, markets and beyond: governance of transboundary water resources." *Natural Resources Journal* 40: 439–73.

Blatter, J. and H. Ingram (eds) (2001) *Reflections on Water. New Approaches to Transboundary Conflicts and Cooperation*. Cambridge: MIT Press.

Bogardi, J.J., D. Dudgeon, R. Lawford, E. Flinkerbusch, A. Meyn, C. Pahl-Wostl et al. (2012) "Water security for a planet under pressure: interconnected challenges for a changing world call for sustainable solutions." *Current Opinion on Environmental Sustainability* 4(1): 35–43.

Briscoe, J. (2010) "Viewpoint – overreach and response: the politics of the WCD and its aftermath." *Water Alternatives* 3(2): 399–415.

Bruch, C. (2009). "Adaptive water management: strengthening laws and institutions to cope with uncertainty." In A.K. Biswas, C. Tortajada, and R. Izquierdo (eds) *Water Management in 2020 and Beyond*. Berlin: Heidelberg.

Bruch, C., L. Jansky, M. Nakayama, and K.A. Salewicz (2005) "Strategies for advancing public involvement in international watershed management." In C. Bruch, L. Jansky, M. Nakayama, and K.A. Salewicz (eds) *Public Participation in the Governance of International Freshwater Resources*, 477–85. Paris: United Nations University Press.

Butterworth, J., J. Warner, P. Moriarty, S. Smits, and C. Batchelor (2010) "Finding practical approaches to integrated water resources management." *Water Alternatives* 3(1): 68–81.

CBD (2010) *Global Biodiversity Outlook 3*. Montreal: Secretariat of the Convention on Biological Diversity (CBD).

Chuan, L. and Y. Chaoyun. (2010) "Social participation in the irrigation sector in Yunnan, China: roles of the state, water users associations and communities." In K.A. Berry and E. Mollard (eds) *Social Participation in Water Governance and Management: Critical and Global Perspectives*, 163–81. London: Earthscan.

Conca, K. (2006) *Governing Water. Contentious Transnational Politics and Global Institution Building*. Cambridge, MA: MIT Press.

Cook, C. and Bakker, K. (2012) "Water security: debating an emerging paradigm." *Global Environmental Change* 22(1): 94–102.

De Stefano, L., J. Duncan, S. Dinar, K. Stahl, K. Strzepek, and A.T. Wolf (2010) *Mapping the Resilience of International River Basins to Future Climate Change-Induced Water Variability*. Water Sector Board Discussion Paper Series No. 15. Washington, DC: World Bank.

Dellapenna, J. and J. Gupta (2008) "Toward global law on water." *Global Governance* 14(4): 437–53.

DG Environment (2006) *Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Improving the Comparability and Quality of the Water Framework Directive Implementation. Progress and Work Programme for 2007 and 2009*. Environment Directorate-General, European Commission.

Dobner, P. (2010) *Wasserpolitik*. Berlin: Suhrkamp.

Dombrowsky, I. (2008) "Integration in the management of international waters: economic perspectives on a global policy discourse." *Global Governance* 14(4): 455–77.

Dore, J. and L. Lebel (2010) "Deliberation and scale in Mekong Region water governance." *Environmental Management* 46(1): 60–80.

Falkenmark, M. (1997) "Society's interaction with the water cycle: a conceptual framework for a more holistic approach." *Hydrological Sciences* 42(4): 451–66.

Finger, M. (2005) "The new water paradigm: the privatization of governance and the instrumentalization of the state." In D.L. Levy and P.J. Newell (eds) *The Business of Global Environmental Governance*, 275–304. Cambridge, MA: MIT Press.

Gawel, E. and K. Bernsen (2011) "Globalization of water: the case for global water governance." *Nature and Culture* 6(3): 205–17.

Gleick, P.H. (ed.) (2012) *The World's Water: The Biennial Report on Freshwater Resources*, Vol. 7. Washington, DC: Island Press.

Goldman, M. (2007) "How 'water for all!' policy became hegemonic: the power of the World Bank and its transnational policy networks." *Geoforum* 38(5): 786–800.

Gouldson, A., E. Lopez-Gunn, J. van Alstine, Y. Rees, M. Davies, and V. Krishnarayan (2008) "New alternative and complementary environmental policy instruments and the implementation of the Water Framework Directive." *European Environment* 18: 359–70.

Griffiths, M. and L.S. Andersen (2009) *Potential Significance of the EU Water Framework Directive to China. EU–China River Basin Management Programme*. Available HTTP: <http://www.euchinarivers.org>.

Grunwald, A. (2007) "Working towards sustainable development in the face of uncertainty and incomplete knowledge." *Journal of Environmental Policy and Planning* 9(3–4): 245–62.

Gupta, J. (2009) "Driving forces in global freshwater governance." In D. Huitema and S. Meijerink (eds) *A Research Companion to Water Transitions around the Globe*. Cheltenham: Edward Elgar.

GWP (2006) *Setting the Stage for Change. Second Informal Survey by the GWP Network Giving the Status of the 2005 WSSD Target on National Integrated Water Resources Management and Water Efficiency Plans*. Available HTTP: <http://www.gwptoolbox.org/images/stories/Docs/gwp_setting%20the%20stage%20for%20change%202006.pdf>.

GWP-TAC. (2000) "Integrated water resources management." *TAC Background Papers*. Stockholm: Global Water Partnership.

Hoekstra, A.Y., A.K. Chapagain, M.M. Aldaya, and M.M. Mekonnen (2011) *The Water Footprint Assessment Manual: Setting the Global Standard*. London: Earthscan.

Holling, C.S. (ed.) (1978) *Adaptive Environmental Assessment and Management*. Chichester: Wiley.

Huitema, D., E. Mostert, W. Egas, S. Moellenkamp, C. Pahl-Wostl, and R. Yalcin (2009) "Adaptive water governance: assessing the institutional prescriptions of adaptive (co-)management from a governance perspective and defining a research agenda." *Ecology and Society* 14(1): Art. 26.

Ingram, H. (2008) "Beyond universal remedies for good water governance: a political and contextual approach." Paper presented at the Rosenberg Forum for Water Policy, Zaragoza, Spain, June 25–26. Available HTTP: <http://rosenberg.ucanr.org/documents/V%20Ingram.pdf>.

IPCC (2007) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the IPCC*. Cambridge: Cambridge University Press.

Kalpowitz, M.D. and F. Lupi (2010) "Ecosystem banking as a quasi-market approach to conservation: building on US wetland banking experience." In T.L. Napier (ed.) *Human Dimensions of Soil and Water Conservation: A Global Perspective*, 185–202. New York: Nova Science.

Kanakoudis, V. and S. Tsitsifli (2010) "On-going evaluation of the WFD 2000/60/EC implementation process in the European Union, seven years after its launch: are we behind schedule?" *Water Policy* 12: 70–91.

Larsson, R. (1993) "Case survey methodology: quantitative analysis of patterns across case studies." *Academy of Management Journal* 36(6): 1515–46.

Lee, K.N. (1995) "Deliberately seeking sustainability in the Columbia River Basin." In L. Gunderson, C.S. Holling, and S.S. Light (eds) *Barriers and Bridges to Renewal of Ecosystems and Institutions*, 214–38. New York: Columbia University Press.

—— (1999) "Appraising adaptive management." *Conservation Ecology* 3(2): 3.

Liefferink, D., M. Wiering, and Y. Uitenboogaart (2011) "The EU Water Framework Directive: a multi-dimensional analysis of implementation and domestic impact." *Land Use Policy* 28: 712–22.

Lubell, M., W.D. Leach, and P.A. Sabatier (2009) "Collaborative watershed partnerships in the epoch of sustainability." In D.A. Mazmanian and M.E. Kraft (eds) *Toward Sustainable Communities: Transition and Transformations in Environmental Policy*, 255–88. Cambridge, MA: MIT Press.

Maganda, C. (2010) "Water management practices on trial: the Tribunal Latinamericano del Agua and the creation of public space for social participation in water politics." In K.A. Berry and E. Mollard (eds) *Social Participation in Water Governance and Management: Critical and Global Perspectives*, 265–87. London: Earthscan.

MEA (2005). *Ecosystems and Human Well-being: Current State and Trends, Volume 1*. Washington, DC: Millennium Ecosystem Assessment (MEA) Board; Island Press.

Medema, W., B.S. McIntosh, and P.J. Jeffrey (2008) "From premise to practice: a critical assessment of integrated water resources management and adaptive management approaches in the water sector." *Ecology and Society* 13(2): Art. 29.

Meijerink, S. and D. Huitema (2009) "Water transitions, policy entrepreneurs and change strategies: lessons learned." In D. Huitema and S. Meijerink (eds) *A Research Companion to Water Transitions around the Globe*, 371–91. Cheltenham: Edward Elgar.

Mekonnen, D.Z. (2010) "The Nile Basin Cooperative Framework Agreement negotiations and the adoption of a 'water security' paradigm: flight into obscurity or a logical cul-de-sac?" *European Journal of International Law* 21(2): 421–40.

Molle, F. (2008) "Nirvana concepts, narratives and policy models: insights from the water sector." *Water Alternatives* 1(1): 131–56.

Mollinga, P.P. (2008) "Water, politics and development: framing a political sociology of water resources management." *Water Alternatives* 1(1): 7–23.

Morgan, C. and A. Wolverton (2008) "Water quality trading in the United States: trading programs and one-time offset agreements." *Water Policy* 10(1): 73–93.

Moss, T. (2004) "The governance of land use in river basins: prospects for overcoming problems of institutional interplay with the EU Water Framework Directive." *Land Use Policy* 21: 85–94.

Moss, T. and J. Newig (2010) "Multilevel water governance and problems of scales: setting the stage for a broader debate." *Environmental Management* 46(1): 1–6.

Moss, T., W. Medd, S. Guy, and S. Marvin (2009) "Organising water: the hidden role of intermediary work." *Water Alternatives* 2(1): 16–33.

Mostert, E. (2003) "The challenge of public participation." *Water Policy* 5(2): 179–97.

—— (2009) "International co-operation on Rhine water quality 1945–2008: an example to follow?" *Physics and Chemistry of the Earth* 34(3): 142–9.

Mysiak, J., H.J. Henrikson, C. Sullivan, J. Bromley, and C. Pahl-Wostl (eds) (2010) *The Adaptive Water Resource Management Handbook*. London: Earthscan.

Newig, J. (2007) "Symbolic environmental legislation and societal self-deception." *Environmental Politics* 16(2): 279–99.

Newig, J. and O. Fritsch (2009) "Environmental governance: participatory, multi-level – and effective?" *Environmental Policy and Governance* 19(3): 197–214.

Newig, J., C. Pahl-Wostl, and K. Sigel (2005) "The role of public participation in managing uncertainty in the implementation of the Water Framework Directive." *European Environment* 15(6): 333–43.

Newig, J., D. Günther, and C. Pahl-Wostl (2010) "Synapses in the network: learning in governance networks in the context of environmental management." *Ecology and Society* 15(4): Art. 24.

Nilsson, C., C.A. Reidy, M. Dynesius, and C. Revenga (2005) "Fragmentation and flow regulation of the world's large river systems." *Science* 308(5720): 405–8.

Ostrom, V., C.M. Tiebout, and R. Warren (1961) "The organization of government in metropolitan areas: a theoretical inquiry." *American Political Science Review* 55(4): 831–42.

Page, B. (2005) "Paying for water and the geography of commodities." *Transactions of the Institute of British Geographers* 30(3): 293–306.

Page, B. and M. Kaika (2003) "The EU Water Framework Directive: Part 2. Policy innovation and the shifting choreography of governance." *European Environment* 13(6): 328–43.

Pahl-Wostl, C. (2007) "Transition towards adaptive management of water facing climate and global change." *Water Resources Management* 21(1): 49–62.

Pahl-Wostl, C. and J. Sendzimir. (2005) "The relationship between IWRM and adaptive managment." NeWater Working Papers No. 3. Osnabrueck, Germany: NeWater Project.

Pahl-Wostl, C., J. Gupta, and D. Petry (2008) "Governance and the global water system: a theoretical exploration." *Global Governance* 14(4): 419–35.

Partzsch, L. (2007) *Global Governance in Partnerschaft. Die EU-Initiative "Water for Life"*. Baden-Baden: Nomos.

—— (2009) "European Union water policy: to transition or not to transition? Coalitions as key." In D. Huitema and S. Meijerink (eds) *A Research Companion to Water Transitions around the Globe*, 237–49. Cheltenham: Edward Elgar.

Partzsch, L. and R. Ziegler (2011) "Social entrepreneurs as change agents: a case study on power and authority in the water sector." *International Environmental Agreements: Politics, Law and Economics* 11(1): 63–83.

Ravesteijn, W., X. Song, and R. Wennersten (2009) "The 2000 EU Water Framework Directive and Chinese water management: experiences and perspectives." *River Basin Management V* 124: 37–46.

Rieu-Clarke, A. and F.R. Loures (2009) "Still not in force: should states support the 1997 UN Watercourses Convention?" *Reciel* 18(2): 185–97.

Sabatier, P.A., W. Focht, M. Lubell, Z. Trachtenberg, A. Vedlitz, and M. Matlock (eds) (2005) *Swimming Upstream. Collaborative Approaches to Watershed Management*. Cambridge, MA: MIT Press.

Salman, S.M.A. (2011) "The World Bank policy and practice for projects affecting shared aquifers." *Water International* 36(5): 595–605.

Scharpf, F.W. (1997) *Games Real Actors Play. Actor-Centered Institutionalism in Policy Research*. Boulder, CO: Westview Press.

Schulte, P. (2012) "The Great Lakes Water Agreement." In P.H. Gleick (Hrsg.) *The World's Water Volume 7: The Biennial Report on Freshwater*, 165–70. Washington, DC: Island Press.

Suhardiman, D., M. Giordano, and F. Molle (2012) "Scalar disconnect: the logic of transboundary water governance in the Mekong." *Society and Natural Resources* 25(6): 572–86.

Tecco, N. (2008) "Financially sustainable investments in developing countries' water sectors: what conditions could promote private sector involvement?" *International Environmental Agreements* 8(2): 129–42.

Tremblay, H. (2011) "A clash of paradigms in the water sector? Tensions and synergies between integrated water resources management and the human rights-based approach to development", *Natural Resources Journal* 51: 307–56.

UNEP (2009) *Water Security and Ecosystem Services: The Critical Connection*, edited by World Water Assessment Programme (WWAP). Nairobi, Kenya.

Vörösmarty, C.J., P.B. McIntyre, M.O. Gessner, D. Dudgeon, A. Prusevich, P. Green et al. (2010) "Global threats to human water security and river biodiversity." *Nature* 467(7315): 555–61.

Walters, C. (1986) *Adaptive Management of Renewable Resources*. In W.M. Getz (ed.), *Biological Resource Management* New York: Macmillan.

Wang, J., J. Huang, L. Zhang, Q. Huang, and S. Rozelle (2010) "Water governance and water use efficency: the five principles of WUA management and performance in China." *Journal of American Water Resources Association* 46(4): 665–85.

WCD (2000) *Dams and Development: A New Framework for Decision-making*. London: World Commission on Dams (WCD); Earthscan.

Wittfogel, K.A. (1957) *Oriental Despotism: A Comparative Study of Total Power*. New Haven, CT: Yale University Press.

WMO (1992) *Dublin Statement on Water and Sustainable Development*. World Meteorological Organization, Dublin, Ireland, January 31. Available HTTP: <http://www.wmo.int/pages/prog/hwrp/documents/english/icwedece.html>.

Wolf, A.T., K. Stahl, and M.F. Macomber (2002) "Conflict and cooperation within international river basins: the importance of institutional capacity." *Water Resources Update* 125. Universities Council on Water Resouces.

Woodward, R.T. and R.A. Kaiser (2002) "Market structures for US water quality trading." *Review of Agricultural Economics* 24(2): 366–83.

WWAP (2012) *The United Nations World Water Development Report 4: Volume 1 – Managing Water under Uncertainty and Risk*. Paris: World Water Assessment Programme (WWAP); United Nations Educational, Scientific and Cultural Organization (UNESCO).

35

Pollution and management of oceans and seas

Peter J. Jacques

What does it mean to pollute the World Ocean? Earth is different from any other planet we know about because it has a large amount of water, and about 97 percent of this water is found in the World Ocean. The World Ocean is that ensemble of interconnected oceans and seas. Most of the world's habitat is found in the World Ocean because not only does this ocean take up more than 70 percent of Earth's surface, it has a depth – the water column – that harbors life throughout. Indeed, most "ecosystem services" come from marine systems (Costanza 2000). Ecosystem services are direct and indirect benefits to human societies that spring from the functions of ecosystems (Hassan et al. 2005) and they can fall into four categories: provisioning, regulating, cultural, and supporting services. The ocean provides fish for us to eat (see Chapter 36), it regulates the climate (see Chapter 28), provides the cornerstone of the entire hydrologic cycle that brings freshwater to us, and provides spiritual, educational, economic, and recreational opportunities for people around the world. Finally, and perhaps most importantly, the World Ocean provides supporting services in cycling nutrients and elements, such as carbon, that then provide the grounds for all the other services.

The future and quality of marine-based services is tightly linked to the integrity of transitional zones and links to the ocean systems – the quality and integrity of saltwater marshes, mangroves, and freshwater inputs, the nature of land use and changes (such as through agriculture), the interactions with the atmosphere, and the integrity and diversity of the biosphere (Hassan et al. 2005; Levin and Lubchenco 2008; Milanese et al. 2011; Sala and Knowlton 2006; Worm et al. 2006). To think of ocean pollution requires us to think about how marine and social systems are integrated, or what might be called "social oceanography" (see Lehodey and Maury 2010; Jacques 2010b; Gallagher and Hammerschlag 2011).

The World Ocean is a system of systems. Within the World Ocean System (WOS), there are subsidiary ecological systems. These involve coastal systems, inter-coastal and inter-tidal systems, open ocean and deep ocean systems that all work together, driven by solar energy that warms the upper ocean layers and fuels primary production of green phytoplankton – the base of the marine food chain, and the source for 40–50 percent of the world's oxygen (Bigg 2003; Earle 1995; Prager and Earle 2000). The WOS absorbs heat and carbon through these cycles. Of the carbon in the ocean–atmosphere system, 98.5 percent is in the ocean as dissolved organic carbon – carbonate and bicarbonate (Houghton 2007). The heat absorbed by the ocean warms the surface

layers, causing the water column to mix because heat and salinity affect water density, sending the densest water to the bottom of the ocean. From this mixing, as well as from wind and other forces, the meridional overturning current (MOC or the thermohaline circulation) moves warm water like a conveyor belt to the poles, and the poles then send cooler water to the tropical and sub-tropical warm areas of the globe in a way that distributes heat around the planet. The WOS stabilizes climate through this process, offers the supportive base for the hydrologic cycle, and provides critical conditions that allow for life on Earth.

The WOS is a complex system (see for example, Somero 2012; Scheffer et al. 2001). A complex system is made up of a dense network of internal parts – seen in the relationship of carbon and heat, plankton, fish, and other parts of the WOS. When one element is altered, it changes other parts of the system, sometimes in unpredictable and uncontrollable ways. Ecological systems and social systems are integrated as social–ecological systems, and in the case of the WOS, social–marine systems. Both social and ecological systems have conditions that define their relationships and functions, which make up the state of the system. Social–ecological systems have stable conditions, but when they are disturbed enough, these stable conditions can be pushed over the edge of breaking points, or thresholds, that move that state into a different state (Adger 2006; Berkes et al. 2003; Folke 2006; Folke et al. 2004; Galaz 2005; Hollings 1973; Walker 2002; Walker et al. 2006; Gunderson and Holling 2002; Scheffer et al. 2001). Thus, there are multiple stable conditions in social–ecological systems, and the ability of a system to sustain disturbance and retain its current state is the system's resilience.

Resilience of a system is tested by the exposure to disturbance, and the sensitivity that system has to the specific disruption. Overall, this is called the Adaptive Cycle (Holling and Gunderson 2002) which has four stages: growth (r), conservation (k), release/collapse (Ω), and reorganization (α). Stages r and k are the stages of development of, say, a whole society or an ecological niche, and stages Ω and α are stages of destruction and renewal where bound up energy is released after enough of a disturbance – and if there is enough matter and energy in the system left, new development stages may begin (Walker et al. 2006). Surviving the "back loop" of Ω and α are the keys to sustainability and require that we not disturb the marine–social systems so much that they cannot withstand disturbance or reorganize after a change in state. This means that the WOS cannot sustain an infinite amount of disturbance before changing critical life support systems (on sustainability, see Chapter 15).

Pollution is one kind of disturbance to the WOS. Note that pollution is not just hazardous or toxic chemicals, but anything that takes up the capacity of the ecological system to cycle or function. In other words, a pollutant is anything that takes up "sink" capacity. One may think that mercury in ocean water that becomes part of fish tissue is an obvious pollutant, as it causes neurological disease, and is suspected of causing brain damage to 316,588–637,233 infants born in the USA (Bottoms 2012). But ocean water itself is a pollutant if it goes into a freshwater aquifer. Pollution is therefore a broad category of contamination or disruption to ecological and social processes.

In this chapter, I will first briefly explore classical foundations to international ocean law and what I will call the "usual suspects" of marine pollution – oil, toxic and hazardous waste, and human sewage – that continue to foul the World Ocean. This is only the beginning, though, because the nature of ocean pollution has become more complicated. The vast majority of ocean pollution comes from on-land sources, and is not adequately conceptualized in terms of ocean dumping since most pollution is not dumped from a specific point source. Rather, many problems of ocean pollution come from diffuse and ubiquitous sources. Now our concern about ocean pollution must include things we might never have thought of as a problem: carbon cycle, nitrogen, heat, and the addition of micro-plastic contaminants. These new pollutants are

much harder, if not impossible, to control once they are produced, forcing us to take new approaches to thinking about marine pollution.

Classical marine politics

If we think of the WOS as a link between distant peoples and distant times, we might divide the primary time periods based on our world political economic organization. Political economy refers to the structure of economic rules and relationships that arrange power in society. A mode of production is the combination of forces, such as raw material and tools, and the relationships that determine what and how people produce things to support subsistence.

The first era of world politics and the oceans spanned 8,000 BCE–1492. During this period, the use of the oceans was determined by local custom, rituals, taboos, and indigenous knowledge. Human civilization consisted of villages, chiefdoms, principalities, and empires, but only used the ocean at an artisanal, or small scale. At this time, there were no global institutions for the use of the oceans (Jacques 2010a). The second era of world politics and the oceans came as European countries used the oceans as a highway to other lands and to build empires and remove the natural resources and people from these lands for the enrichment and empowerment of European kingdoms (see Chapter 21). During this period of mercantile capitalism, the colonial system was forged, where the first global oceanic changes began, and the first global ocean institution is established. The first human-caused global oceanic change was through whaling, and the European empires relied on whale oil and other parts for energy and food. Colonial whaling fleets effectively undermined several populations of whales, and the whale population has not been the same ever since (Jackson et al. 2001; Jackson 2001).

The third and current era is the post-Second World War period of global market capitalism operating as part of a system of nation-states (see Chapters 7 and 22). During the period of mercantile capitalism and colonialism, the principle of *mare liberum* (Latin for "freedom of the seas") was established by Hugo Grotius (1916) (see also Knight 1925; Vieira 2003) in the seventeenth century. This principle was based on the European system of natural law, that proposed that true law was permanent and from Providence, so all peoples around the world should know and observe the tenets of natural law regardless of where they are in the world or their cultural norms. Part of European natural law included the Law of Nations, which asserted that all sovereigns had the right to travel and trade with other peoples, and *mare liberum* proposed that the seas were not owned by any king, and therefore were open to all nations to use for commerce and navigation (Jacques 2009).

As such, *mare liberum* was the first global ocean institution, and applied to pollution, it created an "open system" that had rules limiting neither access nor use. It was not until the 1950s that any international limits to polluting the oceans were developed, and *mare liberum*, in part, explains why it took so long. *Mare liberum* is the reason why there are still places called the "high seas" where little international law exists (see Chapter 10) – though at the end of the twentieth century, the high seas became increasingly regulated, and the first regulations were about oil pollution. However, two core drivers appear to be at the heart of early ocean pollution.

The first cause of ocean pollution was the open-system regime, prior to the United Nations Convention on the Law of the Sea (CLOS), which went into force in 1994 (United Nations Convention on the Law of the Sea 1982). CLOS took decades of negotiation through three conferences called the United Nations Conferences on the Law of the Sea (UNCLOS; on international environmental negotiations, see Chapter 20). UNCLOS I was convened in 1958; it codified *mare liberum* and the freedom to use and navigate the oceans. UNCLOS II met in 1960 because UNCLOS I did not settle any of the disputes that had formed around one central

question: Where does the jurisdiction of a coastal nation end? No agreement was made on these questions at UNCLOS II. UNCLOS III (1973–82), however, produced a landmark treaty that closed down much of the open system by setting up national sovereign control of coasts out to 12 miles, and management of resources (but not sovereign control) out another 188 in exclusive economic zones (EEZs), so that countries, in some cases, control 200 miles out from the shore. Beyond EEZs is the "Area" where resources developed on and below the sea floor are the "Common Heritage of Mankind" and are to be used to raise money for the least developed countries.

The fact that the ocean was an open system and polluters could put whatever they wanted in the ocean without any direct consequences, unless there was relevant domestic law, provided an incentive to pollute. And, typically, ocean regimes have not been very strong unless they were developed after the CLOS in the 1980s (on international environmental regimes, see Chapter 9). However, the collective action problem of the open ocean system only explains some polluting behavior. We will see below that, while some pollution has been reduced, land-based pollution has increased even after CLOS.

Polluters are driven by several plausible and overlapping causes, one of which is the open opportunity described above. The institutional setting, or the types of regimes in place at any particular geography, will have some bearing on polluters' incentives and opportunities. In addition, there are paradigmatic concerns where polluters view the ocean in a particular way. The "old coastal cultures" saw the oceans as a primal, living being with its own agency and will that affected their lives and which they were responsible to, in different cultural contexts around the world (Johannes 1978; Acheson and Wilson 1996; Jacques 2010a). Polluting Mother Ocean comes with very different expectations and more limits than polluting what the English jurist John Seldon called, "som [some] dull heap of matter that Nature could not bring to perfection" (Selden 1972: 172). Today, institutions around the world primarily treat the ocean as a highway for commerce, and certainly not as a "treasure of Mother Earth" (Jackson 1993; Steinberg 2001).

Combined with rules and paradigms are political economic causes of pollution. Political economy refers to the structural conditions that form markets and power. Political economic conditions have changed a great deal since the Second World War, with industrial production and consumption having increased several fold in that time, adding a tremendous amount of waste that has been unaccounted for in our traditional notions of marine pollution (see Chapter 16). This will be discussed further below. First, I will consider the "usual suspects" of marine pollution.

Marine pollution: the "usual suspects"

Oil

The first of the usual suspects in ocean pollution is oil. While many may think that oil pollution is the most important ocean pollutant because it is the one that often makes headlines during a catastrophic shipwreck or other oil tanker spill, most oil pollution in the ocean is emitted from natural seeps in the ocean, and between the 1980s and the 1990s, oil pollution from tanker accidents declined from 140 million gallons per year to 17 million gallons per year (National Research Council 2003). And, of the human sources of oil in the ocean, 90 percent comes from low-level leaks and releases and runoff that comes from extracting and refining oil (National Research Council 2003). Thus, while media may focus on a "tanker on the rocks" the more important oil problems come from continuous, slow, small contributions, such as the oil spill that lasted for about 40 years on the coast of California (Beamish 2002a). In this case, workers, the oil company, and even regulators knew the oil was being spilled into the ocean from an oil

rig on the beach, but no one thought it was a problem until someone called it into the regulators, who already knew, as a whistleblower calling it a problem. Consequently, the important condition for dealing with this low-level but persistent oil pollution is to identify it as a problem, and then remedy the release (Beamish 2002b).

This should not minimize the damage of oil spills of any kind though, because the oil released can stay in the seawater, coastal waterways, and shorelines for a very long time – for example, oil from the 1989 *Exxon Valdez* spill in Alaska, USA, was found in the beaches of the area more than a decade later and it was still toxic. In another case, oil from a spill off Florida's coast was found in sediment a few centimeters under the surface more than 30 years afterward in concentrations like those just after the "accident" (Rabalais 2003). The idea of "accident" should be highlighted here, however, because oil tanker spills and other releases into the ocean in an economic system that relies on oil are a persistent and "normal" part of that system, not an anomaly; and, therefore, regular and substantial tools for responses to spills as well as measures to stop low-level persistent releases should be in place as part of that system.

The first attempts to regulate ocean oil pollution began in the 1920s, but did not succeed until after the establishment of the International Maritime Consultative Organization (now simply the IMO), the international governmental organization responsible for coordinating shipping agreements. In 1954 the London Oil Pollution Convention (OILPOL) designed rules to curb the release of oil by ships. In particular, ships carrying oil would purposefully release "slops," or the mixed oil and water that resulted from putting seawater in an empty tanker for ballast (balance). Prior to OILPOL, an average of 300 tons of these slops per trip were released directly into the ocean; but, afterward, ships could not release slops within 50 miles of the shoreline (Mitchell 1994). Still, none of this addressed tanker accidents, and after the wreck of the *Torrey Canyon* in 1967, a new regime was negotiated. The 1973/78 International Convention for the Prevention of Pollution from Ships (MARPOL) is yet another example of how ocean pollution politics is reactive rather than proactive to *known* hazards, waiting for a crisis to precipitate political action. MARPOL required a permanent and physical change to tankers that was hard to remove once installed, and this made MARPOL compliance much higher than simple change in an expected behavior (Mitchell 1994). Further, 90 percent of oil pollution in the ocean comes from inland sources, and is not addressed in any global regime.

Toxic, hazardous, and nuclear waste

In 1971, the *Stella Maris* left the Rotterdam port with the mission of dumping 650 tons of chlorinated toxic waste straight into the ocean. At that time, this was perfectly legal. Citizen and foreign diplomatic protests forced the ship back to port and led to the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, known as the Oslo Convention or OSPAR. OSPAR later merged with the 1974 Paris Convention that regulated harmful substances discharged from platforms, rivers, and the atmosphere into the North Atlantic. The Paris Convention is important because it demonstrates the feasibility of an international regime to curb inland sources of ocean pollution, but this regime only covers Western European countries.

The 1972 London Dumping Convention is the regime that regulates intentional waste at sea. This regime is thought to be quite successful, and has in fact become increasingly restrictive and precautionary. In the beginning of this institution, there were three levels of waste that could only be dumped if the flag country issued a permit; but, now, waste can only be dumped from ships and ocean platforms if they are on a "safe" list, and these materials still require a permit. Nuclear waste has been more difficult to regulate, but the Convention bans "high level"

radioactive waste, with low levels of radioactive waste allowed through a national permit (Hunter et al. 2006: 737).

Urban runoff and wastewater

Of all the usual suspects, urban runoff is most concerning because it is growing. It is not being reduced like oil spills or radioactive waste – and, in fact, runoff is the major source of oil pollution in coastal waterways. Sometime in 2008, for the first time the human family lived mostly in urban areas, and by 2011 this family was 7 billion strong. Population growth *rates* have slowed compared with the twentieth century, but the family is expected to continue growing to 9–11 billion people (Cohen 2003). These urban centers have both point source (such as a pipe) and non-point source runoff. Point source pollution comes from outlets of human sewage, which is mainly untreated in poor countries where mega-cities have multiplied. Non-point source includes all the contaminants that get washed into the ocean, including dirt that is eroded away and is a serious threat to coral reefs (Fabricius 2005).

This pollution includes organic chemicals, heavy metals, and sludge that contribute to deformity, disease, and death of marine organisms (Decker et al. 2002). Integrated coastal management (ICM) attempts to integrate policies to form a holistic approach to managing coastal pollution, and it has been widely adopted as a way to promote sustainable development of coastal areas. However, runoff has continued to increase, threatening key coastal ecosystems – coral reefs, sea grass beds, mangroves, coastal fisheries, and food webs (Hewawasam 2002).

Sewage fouls coastal areas and harms coral communities, mangroves, and marine life through harmful bacteria, sludge, increased nitrogen and phosphorous, the addition of harmful hormone-mimicking chemicals in the sewage, known as endocrine disrupters, among other problems. Globally, it appears that 66 percent of the world's rivers cannot absorb more of this sewage pollution without serious declines in ecosystem function (Liu et al. 2012). Wealthier industrialized countries have addressed the baseline sewage output through environmental policies and improved infrastructure. However, even in the United States the infrastructure of sewage pipes and treatment facilities was built during a time with a smaller population, less development, and less urbanization, so many of these industrialized systems still shut down after short intervals of, say, 20 minutes, of heavy rainfall (DeGeorges et al. 2010; Duhigg 2009). These sewage systems which normally feed into treatment facilities become overwhelmed, and the valves are shut off, sending feces, storm water, debris, and other pollution into rivers, bays, and coastal waterways (Duhigg 2009).

In poorer countries the situation is much worse, with pipes and sewers, or drainage canals, usually draining untreated into rivers and coastal waterways. The demographic change resulting from massive urbanization has dramatically increased the amount of sewage flowing into the sea, even as environmental policies have improved in many places (Jiang et al. 2001).

Threats to the World Ocean: the "invisibles"

Many of the usual suspects in ocean pollution have been addressed using controls at the source – the ship, the pier, the ocean platform. And this seems to have had some margin of success *at controlling that point source*. However, the new ocean pollution is made up of much more difficult contaminants that create overlapping stresses on the WOS. Unfortunately, there is no point source to look to when we think of heat, carbon, nitrogen, or plastic. The usual institutions, then, will probably not be effective, forcing us to think more holistically about entire political economic system.

Heat

The Earth system has a heat balance – the heat in minus the heat out. Certainly since the last Ice Age, humanity has enjoyed a rather comfortable inter-session that is called the Holocene, where all of civilization has grown up – agriculture, writing, and of course everything in the Industrial Revolution (IR) have occurred within this time period. Before the IR, humanity was mobilizing only small amounts of carbon compared with the rest of nature, but now we have taken control of almost 10 percent of all carbon emissions (Klee and Graedel 2004). At the time of writing, emissions of carbon dioxide have increased by almost 40 percent compared with pre-IR times. Simplistically, because CO_2 absorbs heat, more CO_2 has increased the amount of the "heat in" for the Earth's heat balance (Solomon et al. 2007; Stone et al. 2009). The oceans are the most important place, or "sink," for this heat to go.

Water at the bottom of the Atlantic and the Pacific has warmed, as has the upper 3,000m of the Southern Ocean, while the whole cryosphere(ice)–atmosphere system has been destabilized (Stone et al. 2009). Since the IR, ~84 percent of this added heat has been absorbed by the WOS (Levitus et al. 2005, 2009; Barnett et al. 2005), causing concern that "marine systems are undergoing abrupt shifts to unwanted stable states dominated by microbes, flagellates, bacterial mats, and jellyfish. These opportunistic species are capitalizing on ecosystems stressed by overfishing, eutrophication, pollution, and climate change" (McNeill 2000: 291). Heat pollution, in combination with other factors, is disturbing the WOS *much* more than episodic oil, radioactive, or toxic dumping ever did.

Between 1955 and 2010, the water from 0–2,000 meters warmed by 0.18°C because it absorbed 24 x 10^{22}J, or 240,000,000,000,000,000,000,000J; and "If this heat were instantly transferred to the lower 10km of the global atmosphere it would result in a…warming of this atmospheric layer by approximately 36°C (65°F)" (Levitus et al. 2012: L10603). Thus, the oceans have softened the impacts of global warming, but in the process have absorbed a giant amount of energy. This warming is caused by human emissions that are warming the globe (Barnett et al. 2005). This heat is distributed differently in different regions of large marine ecosystems (LMEs). In the California and Humboldt Currents, cooling was observed. However, in other regions, rapid warming 2–4 times the average rate has been measured (Igor 2009). Ocean warming has already had profound impacts on the WOS (Halpern et al. 2008). For example, changing temperature has already caused shifts in entire food webs in fast, non-linear ways across LMEs through changing the abundance of plankton, the productive base of all marine organisms (McNeill 2000; George 1988; Kirby and Beaugrand 2009).

Naturally, this added heat causes the water to expand, leading to sea level rise (SLR). SLR is caused more and more, however, by the addition of water from inland glaciers. From 1870 to 2000, SLR was 2 mm/year, but this has accelerated to ~3.1 mm/year. Even small amounts of SLR do more than simply raise the shoreline, having also profound consequences inland, causing erosion, loss of salt marshes, shifting and eroding barrier islands, exposing coastal residents to storm dangers, and it puts small island states in an existential crisis (Yamamoto and Esteban 2010). SLR will affect *hundreds of millions* of people in low-lying deltas (such as the densely populated Nile delta), both physically and economically, for at least the next 100 years (Rahmstorf 2012; FitzGerald et al. 2008).

Further, the way the water mixes, as noted above, is changing. The mixing is a fundamental aspect of the MOC. This circulation has slowed by 30 percent between 1957 and 2004, with a dramatic decline in the return of cold water from the deep water (3,000–5,000 m down) to the warmer latitudes (Steffen et al. 2007). This stress may force the WOS into regional or global abrupt shifts, which, in turn, will affect weather and climate patterns, like monsoons, which are

tied to abrupt climactic changes in the past, as well as unexpected changes to biological systems from plankton and fish to apex predators in undesirable ways (Kirby and Beaugrand 2009; McNeill 2000; George 1988; Miles 2009; Wilkinson 2001; Rosenzweig et al. 2008; Alley 2007; McGuire et al. 2006; Overpeck and Cole 2006).

Indeed, one tipping point in the Earth's climate system is the loss of Arctic sea ice (Lenton et al. 2008). The Arctic has experienced non-linear (slow, then fast changes) thinning of ice since the 1960s that accelerated in the early 1990s, with near record lows in 2002–5 (Lindsay and Zhang 2005; Eisenman and Wettlaufer 2009; Winton 2006; Holloway and Sou 2002). It appears that in recent decades, the Arctic sea has lost nearly half of its ice (Winton 2006). By 2007, the Northwest Passage was open for the first time in human memory, allowing ships to pass through the Arctic. Tim Lenton has measured daily Arctic sea ice extent since the availability of satellite measurements in 1979. Models anticipated that the sea ice should have rebounded from that 2007 extreme, but Lenton reports that it has not, and that "The system has passed a tipping point" (Pearce 2012).

Carbon dioxide

Another very important invisible pollutant is carbon dioxide (CO_2). Not only does CO_2 cause greenhouse warming, it also affects the chemistry of the oceans. The main reservoir of the planet's carbon, where most of it is stored, is in the oceans (Houghton 2007). Normally, absorption of carbon into the water is through a process by which carbonate or bicarbonate is created – something similar to what you take for an acidic stomachache. However, as more and more carbon has been taken up by the oceans, the oceans' ability to turn the carbon into carbonate and bicarbonate has slowed, and, instead, the carbon mixes with the ocean water and remains as carbonic acid. As a consequence, the pH has declined – the water has acidified – and the world's oceans are now becoming more acidic because of human emissions of CO_2. Acidification is already being observed and has already affected the development of marine life and will continue to challenge the *basic physiology* of plankton, mussels, coral, and other organisms that depend on calcifying carbon (Doney et al. 2009). Acidification is occurring faster than at any other time in the past 300 million years and is expected to affect fish and other organisms (Bignami et al. 2013; Miles 2009). Like the other "invisibles" there is no way to stop the CO_2 from mixing with sea water once it is emitted; it can only be controlled by reducing CO_2 emissions.

Nitrogen

Nitrogen (N) is truly an ironic contaminant in the ocean because N is a limiting factor for plant growth, and so when we add more N, we get more plant life. However, when enough N is added to marine systems, plant life (phytoplankton) explodes to create algae blooms. When the algae die off, this depletes the oxygen in the water needed by other organisms, in a process called eutrophication. This is the process behind so-called "dead zones" which have grown in step with the industrialization of agriculture, sometimes called the Green Revolution (see Chapter 40). In the Green Revolution, petro-chemicals and biocides were added to agricultural systems to increase food yields. N is added in ammonium nitrate as a fertilizer. In the United States, the destination of nearly all nitrogen fertilizer applied to crops is fresh and marine water systems. Farmers in the USA apply about 12 teragrams (Tg) of nitrogen, and 10 teragrams filter through the soils, unused by the plants (Robertson and Vitousek 2009). N is also added through municipal sewage. Currently, there are over 400 temporary, seasonal, or permanent dead zones around the world, and they usually are in areas that receive industrial N runoff, as in the Gulf of Mexico

which receives runoff from the Midwest agricultural system in the United States (Diaz and Rosenberg 2008; Sonnett 2010). This process can also be spurred by phosphorus in a similar way (Smil 2000; Strauss et al. 2012).

Some scientists believe that by doubling the global amount of reactive nitrogen produced by nature, humanity has exceeded a "planetary boundary" (Foley et al. 2011; Rockstrom et al. 2009a, 2009b). The consequences of nitrogen pollution are profound, and, in addition to coastal hypoxic zones, include the release of a powerful greenhouse gas (nitrous oxide; see Chapter 28), the release of reactive nitrogen in the troposphere, nitrogen deposition in natural areas like forests (see Chapter 38), biodiversity loss (see Chapter 37), compromised air and water quality (see Chapters 30 and 34), and "threats to human health across large areas of Earth" (Robertson and Vitousek 2009: 98).

Plastics

By 2009, 260 million tons of plastic have been produced per year, using about 8 percent of world oil production(Thompson et al. 2009). Plastic pollution comes in different sizes – mega, meso, and micro (big items, medium items, and really small bits). Plastics are different from the other "new ocean pollutants" in that heat, CO_2, and N are all natural, but plastics are synthetic products that *should* be controllable as point source pollution – just stop dumping the plastic, right? Unfortunately, the "majestic life of the plastic bag" (see the mockumentary by the civic group, Heal the Bay 2010) is one that is not easily controlled. Plastics are ubiquitous, lightweight, and durable. One account describes "plastic swallowed by an albatross [that] had originated from a plane shot down 60 years previously some 9600 km away" (Barnes et al. 2009: 1986).

The physical nature of plastic means that it is often buoyant and may last hundreds or thousands of years before it breaks down into simpler minerals. However, plastic often will photodegrade and fragment into pieces, as well as absorb water and other elements as it floats in the sea (Barnes et al. 2009). If you think about a plastic water jug left out in the sun for a few weeks, the plastic does not go away, but it does become brittle. Plastic pieces in the ocean, then, are often micro-pieces that are dispersed across large areas and float under the surface of the water, so it is not feasible to just go scoop them up. Thus, plastic falls into our "invisibles" category under these qualifications. One well-known area where plastic has collected over a widely dispersed zone is in the Pacific, sometimes called the "Great Pacific Garbage Patch"(Law et al. 2010).

The plastic material poses serious problems for marine life which may become ensnared in the material (such as in discarded lines), or may confuse it for food. In autopsies of dead regal leatherback turtles, which confuse floating plastic bags for their main food, jellyfish, over one-third of the animals were found to have blockage by plastic. Plastic comes with other problems, too, because plastics are made with many additives, such as phthalates, bisphenol A (BPA), polybrominated diphenyl ethers (PBDE), flame retardants, anti-microbial agents, and other plasticizers and synthetic polymers and monomers, many of which harm human and animal health. There is concern, for example, that phthalates mimic female hormones, disrupting the endocrine system. In addition, the plastic attracts persistent organic pollutants, creating concentrated doses of these harmful chemicals (Teuten et al. 2007; Zarfl and Matthies 2010; Rios et al. 2010). Plastic enters the WOS through several means including wind, rivers, and sewer systems.

Conclusion

There is little doubt that the complex adaptive systems of the oceans, as part of the Earth system, have crossed "planetary boundaries" and overshot various limits that provide critical ecosystem

life supports required for human well-being (Rockstrom et al. 2009a; Steffen et al. 2011; Wackernagel et al. 2002; Levin and Lubchenco 2008; Chapin et al. 2000; Gallagher and Hammerschlag 2011). One of the largest assemblies of scientists in history in the Millennium Ecosystem Assessment concluded the "bottom line" was that,

> At the heart of this assessment is a stark warning. Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted. The provision of food, fresh water, energy, and materials to a growing population has come at considerable cost to the complex systems of plants, animals, and biological processes that make the planet habitable.
>
> (Millennium Ecosystem Assessment 2005a: 5)

At the global scale, marine pollution has fundamentally changed from the usual suspects to the "invisibles" – most of which are completely natural components, but which are overwhelming the oceanic adaptive cycles. The open system institutionalized by *mare liberum* explains the usual suspects fairly well, but not this new set of problems, in part because the new pollution problems do not come from deliberate marine dumping.

The actors and interests involved in polluting with the "usual suspects" are oil companies, nation-states, militaries, and companies producing toxic synthetic chemicals (see Chapters 7 and 13). There is a lot of power in these sectors, to be sure, but they are sectors. The actors and interests of "new ocean pollutants" are industrial society writ large – industrial energy base emits carbon dioxide that indirectly heats and directly acidifies the oceans, industrial agriculture produces unsustainable N runoff, and industrial production processes generate a ubiquity of plastic. The new pollution is not from any point source, but from the structure of the entire industrial economic system.

Unfortunately, once these new pollutants are created, they generally cannot be controlled and kept out of the ocean – there is no way to keep heat, for example, from warming the oceans. Industrial society produces these crises, but cannot control the consequences, making it a perfect example of Ulrich Beck's (1999) "risk society" (see Chapter 18). Beck argues that there is little in the way of "solutions" per se, until industrial society ends or transitions. However, as it becomes clearer that industrial society, built on an ethos of controlling nature, produces crises (the opposite of control), citizens across the world will challenge the legitimacy of the institutions and actors that have brought us to catastrophe. A combination of small and large actors will ally to challenge other large actors to drive changes. Others are less optimistic, seeing industrial civilization heading to a cataclysmic end as the solutions it uses to solve problems cost more and more and work less and less (Tainter 1988: 215) while it lurches continually toward devastating and irreversible changes.

Social oceanography is a proposed new field of integrated marine social science, that brings social science methods to bear to understand the causes *and* consequences of coupled human–marine systems (Jacques 2010b). It is clear that *everything* we do inland has consequences for the ocean, and we cannot effectively divorce our energy, agricultural, or manufacturing policies from marine systems. In several of these problems, there are *increased* environmental policies that govern water quality and pollution and dumping, but they are foiled by the larger scale and structures of a globalized economy, industrialized consumption that is growing not only in Northern countries, but in rising powers like Brazil, India, and China, and a very large growing urbanized human population (Clapp and Helleiner 2012). Based on Clapp and Helleiner, and others, it appears these structural concerns overwhelm many of our efforts, like better farming techniques to limit N pollution, or efficiency gains in fossil fuel use.

The bottom line is that N, CO_2, plastic, heat, and sewage all continue to increase apace in the face of policies to reduce them (see also Dauvergne 2008). Some scholars have suggested, in fact, that these environmental regimes and global governance reforms between states exist within and for the growth of the market economy (see Newell 2008; Paterson 1999). A social oceanography of marine pollution, then, indicates that we must treat the causes of growth in political economy as one central cause of more and more complicated and degraded marine environments, loss of ecosystems services, and threats to human and non-human health. With integrated social–marine systems, pollution we generate on land affects the marine world, and this marine world is a cornerstone for human well-being.

References

Acheson, J. M. and Wilson, J. A. 1996. Order out of chaos: the case for parametric fisheries management. *American Anthropologist*, 98, 579–59.

Adger, W. N. 2006. Vulnerability. *Global Environmental Change*, 15, 268–81.

Alley, R. B. 2007. Wally was right: predictive ability of the North Atlantic "Conveyor Belt" hypothesis for abrupt climate change. *Annual Review of Earth and Planetary Sciences*, 35, 241–72.

Barnes, D. K. A., Galgani, F., Thompson, R. C. and Barlaz, M. 2009. Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364, 1985–98.

Barnett, T. P., Pierce, D. W., Achutarao, K. M., Gleckler, P. J., Santer, B. D., Gregory, J. M. and Washington, W. M. 2005. Penetration of human-induced warming into the world's oceans. *Science*, 309, 284–7.

Beamish, T. 2002a. *Silent Spill: The Organization of Industrial Crisis*. Cambridge, MA: MIT Press.

—— 2002b. Waiting for crisis: regulatory inaction and ineptitude and the Guadalupe Dunes oil spill. *Social Problems*, 49, 150–77.

Beck, U. 1999. *World Risk Society*. Cambridge: Polity Press.

Berkes, F., Colding, J. and Folke, C. 2003. *Navigating Social–Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.

Bigg, G. 2003. *The Oceans and Climate*, 2nd edn. Cambridge: Cambridge University Press.

Bignami, S., Sponaugle, S. and Cowen, R. K. 2013. Response to ocean acidification in larvae of a large tropical marine fish, *Rachycentron canadum*. *Global Change Biology*, 19, 996–1006.

Bottoms, S. 2012. Climate change "science" on the London stage. *Wiley Interdisciplinary Reviews: Climate Change*, 3(4), 339–48.

Chapin III, F. S., Zavaleta, E. S., Eviner, V. T., Naylor, R. L., Vitousek, P. M., Reynolds, H. L., et al. 2000. Consequences of changing biodiversity. *Nature*, 405, 234–42.

Clapp, J. and Helleiner, E. 2012. International political economy and the environment: back to the basics? *International Affairs*, 88, 485–501.

Cohen, J. 2003. Human population: the next half century. *Science*, 302, 1172–5.

Costanza, R. 2000. *The Ecological, Economic, and Social Importance of the Oceans*. New York: Pergamon Press.

Dauvergne, P. 2008. *The Shadows of Consumption: Consequences for the Global Environment*. Cambridge, MA: MIT Press.

Decker, E. H., Elliott, S. and Smith, F. A. 2002. Megacities and the environment. *Scientific World Journal*, 2, 374–86.

Degeorges, A., Goreau, T. J. and Reilly, B. 2010. Land-sourced pollution with an emphasis on domestic sewage: lessons from the Caribbean and implications for coastal development on Indian Ocean and Pacific coral reefs. *Sustainability*, 2, 2919–49.

Diaz, R. J. and Rosenberg, R. 2008. Spreading dead zones and consequences for marine ecosystems. *Science*, 321, 926–9.

Doney, S. C., Fabry, V. J., Feely, R. A. and Kleypas, J. A. 2009. Ocean acidification: the other CO_2 problem. *Annual Review of Marine Science*, 1, 169–92.

Duhigg, C. 2009. Sewers at capacity, waste poisons waterways. *New York Times*: A1, A18.

Earle, S. 1995. *Sea Change: A Message of the Oceans*. New York: Fawcett Columbine.

Eisenman, I. and Wettlaufer, J. 2009. Nonlinear threshold behavior during the loss of Arctic sea ice. *Proceedings of the National Academy of Sciences*, 106, 28–32.

Fabricius, K. E. 2005. Effects of terrestrial runoff on the ecology of corals and coral reefs: review and synthesis. *Marine Pollution Bulletin*, 50, 125–46.
Fischhoff, B. 1995. Risk perception and communication unplugged: twenty years of Process 1. *Risk Analysis*, 15, 137–45.
Fitzgerald, D. M., Fenster, M. S., Argow, B. A. and Buynevich, I. V. 2008. Coastal impacts due to sea-level rise. *Annual Review of Earth and Planetary Sciences*, 36, 601–47.
Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., et al. 2011. Solutions for a cultivated planet. *Nature*, 478, 337–42.
Folke, C. 2006. Resilience: the emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16, 253–67.
Folke, C., Carpenter, S. R., Walker, B. H., Scheffer, M., Elmqvist, T., Gunderson, L. H. and Holling, C. S. 2004. Regime shifts, resilience and biodiversity in ecosystem management. *Annual Review in Ecology, Evolution and Systematics*, 35, 557–81.
Freudenburg, W. R. 1988. Perceived risk, real risk: social science and the art of probabilistic risk assessment. *Science*, 242, 44–9.
Galaz, V. 2005. Social–ecological resilience and social conflict: institutions and strategic adaptation in Swedish water managament. *Ambio*, 34, 567–72.
Gallagher, A. J. and Hammerschlag, N. 2011. Global shark currency: the distribution, frequency, and economic value of shark ecotourism. *Current Issues in Tourism*, 14, 797–812.
George, S. 1988. *A Fate Worse than Debt: [a Radical Analysis of the Third World Debt Crisis]*. London: Penguin Books.
Grotius, H. 1916. The Freedom of the Seas or The Right Which Belongs to the Dutch to Take Part in the East Indian Trade. Scott, J. B. (ed.). New York: Carnegie Endowment for International Peace/ Oxford University Press.
Gunderson, L. H. and Holling, C. S. (eds.) 2002. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press.
Halpern, B. S., Walbridge, S., Selkoe, K. A., Kappel, C. V., Micheli, F., D'Agrosa, C., et al. 2008. A global map of human impact on marine ecosystems. *Science*, 319, 948–52.
Hassan, R. M., Scholes, R. and Ash, N. 2005. Ecosystems and human well-being: current state and trends: findings of the Condition and Trends Working Group of the Millennium Ecosystem Assessment. *Millennium Ecosystem Assessment* [Online], 1.
Heal the Bay (dir.) 2010. *The Majestic Plastic Bag – A Mockumentary*. Narr. Jeremy Irons. Santa Monica, CA.
Hewawasam, I. 2002. *Managing the Marine and Coastal Environment of Sub-Suharan Africa: Strategic Directions for Sustainable Development*. World Bank Publications.
Holling, C. S. 1973. Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 265, 1547–51.
Holling, C. S. and Gunderson, L. H. 2002. Resilience and adaptive cycles. In: Gunderson, L. H. and Holling, C. S. (eds.) *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press.
Holloway, G. and Sou, T. 2002. Has Arctic sea ice rapidly thinned? *Journal of Climate*, 15, 1691–701.
Houghton, R. A. 2007. Balancing the global carbon budget. *Annual Review of Earth and Planetary Sciences*, 35, 313–47.
Hunter, D., Zaelke, D. and Salzman, J. (eds.) 2006. *International Environmental Law and Policy*. Boulder, CO: West Group.
Igor, M. B. 2009. Rapid warming of large marine ecosystems. *Progress in Oceanography*, 81, 207–13.
Jackson, J. B. C. 2001. What was natural in the coastal oceans? *Proceedings of the National Academy of Sciences*, 98, 5411–18.
Jackson, J. B., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., et al. 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science*, 293, 629–39.
Jackson, M. 1993. *Indigenous Law and the Sea*. Washington, DC: Island Press.
Jacques, P. 2009. The power and death of the sea. In: Kütting, G. and Lipschutz, R. D. (eds.) *Environmental Governance: Power and Knowledge in a Local–Global World*. New York: Routledge.
—— 2010a. International regulation of ocean pollution and ocean fisheries. In: Denemark, B. (ed.) *International Studies Encyclopedia*. Blackwell Reference Online.
—— 2010b. The social oceanography of top oceanic predators and the decline of sharks: a call for a new field. *Progress in Oceanography*, 86, 192–203.

Jiang, Y., Kirkman, H. and Hua, A. 2001. Megacity developments: managing impacts on the marine environment. *Ocean and Coastal Management*, 44, 293–318.
Johannes, R. 1978. Traditional marine conservation methods in Oceania and their demise. *Annual Review of Ecology and Systematics*, 9, 349–64.
Kirby, R. R. and Beaugrand, G. 2009. Trophic amplification of climate warming. *Proceedings of the Royal Society B*, 276, 4095–103.
Klee, R. J. and Graedel, T. E. 2004. Elemental cycles: a status report on human or natural dominance. *Annual Review of Environment and Resources*, 29, 69–107.
Knight, W. S. M. 1925. *The Life and Works of Hugo Grotius*. London: Sweet and Maxwell.
Law, K. L., Morét-Ferguson, S., Maximenko, N. A., Proskurowski, G., Peacock, E. E., Hafner, J. and Reddy, C. M. 2010. Plastic accumulation in the North Atlantic subtropical gyre. *Science*, 329, 1185.
Lehodey, P. and Maury, O. 2010. Climate impacts on oceanic top predators (CLIOTOP): introduction to the special issue of the CLIOTOP International Symposium, La Paz, Mexico, 3–7 December 2007. *Progress in Oceanography*, 86, 1–7.
Lenton, T. M., Held, H., Kriegler, E., Hall, J. W., Lucht, W., Rahmstorf, S. and Schellnhuber, H. J. 2008. Tipping elements in the Earth's climate system. *Proceedings of the National Academy of Sciences*, 105, 1786.
Levin, S. A. and Lubchenco, J. 2008. Resilience, robustness, and marine ecosystem-based management. *Bioscience*, 58, 27–32.
Levitus, S., Antonov, J. and Boyer, T. 2005. Warming of the world ocean, 1955–2003. *Geophysical Research Letters*, 32, L02604.
Levitus, S., Antonov, J. I., Boyer, T. P., Locarnini, R. A., Garcia, H. E. and Mishonov, A. V. 2009. Global ocean heat content 1955–2008 in light of recently revealed instrumentation problems. *Geophysical Research Letters*, 36, L07608.
Levitus, S., Antonov, J. I., Boyer, T. P., Baranova, O. K., Garcia, H. E., Locarnini, R. A., Mishonov, A. V. et al. 2012. World ocean heat content and thermosteric sea level change (0–2000 m), 1955–2010. *Geophysical Research Letters* 39, L10603.
Lindsay, R. and Zhang, J. 2005. The thinning of Arctic sea ice, 1988–2003: have we passed a tipping point? *Journal of Climate*, 18, 4879–94.
Liu, C., Kroeze, C., Hoekstra, A. Y. and Gerbens-Leenes, W. 2012. Past and future trends in grey water footprints of anthropogenic nitrogen and phosphorus inputs to major world rivers. *Ecological Indicators*, 18, 42–9.
Mcguire, A. D., Chapin, F. S., Walsh, J. E. and Wirth, C. 2006. Integrated regional changes in Arctic climate feedbacks: implications for the global climate system. *Annual Review of Environment and Resources*, 31, 61–91.
Mcneill, J. R. 2000. *Something New under the Sun: An Environmental History of the Twentieth-Century World*. New York: W. W. Norton.
Milanese, M., Sara, A., Sara, G. and Murray, J. H. 2011. Climate change, marine policy and the valuation of Mediterranean intertidal ecosystems. *Chemistry and Ecology*, 27, 95–105.
Miles, E. L. 2009. On the increasing vulnerability of the world ocean to multiple stresses. *Annual Review of Environment and Resources*, 34, 17–41.
Millennium Ecosystem Assessment 2005a. Ecosystems and Human well-being: Synthesis. Washington, DC. p.5.
Mitchell, R. 1994. *International Oil Pollution at Sea: Environmental Policy and Treaty Compliance*. Cambridge, MA: MIT Press.
National Research Council 2003. *Oil in the Sea III: Inputs, Fates, and Effects*. Washington, DC: National Academies Press.
Newell, P. 2008. The political economy of global environmental governance. *Review of International Studies*, 34, 507–29.
Overpeck, J. T. and Cole, J. E. 2006. Abrupt change in Earth's climate system. *Annual Review of Environment and Resources*, 31, 1–31.
Paterson, M. 1999. Interpreting trends in global environmental governance. *International Affairs*, 75, 793–802.
Pearce, F. 2012. Arctic sea ice may have passed crucial tipping point. *New Scientist*, 27 March.
Prager, E. and Earle, S. 2000. *The Oceans*. New York: McGraw Hill.
Rabalais, N. 2003. Oil in the sea. *Issues in Science and Technology*, 20, 74–8.
Rahmstorf, S. 2012. Sea-level rise: towards understanding local vulnerability. *Environmental Research Letters*, 7, 021001.

Rios, L. M., Jones, P. R., Moore, C. and Narayan, U. V. 2010. Quantitation of persistent organic pollutants adsorbed on plastic debris from the northern Pacific gyre's "eastern garbage patch". *Journal of Environmental Monitoring*, 12, 2226–36.

Robertson, G. P. and Vitousek, P. M. 2009. Nitrogen in agriculture: balancing the cost of an essential resource. *Annual Review of Environment and Resources*, 34, 97–125.

Rockstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., Lambin, E. F., et al. 2009a. Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society*, 14.

Rockstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., Lambin, E. F., et al. 2009b. A safe operating space for humanity. *Nature*, 461, 472–5.

Rosenzweig, C., Karoly, D., Vicarelli, M., Neofotis, P., Wu, Q., Casassa, G., et al. 2008. Attributing physical and biological impacts to anthropogenic climate change. *Nature*, 453, 353–7.

Sala, E. and Knowlton, N. 2006. Global marine biodiversity trends. *Annual Review of Environment and Resources*, 31, 93–122.

Scheffer, M., Carpenter, S., Foley, J., Folke, C. and Walker, B. 2001. Catastrophic shifts in ecosystems. *Nature*, 413, 591–6.

Selden, J. 1972. Of the dominion, or ownership, of the sea. In: Silk, L. (ed.) *The Evolution of Capitalism*. New York: Arno Press.

Smil, V. 2000. Phosphorus in the environment: natural flows and human interferences. *Annual Review of Energy and the Environment*, 25, 53–88.

Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K. B., Tignor, M. and Miller, H. L. (eds.) 2007. *Climate Change 2007 – The Physical Science Basis: Contribution of Working Group I to the Fourth Assessment Report of the IPCC*. New York: Cambridge University Press.

Somero, G. N. 2012. The physiology of global change: linking patterns to mechanisms. *Annual Review of Marine Science*, 4, 39–61.

Sonnett, J. 2010. Climates of risk: a field analysis of global climate change in US media discourse, 1997–2004. *Public Understanding of Science*, 19, 698–716.

Steffen, W., Crutzen, P. J. and Mcneill, J. R. 2007. The Anthropocene: are humans now overwhelming the great forces of nature? *Ambio: A Journal of the Human Environment*, 36, 614–21.

Steffen, W., Rockström, J. and Costanza, R. 2011. How defining planetary boundaries can transform our approach to growth. *Solutions*, 2(3).

Steinberg, P. E. 2001. *The Social Construction of the Ocean*. Cambridge: Cambridge University Press.

Stone, D. A., Allen, M. R., Stott, P. A., Pall, P., Min, S.-K., Nozawa, T. and Yukimoto, S. 2009. The detection and attribution of human influence on climate. *Annual Review of Environment and Resources*, 34, 1–16.

Strauss, B. H., Ziemlinski, R., Weiss, J. L. and Overpeck, J. T. 2012. Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States. *Environmental Research Letters*, 7, 014033.

Tainter, J. A. 1988. *The Collapse of Complex Societies*. Cambridge: Cambridge University Press.

Teuten, E. L., Rowland, S. J., Galloway, T. S. and Thompson, R. C. 2007. Potential for plastics to transport hydrophobic contaminants. *Environmental Science and Technology*, 41, 7759–64.

Thompson, R. C., Swan, S. H., Moore, C. J. and Vom Saal, F. S. 2009. Our plastic age. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364, 1973–6.

United Nations Convention on the Law of the Sea (CLOS) of 10 December 1982. *Law of the Sea*. Division of Ocean Affairs and the Law of the Sea.

Vieira, M. B. 2003. *Mare liberum* vs. *mare clausum*: Grotius, Freitas, and Selden's debate on dominion over the seas. *Journal of the History of Ideas*, 64, 361–77.

Wackernagel, M., Schulz, N. B., Deumling, D., Linares, A. C., Jenkins, M., Kapos, V., et al. 2002. Tracking the ecological overshoot of the human economy. *Proceedings of the National Academy of Science*, 99, 9266–71.

Walker, B. 2002. Resilience management in social–ecological systems: a working hypothesis for a participatory approach. *Conservation Ecology*, 6.

Walker, B., Gunderson, L., Kinzig, A., Folke, C., Carpenter, S. and Schultz, L. 2006. A handful of heuristics and some propositions for understanding resilience in social–ecological systems. *Ecology and Society*, 11.

Wilkinson, I. 2001. Social theories of risk perception: at once indispensable and insufficient. *Current Sociology*, 49, 1–22.

Winton, M. 2006. Does the Arctic sea ice have a tipping point. *Geophysical Research Letters*, 33, L23504.

Worm, B., Barbier, E. B., Beaumont, N., Duffy, J. E., Folke, C., Halpern, B. S., et al. 2006. Impacts of biodiversity loss on ocean ecosystems. *Science*, 314, 787–90.

Yamamoto, L. and Esteban, M. 2010. Vanishing island states and sovereignty. *Ocean and Coastal Management*, 53, 1–9.

Zarfl, C. and Matthies, M. 2010. Are marine plastic particles transport vectors for organic pollutants to the Arctic? *Marine Pollution Bulletin*, 60, 1810–14.

36

Fisheries and marine mammals

Elizabeth R. DeSombre

Protecting or conserving the animal resources – be they fish or mammals – that live in the ocean is among the most difficult of global environmental issues. Large portions of the oceans are international space, owned by no one and accessible by many. Fisheries are common pool resources, meaning that it is difficult, either practically or legally, to exclude others from access to them, and that use by some diminishes the ability of others to use the resource. Uncertainty is rampant, about the condition of the resource and about the behavior of those who make use of it (and, sometimes, about the relationship between the two) (see Chapter 18).

But fishery resources (including marine mammals) create their own incentive for management: if enough members of a given species remain in the ocean, they will reproduce and thereby create the next generation, and at least some of them do so on a reasonably short time frame for natural resources. If those who harvest them can successfully cooperate to ensure that sufficient numbers remain, they will be able to continue harvesting these resources indefinitely. Yet even with this incentive structure it has been difficult to manage international fisheries or marine mammal populations successfully.

The history of efforts to protect marine fisheries and mammals suggests that the difficulties can overwhelm the incentives for cooperation, especially when there is some level of uncertainty about stock sizes or behavior of fishing vessels. Increased national control of some ocean resources failed to protect fish stocks, because states instead worked to increase fishing capacity. Even the most successful cooperative efforts regionally to conserve some fish stocks have suffered from the global nature of the fishing industry, in which capacity can move from one area to another in response to restrictions or opportunities. Some of the most successful protection of ocean resources came in the case of marine mammals, by changing the reason they are protected – moving them from a resource to be harvested sustainably to individuals protected from harm. Even then, this redefinition is contentious and thus fragile, and the future protection of fisheries and marine mammals remains in question.

Resource overharvesting

Ocean fish and mammals have provided protein and other resources for human populations for millennia. As long as the human population was sufficiently low and fishing technology simple,

there was little human impact on the availability of fish resources globally. Technological innovation made fishing, and the distribution of fish and marine mammal resources worldwide once caught, much more efficient over time, and thus contributed to the human ability to affect marine resources on a global level.

These technological advances included storage and transportation; refrigeration (and freezing) both on land and at sea made it possible for ships to stay out for long periods and travel far to catch previously inaccessible fish or whales, and to transport them to new markets (inland or overseas) once they are landed. The decreasing cost and increasing speed of transport also meant that fresh fish could be shipped long distances. Increasingly available and decreasingly expensive air travel allowed high-value fish like bluefin tuna to reach Japanese markets where the freshness of fish mattered if it were to be eaten raw (Kurlansky 1997; Cushing 1988).

Some of the most important technologies included those that allowed fish to be found, and harvested, more efficiently. Mechanization allowed enormous nets or lines to be deployed and hauled in. Radar and then sonar were used to locate large schools of fish. Global Positioning System (GPS) technology aided ships in navigation to fishing grounds, and gear (or productive fishing areas) to be located. Increased sophistication of technology makes it possible for a smaller number of fishers to catch more fish (Roberts 2007; Cushing 1988).

This technology has frequently been underwritten by national subsidies, as states encouraged development of domestic fishing fleets, both for reasons of food security and to have ready access to naval capacity in times of war. Almost every country in the world with a fishing fleet subsidizes it in one way or another, and there are many different ways that fishing can be subsidized, from low-interest loans or grants for ship modernization or purchasing, to assistance with operating costs (such as exemptions from fuel taxes). Subsidies ultimately lead to overcapitalization, an increase in investment in fishing capacity beyond what the resource can support (UNEP 2004).

This technological innovation and subsidization led to ever-increasing catches, from a global average of approximately 2 million tonnes in 1850, to 10 million tonnes annually by 1930 and reaching 20 million tonnes per year by 1950. These catches continued upwards, reaching a peak of almost 90 million tonnes per year in the late 1990s. Since then they have declined somewhat, holding steady at around 80 million tonnes per year. Current catches are likely not sustainable, and certainly do not allow for continued growth in fishing. The United Nations Food and Agriculture Organization estimates that 80 percent of global fish stocks are overfished or incapable of sustaining any additional fishing pressure (UN Food and Agriculture Organization 2009).

Managing fisheries

As soon as it became clear that human fishing efforts were having an effect on fish stocks, either regionally or globally, states understood the necessity of cooperating to attempt to prevent overfishing. Because most of the ocean has, historically, been un-owned space, there was no governmental entity with the authority to prevent overfishing. There was also serious likelihood of fishers or states free-riding on the efforts of others to protect the resource; even if fishers would gain collectively by fishing at a level that would allow fish stocks to replenish over time, individual fishers would be better off if others conserved and they continued to catch at preferred levels. Even those hoping to act collectively realize that if others do not, their good behavior will be undermined and the stocks might collapse. Fishery conservation can thus only be achieved collectively, and on the open ocean, these issues could only be addressed internationally via voluntary cooperative efforts.

Underlying fisheries management globally at this point in time is the United Nations Convention on the Law of the Sea (UNCLOS), a sweeping global treaty negotiated in 1982

with the intention of covering all aspects of ocean regulation (see Chapter 35). Although its breadth decreases its ability to formulate specific rules, the agreement did create two important structures for fisheries regulation. The first was the expansion and codification of what came to be known as Exclusive Economic Zones (EEZs) – areas extending from coastlines that states have jurisdiction over. States have always had a territorial sea – a small stretch of ocean (previously 3 nautical miles) extending from the shore that they have been allowed to control in the same way they control their territory. But beginning in the 1940s some Latin American states started to declare jurisdiction of 200 miles or more, which created a patchwork of unilateral and sometimes conflicting claims of control over ocean spaces and resources. UNCLOS, the negotiations of which were completed in 1982, extended the territorial sea to 12 miles, and created EEZs out to 200 miles. In these areas states were permitted to control access to resources. This process put more than 35 percent of ocean spaces (Sanger 1986: 67), and the vast majority of commercially caught fish (Colson 1995: 100), under some form of national jurisdiction.

A large part of the logic for this extended zone of control was that it would help protect fisheries resources. Because the common pool resource nature of fisheries led to cooperation problems – and problems when states failed to cooperate – it was logical to assume that putting the resources of large parts of the oceans under state control could ameliorate that problem. Fishers from different nationalities would no longer be competing for the same fish, and in nationally controlled spaces governments actually had the jurisdiction to impose and enforce management priorities.

Although states did, indeed, kick foreign fishers out of their newly controlled waters, the broader principles of successful management were not implemented. Many states responded to the new control over resources by subsidizing domestic fishing fleets, thereby increasing global fishing capacity, and threatening to overwhelm the fish stocks newly released from foreign fishing pressure. Moreover, few states responded by strict regulation of national fishing inside their EEZ. To the extent that there were regulations they were often collective (rather than individual) catch limits, thereby increasing the incentive for overcapitalization as fishers now turned to competition with other vessels of the same nationality where they had previously competed with foreign fishers (Scheiber 2001). Fish stocks in these newly nationalized areas frequently declined, sometimes precipitously, as was the case with cod in Canadian Atlantic waters. This new global capacity then also competed in international waters as vessels moved elsewhere in search of increasingly scarce fish stocks.

Other issues were not resolved by UNCLOS, most notably the fish that straddled the EEZs of multiple states or those that swam long distances across the ocean, perhaps crossing from EEZs to the high seas and back. Although UNCLOS directed states to cooperate in addressing these stocks, in practice states resisted such cooperation, and these species were the subject of conflict (Mack 1996). The United Nations convened a conference in 1993 to negotiate a way to address this situation; the result was the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995). It does not lay out an actual management process for dealing with these fish stocks, but rather makes clear the necessity to cooperate to address them and the obligation of states to join the relevant regional fishery management organizations or comply with their regulations, if fishing for species regulated by these organizations, and allow for the enforcement of rules to manage these fish stocks (*Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* 1995: Articles 8, 13 and 19–23).

Regional fishery management organizations

Most international efforts to protect fish stocks in international waters are undertaken through Regional Fishery Management Organizations (RFMOs). These are organized by species, region, or some combination of the two, like the Indian Ocean Tuna Commission, the Northwest Atlantic Fisheries Organization, or the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

The regional and species-based organization of international fisheries management is, in part, a historical accident, as the first agreements arose to address specific management issues. The International Convention for Regulating the Police of the North Sea Fisheries Outside Territorial Waters, for example, was negotiated in 1882 to harmonize domestic fishing regulations (and enforcement) among Great Britain, Germany, France, Denmark, and Belgium. The Agreement for the Establishment of the Asia-Pacific Fishery Commission (1948) created a research and regulatory process for fishing in that region that still exists today.

The proliferation of RFMOs may in part have been path-dependent: once some organizations had been created, this management model was easy to adapt for the next stock or region in need of cooperation. Management by species or region also avoided the difficulties of having to gain the agreement of large numbers of states over multiple issues (a problem UNCLOS itself later demonstrated). And although RFMOS have had varying degrees of success, initial regional cooperation at least helped to address coordination problems among states and allow for collective research and decision-making (on international environmental cooperation generally, see Chapter 8).

Prior to the UNCLOS-codified expansion of EEZs, these regional agreements addressed fisheries management outside of territorial seas; in the wake of the new nationalization of management of resources some RFMOs changed their mandates (or reconstituted themselves altogether) to reflect their new jurisdiction; some, however (especially those protecting highly migratory fish stocks), maintained their regulation of the relevant stocks wherever they were found (Peterson 1993). Although each RFMO runs in its own way there are some common elements across RFMOs generally. Almost all RFMOs have open membership – any state with vessels fishing in the region can join. Most RFMOs have two central components (although many have others as well): a scientific committee (sometimes called a council) and a commission. The scientific committees are charged with either conducting, or, more frequently, aggregating, the relevant scientific research on stock health to inform the political decisions; often this committee makes recommendations about sustainable catch levels (on science in global environmental politics, see Chapter 17).

The commission is designed to decide on the actual rules that must be followed. Any actual regulations are passed by the commission. RFMOs set out in their founding documents what types of rules they can adopt, but these most frequently involve catch limits, opened or closed areas or seasons for fishing, size limitations on the fish caught, gear restrictions, and (less frequently) bycatch limits. The process of passing these rules varies by organization, but generally each member state has one vote. Commissions usually meet annually (or at least every two or three years), and regulations are passed at each meeting. This process gives commissions the ability to adapt to new information about improving or declining stock health as they create regulations, and is more responsive than regulations that last for a longer period. These procedures combine to allow for rapid changes in regulations that can take account of new scientific information and the potential impacts of previous regulatory decisions. But they also allow for political factors (such as the interests states have in supporting their domestic fishers) to trump scientific ones in the setting of quotas (see Chapter 17).

Although recently created RFMOs frequently require unanimous voting to pass rules, historically it was more common to require instead a majority or supermajority (such as three-quarters) vote. RFMOs that use non-unanimous voting almost always include an objections procedure (also called a reservations procedure) by which states that did not vote in favor of a rule that nevertheless passed can opt out of being bound by it. The process used by the Northwest Atlantic Fisheries Organization is illustrative. Rules can be passed by simple majority. Within 60 days after a regulation has been passed, any state may lodge an objection, which means that it chooses not to be bound by that obligation. Because a state that might have been willing to follow the rule if every state agreed to take it on might feel differently if it knew that some states were objecting, an additional 40 days is allowed after a state has lodged an objection to allow other states to do so as well. If a majority of states, by the end of this period, have objected to the measure, it does not become binding. Otherwise, it does, but only for those that have not objected to it. In addition, states may remove their objections at any time (*Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries* 1978: Article XII).

This objections process is controversial, and has occasionally resulted in fishing seasons in which none of the major fishing states in an RFMO were bound by some of the rules the organization had passed (Schiffman 2008). But without such a rule non-unanimous voting would not be possible, and regulation could not move forward without the agreement of all states, including those most reluctant to accept regulation. Situations in which most major states opt out of rules are counterbalanced by those in which many do agree and the process of regulation can move forward. In the best situations states that have initially objected to a rule can be persuaded to remove their objections.

Other potential difficulties plague efforts within RFMOs to pass regulations sufficiently stringent to ensure the sustainability of the fish stocks they oversee. Frequently there is a difference between the catch levels recommended by scientific committees and the catch limits agreed to by fisheries commissions. Not surprisingly, that difference usually involves the rules allowing for larger catches than the scientific process recommended (Barkin and DeSombre 2013). Once rules are passed, there is also the potential for non-compliance. Although discussions of problems with global fisheries regulation often use the acronym "IUU" (for Illegal, Unreported, and Unregulated) fishing, actively illegal fishing (much of which is also unreported) is different conceptually than unregulated fishing, and worth discussing in its own right. Although ships and states find many ways to avoid being bound by fishing regulations (hence counting as "unregulated") – some of them discussed elsewhere – non-compliance involves fishing in a manner that contravenes regulations the vessels are unquestionably obligated to follow.

It is remarkably easy to avoid international rules. The ocean is vast; fish move around in it and individual ships are difficult to keep track of at any moment. Each fishing vessel has the opportunity to obey, or disobey, existing rules every time it catches fish, and there are too many commercial fishing vessels for anyone to realistically check at all moments whether a given ship is obeying the rules. Vessels can catch fish of the wrong size or species or in the wrong location, and can use prohibited gear; in some cases ships even falsify log books so that their records show compliance with rules they are nevertheless breaking. Some efforts, discussed below, have managed to decrease the ability of ships to break fishing regulations they are obligated to uphold, but non-compliance is a more difficult problem for international fisheries regulation than for many other issues of international cooperation (see Chapter 8).

Problems with existing regulatory approaches

There are some advantages to small numbers of organizations that focus on a certain area or set of species. Uncertainty is a major issue in fisheries management, and the scientific analysis can

focus on the information relevant to the actors and the species in the region the organization oversees. Agreement on management is difficult enough with a small number of actors; increasing the number of those participating in any decisions might make agreement more difficult. But there are difficulties created by this approach as well. Although regulation is regional, the high-seas fishing industry is, for the most part, global. The largest fishing fleets or companies, when faced with regulation in one species or region, can switch to another species or region to continue catching fish. In this type of situation, successful fisheries management in one region may help address problems there, but only shifts the capacity elsewhere, depleting additional stocks and causing problems in new regions (Barkin and DeSombre 2013).

The other way that fishing vessels can escape regulation is by changing their registration. All ships are required by international law to be registered with a state; this registration determines the nationality of the vessel and hence the domestic and international regulations it must follow. The phenomenon of open registration (also derisively called "flags of convenience," FOC) involves states offering registration to vessels owned by non-nationals, as a revenue-generating mechanism (because taxes and registration fees can be collected). One way to lure ships to register is to keep regulation levels low, which can include remaining outside of international cooperative agreements, since ships are only bound by international rules their registry states have taken on (DeSombre 2006).

This use of flags of convenience in order to escape international regulation has been a major problem for RFMOs. Approximately 10 percent of the major commercial fishing vessels are registered in open registries (DeSombre 2005), with other sources estimating numbers as high as 21.5 percent (ICTFU et al. 2002) and noting that FOC-registered vessels are likely to be larger than average (Gianni and Simpson 2004). RFMOs can see the effects of this open registration. Recent estimates of the impact of fishing in the regulatory area by vessels flagged in non-member states (most of which are FOCs) has ranged from 10 percent in some RFMOs (such as International Commission for the Conservation of Atlantic Tunas and the Indian Ocean Tuna Commission; OECD 2004) to between 15 and 35 percent for the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) (Swan 2002) and considerably higher than that in the Commission for the Conservation of Antarctic Marine Living Resources (Lack and Sant 2001).

Recently, however, this situation has improved, due to carefully crafted action by RFMOs. Although they cannot (practically, or in many cases legally) exclude vessels that are not members of the organization from fishing in a given management area, they have created a tracking process to require vessels fishing within the rules to document their catches and allow – or sometimes require – states that permit these catches to be landed or transshipped to do so only if it can be demonstrated that they were caught within the regulatory process. In other words, member states in the RFMOs can exclude unregulated catches from their markets, thereby decreasing the value to the vessels of catching fish outside the regulatory process (DeSombre 2005).

While this approach has certainly not eliminated the problems of flag-of-convenience fishing, it has persuaded some FOCs to join RFMOs where their vessels are fishing and in other cases caused registry states to remove fishing vessels from their rolls. And although those who catch fish outside these RFMOs can continue to find markets on which to sell them, the price these fish fetch is considerably lower than when sold in the major fish markets from which fish caught outside the regulatory process are excluded. For example, in CCAMLR, undocumented catches of regulated species fetch a price that is consistently 20 to 40 percent lower than documented catches (Stokke and Vidas 2004).

Another difficulty with the RFMO regulatory focus on species is the problem of bycatch. A 1997 estimate by the United Nations Food and Agriculture Organization (FAO) suggested that one-quarter of all global fish catch is non-target species (Clucas 1997); a more recent

(Davies et al. 2009) estimate calculates global bycatch at approximately 40.4 percent of marine catches. Often these fish are returned to the ocean, but mortality from discarded catches is extremely high (up to 100 percent), and the methods, like trawling, that produce the greatest bycatch are also responsible for the greatest mortality from bycatch (Pascoe 1997). Commercial fishing operations discard between 18 and 40 million tons of fish annually of non-target species (Kock et al. 2007). Bycatch also poses a problem for scientific analysis; neither the discards nor their levels of mortality are generally recorded (Hilborn and Walters 1992). Scientific efforts to estimate catches thus undercount actual fishing mortality, and extent of depletion may be much greater than expected for a given catch limit, making recovery or sustainability estimates inaccurate.

RFMOs have attempted to deal with bycatch issues, often through gear restrictions, fishing techniques, or other prohibitions. Mandating or prohibiting certain types of fishing gear is frequently used to address the bycatch of non-fish species, such as turtles, marine mammals (discussed below), or birds. Shrimp fishers in many areas are now required to use "turtle excluder devices" (TEDs), escape hatches in shrimp trawl nets, that allow sea turtles pulled in with shrimp to escape before the nets are hauled in. In order to prevent seabirds from being caught in swordfish longlining, some RFMOs mandate the use of circle hooks that are much less likely to ensnare birds. In addition, some RFMOs have bycatch limits, closing the fishery (regardless of catch of target species) once they are reached (Lodge et al. 2007). A related regulatory problem is the issue of high-grading, or catching more fish than allowed, keeping those that are highest value, and discarding the rest overboard; as with bycatch, most fish discarded in this manner do not survive (Chopin et al. 1996). Although high-grading is most common when there are catch limits, it can also happen when there are physical limits fishers must contend with, like space or cooling/freezing capacity (Arnason 1994).

In addition, RFMOs continue to face the problem of non-compliance with existing rules. Most RFMOs rely on self-reported data. States are obligated to report catches by the vessels they register, and to ensure that their ships are following the rules. Ship crews have an incentive to underreport catches and states have little incentive to police their own ships. While it has been difficult to even estimate the extent to which ships bound by international regulation are evading it, there is circumstantial evidence that some are (such as improbably distributed catch sizes or locations); recently the Australian Scientific Committee to the CCSBT, for example, concluded from an analysis of Southern bluefin tuna sold at the Japanese wholesale fish markets that the number sold exceeded the number reported as caught by Japan and the other states that provide tuna to those markets by at least 100 percent (Polachek and Davies 2008). There is also the occasional spectacular example of ships caught with illegal catches and illegal gear, falsified logbooks, or hidden storage areas (Springer 1997).

Efforts to address this non-compliance are intrusive and controversial, but have been increasingly accepted in contexts where non-compliance is rampant. One early approach was the exchange of observers on fishing vessels so that nationals from one state would observe and report on fishing behavior on another state's vessels. This practice was initiated in the regulatory process for whaling. Other fishery commissions experimented with observer exchanges, including CCAMLR and a robust current one in the Inter-American Tropical Tuna Commission, ensuring that dolphins are not harmed in the course of tuna fishing (as discussed below). Observer schemes are expensive, however, and observers regularly report harassment or bribery in efforts to prevent them from reporting illegal behavior (Rojas 2008).

A more recent approach is a vessel monitoring system (VMS), in which a satellite (or sometimes radio) tracking system is mounted on a fishing vessel. It relays real-time information about its position and speed either to regulatory agencies within registry states or to regional fishery

management organization headquarters. This technology is used by some regional fishery management organizations, such as in the Patagonian toothfish fishery in Antarctic waters and for Southern bluefin tuna caught under the auspices of the CCSBT. The information provided by this technology can be used to determine whether fishing happened within the proper regulatory area. Although there are incidences of falsifying tracking data or moving catches to unregulated areas once tracking commenced, a VMS system is one approach to monitoring compliance.

Catches can also be inspected at the point of landing, and frequently are; vessel monitoring or observer reports contribute to this process. But it may nevertheless be impossible to determine at that point whether the fish were caught using the proper procedures, and truly illegally caught fish are likely landed in difficult-to-monitor locations. In short, because of the vast and distant spaces and large number of actors involved in ocean fishing, it is much more likely than in other resource extraction or environmental issues that international rules are regularly broken.

Marine mammal conservation

Historically marine mammals were simply considered another "fishery," although they are, of course, not actually fish. But they were addressed in the same way as any other resource to be harvested. In that capacity they suffered many of the same problems that face fisheries conservation currently, with overharvesting rampant, and difficulties setting and enforcing catch limits. Some of the earliest international cooperation efforts emerged in the context of marine mammal conservation. One of the earliest international resource agreements of any sort was the Fur Seal Treaty of 1911 (officially the Convention between the United States, Great Britain, Russia, and Japan for the Preservation and Protection of Fur Seals), which attempted to use biological indicators to ensure that seals (and other marine mammals such as otters) were not overharvested. It outlawed hunting of these species in the open ocean and protected the most endangered species from being hunted on land (*Convention between the United States, Great Britain, Russia, and Japan for the Preservation and Protection of Fur Seals* 1911: Articles I and III).

Similarly, there have been many international efforts to conserve whale stocks globally. The first of these was the Geneva Convention for the Regulation of Whaling, negotiated under the auspices of the League of Nations in 1931. It limited the taking of especially depleted species, such as right whales, and prohibited the taking of whale calves. Because this agreement was not signed by some of the important whaling states at the time, such as Germany, Japan, and the Soviet Union, its effectiveness was hindered (Frances 1990: 209–10). A second global agreement, the International Agreement for the Regulation of Whaling, was attempted in 1937. It attempted to regulate through the setting of season and catch size limits, rather than through catch limits, and ultimately had little success in protecting whale stocks (Francis 1990: 210). Negotiations of additional protocols continued, in an effort to make the agreement more effective, but the best protection for whale stocks came during the Second World War, when whaling largely ceased because of the fighting, and many whale stocks recovered.

The agreement that currently oversees international whaling efforts is the International Convention for the Regulation of Whaling, negotiated in 1946. As with other early whaling (and marine mammal agreements more generally) it was intended as a conservation treaty, restricting catches so that "increases in the size of whale stocks will permit increases in the number of whales which may be captured without endangering these natural resources" (*International Convention for the Regulation of Whaling* 1946: preamble). It created an International Whaling Commission (IWC) to make decisions (with advice from a Scientific Committee) annually on regulations about whale catches. The decision process for rules about catch limits requires a three-quarters majority vote. The same type of process described above for RFMOs

allows states to "object" to (opt out of) rules by following a particular process within 90 days after they are passed (and then, if some do object, others are given an additional period of time during which they can also object). This process resulted in some whaling seasons in which the majority of the whaling states opted out of the regulations passed.

The IWC creates regulation through a "schedule," passed every year. Over time the approaches it takes to conservation have evolved. The Commission began by following pre-IWC practice of regulating catches in "Blue Whale Units" rather than by specific numbers and species – a comparison based on how much oil each whale contained (since whale oil was the primary product that came from whales at the time) designated in comparison to the largest whale species. Quotas during this period were global, rather than allocated by state or vessel, leading to a form of competition for who could catch whales the fastest, which came to be known as the "Whaling Olympic." Since the whaling season closed after the annual quota had been caught, those who caught whales fastest would bring in the greatest numbers. Owners of whaling vessels had an incentive to increase size and technological sophistication of their ships in order to be able to find and catch whales before others could. As ships became faster and more sophisticated, the length of the whaling season decreased dramatically, moving from 112 days in 1946 to only 64 days by 1951 (Clark and Lamberson 1992: 107–9).

By 1972 the IWC had moved to regulating by species (or sometimes subspecies) and region, with the catching of some especially endangered species prohibited altogether. It was difficult, however, to gain agreement to decrease quotas to a low enough level and by the 1970s whale stocks were unquestionably depleted. The IWC began debating the possibility of a moratorium on commercial whaling, to allow whale stocks the chance to recover; this moratorium (officially an annual quota set at zero) was finally passed in 1982, to take effect beginning with the 1986 whaling season.

Early marine mammal conservation efforts had mixed success, and often demonstrated in a particularly stark way the difficulties of international cooperation to protect ocean resources. Some of the clearest problems of non-compliance were witnessed in the case of whaling, for instance. In the early years of international cooperation efforts there were minimum catch sizes required, so that juvenile whales would not be caught before they had the chance to reproduce. As with almost all international agreements, information on catches was self-reported, and there were years in the 1960s when 90 percent of whale catches were reported at within one foot of the legal minimum, a statistical impossibility (Birnie 1985: 338).

Whaling also provides the clearest example of intentional state-level non-compliance (see Chapters 7 and 10). After the collapse of the Soviet Union, scientists in Russia released the official state-level statistics that were kept on whale catches, which were different from those submitted to the IWC. The Soviet Union had reported catches during this era that were entirely in line with its obligations, while its actual catches were not within legal limits and often included catches of species that were under moratorium and should not have been caught at all (Brown 1994). In addition to demonstrating the difficulties of monitoring and implementation of international agreements this episode demonstrated the relationship between scientific research and compliance (see Chapter 17). During this period some of the species, such as humpback, right, and blue whales that were under moratorium, were failing to rebound as scientific models predicted they should have if, as reported, none were being caught. This misreporting made scientific estimate of stock recovery or future sustainable harvesting unreliable ("Call Me Smiley" 1994).

From conservation to preservation

What is particularly interesting about efforts to protect marine mammals, however, is that the reason and process for protecting them has changed over time, from seeing them as a resource

to be hunted sustainably so that they can continue to be used over time, to seeing them as entities deserving of protection as individuals. This view is not universally accepted. There are enormous political fights in regulatory contexts among states that believe these species should be considered in the same way as any other resource and harvested in a sustainable manner, and those that argue that they should not be harmed for their own sake. But the latter view has played an increasingly important role in how they have been protected.

This context has been clearest in the case of dolphins. Although there are some places where small cetaceans are hunted as a resource, most frequently by indigenous populations, dolphins are often killed as bycatch in the process of fishing for other species. That has been particularly true of fishing for yellowfin tuna in the Eastern Tropical Pacific (ETP) Ocean. In that region, dolphins school with tuna, for reasons that are not entirely understood. Because dolphins, as mammals, have to surface to breathe, they are much easier to locate than are schools of tuna, which remain under the water. A standard fishing technique developed in the 1950s to take advantage of this association. Fishers would encircle dolphins with purse seine nets, to catch the tuna that would be schooling below. As the nets were drawn closed to gather in the fish, the dolphins would be held under water and would drown.

By the early 1970s, dolphin deaths in the ETP from this practice were above three hundred thousand annually (Bonanno and Constance 1996: 127). An exposé of these dolphin deaths by an environmental organization helped change public opinion in the United States; the United States was the biggest fishing state in this region at that point (DeSombre 2000; on public opinion, see Chapter 26). This public outrage helped lead to the passage in the United States in 1972 of the Marine Mammal Protection Act, which imposed restrictions on behavior harming marine mammals. Beginning in 1974 the National Marine Fisheries Service created quotas for how many dolphins could be killed in this fishing process.

Complicated political struggles followed, in which the United States, in part to appease its domestic tuna fishing industry, imposed economic sanctions on states that did not follow the same fishing practices (and prevent the same number of dolphin deaths) as US tuna fishers (DeSombre 2000). These sanctions, poorly designed from a trade perspective, were twice ruled illegal by the dispute-resolution procedure of the General Agreement on Tariffs and Trade (DeSombre and Barkin 2002), but nevertheless led many fishing vessels to change their tuna-fishing practices to protect dolphins sufficiently that their tuna could be exported to the United States. At the same time, many US tuna vessels left the region, either moving to fish elsewhere, or changing registration to other states with laxer dolphin-protection regulation.

The Inter-American Tropical Tuna Commission (IATTC), more importantly, took up the mantle of dolphin protection. As the RFMO that regulated fishing behavior in this region, it was the most obvious international organization to get involved in addressing this issue. It began examining the relationship between tuna fishing and dolphins in the 1970s. The IATTC led the creation of the Agreement for the Conservation of Dolphins (also known as the La Jolla Agreement) in 1992, which created continually decreasing mortality limits on dolphins in the context of tuna fishing, and observer coverage on all member vessels, to ensure that rules about protecting dolphins were followed. Dolphin mortality in tuna fishing has dramatically decreased from this combination of endeavors.

This shift of approach to protecting marine mammals has also contributed to the way whales are protected in the International Whaling Commission. "Save the Whales!" became a cry of the early environmental movement, and whales were seen as worthy of saving not because they are a resource, but because they are seen as individuals that can feel pain, are intelligent, and form strong family relationships (D'Amato and Chopra 1991; see Chapter 14). Some traditional whaling states, like the United Kingdom, the United States, Australia, and New Zealand, shifted

to oppose whaling, driven largely by domestic pressures. In the United States, the transition officially came with passage of the Marine Mammal Protection Act in 1972.

There was no question that the process of regulating whaling as a resource conservation effort had failed to successfully conserve whale stocks. When the moratorium was initially passed, it was through the combined agreement between whaling states that recognized that whaling had to pause in order to allow stocks to regenerate, and those states that had concluded – due largely to domestic animal-rights pressure – that whaling for any reason was unethical. Since then the moratorium has held, despite evidence that some whale stocks have recovered sufficiently that they could be harvested in a sustainable manner. To states or domestic populations that oppose whaling for ethical reasons, the sustainability argument is no longer persuasive.

The battle over the basis for regulating whaling persists, with some states regularly threatening to leave the IWC over its unwillingness to bring back commercial whale harvesting, and other states – such as Norway – continuing to hunt whales commercially through a previously existing objection to the zero catch limits initially passed. This political problem is in some ways intractable, since the two different bases for protecting whales differ conceptually, with no clear compromise possible.

Conclusion

The efforts to protect ocean fisheries and marine mammals demonstrate that, despite collective incentives to use these resources sustainably, actual protection of these resources has been extremely difficult. The broader problems of uncertainty about resources (and behavior of actors) in an international space combine with a common-pool resource structure that means that it is difficult to exclude actors from access to the resource and that overfishing by some affects the state of the resource for others.

The specific form of regulation has also experienced difficulties, with regionally based organizations unable to deal with the shifts of capacity to new regions or species in the context of a global fishing industry, and collective action problems faced within RFMOs as the political process chooses catch levels higher than recommended by scientific advice. Even when regulations are created, fishing vessel owners find ways around them, by registering their ships in states that are not members of the relevant RFMOs or occasionally through outright – but difficult to detect – non-compliance.

Marine mammal protection has in some ways had a more successful recent history, and changed the approach from one of sustainable use to complete preservation. But that perspective is not universally accepted, and may thus not be a more broadly applicable model, especially with respect to fisheries. Overall, although there have been some signs of progress in better management of resources, efforts to address marine fisheries resources demonstrate how difficult cooperation to protect international resources can be.

References

Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995).

Arnason, R. (1994) "On Catch Discarding in Fisheries," *Marine Resource Economics* 9(3): 189–207.

Barkin, J.S. and DeSombre, E.R. (2013) *Saving Global Fisheries: reducing fishing capacity to promote sustainability*, Cambridge: MIT Press.

Birnie, P. (1985) *International Regulation of Whaling: from conservation of whaling to conservation of whales and regulation of whale watching*, New York: Oceana Publications.

Bonanno, A. and Constance, D. (1996) *Caught in the Net: the global tuna industry, environmentalism, and the state*, Lawrence: University Press of Kansas.
Brown, P. (1994) "Soviet Union Illegally Killed Great Whales," *Guardian* (12 February): 14.
"Call me Smiley" (1994) *New York Times Magazine* (13 March): 14.
Chopin, F., Inoue, Y., Matsushita, Y., and Arimoto, T. (1996) "Source of Accounted and Unaccounted Fishing Mortality," in Alaska Sea Grant College Program, ed., *Solving Bycatch: considerations for today and tomorrow*, Report 96–03, Fairbanks: University of Alaska.
Clark. C.W. and Lamberson, R. (1992) "An Economic History and Analysis of Pelagic Whaling," *Marine Policy* 6(2): 107–9.
Clucas, I. (1997) "Fisheries Bycatch and Discards," *FAO Fisheries Circular 928*, Rome: FAO.
Colson, D.A. (1995) "Current Issues in Fishery Conservation and Management," *US Department of State Dispatch* 6(7). Available HTTP: <(http://dosfan.lib.uic.edu/ERC/briefing/dispatch/1995/html/Dispatchv6no07.html)>.
Convention between the United States, Great Britain, Russia, and Japan for the Preservation and Protection of Fur Seals (1911).
Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries (1978).
Cushing, D.H. (1988) *The Provident Sea*, Cambridge: Cambridge University Press.
D'Amato, A. and Chopra, S.K. (1991) "Whales: their emerging right to life," *American Journal of International Law* 85: 21–62.
Davies, R.W.D., Cripps, S.J., Nicksona, A., and Porter, G. (2009) "Defining and Estimating Global Marine Fisheries Bycatch," Marine Policy. Available HTTP: <http://dx.doi.org/10.1016/j.marpol.2009.01.003> (accessed 4 May 2012).
DeSombre, E.R. (2000) *Domestic Sources of International Environmental Policy: industry, environmentalists, and US power*. Cambridge, MA: MIT Press.
—— (2005) "Fishing under Flags of Convenience: using market power to increase participation in international regulation," *Global Environmental Politics* 5(4): 73–94.
—— (2006) *Flagging Standards: globalization and environmental, safety, and labor standards at sea*, Cambridge, MA: MIT Press.
DeSombre, E.R. and Barkin, J.S. (2002) "Turtles and Trade: the WTO's acceptance of environmental trade restrictions," *Global Environmental Politics* 2(1): 12–18.
Francis, D. (1990) *A History of World Whaling*, Ontario: Viking.
Gianni, M. and Simpson, W. (2004) *Flags of Convenience, Transshipment, Re-supply and at-Sea Infrastructure in Relation to IUU Fishing,* OECD, Fisheries Committee, Directorate for Food, Agriculture and Fisheries, AGR/FI/IUU, Rome: FAO.
Hilborn, R. and Walters, C.J. (1992) *Quantitative Fish Stock Assessment: choice, dynamics and uncertainty*, New York: Chapman and Hall.
ICTFU, Trade Union Advisory Committee to the OECD, ITC, and Greenpeace International (2002) "More Troubled Waters: fishing pollutions and FOCs," Major Group Submission for the 2002 World Summit on Sustainable Development, Johannesburg.
International Convention for the Regulation of Whaling (1946).
Kock, K., Reid, K., Croxall, J., and Nicol, S. (2007) "Fisheries in the Southern Ocean: an ecosystem approach," *Philisophical Transations: Biological Sciences* 362(1488): 2333–49.
Kurlansky, M. (1997) *Cod: a biography of the fish that changed the world*, New York: Walker.
Lack, M. and Sant, G. (2001) "Patagonian Toothfish: are conservation and trade measures working?" *TRAFFIC Bulletin* 19(1): 1–19.
Lodge, M.W., Anderson, D., Løbach, T., Munro, G., Sainsbury, K., and Willock, A. (2007) *Recommended Best Practices for Regional Fishery Management Organizations*, London: Chatham House.
Mack, J.R. (1996) "International Fisheries Management: how the UN conference on straddling and highly migratory stocks changes the law of fishing on the high seas," *California Western International Law Journal* 26 (Spring): 318–21.
OECD (2004) "Draft Chapter 2 – Framework for Measures Against IUU Fisheries Activities," OECD, Fisheries Committee, Directorate for Food, Agriculture and Fisheries, AGR/FI/IUU(2004)5/PROV.
Pascoe, S. (1997) "Bycatch Management and the Economics of Discarding," *FAO Technical Paper 370*, Rome: FAO.
Peterson, M.J. (1993) "International Fisheries Management," in Peter M. Haas, Robert O. Keohane, and Marc A. Levy (eds) *Institutions for the Earth*, Cambridge, MA: MIT Press: 249–305.

Polachek, T. and Davies, C. (2008) "Consideration of the Implications of Large Unreported Catches of Southern Bluefin Tuna for Assessments of Tropical Tuna, and the Need for Independent Verification of Catch and Effort Statistics," *CSIRO Marine and Atmospheric Research Paper* 23.

Roberts, C. (2007) *The Unnatural History of the Sea*, Washington, DC: Covelo Press.

Rojas, E. (2008) "Fisheries Observer Harassment and Interference – A Global Challenge," *APO Mail Buoy* 2(3): 6–11.

Sanger, C. (1986) *Ordering the Oceans: the making of the law of the sea*, London: Zed Books.

Scheiber, H.N (2001) "Ocean Governance and the Marine Fisheries Crisis: two decades of innovation and frustration," *Virginia Environmental Law Journal* 20: 119–37.

Schiffman, H.S. (2008) *Marine Conservation Agreements: the law and policy of reservations and vetoes*, Leiden: Martinus Nijhoff Publishers.

Springer, A.L. (1997) "The Canadian Turbot War with Spain: unilateral state action in defense of environmental interests," *Journal of Environment and Development* 6(1): 26–60.

Stokke, O.S. and Vidas, D. (2004) *Regulating IUU Fishing or Combating IUU Operations?* OECD, Fisheries Committee, Directorate for Food, Agriculture and Fisheries, AGR/FI/IUU, Rome: FAO.

Swan, J. (2002) "Fishing Vessels Operating under Open Registers and the Exercise of Flag State Responsibilities – Information and Options," *FAO Fisheries Circular No. 980*, FITT/C980, Rome: FAO.

UNEP (2004) *Analyzing the Resource Impact of Fisheries Subsidies: A Matrix Approach*, Geneva: United Nations Environment Programme.

UN Food and Agriculture Organization (2009) *FAO Yearbook: Fishery and Aquaculture Statistics, 2007*, Rome: FAO.

37

Biodiversity, migratory species and natural heritage

Volker Mauerhofer and Felister Nyacuru

This chapter introduces the overlapping issues of biodiversity, migratory species and natural heritage. In the context of global environmental politics, these issues have somewhat different meanings in theory and in practice. This chapter describes each of the issues and focuses on the practical governance of each one, and it explores their relationships to one another. The chapter applies a distinction made by North (1990), who pointed to formal institutions as the "rules of the game" in terms of formal regulatory rules that govern individual behavior and structure social interactions. The chapter aims to provide a focused overview of these formal global institutions, with a lesser emphasis on the relevant organizations (see also Chapters 8 and 9). Where deemed to be appropriate, governance-relevant information from the regional, national and subnational levels has also been included (see also Chapters 12 and 14).

International (global) formal institutions are understood in this chapter as a subset of multilateral environmental agreements (MEAs). Specific MEAs regarding biodiversity, migratory species and natural heritage emerged early in the last century. They include the 1900 London Convention for the Protection of Wild Animals, Birds and Fish in Africa (replaced by the 1933 London Convention Relative to Preservation of Flora and Fauna in their natural state), the 1902 Convention for the Protection of Birds Useful for Agriculture, the 1911 Treaty for the Preservation and Protection of Fur Seals, and the 1923 Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean (see Sands 1995: 338; Brown-Weiss 1992: 479; see also Chapter 36)

Biodiversity

The three issues examined in this chapter are characterized by a considerable degree of overlap. Biodiversity, for example, covers all migratory species. Nevertheless, some significant differences in the conceptual basis and further understanding can also be found, as discussed below. There are numerous frameworks governing biodiversity (see Leary and Pisupati 2010; Jardin 2010; Shearing 2010). Distinctions can be made quantitatively and qualitatively. Basic quantitative differentiations can concern the number of species covered while qualitative distinctions address the different level of political commitment or the different structure of the framework itself (e.g.,

Memorandum of Understanding versus Convention) or its organizational units (e.g., frameworks with or without enforcement mechanisms).

The database of the United Nations Environmental Program (UNEP) currently contains 10 MEAs that are in some way relevant to biodiversity in the broad sense (UNEP 2012). Numerous bilateral environmental agreements also exist wherein two parties, in most cases countries, agree on issues related to biodiversity. Several definitions of biodiversity exist; the term is often used synonymously with biological diversity. The most widely agreed definition is enshrined in the Convention on Biological Diversity (CBD) concluded in 1992: "'Biological diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Article 2 CBD). The CBD's definition of biodiversity does not expressly cover abiotic issues, but these also provide a continuous contribution to shaping species and ecosystems. In comparison, another definition explicitly includes abiotic factors: "The term biodiversity encompasses all of the species that currently exist on Earth, the variations that exist within each species, and all of the interactions that exist among all of these organisms and their biotic and abiotic environments as well as the integrity of these interactions" (Gowdy 1997: 186).

There are numerous politically agreed-upon frameworks for governing biodiversity. They range from binding international treaties to informally institutionalized networks among nations and other stakeholders. International treaties, which are largely steered by the nation-states themselves, set up rules and regulations to which the state parties commit (Jardin 2010). Such formal frameworks can be very broadly formulated thematically. They can address an ecosystem or habitat type, or they can focus exclusively on species (see Table 37.1).

Several formal MEAs listed in Table 37.1 address the issue of conservation areas (Cirelli 2002; Koester 2002; Dudley et al. 2007). Informal governing frameworks establish more loose networks and platforms for initiating a broad range of enterprises and policy initiatives. One of the informal frameworks is the International Union for Conservation of Nature (IUCN), which is the world's oldest and largest global environmental organization. It is a leading authority on the environment and sustainable development, and has many members drawn from both governmental and nongovernmental organizations. The IUCN has a network of more than 11,000 voluntary scientists and experts who have established global standards in their respective fields

Table 37.1 Examples of biodiversity multilateral environmental agreements and their themes at global and regional levels

Themes	*Geographic level*	
	Global	*Regional*
General	• Convention on Biological Diversity	• European Alpine Convention (Alpine Convention 2012)
Habitat/ecosystem-related	• World Heritage Convention	• EU – Habitat and Birds Directives
Species-related	• Convention on the Conservation of Migratory Species of Wild Animals • Convention on the International Trade in Endangered Species of Wild Fauna and Flora	• Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Flora and Fauna • Agreement on Conservation of African Eurasian Migratory Water Birds

by setting definitive international standards, such as the IUCN Red List of Threatened Species (Rodriguez et al. 2011). Another example of such a network is the Global Biodiversity Information Facility, an international initiative created and funded by governments that is focused on making biodiversity data available to all for scientific research, conservation and sustainable development (Telenius 2011).

Global governance of biodiversity

A number of key international agreements have been reached in recent decades to address questions of biodiversity, including the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and the International Treaty on Plant Genetic Resources for Food and Agriculture (see Chapter 40). The CBD, which was concluded in 1992 during the Rio Earth Summit, has been ratified by 193 parties (Swanson 1999; Wolfrum 2001; Harrop and Prichard 2011). Its wide scope covers ecosystems, species and genetic resources, and it aims at the conservation of biological diversity, sustainable use of the components of biodiversity as well as the fair and equitable sharing of benefits arising from the utilization of genetic resources (see Chapter 24). The Conference of the Parties (COP) is the most important decision-making structure of the CBD. It governs the Convention and furthers its implementation through the decisions taken at its periodic conferences (CBD 2012a). The CBD is administered by a Secretariat, which is embedded in a larger organizational structure (Siebenhüner 2007). The parties play a key role towards implementation of the Convention; at their respective national levels, they use National Focal Points (NFPs) to prepare national reports (Chandra and Idrisova 2011).

Judging by the number of ratifications, the CBD can already be considered one of the most successful biodiversity-related conventions, with no other convention coming near. This number can also be seen, however, as a direct reflection of how many of the Convention's articles are formulated, leaving much up to the discretion of its ratifying parties. Doubtless, the CBD has shown its merits by bringing biodiversity closer to the center of global environmental policy over the past two decades (Glowka 2000; Birnie et al. 2009). Numerous countries have started to produce national and local strategies and action plans (Butchart et al. 2010) and, based on Article 26 of the CBD, countries with weak or non-existent policies have had to continuously and publicly report on biodiversity issues. It also generated several more binding formulations of efforts to stop the loss of biodiversity, notably within the EU, and to reduce the rate of that loss (Sands et al. 2012). Several of these aims, in particular the more ambitious ones, failed spectacularly due to insufficient political efforts and too many countervailing interests (Rands et al. 2010; Sands et al. 2012). It is yet to be seen whether the outcomes of recent and future COP meetings can contribute to more focused efforts and increased accountability by global environmental policy stakeholders.

Perhaps the most important thematic result of the tenth COP meeting held in October 2010 (COP10) was the conclusion of the Nagoya Protocol on an instrument for the implementation of provisions on Access and Benefit Sharing (ABS) of genetic resources (Harrop 2011). The CBD provides the substantive, institutional and procedural basis for the Nagoya Protocol, including dispute settlement mechanisms and secretariat services. This protocol has 92 parties and membership is open to all parties to the CBD. The Nagoya Protocol has already been critically assessed (Kamau et al. 2010; Harrop 2011). Particularly positive aspects include its binding nature and a clear definition of "utilization of genetic resources" integrating the use of biochemicals (Kamau et al. 2010). On the other hand, attention should be drawn to the frequent and central use of "if appropriate", "where applicable" and similar terms, and of weak language ("endeavor",

"encourage", "consider" and the like), as well as the lack of a self-standing obligation on user states to ensure benefit sharing (Kamau et al. 2010; Harrop 2011).

Other important outcomes of COP10 include: (1) the Strategic Plan for Biodiversity 2011–20, with 5 goals and 20 (only partly) quantifiable targets (the "Aichi Targets"), such as "Target 5": "By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced"(CBD 2012b); (2) a proposal for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, constituting an international panel of biodiversity scientists (similar to the Intergovernmental Panel on Climate Change or IPCC) (Perrings et al. 2011); and (3) the proposal for a "UN Decade on Biodiversity", which has since been concluded by the UN General Assembly and which will contribute to the implementation of the Strategic Plan for Biodiversity. These three examples of outcomes of COP10 should help around the world to make successes and failures in biodiversity conservation more measurable, to provide an even better scientific basis for discussion with, as well as among, politicians, and to raise more public awareness for the still decreasing biological diversity in most of the world regions (see Chapter 26).

The Cartagena Protocol on Biological Safety was concluded in 2000 and is based on the CBD. It has a total 163 parties (as of August 2012) and aims to ensure the safe handling, transport and use of living modified organisms resulting from modern biotechnology (Falkner 2000; Falck-Zepeda and Zambrano 2011). During negotiation of the Protocol, there were intense disputes over its scope, its decision matrix and the role of the precautionary principle, its relationship to other agreements and the issues of liability and redress (Cosbey and Burgiel 2000). Five negotiating alliances were the main players. These alliances had different perspectives, ranging from a producer/exporter perspective to skeptical and concerned importer perspectives (Gupta 2008). Though the Cartagena Protocol is commonly seen as the first widely agreed global institutional framework for a more precautionary approach (Gupta 2008), issues around the application of the precautionary principle, in particular, as well as the overlap with the Sanitary and Phytosanitary Measures (SPS) Agreement concluded under the World Trade Organization (WTO), are highly contested (Chambers et al. 2008; see Chapter 22). The Protocol currently has an intrinsic political weakness: the United States has not ratified the CBD. The USA prefers the WTO framework (Young 2008; Kelly 1995).

In October 2010 the Nagoya–Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety was adopted, parallel to the Nagoya Protocol. Its parties include 162 countries and the European Union. Its main objective is to contribute to the conservation and sustainable use of biological diversity, while taking into account risks to human health, by providing international rules and procedures in the field of liability and redress relating to living modified organisms. On the one hand, it is recognized that this new Supplementary Protocol concretizes the norms of the Cartagena Protocol, while, on the other hand, the concrete outcome has been considered quite disappointing as it primarily focuses on binding international rules rather than nationally defined civil liability solutions (Sands et al. 2012).

In general, all the current protocols of the CBD focus on trade and other use-related issues. Topics that are more protection-oriented appear to gain less attention when it comes to further specifying the effects of the CBD in a legally binding way within global environmental policy forums. The CBD also has two biodiversity-relevant sister conventions, both of which were also concluded at the 1992 Rio Summit, namely the Framework Convention on Climate Change (see Chapter 28) and the Convention to Combat Desertification (see Chapter 39). The significance of these two sister conventions rests in the fact that they complement one another to help address two of the most important driving forces of global problems that are directly or indirectly affecting biodiversity.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was concluded in March 1973. Politically it can be seen as an outcome of the 1972 United Nations Conference on the Human Environment (also known as the Stockholm Conference). Adoption of a resolution at that conference led to another large conference in Washington where CITES was finally adopted (Wijnstekers 2011). This Convention entered into force in July 1975 and currently has 173 parties (CITES 2012). CITES aims to improve international cooperation on the conservation of specimens of wild animals and plants to ensure that international trade does not threaten their survival (Gomar and Stringer 2011). It functions by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction by sea of species covered by the Convention must be authorized through a licensing system. The COP, as the supreme governing body of CITES, decides on changes within the Appendices. The COP's meetings are organized by the CITES Secretariat, which is located in Geneva, Switzerland, and is administered by UNEP. The Secretariat primarily distributes information to the parties through meeting documents and notifications. While the Convention has been quite successful in including several marine species such as whales and turtles, it astonishingly permits parties to make general reservations to the conservation of any species listed. Furthermore, the inclusion of new commercial fish species has led to heated debates, such as those surrounding the (failed) trial to include the Atlantic blue fin tuna in Appendix I of CITES (Sands et al. 2012). Nevertheless, because it provides sanctions for non-compliance, CITES is considered to be one of the most effective major global wildlife conventions (Birnie et al. 2009).

The International Treaty on Plant Genetic Resources for Food and Agriculture was negotiated by the United Nations Food and Agriculture Organization (FAO) and entered into force in 2002. It replaced a previous voluntary agreement – the 1983 International Undertaking on Plant Genetic Resources for Food and Agriculture. The treaty seeks to increase recognition of the importance of diversity among certain crops, to establish a global system of access sharing for plant genetic materials, to ensure benefit sharing with countries of origin of these genetic materials, and to further conservation and sustainable use (Heywood 2011; see Chapter 40). Since 2006 it has had its own Governing Body under the aegis of the FAO. This Body is the highest organ of the Treaty as established in Article 19 and composed of representatives of all 127 contracting parties (as of August 2012; Planttreaty 2012). In March 2011, this Governing Body committed to review the global crop gene pool of the Plant Treaty (Planttreaty 2011), which will also provide information about the effectiveness of the flow of resources under that treaty.

Regional governance of biodiversity

Several regional multilateral agreements related to biodiversity have been reached, including the Lusaka Agreement on illegal species trade and the European Union's Habitats Directive. The Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora was concluded in 1994; it entered into force in 1996 (UNEP 2005). There are currently seven parties to the Agreement, namely the Republic of the Congo (Brazzaville), Kenya, Liberia, Tanzania, Uganda, Zambia and the Kingdom of Lesotho (Lusaka Agreement 2012a). It has its headquarters at the Kenya Wildlife Service in Nairobi. The Agreement establishes a three-tier institutional mechanism with a Governing Council functioning as a policy- and decision-making organ, a Task Force as a permanent law enforcement institution, and a National Bureau as a governing body. The Lusaka Agreement aims, in particular, to strengthen the enforcement capacity among its members, for example through a new Wildlife Enforcement Monitoring System (WEMS). WEMS addresses information and reporting processes as well as

analyzing capabilities regarding the monitoring of the illegal wildlife trade at both the national and the regional levels. Furthermore, it will also affirm the obligation of parties to the Lusaka Agreement and CITES to collaborate closely, as laid down in a resolution to CITES (Lusaka Agreement 2012b; Chandran et al. 2011).

Cornerstones of the EU's nature conservation policy include the 1979 Birds Directive and the 1992 Habitats Directive forms. EU policy is built around two pillars: the so-called Natura 2000 network of protected sites and a strict system of species protection (Mauerhofer 2008a; Morris 2011). In total, the Directives protect over 1,000 animal and plant species, and over 200 so-called "habitat types" (i.e., special types of forests, meadows, wetlands and so forth). The EU Commission supervises the implementation of these Directives by the EU's 27 member states. Binding rulings on infringement, preliminary rulings, and penalty procedures made at the European Court of Justice (ECJ) can be seen as the world's most progressive enforcement mechanism for MEAs (Cashman 2006; Mauerhofer 2010). The central aim of the Habitat Directive is to maintain or restore a favorable conservation status for species and habitat types (and similarly for the Birds Directive). The ECJ was very progressive in, for example, the application of the precautionary principle for a case dealing with annual fishery activities within a Natura 2000 site in the Netherlands (Mauerhofer 2008a, 2008b). In this case, the ECJ twice shifted the burden of proof beyond scientific doubt on to the shoulders of those proposing an activity: first concerning the question of whether an appropriate assessment of the implications of these activities is necessary and, second, concerning the question of whether these activities adversely affect the integrity of the site. This and similar decisions "*in dubio pro nature*" of the ECJ contributed to the Natura 2000 site network aiding the increase in populations of wild birds in Europe (Donald et al. 2007). This has been due to the network's important role in bird migrations and its crucial influence on bird populations in other regions of the world.

International grades

"International grades" are non-binding certificates of excellence regularly used for site conservation. They often play an important role in influencing biodiversity-related decisions by policy-makers and other stakeholders. On the global level, the nomination of biosphere reserves (UNESCO 1974; Price et al. 2010), established as a network in 1977 by UNESCO's Man and Biosphere program, is among the best-known examples of such international grades (Schliep and Stoll-Kleemann 2010). The 598 sites designated in 117 countries (as of August 2012) include Serengeti-Ngorongoro, Archipiélago de Colón (Galápagos), Danube Delta and the Rocky Mountains (UNESCO 2012a). Entry into the IUCN's list of protected areas (Dudley et al. 2010) is also a type of international grade. This list contains a classification into different categories according to management objectives (IUCN 2012). One example of a classification category II is "National Park", which has some quantified management criteria and has played an important role – although a non-binding one – in national designations of protected areas, for example in Austria. Other examples of such international grades include designation of areas as Globally Important Agricultural Heritage Systems (GIAHS) by the FAO (Harrop 2009) and the European Diploma of Protected Areas granted by the Council of Europe to protected areas based on their outstanding scientific, cultural or aesthetic qualities (CoE 2012).

Migratory species

Migration of wild species can be classified according to different factors. These can be broken down into factors influenced by humans and those that are not. With the projected impacts of

global climate change (Chapter 28), the issue of migratory species is likely to gain increased prominence. In the broadest sense, "migratory species" can be defined as "the entire population or any geographically separate part of the population of any species or lower taxon of wild animals or plants, a significant proportion of whose members autonomously cross one or more national jurisdictional boundaries" (Convention on Migratory Species, Article 1). This definition includes plants that are able to migrate, for example due to climate change (Grabherr et al. 1994; Pauli et al. 2012), as well as alien species in general (Essl et al. 2011).

Global governance of migratory species

The Convention on Wetlands of International Importance – the Ramsar Convention – was concluded in 1971 in the city of Ramsar in Iran (see Chapter 34). It has 162 parties (Ramsar 2012). The development of this Convention was largely driven by the efforts of the nongovernmental International Waterfowl Research Bureau (Sands et al. 2012). The Ramsar Convention focuses in particular on the conservation and sustainable maintenance ("wise use") of internationally important wetlands (Davidson and Coates 2011). Sites are selected based on certain criteria, including among other things the occurrence of a specified number of migratory bird species (Scott and Jones 1995; Ramsar 2010). Currently, the Ramsar List covers 2,046 wetlands with a total surface area of 193,553,062 hectares (as of August 2012; Ramsar 2012). The preamble to the Convention states that waterfowl migration is seasonal and not caused by humans, although there is likely to be a large influence from human-caused climate change (see Chapter 28). The Ramsar Convention is organizationally administered by a Secretariat based in Gland, Switzerland, which has organized 11 COPs and also administers the Montreux Record. The latter is a sort of watchlist that includes 48 sites that are in some way endangered by human pressures (Ramsar 2012). However, this list does not carry much practical political impact, although 28 sites have been recorded there since 1990 (Ramsar 2012). This corresponds with the criticism that the focus of the parties to the Convention is more on the listing of sites than on the effective provision of wise use (Birnie et al. 2009). Recently, the Convention has developed some significance in international dispute settlement as the International Court of Justice has issued a provisional order in a dispute between Costa Rica and Nicaragua involving two wetlands on the Ramsar List (Sands et al. 2012).

The Convention on Migratory Species (CMS) was signed in 1979 in Bonn under the aegis of UNEP. It entered into force in November 1983 and has 116 parties (CMS 2012). The CMS is fully focused on the conservation of wild animals throughout their range, with an emphasis on terrestrial, marine and avian migratory species (Birnie 1989; Koester 2002). Article 1 (a) of the convention defines migratory species as "the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries". The CMS aims to conserve migratory species and their habitats by providing strict protection for species through multilateral agreements, Memoranda of Understanding (MoU) and cooperative research activities. The COP is the decision-making organ of the Convention. It reviews the implementation of the Convention, can adopt recommendations, and provides an overview of information from all the agreements concluded under the CMS (CMS Articles IV, V and IX). For many countries, the Convention on its own does not have much immediate influence because its Appendix 1 list of species often does not contain many species that occur on their national territory. Furthermore, the impacts of climate change have rendered migratory patterns increasingly unpredictable (ZSL 2010; Visser 2012; on climate change, see Chapter 28). In general, more intense cooperation and coordination with other conventions is strongly recommended (Glowka 2000; Birnie et al. 2009).

The African–Eurasian Migratory Waterbirds Agreement (AEWA) currently has 66 parties and is therefore by far the most comprehensive agreement established under the CMS (UNEP–AEWA 2012; Lenten 2001, 2005; Thomas and Guitart 2005). It was concluded in The Hague in 1995 and entered into force in November 1999. The AEWA covers 235 species of birds ecologically dependent on wetlands for at least part of their annual cycle, with a geographic area encompassing parts of Canada and 116 countries in Europe, Asia, the Middle East and Africa. The overall aim of the AEWA is to maintain or restore a favorable conservation status for wild migratory waterbirds. Among other things, a need exists for action plans. Such plans can be enforced by the European Commission at the European Court of Justice against EU member states even if those states are not parties to the AEWA (Mauerhofer 2010).

Besides the AEWA, there are six other agreements and 19 MoU that have been concluded under Article IV (3) and (4) of the CMS (CMS 2012) (see Table 37.2). The number of agreements and MoUs is considered to be too low (Birnie et al. 2009).

Regional governance of migratory species

Apart from the internationally agreed upon CMS, there are several regionally concluded treaties dealing with migratory species. The reason these treaties were not concluded under the CMS is partly because one or more of the parties are not members of the Convention. Several bilateral migratory bird agreements exist, for example between Australia and other countries, namely the 1974 Japan–Australia Migratory Bird Agreement, the 1986 China–Australia Migratory Bird Agreement, and the 2002 Republic of Korea–Australia Migratory Bird Agreement (Sands et al. 2012). Examples of regional agreements from other continents include the 1937 US–Mexico Convention for the Protection of Migratory Birds and Game Animals, and the 1972 US–Japan Convention for the Protection of Migratory Birds in Danger of Extinction and their Environment (EPA 2012). A common factor among these conventions, treaties and agreements is that they seek to conserve species as "common heritage of mankind" on behalf of future generations (as noted in the preambles of the CMS and AEWA).

Natural heritage

The term "natural heritage" can, on the one hand, be understood to include both biotic and abiotic environments, and therefore be broader than "biodiversity". On the other hand, the term

Table 37.2 List of agreements and examples of Memoranda of Understanding concluded under the Convention on Migratory Species

Agreements (species listed in CMS Appendix II)	*Memoranda of Understanding*
• African–Eurasian Waterbirds Agreement	• African Elephant – West Africa
• Albatrosses and Petrels	• Aquatic Warbler
• Small Cetaceans – Mediterranean and Black Seas	• Bukhara Deer
• Small Cetaceans – Baltic and North Seas	• Cetaceans – Pacific
• Wadden Sea Seals	• Great Bustard
• European Bats (Eurobats)	• Marine Turtles – Indian Ocean/Southeast Asia
• Gorillas and their Habitats	• Birds of Prey
	• Saiga Antelope
	• Siberian Crane
	• Slender-billed Curlew

has a clear anthropocentric and unidirectional orientation, putting humanity into the role of a sort of supervisor or protector of something we allegedly have "inherited" from past generations and which we are to maintain in the present and bestow to the benefit of future generations. The World Heritage Convention (WHC) was adopted in 1972 by the General Conference of UNESCO in Paris. It has been ratified by 189 parties (as of August 2012; UNESCO 2012b). Article 2 of the WHC defines the term "natural heritage" in three different ways: (1) natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view; (2) geological and physiographical formations, and precisely delineated areas, which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; and (3) natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty

The WHC contains procedures and criteria, such as legal and integrity checks, for areas to be listed as cultural, natural or mixed World Heritage Sites (Jardin 2010). The list includes 755 cultural heritage sites, 188 natural heritage sites and 29 sites containing mixed objects, with a total of 157 state parties (UNESCO 2012c). Delisting is possible, as was the case with the former Dresden Elbe World Heritage Site, which was delisted due to the serious impact on the integrity of the site's landscape due to the construction of a bridge across the Elbe. If there is a threat to a protected site, it is put on the "WHL in Danger" list until substantial renovations have been carried out and the site is out of danger (Jardin 2010; Battini 2011). Additional dynamics toward stronger conservation could be developed by national courts. The High Level Court of Australia judged in 1983 that the conservation obligations of the WHC regarding certain listed Australian Wilderness parks are legally binding for Australia (Birnie et al. 2009). If other courts would take a similar stance, the impact of the WHC would increase tremendously in global environmental policy.

Conclusion

Proposed and concretely envisaged global environmental policies can foster and strengthen biodiversity, migratory species and natural heritage. Some policy approaches are aimed at strengthening mandates for existing institutions, such as UNEP (Olsen and Elder 2011; UN 2012), expanding the mandate of the United Nations Security Council (Elliott 2005), creating new institutions, such as a World Environment Court (Pauwelyn 2005), or replacing the Commission on Sustainable Development by a high-level Political Forum (UN 2012). Another proposal aims at clustering MEAs in order to overcome their fragmentation (von Moltke 2005). These proposals and ongoing efforts can all be seen as largely addressing the biodiversity and species protection from a top-down perspective. New and innovative bottom-up implementation mechanisms are additionally needed. Indeed, they are gaining increasing importance, in part due to a lack of adequate existing enforcement mechanisms (Mauerhofer 2011, 2012; Schindler et al. 2011). In general, the effective implementation of existing MEAs (Young 2011; Mauerhofer 2011), and in particular implementing biodiversity-related MEAs in a more coordinated manner (Richerzhagen 2011; Birnie et al. 2009), should be considered as the more pressing task in comparison with the negotiation of new MEAs. Notwithstanding, certain geographic areas may still be insufficiently covered, in particular in regard to regional solutions and certain types of habitats that have not yet been adequately addressed by MEAs, for example oceanic and coastal areas (Guerreiro et al. 2011; see Chapters 35 and 36).

While the effectiveness and significance of each of the MEAs for the conservation of a single element of biodiversity is difficult to evaluate due to overlap among their implementation measures, it seems clear that the overall trends for most of the covered species and habitat types are

negative in absolute terms, as evidenced by their declining populations (Butchart et al. 2010; Pereira et al. 2010; Rands et al. 2010; Rockstrom et al. 2009). At the same time, it could be questioned where we would stand now regarding the status of biodiversity, migratory species and natural heritage without the MEAs described in this chapter. Whatever approach is chosen to tackle this decrease, based on the outcome of the 2012 United Nations Rio+20 Conference on Environment and Development (UN 2012), it seems clear that by itself any single approach is insufficient to protect species and natural areas. Global environmental policies fostering biodiversity, migratory species and natural heritage call for a plurality of theoretical strategies and practical implementation measures that span a range of temporal, spatial and thematic levels.

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References

Alpine Convention 2012. Alpine Convention. http://www.alpconv.org/pages/default.aspx (accessed 2012/05/19).

Battini, S. 2011. The procedural side of legal globalization: the case of the World Heritage Convention. *Icon: International Journal of Constitutional Law*, 9, 340–68.

Birnie, P.W. 1989. The international law of migratory species. *Natural Resources Journal*, 29, 903–1065.

Birnie, P., Boyle, A. and Redgewell, C. 2009. *International Law and the Environment*, 3rd edn, Oxford: Oxford University Press.

Brown-Weiss, E. 1992. *Environmental Change and International Law: New Challenges and Dimensions*, Tokyo: United Nations University Press.

Butchart, S.H.M., Walpole, M., Collen, B., Van Strien, A., Scharlemann, J.P.W., Almond, R.E.A., et al. 2010. Global biodiversity: indicators of recent declines. *Science*, 328, 1164–68.

Cashman, L. 2006. Commission compliance promotion and enforcement in the field of environment. *Journal for European Environmental and Planning Law,* 5, 385–94.

CBD 2012a. Conference of the Parties (COP) background and status. http://www.cbd.int/cop/ (accessed 15/5/2012).

—— 2012b. Aichi Targets. http://www.cbd.int/doc/strategic-plan/2011–20/Aichi-Targets-EN.pdf (accessed 15/5/2012).

Chambers, W.B., Kim, J.A. and ten Have, C. 2008. Institutional interplay and the governance of biosafety, in Young, O., Chambers, W.B., Kim, J.A., and ten Have, C. (eds) *Institutional Interplay Biodiversity and Trade*, Tokyo: United Nations University Press.

Chandra, A. and Idrisova, A. 2011. Convention on Biological Diversity: a review of national challenges and opportunities for implementation. *Biodiversity and Conservation*, 20, 3295–316.

Chandran, R., Krishnan, P. and Nguyen, K. 2011. Wildlife Enforcement Monitoring System (WEMS): a solution to support compliance of multilateral environmental agreements. *Government Information Quarterly*, 28, 231–8.

Cirelli, M.T. 2002. *Legal Trends in Wildlife Management. Food and Agriculture Organization of the United Nations*, Rome: FAO Legislative Study 74.

CITES 2012. CITES at work. http://www.cites.org/ (accessed 15/5/2012).

CMS 2012. Convention on Migratory Species. http://www.cms.int/ (accessed 15/8/2012).

CoE 2012. Council of Europe: European Diploma of Protected Areas. http://www.coe.int/t/dg4/culture-heritage/nature/diploma/default_en.asp (accessed 15/8/2012).

Cosbey, A. and Burgiel, S. 2000. *The Cartagena Protocol on Biosafety: An Analysis on Results. An IISD Briefing Note*. International Institute for Sustainable Development Winnipeg, Canada. http://www.iisd.org/publications/pub.aspx?id=332 (accessed 15/8/2012).

Davidson, N. and Coates, D. 2011. The Ramsar Convention and synergies for operationalizing the Convention on Biological Diversity's ecosystem approach for wetland conservation and wise use. *Journal of International Wildlife Law and Policy*, 14, 199–205.

Donald, P.F., Sanderson, F.J., Burfield, I.J., Bierman, S.M., Gregory, R.D. and Waliczky, Z. 2007. International conservation policy delivers benefits for birds in Europe. *Science*, 317, 810–13.

Dudley, N., Belokurov, A., Higgins-Zogib, L., Hockings, M., Stolton, S. and Burgess, N. 2007. *Tracking Progress in Managing Protected Areas around the World*, Gland: WWF International.

Dudley, N., Parrish, J.D., Redford, K.H. and Stolton, S. 2010. The revised IUCN protected area management categories: the debate and ways forward. *Oryx*, 44, 485–90.

Elliott, L. 2005. Expanding the mandate of the United Nations Security Council, in Chambers, B.W. and Green, J.F. (eds) *Reforming International Environmental Governance*, Tokyo: United Nations University Press.

EPA 2012. Bird Conservation. www.epa.gov/owow/birds/epa.html (accessed 15/8/2012).

Essl, F., Dullinger, S., Rabitsch, W., Hulme, P.E., Hülber, K., Jarosik, V., et al. 2011. Socioeconomic legacy yields an invasion debt. *Proceedings of the National Academy of Sciences of the United States of America*, 108, 203–7.

Falck-Zepeda, J.B. and Zambrano, P. 2011. Socio-economic considerations in biosafety and biotechnology decision making: the Cartagena Protocol and National Biosafety Frameworks. *Review of Policy Research*, 28, 171–95.

Falkner, R. 2000. Regulating biotech trade: the Cartagena Protocol on Biosafety. *International Affairs*, 76, 299–313.

Glowka, L. 2000. Complementarities between the Convention on Migratory Species and the Convention on Biological Diversity. *Journal of International Wildlife Law and Policy*, 3, 205–52.

Gomar, J.O.V. and Stringer, L.C. 2011. Moving towards sustainability? An analysis of CITES' conservation policies. *Environmental Policy and Governance*, 21, 240–58.

Gowdy, J.M. 1997. The value of biodiversity: markets, society, and ecosystems. *Land Economics*, 73, 25–41.

Grabherr, G., Gottfried, M. and Pauli, H. 1994. Climate effects on mountain plants. *Nature*, 369, 448.

Guerreiro, J., Chircop, A., Dzidzornu, D., Grilo, C., Ribeiro, R., Van Der Elst, R. and Viras, A. 2011. The role of international environmental instruments in enhancing transboundary marine protected areas: an approach in East Africa. *Marine Policy*, 35, 95–104.

Gupta, A. 2008 Global biosafety governance: emergence and evolution, in Young, O., Chambers, W.B., Kim, J.A. and ten Have, C. (eds) *Institutional Interplay Biodiversity and Trade*, Tokyo: United Nations University Press.

Harrop, S.R. 2009. Globally important agricultural heritage systems: an examination of their context in existing multilateral instruments dealing with conservation and land tenure. *Journal of International Wildlife Law and Policy*, 12, 127–65.

—— 2011. Living in harmony with nature? Outcomes of the 2010 Nagoya Conference of the Convention on Biological Diversity. *Journal of Environmental Law*, 23, 117–28.

Harrop, S.R. and Pritchard, D. J. 2011. A hard instrument goes soft: the implications of the Convention on Biological Diversity's current trajectory. *Global Environmental Change: Human and Policy Dimensions*, 21, 474–80.

Heywood, V.H. 2011. Ethnopharmacology, food production, nutrition and biodiversity conservation: towards a sustainable future for indigenous peoples. *Journal of Ethnopharmacology*, 137, 1–15.

IUCN 2012. IUCN Protected Area Management Categories. http://iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/ (accessed 15/8/2012).

Jardin, M. 2010. Global biodiversity governance: the contribution of the main biodiversity related conventions, in Billé, R., Chabason, L., Chiarolla, C., Jardin, M., Kleitz, G. and Le Duc, J.P. (eds) *Global Governance of Biodiversity: New Perspectives on a Shared Challenge*, Paris: IFRI. www.ifri.org/downloads/hereport6biodiversitygouvernance.pdf (accessed 16/5/2012).

Kamau, E.C., Fedder, B. and Winter, G. 2010. The Nagoya Protocol on Access to Genetic Resources and Benefit Sharing: what is new and what are the implications for provider and user countries and the scientific community? *Law, Environment and Development Journal*, 6, 246–62.

Kelly, J.P. 2005. The seduction of the appellate body: Shrimp/Sea turtle I and II and the proper role of states in WTO governance. *Cornell International Law Journal*, 38, 459–91.

Koester, V. 2002. The five global biodiversity-related conventions: a stocktaking. *Review of European Community and International Environmental Law*, 11, 96–103.

Leary, D. and Pisupati, B. 2010. Introduction, in Leary, D. and Pisupati, B. (eds) *The Future of International Environmental Law*, Tokyo: United Nations University Press.

Lenten, B. 2001. A flying start for the Agreement on the Conservation of African–Eurasian Migratory Waterbirds (AEWA). *Journal of International Wildlife Law and Policy*, 4, 159–64.

—— 2005. The role of the AEWA in phasing out lead shot for hunting in wetlands. *Bird Conservation International*, 15, 161–3.
Lusaka Agreement 2012a. Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade. http://www.lusakaagreement.org/ (accessed 15/8/2012).
—— 2012b. Press Release 11 July 2011 MR/E08/11 to the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade. http://www.lusakaagreement.org/library_newsletter.html (accessed 15/8/2012).
Mauerhofer, V. 2008a Conservation of wildlife in the European Union with a focus on Austria, in Panjwani, R. (ed.) *Wildlife Law – A Global Perspective*, Chicago, IL: American Bar Association – ABA Publishing.
—— 2008b. 3-D sustainability: an approach for priority setting in situation of conflicting interests towards a sustainable development. *Ecological Economics*, 64, 496–506.
—— 2010. Missing links: how individuals can contribute to reserve policy enforcement on the example of the European Union. *Biodiversity and Conservation*, 19, 601–18.
—— 2011. A bottom-up "Convention-Check" to improve top-down global protected area governance. *Land Use Policy*, 28, 877–86.
—— 2012. A "Legislation-Check" based on "3-D Sustainability" – addressing global precautionary land governance. *Land Use Policy*, 29, 652–60.
—— 2013. The "Governance-Check": assessing the sustainability of public spatial decision-making structures. *Land Use Policy*, 30, 328–36.
Morris, R.K.A. 2011. The application of the Habitats Directive in the UK: compliance or gold plating? *Land Use Policy*, 28, 361–9.
North, D.C. 1990. *Institutions, Institutional Change and Economic Performance*, Cambridge: Cambridge University Press.
Olsen, S.H. and Elder, M. 2011. *Strengthening International Environmental Governance by Two-phased Reform of UNEP: Analysis of Benefits and Drawbacks*, Hayama: IGES Policy Report.
Pauli, H., Gottfried, M., Dullinger, S., Abdaladze, O., Akhalkatsi, M., Alonso, J.L.B., et al. 2012. Recent plant diversity changes on Europe's mountain summits. *Science*, 336, 353–5.
Pauwelyn, J. 2005. Judicial mechanisms: is there a need for a World Environment Court, in Chambers, B.W. and Green, J.F. (eds) *Reforming International Environmental Governance*, Tokyo: United Nations University Press.
Pereira, H.M., Leadley, P.W., Proenca, V., Alkemade, R., Scharlemann, J.P.W., Fernandez-Manjarres, J.F., et al. 2010. Scenarios for global biodiversity in the 21st century. *Science*, 330, 1496–501.
Perrings, C., Duraiappah, A., Larigauderie, A. and Mooney, H. 2011. The biodiversity and ecosystem services science–policy interface. *Science*, 331, 1139–40.
Planttreaty 2011. Planttreaty news from the 4th meeting of the treaty's Governing Body, Bali, Indonesia, March 14–18. http://www.planttreaty.org/content/planttreaty-news-leading-field-0 (accessed 14/8/2012).
—— 2012. International Treaty on Plant Genetic Resources for Food and Agriculture. http://www.planttreaty.org/list_of_countries (accessed 15/5/2012).
Price, M., Park, J.J. and Bouamrane, M. 2010. Reporting progress on internationally designated sites: the periodic review of biosphere reserves. *Environmental Science and Policy*, 13, 549–57.
Ramsar 2010. *Designating Ramsar Sites. Ramsar Handbook 17*, 4th edn. Ramsar Convention Secretariat, Gland, Switzerland. http://www.ramsar.org/cda/en/ramsar-pubs-handbooks/main/ramsar/1-30-33_4000_0 – (accessed 15/8/2012).
—— 2012. The year of tourism and wetlands for Ramsar. http://www.ramsar.org/ (accessed 15/8/2012).
Rands, M.R.W., Adams, W.M., Bennun, L., Butchart, S.H.M., Clements, A., Coomes, D., et al. 2010. Biodiversity conservation: challenges beyond 2010. *Science*, 329, 1298–303.
Richerzhagen, C. 2011. Effective governance of access and benefit-sharing under the Convention on Biological Diversity. *Biodiversity and Conservation*, 20, 2243–61.
Rockstrom, J., Steffen, W., Noone, K., Persson, A., Chapin, F.S., Lambin, E.F., et al. 2009. A safe operating space for humanity. *Nature*, 461, 472–5.
Rodriguez, J.P., Rodriguez-Clark, K.M., Baillie, J.E.M., Ash, N., Benson, J., Boucher, T., et al. 2011. Establishing IUCN Red List criteria for threatened ecosystems. *Conservation Biology*, 25, 21–9.
Sands, P. 1995. *Principles of International Environmental Law Vol. 1: Frameworks, Standards and Implementation*, Manchester: Manchester University Press in Association with IUCN.

Sands, P., Peel, J., Fabra, A. and MacKenzie, R. 2012. *Principles of International Environmental Law*, Cambridge: Cambridge University Press.

Schindler, S., Curado, N., Nikolov, S.C., Nikolov, C., Kret, E., Carcamo, B., Catsadorakis, G., Poirazidis, K., Wrbka, T. and Kati, V. 2011. From research to implementation: nature conservation in the Eastern Rhodopes mountains (Greece and Bulgaria), European Green Belt. *Journal for Nature Conservation*, 19, 193–201.

Schliep, R. and Stoll-Kleemann, S. 2010. Assessing governance of biosphere reserves in Central Europe. *Land Use Policy*, 27, 917–27.

Scott, D.A. and Jones, T.A. 1995. Classification and inventory of wetlands: a global overview. *Vegetatio*, 118, 3–16.

Shearing, S. 2010. *Biodiversity*, in Leary, D. and Pisupati, B. (eds) *The Future of International Environmental Law*, Tokyo: United Nations University Press.

Siebenhüner, B. 2007. Administrator of global biodiversity: the Secretariat of the Convention on Biological Diversity. *Biodiversity and Conservation*, 16, 259–74.

Swanson, T. 1999. Why is there a biodiversity convention? The international interest in centralized development planning. *International Affairs*, 75, 307–31.

Telenius, A. 2011. Biodiversity information goes public: GBIF at your service. *Nordic Journal of Botany*, 29, 378–81.

Thomas, V.G., and Guitart, R. 2005. Role of international conventions in promoting avian conservation through reduced lead toxicosis: progression towards a non-toxic agenda. *Bird Conservation International*, 15, 147–60.

UN 2012. *The Future We Want*, Outcome Document of the United Nations Rio+20 Conference, New York. http://www.uncsd2012.org/thefuturewewant.html (accessed 15/8/2012).

UNEP 2005. *A Decade of Regional Wildlife Law Enforcement: The Case of the Lusaka Agreement*, Nairobi: UNEP. http://www.lusakaagreement.org/Documents/Microsoft%20Word%20-%20LATF%20Evaluation%20Report.pdf (accessed 14/5/2012).

—— 2012. Database with biodiversity relevant MEAs. http://www.unep.org/dec/links/biodiversity.html (accessed 14/5/2012).

UNEP–AEWA 2012. Contracting parties and signatories to AEWA. www.unep-aewa.org/map/parties.htm (accessed 15/8/2012).

UNESCO 1974. Final report, task force on criteria and guidelines for the choice and establishment of biosphere reserve. MAB Report Series No. 22. http://unesdoc.unesco.org/images/0000/000098/009834eb.pdf (accessed 15/8/2012).

—— 2012a. Biosphere reserves – learning sites for sustainable development. http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/ (accessed 15/8/2012).

—— 2012b. States parties: ratification status. http://whc.unesco.org/en/statesparties (accessed 15/8/2012).

—— 2012c. World Heritage List. http://whc.unesco.org/en/list (accessed 15/5/2012).

Visser, M.E. 2012. Birds and butterflies in climate debt. *Nature Climate Change*, 2, 77–8.

Von Moltke, K. 2005. Clustering international environmental agreements as an alternative to a world environment organization, in Biermann, F. and Bauer, S. (eds) *A World Environment Organization. Solution or Threat for Effective International Environmental Governance?* Aldershot: Ashgate.

Wijnstekers, W. 2011. *The Evolution of CITES*, 9th edn. http://www.cites.org/common/resources/Evolution_of_CITES_9.pdf (accessed at 13/8/2012).

Wolfrum, R. 2001 The Convention on Biodiversity: obligations and enforcement mechanisms, in Zhenghua, T. and Wolfrum, R. (eds) *Implementing International Environmental Law in Germany and China*, London: Kluwer Law International.

Young, O. 2008 Deriving insights from the case of the WTO and the Catagena Protocol, in Young, O., Chambers, W.B., Kim, J.A. and ten Have, C. (eds) *Institutional Interplay Biodiversity and Trade*, Tokyo: United Nations University Press.

—— 2011. Effectiveness of international environmental regimes: existing knowledge, cutting-edge themes, and research strategies. *Proceedings of the National Academy of Sciences of the United States of America*, 108, 19853–60.

ZSL 2010. *Climate Change Vulnerability of Migratory Species*. London: Zoological Society. http://www.cms.int/publications/pdf/cms_climate_change_vulnerability.pdf (accessed on 15/5/2012).

38

Forests

David Humphreys

This chapter surveys the complex international political landscape of forest conservation. So far governments have been unable to agree even to initiate negotiations for an international forest convention, still less to agree the details of such an instrument itself. Yet this issue is frequently raised in international forest negotiations, most recently in 2006–7 at the United Nations Forum on Forests in New York. With no immediate likelihood of a convention being agreed, governments and other actors have looked instead to other policy initiatives in an effort to find a creative new forest politics in which the forces for conservation are greater than those for forest degradation. The most recent policy focus, examined in the second half of this chapter, is on providing incentives to encourage governments and forest owners to protect forests as sinks for carbon, thereby mitigating climate change (on climate change, see Chapter 28).

Going against convention: failing to agree on international forest law

The failure of the world's governments to agree a forest convention has been a defining feature of international forest politics since 1990 when the preparations began for the 1992 United Nations Conference on Environment and Development (UNCED). The convention debate continues to be an undercurrent of forest politics and policy to this day, although the demand for a convention has weakened over the past 20 years as states have pursued alternative international forest policy measures (MacKenzie 2012).

An international forest convention could have various advantages. First, it would demonstrate political commitment from states, serving as a statement of intent that governments are serious about addressing deforestation. Second, a convention could complement other international environmental conventions with a forest-related mandate, including the UN Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity and the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (see Chapter 37). Third, a forest convention could provide a rationalization function, integrating in one comprehensive instrument all forest-related provisions in international environmental law, in the process eliminating gaps, duplications and uncertainties (on international environmental law generally, see Chapter 10). In so doing a forest convention could re-energize international forest policy by providing strategic leadership on forests. Finally, a forest convention could clarify

how some established principles of international environmental law should apply to forests (see Chapter 10). These principles include sovereignty, the precautionary principles and common but differentiated responsibilities.

However, there are some arguments against these claimed advantages. A convention is not a precondition for political action to address deforestation; states and other actors can take meaningful action on forests without such an instrument. Indeed a convention could deflect political attention and resources away from implementation on the ground. A convention could generate jurisdictional complexities. Were a forest convention to be agreed the question would inevitably arise over which instrument should take the lead on conserving forest-related carbon sinks: the UNFCCC or the forest convention. There is certainly no legal basis for a forest convention acting as the lead instrument on forests, with other forest-related instruments such as the UNFCCC having a secondary role. Conferences of parties to other instruments would be under no obligation to take their lead from parties to a forests convention. On this view, far from rationalizing international forest-related law a forest convention could add another layer of political and legal uncertainty to international forest policy.

These, then, are some of the generalized arguments for and against a forest convention. Different states, however, may perceive different advantages and benefits based on different value-based conceptions of the national interest. Five different ideal type arguments for and against a convention may be posited. The first relates to the anticipated environmental benefits. For example, a state may desire a convention because it wishes to contribute to intergenerational equity, promoting long-term forest conservation for future generations. However this appears to be a motivating factor for very few states. For example, countries from the global South have often asserted in international forest negotiations that states should address issues of intragenerational equity, poverty and economic inequality before turning to issues of intergenerational equity.

A second set of arguments revolves around sovereignty and forest ownership. Some tropical countries resist a convention, arguing that such an instrument could erode their sovereign rights to exploit their natural resources. Brazil in particular has taken a persistently strong line on sovereignty, making clear it will accept no international regulation of its policies for the Amazon. During the UNCED forest negotiations Malaysia, which led for the Group of 77 Developing Countries (G77), spoke out against a convention on the grounds that it would infringe national sovereignty over forest use. Related to sovereignty is the question of forest ownership and privatization. There is a suspicion from some countries in the global South that some countries in the global North seek a forest convention to promote forest privatization and further trade liberalization in the forest sector (on North–South relations, see Chapter 21). Most of the world's forests are publicly owned by the state or regional forest authorities (White and Martin 2002). Some developed countries, in particular the USA, have argued that forests are more effectively and sustainably managed when under private ownership. The G8 countries endorsed a forest privatization agenda in 1998, presumably anticipating that forest-based corporations in G8 countries would be among the main beneficiaries (Humphreys 2006). However, tropical forest countries are unwilling to privatize their forests as under international trade and investment rules their forests could end up under foreign ownership (on international trade and the environment, see Chapter 22).

A third set of arguments revolve around forest management standards. Countries that have adopted high forest management standards may incur additional costs, and thus find themselves at a disadvantage in international trade relative to states with lower standards (see Chapter 22). The former may favour a convention in order to promote high international standards in order to erode any such disadvantages. The long-term support of Canada, a country with high forest management standards, can be explained in this light. Canada has been the most persistent

advocate for a forest convention in international forest negotiations. Higher global forest management standards would improve the international competitiveness of Canadian timber. Many Canadian forest businesses have voluntary signed up to the International Organization of Standards (ISO), and the Canadian Pulp and Paper Association has argued that ISO standards should apply worldwide (Lipschutz 2001; see Chapter 13). However, states with low management standards tend to oppose a forest convention that might impose additional costs on their forest industry, thus eroding the international competitiveness of their forest products.

A fourth set of arguments also focuses on trade. States with a strong forest industry may seek a forest convention as a mechanism to promote the international trade in forest products and gain access to new markets, thus realizing economic gains. The desire to achieve market openings for domestic industries has driven some previous international environmental instruments (see Chapter 22). Davenport (2006) argues that the USA was a leader in negotiating the Vienna Convention and Montreal Protocol on ozone depletion because US industry foresaw market opportunities in the production of ozone-friendly chemicals for aerosols and refrigeration (see Chapter 29).

A fifth set of arguments rest on bargaining between forest conservation and other issues. A recurring thread to all international forest negotiations is the G77's linkage of forest conservation with the transfer of financial and technological aid. Some tropical countries support a convention that would provide increased flows of official development assistance (ODA) to tropical forest countries vulnerable to deforestation. Similarly, some European and North American states have opposed a convention as this could increase the expectations of tropical countries of increased ODA. Preferring to deal with aid issues on a bilateral rather than a multilateral basis, countries such as the USA, UK and Sweden have argued that merely agreeing a convention would not increase forest-related aid transfers, emphasizing that increased funding can come from a variety of sources, including the private sector.

North–South differences are often overemphasized in analyses of international relations (see Chapter 21). However, in the UNCED forest negotiations there was a clear North–South polarization. Broadly speaking, all the countries of the global North favoured a forest convention while all those of the global South opposed one. No country from the global North opposed a convention which was supported by the USA, Canada, Japan and the European Union (or European Community as it was then called). Meanwhile, no country from the global South supported a convention, with many vocally against, in particular India and Malaysia.

Sovereignty was a major issue for the global South at Rio. Part of the reason for this was a shift in World Bank forest policy during the lead up to the UNCED. In 1991 the World Bank introduced a ban on financing logging projects in tropical forests, the key provision being that "the Bank Group will not under any circumstances finance commercial logging in primary tropical moist forests" (World Bank 1991). This was in response to criticisms from nongovernmental organizations (NGOs) and community groups that the Bank had financed destructive developments in the Amazon, with the Grande Carajás iron ore and mining project and the Polonoroeste highway construction and colonization project attracting strong criticism (on NGOs in global environmental politics, see Chapter 14). But the logging ban did not apply to non-tropical forests, fuelling the suspicions of tropical forest governments that developed countries and international development organizations such as the World Bank were seeking to deny them the right to exploit their forests.

During the UNCED process the USA promoted a convention, although without particular enthusiasm, to project an environmentally concerned façade in the run up to the UNCED. The shift from a pro- to an anti-convention position can be attributed to the change of administration from George H.W. Bush to Bill Clinton, the latter opposing a convention fearing it could

impose additional costs on US industry through agreeing tough international forest management standards (Davenport 2006: 131). Bush junior continued Clinton's opposition to a convention, although for different reasons; his administration was ideologically opposed to any measure that could be construed as environmental regulation either nationally or internationally. President Obama has also maintained an anti-convention position

Malaysia – the most outspoken critic of a convention during the UNCED negotiations – now supports a convention. The Malaysian change of position can be explained by a shift in the lead agency for international forest policy, from the Ministry of Foreign Affairs, which framed forestry as an issue of national security and sovereignty, to the Ministry of Primary Resources, which sees forests as an issue of trade and market access (Kolk 1996: 162; see Chapters 19 and 22). Another Southeast Asian forest power, Indonesia, has also shifted to support a convention after earlier opposition. Here the reason lies in the change of regime following the resignation of President Suharto in 1998. Suharto had a policy of aggressively exploiting Indonesia's timber resources, including extensive clear felling in Sumatra and Kalimantan. Since 1998 Indonesia has favoured a forest convention and adopted a pro-conservation stance, including leading a regional Southeast Asian initiative against illegal logging in 2001.

States have revisited the convention question three times since the UNCED: at the UN Intergovernmental Panel on Forests (IPF), a temporary forest body that existed for two years between 1995 and 1997; at the UN Intergovernmental Forum on Forests (IFF), the IPF's successor that existed for three years until 2000; and in 2006–7 at the United Nations Forum on Forests, a body created in 2001 that reports directly to the UN Economic and Social Council. On each occasion there was no consensus. Countries arguing most strongly for a convention were Canada, Malaysia, most of the EU countries (in particular Germany and the Netherlands), Russia, Norway, Finland, many African countries (including Nigeria) and the Central American countries (in particular Costa Rica). Meanwhile opponents have included the US, UK, Sweden, China, Japan, New Zealand and almost all South American countries.

The South American countries have been led by Brazil. As the tropical forest state with the largest expanse of tropical forest cover, Brazil has issue-specific power that it uses to good effect in international forest negotiations. Brazil regularly attracts forest-related development assistance from bilateral and multilateral donors and does not consider that a forest convention will provide the country with additional aid. Brazil can walk away from a forest convention without suffering any costs. The Central American countries, by contrast, are much smaller and tend to have more difficulty attracting forest aid, one of the reasons they favour a convention.

With no agreement for a convention, states have opted for soft law on forests, the most recent example being the 2007 Non-legally Binding Instrument on All Types of Forests, and other alternatives. Arguably the most successful policy initiatives are voluntary, non-state market-driven certification and labelling schemes. The pioneer scheme was the Forest Stewardship Council (FSC), established in 1993 after the International Tropical Timber Organization – an intergovernmental organization that aims to promote the trade in tropical timber while also taking action to ensure the long-term conservation of the resource base – decided against introducing a labelling scheme for timber from sustainable sources (Gale 1998). Decision-making authority in the FSC is divided equally between environmental, economic and social chambers, with equal representation between developed and developing countries (Cashore et al. 2004).

The FSC awards its label to forest concessions that meet the FSC criteria for well-managed forests. The FSC relies on both supply-side measures (forest owners and managers prepared to harvest timber that is managed according to the FSC's principles for well-managed forests) and demand-side measures (retailers and consumers prepared to purchase only FSC-certified timber). As of April 2012 the FSC had certified 147,102,231 hectares of forests in 80 countries (FSC 2012).

The success of the FSC led to the creation of competitor schemes, most of them now consolidated under the Programme for the Endorsement of Forest Certification (PEFC). The PEFC endorses national certification schemes. As of March 2012 the PEFC had certified 243,000,000 hectares of forest in 27 countries (PEFC 2012). The PEFC thus certifies more forests per country than the FSC, leading to suggestions that the PEFC has the looser standards (Humphreys 2006).

From the early 1990s to the mid-2000s forest certification and labelling was the dominant international policy response to deforestation. The FSC and PEFC remain important initiatives (Chan and Pattberg 2008; Gulbrandsen 2012). However, the international forest policy focus has changed since then from well-managed and sustainably managed forests to maintaining the carbon sequestration and sink function of forests.

Forests and carbon

Carbon is often called the "stuff of life" – all life forms of flora or fauna have carbon in their genetic structure – and it is now increasingly the basis around which social life is structured. Since the dawn of the Industrial Revolution the mining and burning of oil, coal and natural gas formed and laid down in earlier geological eras, primarily the Carboniferous period (*c.*360–300 million years ago), represents a massive anthropogenic intervention in the carbon cycle leading to increased atmospheric concentrations of carbon dioxide. Growing scientific knowledge on anthropogenic climate change since the 1950s, and especially since the creation of the Intergovernmental Panel on Climate Change in 1988, has led to the recognition that mitigation policies, including enhancing forest-based carbon sinks, should be put in place to reduce the concentration of carbon dioxide in the atmosphere (on the role of science in global environmental politics, see Chapter 17). If the extraction and burning of fossils fuels is the "old" carbon economy, therefore, then the downstream capture and sequestration of carbon dioxide including in forests may be seen as the "new" carbon economy (Bridge 2011). The development of the new carbon economy, however, is relatively recent, dating only from agreement of the UN Framework Convention on Climate Change (UNFCCC) in 1992 (see Chapter 28).

The flow of carbon through social structures – from extraction, burning and carbon dioxide emission to carbon sequestration – is often framed in terms of avoiding catastrophe. If there is "not enough" carbon then electrically powered infrastructures cease functioning and the global economy falls into recession, maybe even collapsing. If there is "too much" carbon positive feedbacks in the global climatic system will be set in train, such as the melting of ice sheets and thawing of permafrost, leading to further global warming. As Gavin Bridge (2011: 821) has argued "carbon is fast becoming a common denominator for thinking about the organization of social life in relation to the environment".

The focus on forest carbon is not intrinsically a forest problem; it is part of the problem of "too much" atmospheric carbon. It has been constructed as a forest problem in part because there now seems little prospect that states will agree to deep emissions cuts. The Kyoto Protocol's attempts to set legally binding limits on greenhouse gas emissions may be seen as a failed experiment. The idea of internationally agreed limits on the extraction and burning of fossil fuels has not even made it to the political agenda. As a result, the geography of responsibility for addressing climate change has shifted from the fossil fuel economy to the forest economy.

One reason for the recent international political focus on the carbon sink function of forests concerns US domestic politics (on domestic political forces, see Chapter 12). In 1997 the US Senate passed the Byrd–Hagel resolution stating that Senate would not ratify a post-Kyoto agreement that does not include emissions reductions targets for developing as well as developed countries. Unless this resolution is overturned any post-Kyoto agreement is unlikely to be ratified

through Senate unless it includes emissions from forests. A further reason for international attention on the role of forests in climate change is that with no multilateral legal framework on forests, developing countries are searching for alternative mechanisms through which they can secure forest-related aid transfers. Countries with stable forest cover do not attract forest-related aid whereas countries with deforestation problems do. Somewhat perversely, therefore, tropical forest-rich countries have an incentive to find forest problems.

Framing forest loss as a climate change problem has led to a shift in the political centre of gravity of international forest politics from the United Nations Forum on Forests to the UNFCCC. Forests are now increasingly valorized for the role that they can play in sequestering and storing carbon from the atmosphere. In December 2007 the thirteenth conference of parties to the Framework Convention on Climate Change (FCCC) agreed in Bali a decision on reducing emissions from deforestation in developing countries in order to enhance carbon stocks (United Nations 2007a). This followed a proposal from the governments of Costa Rica and Papua New Guinea which led to the concept of Reducing Emissions from Deforestation and forest Degradation (REDD). The idea of REDD is consistent with Article 2 of the UNFCCC on "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations 1992a).

The underlying rationale of REDD is that financial incentives should be set in place to encourage countries suffering from deforestation to reduce their deforestation rates. REDD is the incentivizing of forest conservation through valuing the carbon that is stored in forests to prevent deforestation that would otherwise take place. REDD can be seen as part of a drive from the global South to shape international climate and forest policies in a way that is consistent with developing country interests and understandings of fairness and climate justice (see Chapter 23). It is an emerging policy idea; at present there is not a single, coherent policy approach to REDD or a single governing institution. The term "REDD" is sometimes loosely used to denote any payment made to avoid deforestation in order to enhance forest-related carbon stocks. Although the idea of REDD has been endorsed by parties to the UNFCCC there is at this writing no agreed multilateral framework for REDD, although one is slowly evolving under the auspices of the UNFCCC.

Until such a framework is agreed REDD commitments will remain voluntary. One approach to REDD is the negotiation of conservation commitments from forest countries in exchange for transfers of international public finance. This approach can involve the use of bilateral or multilateral ODA to secure, for example, the conservation of an area of tropical forest or a reduction in the rate of deforestation that is agreed between donors and the host government. Brazil favours a public finance approach to REDD. Two other South American countries have made offers to conserve their tropical forests. In 2007 the government of Guyana made an offer to protect its rainforest if it received in exchange financial resources to address the country's poverty (Howden 2007). In 2009 the governments of Guyana and Norway signed a memorandum of understanding on forest conservation that was claimed as one of the first results-based payment mechanisms for REDD (Ministry of the Environment of Norway 2009). The deal allows Guyana to earn up to $500 million over four years. However, the environmental group Global Witness subsequently claimed that deforestation rates increased after the agreement was signed (Global Witness 2011).

The government of Ecuador has also offered to protect its rainforests and desist from exploiting its Amazonian oil fields. The Ecuadorian case brings together the old and new carbon economies in the same geographical space (Bridge 2011: 829). The government of Ecuador offered to forgo revenues from the old carbon economy of oil extraction in exchange for payments from the new carbon economy of forest-based sequestration. President Rafael Correa

commented, "Ecuador doesn't ask for charity, but does ask that the international community share in the sacrifice and compensates us with at least half of what our country would receive, in recognition of the environmental benefits that would be generated by keeping this oil underground" (cited in Martin 2011: 33). The proposal was for Ecuador to receive $350 million per year to be placed in a United Nations Development Programme (UNDP) trust fund. In 2010 Ecuador signed a revised agreement with the UNDP, through not for the full amount being sought. The Ecuadorian government is continuing to raise additional money for the initiative which according to one commentator provides a model for other forest-rich countries such as Bolivia, Peru, Indonesia and Nigeria (Martin 2011: 39).

Two principles underlie the global South's bargaining drive for financial resources in exchange for forest conservationist pledges. The first is compensation for opportunity cost forgone, a claim made by the G77 during the UNCED forest negotiations. Simply stated, the principle means that if a country is to desist from exploiting forests or other natural resources for the common good of humanity, then that country should expect to receive some compensation in lieu of the money it would have received from exploiting the resources (Grainger 1997; Humphreys 1996). The G77 did not succeed in inserting this principle into the UNCED outputs and has not secured its inclusion in any post-UNCED multilateral legal and political declarations. However, it remains a key guiding principle for developing countries in international forest politics. No forest country has indicated that it is prepared to make significant forest conservation pledges without some financial *quid pro quo* from the donor community.

The second principle is common but differentiated responsibilities. This principle is included in the UNFCCC (United Nations 1992a: articles 3.1, 4.1), the Rio Declaration on Environment and Development (United Nations 1992b: principle 7) and the Non-legally Binding Instrument on All Types of Forests (United Nations 2008). This principle encompasses two things: that while all states have a responsibility to address international environmental problems, some have more responsibility than others; and that different states may have different types of responsibility, depending on the issue at hand. The deals reached over forest conservation in Guyana and Ecuador are consistent with an interpretation of the principle of common but differentiated responsibilities, namely that forest-rich countries have a responsibility to conserve their forests and carbon stocks if developed countries acknowledge a correlative responsibility to pay for this conservation. It should be stressed, however, that in international law the principle is a guiding one only with no agreed interpretation or applicability (see Chapter 10).

If negotiating aid transfers is one possible approach to REDD a second is a market-based approach. There is as yet no global market-based REDD scheme. However, in 2011 the seventeenth conference of parties to the UNFCCC meeting in Durban agreed that an international legal instrument on forests should be finalized no later than 2015, coming into effect no latter than 2020. To accommodate the United States any new agreement will need to include emissions from developing countries and it may include agreement on a global market-based scheme for REDD. Such a scheme would bring together the sellers of credits with the buyers. A likely model is that countries that reduced their deforestation beneath an agreed baseline would create carbon credits. These credits could then be sold to other countries that wished to exceed any internationally agreed carbon emissions allowance and thus needed credits to offset the difference. Or the credits could be bought by other actors, for example businesses, that wished to implement a low carbon policy in response to demands from key constituents, such as consumers and environmental NGOs (see Chapters 14, 16, 26 and 27).

One potential flaw of a market-based scheme is that the earnings that the sellers would receive would not be predictable, and would vary with fluctuations in the international price of carbon. This need not necessarily be sufficient to offset the opportunity cost forgone of

conserving forests or converting them to other land uses. For example, if the revenue that an actor (say a private owner) could receive from REDD credits earned by conserving a given area of forest exceeded the revenue it could earn from deforestation and growing palm oil then the rational actor would forgo conversion to palm oil and sell REDD credits. But were the price of REDD credits to fall and the price of palm oil to rise so that the revenue from palm oil now exceeded that which could be earned from REDD credits, then the rational response would be to shift from conservation to conversion (assuming that the transaction costs of conversion were not prohibitively high).

Conservation will occur, therefore, only when the money from REDD credits exceeds the most attractive opportunity cost forgone. But there is no basis in market economic theory why this should be so, and because REDD revenues would not necessarily exceed the opportunity cost a market-based REDD scheme could not guarantee conservation. A further complicating factor is that the difference between REDD revenues and opportunity costs will vary over space as well as time; a REDD price may be sufficiently high to avoid deforestation in one space, but not in another (Costenbader 2011). So if a market-based REDD scheme is to provide long-term incentives for forest conservation on a global scale the prices of REDD credits around the world would need to rise so that they always exceeded the most attractive local opportunity costs.

Again, there is no principle in market theory why this should be the case. The price of REDD credits will be decided by the demand for and supply of REDD credits, not the price of alternative land uses. To be desirable in conservation terms as many forest owners as possible should offer their forests on a REDD market. But the greater the supply of REDD credits, the lower the price. When the per hectare price falls below that of alternative land uses some forest owners will elect for conversion. This will reduce the supply of REDD credits so that the REDD credit price will increase. The market will correct itself, but some forests will have been lost. So there needs to be a mechanism to make up the shortfall between the revenue a forest owner can obtain from REDD, and the revenue available from converting forests to the most attractive opportunity cost forgone. At present the only option available is international development assistance (Karsenty et al. 2013)

Reducing carbon emissions from deforestation

Different actors bring their own values and interests to the REDD debate. For example, environmental NGOs stress that REDD should not just focus on carbon but incorporate the multifaceted goods and services that forests provide, while community and indigenous peoples' groups argue that REDD projects should include recognition of traditional land rights. Indigenous peoples' groups claim that their approval should be sought before REDD projects are implemented on their traditional, customary land. These groups often cite the principle of free, prior and informed consent that appears in the United Nations Declaration on Indigenous Peoples adopted by the UN General Assembly in 2007 (United Nations 2007b). This principle holds that consent should be free (with no coercion or intimidation), prior (before the authorization and commencement of any project or development activities) and informed (by full knowledge of what any proposed project or development activities will entail) (Anderson 2011).

The issue of land tenure is integral to indigenous peoples' rights. Lorenzo Cotula and James Mayers argue that tenure, which they define as "the system of rights, rules, institutions and processes regulating resource access and use", and how tenure is upheld and enforced is key to determining how the risks, costs and benefits from REDD are distributed (2009: 3). Where tenure is unclear the risks – to investors and of forest loss – are increased. Insecure tenure rights may lead to insecure carbon rights. Tropical forest governments have increasingly recognized in

recent years that centralized state management of forests is cost-ineffective. Granting secure tenure rights to local communities can lead to more effective forest conservation at a lower cost to the national exchequer. Secure tenure rights for local communities who can monitor forest loss and degradation and report illegal logging can reduce these risks. Cotula and Mayers identify Brazil and Malaysia as two countries that have strong local tenure regimes both on paper and in practice, while the Democratic Republic of the Congo, Indonesia and Guyana have weak tenure regimes for local communities. The latter countries carry the greatest risks and are also poorly equipped to ensure that local communities benefit from REDD projects.

Although a REDD regime is still emerging there is a tentative agreement on three basic principles – additionality, permanence and leakage – that pilot REDD projects are expected to address if they are to qualify for funding. The principle of additionality holds that any reductions in deforestation should be those that would not have occurred were it not for REDD payments, either ODA or REDD credits. To maximize additionality REDD should target forests that are most at risk of deforestation, such as those that are near to a major deforestation front. However, there is the risk that targeting high risk forests could create perverse incentives. Governments or forest owners could announce they intended to convert forests to alternative uses. Speculators could buy high value forests then threaten to fell them unless they were compensated. To Michael Richards and Michael Jenkins (2007: 4): "The danger is that the main 'winners' could turn out to be would-be developers or degraders, e.g., large scale and capital rich plantation crop or cattle farmers, rather than forest conserving communities." Owners that have a record of effective long-term conservation of their forests would not be eligible for REDD credits as there would be no additionality in paying for the conservation of forests that were secure, well managed and with no deforestation risk.

The principle of permanence holds that any carbon dioxide stored in forests should remain there. According to this principle it makes little sense to use REDD money to fund reduced deforestation in forests that, in all likelihood, will be lost within a few years. Against this it might be countered that it is precisely these forests that REDD should target, as it is here where the greatest added value can be realized. The principle of permanence is a relative one and its definition will depend on a stipulated time horizon over which permanence is measured. When assessing the principle in any REDD project it is necessary to balance the likely gains of reducing carbon dioxide emissions from high risk forests against the risks of forest loss in the near future. Over the long term permanence is difficult to achieve as all forests are at risk from deforestation pressures, both natural and anthropogenic.

Leakage occurs when deforestation is not so much reduced but as displaced. If the rate of deforestation in, say, forest A is reduced but in such a way that deforestation pressures are shifted over space to forest B, then no net reduction will have occurred and any REDD payments will have benefited the owner of forest A without leading to any net deforestation. The concept of leakage is based on the idea that carbon accounting boundaries should be broadly drawn to encompass global carbon budgets, rather than narrowly drawn around a particular REDD project. Because leakage cannot be known in advance some assessment of the risks of leakage is necessary prior to project approval. The risks of leakage are likely to be highest when deforestation in forests at risk is reduced through denying forest access to forest businesses that have the resources and power to relocate easily to other forestlands.

One important question an international market-based REDD scheme will need to address is how deforestation baselines should be agreed. The baseline is the background (or "business as usual") rate of deforestation against which any reduced deforestation and forest degradation should be measured. Agreeing baselines will involve methodological and technological issues, such as how the rate of deforestation should be measured, whether measurement should be

carried out by local surveys, satellite mapping or a combination of both, and over what time period the background rate should be calculated. In addition there is also likely to be a political dimension to agreeing baselines. This can be explained in terms of possible trade-offs between participation and effectiveness.

A global REDD scheme will be more effective the more countries participate in it. All other things being equal a country will have a greater incentive to participate in REDD when its baseline is generous (in other words, is higher than the actual rate of deforestation on the ground). The more generous the baseline, the easier it will be for that country to claim that it has achieved significant reductions in deforestation. When negotiating the terms of a REDD scheme (either publicly financed or market-based) a country will thus have an incentive to bargain for a high baseline which will offer the possibility of generating more REDD credits. Conversely, the more stringent the baselines, the more difficult it will be to claim reduced deforestation. Ideally, of course, the baselines agreed should correspond as closely as possible to the actual deforestation.

Other things being equal, generous baselines would increase earnings potential and lead to a higher uptake of forested countries within REDD schemes than would otherwise be the case. This would run the risk of being counterproductive in environmental terms. States might calculate that rather than incur additional costs by taking strong measures to reduce deforestation they can earn more by bargaining hard for a generous baseline; in effect, earning more from less. Furthermore, if generous baselines are agreed for all, or most, countries in a market-based scheme then the result will be an increase in the supply of REDD credits, thus depressing the global price. States that wished to increase their emissions of carbon dioxide would thus be able to purchase REDD credits more cheaply and would thus have less incentive to invest in clean technology to reduce their carbon dioxide emissions. In short, while some laxity in baselines would lead to higher participation among forested states, it would reduce incentives both for reducing deforestation in countries selling REDD credits and for investing in emission reduction technology in countries buying REDD credits. But a higher price need not necessarily be desirable in environmental terms. A high price would draw in more sellers willing to conserve their forests but would do so only because more developed countries wished to exceed any internationally agreed carbon dioxide emissions. Forest conservation would thus be used as a pretext to permit carbon dioxide emissions from the industrial sector.

Conclusion

A great many environmental goods and services are at stake in forest politics, one of the most important being carbon. In many respects the struggle over carbon flows is one of the defining features of our age. Those who have carbon – as oil, timber or carbon sink – seek to sell it to those who do not. Over the past three centuries underground carbon has been removed and introduced to the atmosphere through fossil fuel burning. Each molecule of carbon dioxide remains in the atmosphere for approximately one hundred years, although it will remain in the biosphere for much longer. Any REDD scheme that avoids deforestation is certainly desirable, provided no linkage is drawn between the old and new carbon economies. In this respect a market-based REDD scheme is highly problematic as it allows for additional emissions from the energy sector while maintaining forest cover, thus increasing the sum total of carbon in the biosphere. In short, there is a fundamental ontological problem to the market-based notion of REDD as while it may conserve forests it is not doing what it claims to do, namely contribute to climatic stability. However, any scheme where deforestation is avoided but where there is no linkage to energy emissions should be seen as desirable from the standpoints of both forest

conservation and climatic stability. In this respect the international public finance approach to REDD has much to commend it.

References

Anderson, Patrick (2011) *Free, Prior and Informed Consent in REDD+: Principles and Approaches for Policy and Project Development*, RECOFTC (Centre for People and Forests)/Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. Available online at: <http://www.recoftc.org/site/uploads/content/pdf/FPICinREDDManual_127.pdf> (accessed 13 May 2012).

Bridge, Gavin (2011) "Resource geographies 1: making carbon economies, old and new", *Progress in Human Geography* 35(6): 820–34.

Cashore, Benjamin, Graeme Auld and Deanna Newsom (2004) *Governing through Markets: Forest Certification and the Emergence of Non-state Authority*, New Haven, CT: Yale University Press.

Chan, Sander and Philipp Pattberg (2008) "Private rule-making and the politics of accountability: analyzing global forest governance", *Global Environmental Politics* 8(3): 103–21.

Costenbader, John (2011) "REDD+ benefit sharing: a comparative assessment of three national approaches", UN-REDD Programme, 1 June. Available online at: <http://www.theredddesk.org/resources/reports/redd_benefit_sharing_a_comparative_assessment_of_three_national_policy_approaches> (accessed 15 March 2012).

Cotula, Lorenzo and James Mayers (2009) *Tenure in REDD: Start-point or Afterthought?* London: International Institute for Environment and Development.

Davenport, Deborah Saunders (2006) *Global Environmental Negotiations and US Interests*, Basingstoke: Palgrave Macmillan.

Forest Stewardship Council (FSC) (2012) "Global FSC certificates: type and distribution". Available online at:<http://www.fsc.org/fileadmin/web-data/public/document_center/powerpoints_graphs/facts_figures/2012-03-15-FSC-FIG-Global_FSC_certificates-EN.pdf> (accessed 2 April 2012).

Gale, Fred (1998) *The Tropical Timber Trade Regime*, New York: St Martin's Press.

Global Witness (2011) "Guyana sees a three-fold increase in deforestation despite landmark deal to protect its forests". Available online at: <http://www.globalwitness.org/library/guyana-sees-three-fold-increase-deforestation-despite-landmark-deal-protect-its-forests> (accessed 15 March 2012).

Grainger, Alan (1997) "Compensating for opportunity costs in forest-based global climate change mitigation", *Critical Reviews in Environmental Science and Technology* 27(S001): 163–76.

Gulbrandsen, Lars H. (2012) "International forest politics: intergovernmental failure, non-governmental success?", in Steinar Andresen, Elin Lerum Boasson and Geir Hønneland (eds) *International Environmental Agreements: An Introduction*, London: Routledge.

Howden, D. (2007) "Take over our rainforest: Guyana's extraordinary offer to Britain to save one of the world's most important carbon sinks", *The Independent*, 24 November, pp. 1–3.

Humphreys, David (1996) *Forest Politics: The Evolution of International Cooperation*, London: Earthscan.

—— (2006) *Logjam: Deforestation and the Crisis of Global Governance*, London: Earthscan.

Karsenty, Alain, Aurélie Vogel and Frédéric Castel (2013) "'Carbon rights', REDD+ and payments for environmental services", *Environmental Science and Policy* (forthcoming).

Kolk, Ans (1996) *Forests in International Politics: International Organizations, MGOs and the Brazilian Amazon*, Utrecht: International Books.

Lipschutz, Ronnie D. (2001) "Why is there no international forestry law? An examination of international forestry regulation, both public and private", *Journal of Environmental Law* 19(1): 153–79.

MacKenzie, C.P. (2012) "Future prospects for international forest law", *International Forestry Review* 14(1): 1–9.

Martin, Pamela L. (2011) "Global governance from the Amazon: leaving oil underground in Yasuní National Park, Ecuador", *Global Environmental Politics* 11(4): 22–42.

Ministry of the Environment of Norway (2009) "Guyana–Norway partnership in climate and forests". Available online at: <http://www.regjeringen.no/en/dep/md/Selected-topics/climate/the-government-of-norways-international-/guyana-norwaypartnership.html?id=592318> (accessed 6 March 2012).

Programme for the Endorsement of Forest Certification (PEFC) (2012) "PEFC global certification: forest management and chain of custody". Available online at: <http://www.pefc.org/resources/webinar/item/801> (accessed 2 April 2012).

Richards, Michael and Michael Jenkins (2007) "Potential and challenges of payments for ecosystem services from tropical forests", *Forestry Briefing* 16, London: Overseas Development Institute.

United Nations (1992a) *United Nations Framework Convention on Climate Change*, New York: United Nations.

—— (1992b) *Rio Declaration on Environment and Development*. Available online at: <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163> (accessed 6 March 2012).

—— (2007a) FCCC/SBSTA/2009/L.19/Add.1. "Reducing emissions from deforestation in developing countries: approaches to stimulate action". Available online at: <http://unfccc.int/resource/docs/2009/sbsta/eng/l19a01.pdf> (accessed 6 March 2012).

—— (2007b) *United Nations Declaration on the Rights of Indigenous Peoples*. Available online at: <http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf> (accessed 13 May 2012).

—— (2008) *Non-legally Binding Instrument on All Types of Forests*. Available online at: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N07/469/65/PDF/N0746965.pdf?OpenElement> (accessed 31 January 2012).

White, Andy and Alejandra Martin (2002) *Who Owns the World's Forests? Forest Tenure and Public Forests in Transition*, Washington, DC: Forest Trends and Center for International Environmental Law.

World Bank (1991) *The Forest Sector: A World Bank Policy Paper*, Washington, DC: World Bank.

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Desertification

Meri Juntti

Desertification, like climate change and biodiversity loss, has been deemed a global environmental challenge that merits its own multilateral convention to achieve coordinated action to combat and mitigate its impact (see Chapters 28 and 37). The United Nations Convention to Combat Desertification (UNCCD), established in the wake of the 1992 Rio Earth Summit on sustainable development, orchestrates action on desertification at a global level. However, like many other environmental issues, desertification is a nebulous concept, where scientific knowledge (see Chapter 17), political opinion (see Chapter 26) and operative-level experience and know-how converge, conflict and vie for domination. Over a hundred definitions of desertification are identifiable from the literature, but most relate it to the loss of an area's resource potential, through depletion of soil cover, vegetation cover or loss of useful plant species (Middleton 2008).

Desertification arguably poses a so-called "wicked" (Turnpenny et al. 2009) challenge to environmental managers and legislators, due to its complex and interdisciplinary nature, characterized by high uncertainty and ambiguous relations of cause and consequence which hinder clear allocation of responsibility for and identification of possible solutions. These characteristics are of course peculiar to environmental problems in general, which tend to be particularly challenging for policy due to typically slow accumulation over long time frames, their tendency to concern and connect geographically distant areas and to involve causes and consequences that are unequally distributed among populations and, finally, because they tend to be mostly formulated by scientists but frequently engage and involve wide ranges of stakeholders with different belief and value systems and interests (Mickwitz 2003).

This chapter outlines the various different ways of defining desertification and the political motivations and implications that these carry. It looks critically at the role of evidence, particularly the scientific versus lay-knowledge dichotomy, in the prevalent desertification discourses. It also explores some examples of combating desertification in practice and describes some key contextual factors that influence the success of the participatory approach in understanding and mitigating desertification. The chapter concludes by looking at recent developments in combating desertification and anticipates future developments in the knowledge and politics of desertification.

International politics of desertification

It is the wickedness of desertification that renders it a highly politicized issue. Many writers have explored the factors that contribute to this politicization. The best known of these are perhaps Piers Blaikie and Harold Brookfield who in 1987 edited (and wrote much of) the seminal volume *Land Degradation and Society*, highlighting through a political ecology lens and with many empirical examples, how land degradation processes (that in many cases amount to desertification) are intrinsic to certain social, economic and cultural processes of resource use and modification as well as patterns of appropriation and relationships of power. Blaikie and Brookfield deem land degradation to be essentially a social problem, where the degree of degradation can only be meaningfully defined in relation to actual or potential uses of a specified area of land. They also highlight the need to think carefully about how we define and conceptualize the society–degradation relationship because this is significant for how we address the problem. Many other writers identify several modes of the politicization of desertification and explore and identify different manifestations, ranging from the political motives behind the framing of the UN Desertification Convention itself (Adger et al. 2001) to unravelling some of the "myths" associated with desertification and revealing the underpinning uncertainties (Thomas and Middleton 1994).

Varying interpretations of what desertification actually is, how it manifests itself and to what extent it is posing a problem for livelihoods in specific areas are rife among stakeholders, and this has a significant impact on how natural resource management policies and programmes are implemented and impact the natural resources of affected areas (Wilson and Juntti 2005). The Millennium Ecosystem Assessment and related reports by the World Resources Institute (WRI 2005) attempt to identify and conceptualize the impact of desertification on human well-being, pointing out that while the local magnitude of the impact varies in relation to degree of aridity and population pressure, desertification occurs on all continents except Antarctica, and affects over a million people, the majority of whom already live in poverty and can be classified as vulnerable. Many reports also place the problem of desertification in the context of the need to feed a population of an estimated 9 billion people by 2050 on available and diminishing land resources, where desertification in many areas poses a threat to food security (Government Office for Science 2011; see Chapter 40).

The UNCCD identifies 194 countries as parties to the Convention and thus affected by processes of desertification. The Convention constitutes the sole legally binding international agreement linking environment and development to sustainable land management and is committed to a bottom-up approach, encouraging the participation of local people in combating desertification and land degradation, as well as knowledge and technology transfer from North to South. Its principal aims are to improve the living conditions for people in drylands, to maintain and restore land and soil productivity, and to mitigate the effects of drought (UNCCD 2012). In terms of the future, inspired by the Rio+20 Convention in June 2012, the UNCCD has formulated a global "zero net degradation" target supported by specific sustainable development goals for ratification (UNCCD 2011). Figure 39.1 details the different institutions involved in the UNCCD and the main connections and some features of the hierarchy among these. In its 10-year strategy adopted in 2007, the Convention outlines its aim: "to forge a global partnership to reverse and prevent desertification/land degradation and to mitigate the effects of drought in affected areas in order to support poverty reduction and environmental sustainability" (UNCCD 2007: 16). This gives an indication of globally shared responsibility, but no funds for fulfilling this goal are available through the Convention itself. Initially, the Global Mechanism

(GM) was established in 1998 with the remit to support developing countries in increasing investment in land as a resource at the national and international levels. The GM also helps countries to identify national and international, private and public sources of finance for sustainable land management practices.

In 2010 the Global Environment Facility (GEF) finally adopted the mandate to finance the UNFCCD, but linking desertification to other cross-cutting issues, such as climate change, has been seen as necessary in order to attract significant funds to date and the Secretariat of the Convention plays a key role in this (Conliffe 2011). Scientific evidence linking climate change and incidences of desertification is widespread, and desertification has been hailed by many as a noteworthy potential contributor to carbon emissions – particularly in terms of loss of soil

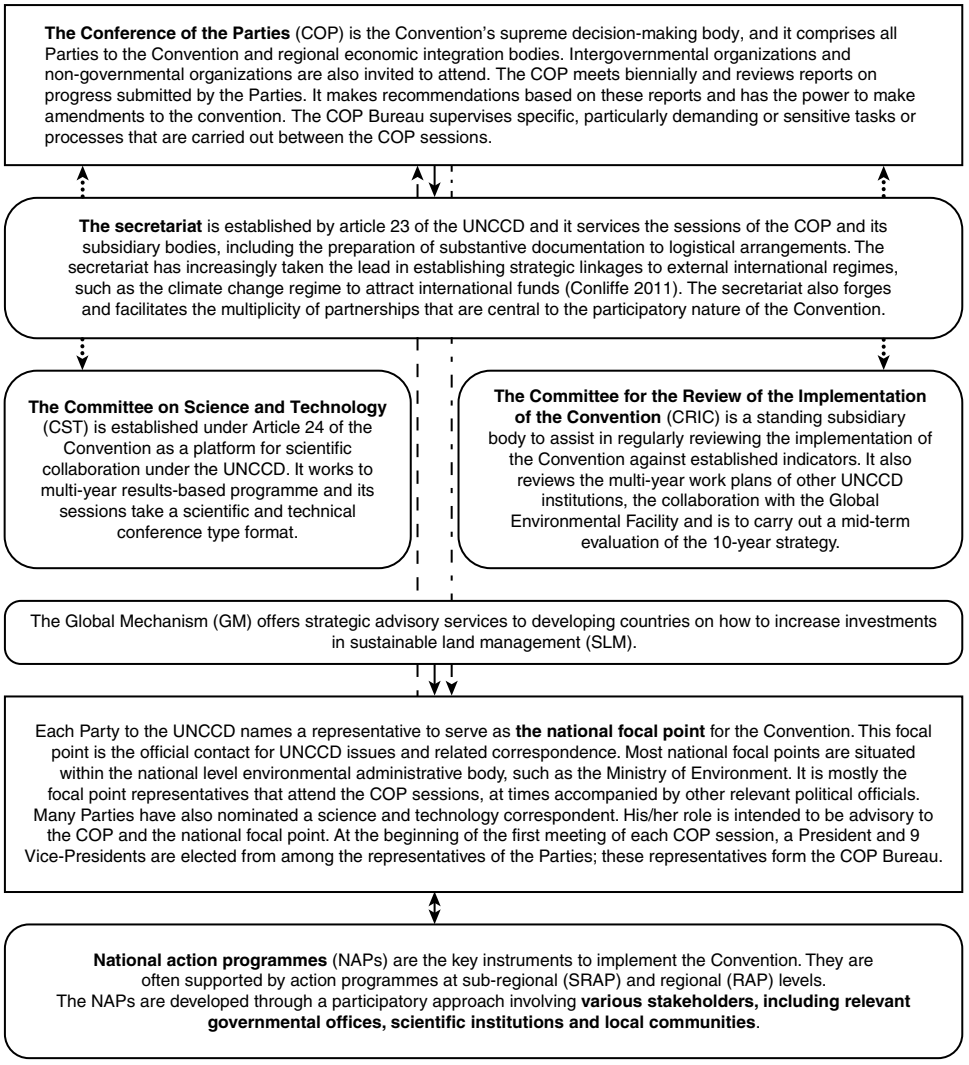


Figure 39.1 UNCCD institutions and decision-making structure
Source: Collated from UNCCD 2012

carbon sequestration capacity (Conliffe 2011). While this means that attempts to combat desertification are likely to be able to tap into a wider range of funding sources in the future, it also implicates desertification in the knowledge struggles, manifested in the recent very public allegations regarding the validity and reliability of evidence that these complex phenomena are "unequivocal" and attributable to human activity (IPCC 2007: 30).

Defining desertification

The most obvious manifestations of the politicized nature of desertification have to do with what should be a very simple matter of agreeing on a definition of what desertification means in practice. There are many definitions of desertification that relate to the processes involved and/or the significance of climate and people. Confusion prevails between the concepts of desertification, drought and progressive desiccation (Goudie 1990). According to Wellens and Millington (1992: 245) desertification comprises "a set of well-defined processes which operate singly or in combination in dryland regions to cause environmental degradation. These are naturally occurring processes which are aggravated under adverse climatic conditions and where population pressure is high." Wellens and Millington also point out that desertification is an evocative and misleading concept: it does not necessarily manifest itself in the spreading of desert-like conditions and it certainly does not consist of a single process but rather of a combination of mutually reinforcing and often cyclical developments. This alludes to the problems that scientists from different fields relevant to these developments face in attempting to identify and provide evidence of desertification. Indeed, over the years, it has proved very difficult, through empirical scientific exploration, to define whether an area is desertified or not.

Desertification is often deemed to be the combined effect of the following processes: accelerated wind and water erosion, woodland destruction, and waterlogging and the salinization of irrigated land (WRI 2005; Middleton 2008). It is important to note that the acceleration may be climatically induced and/or anthropogenic, although the relative influence of these drivers is debated. The UNCCD acknowledges this duality and defines desertification as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" (UN 1994). Land degradation, in turn, is defined as:

> the reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation.
>
> (UN 1994: 5)

Finally, the World Commission on Environment and Development (WCED; the Brundtland Report) refrains from ascribing blame but defines desertification in very anthropocentric terms, as "the process whereby productive arid and semi-arid land is rendered economically unproductive"(WCED 1987). This definition is interesting as it identifies desertification as occurring only where there are economic consequences.

Many argue that these global-level definitions of desertification remain by and large detached from the context in which desertification is experienced first-hand and where policies and programmes are implemented (Adger et al. 2001). Juntti and Wilson (2005) point out that while it is clear that the difference in emphasis detectable in the above definitions can lead to very

different ways of conceptualizing and diagnosing the problem of desertification and, consequently, to the adoption of different remedial methods, different emphases can also be used to serve different stakeholder interests. Juntti and Wilson identify five different ways of defining desertification at the "operative" level, by stakeholders such as farmers, water and environmental officials and citizens living and working in environments that the UNCCD identifies as affected by desertification in the northern Mediterranean region. While the five categories overlap to some extent, each holds a different interpretation of the role of the natural resources in the economy, the justifiable ends towards which these resources are to be used and, hence, a different morality according to which the extent and nature of desertification has been defined and is influencing how natural resources are managed. In Juntti and Wilson's (2005) data, desertification is defined as depopulation (the "anthropocentric" interpretation), most often by actors that derive their livelihoods from the management of land and water resources, such as farmers and foresters, as well as their interest organizations (see Chapters 34 and 38). Indeed, the WRI (2005) indicates that desertification is a potential cause of migration of people from affected areas to others, which can in turn cause instability and overexploitation of resources in the receiving areas.

The second operative-level interpretation identified by Juntti and Wilson defines desertification as a water management issue (the "reductionist agrarian" interpretation; see Chapter 34). This is particularly prominent in areas where intensive use of water resources is linked to resource scarcity but also to significant economic growth. Juntti and Wilson claim that understanding desertification as depopulation and as a mere water management issue reflects a morality where the rural population and the existing forms of land management (mainly irrigation farming and horticultural production) are regarded not only as necessary economically productive functions, but also as examples of good management of the natural resources of the locality, especially the productivity of the soil (Juntti and Wilson 2005: 233; see also Oñate and Peco 2005). Economic development is thus seen to justify overexploitation and in many cases technological solutions such as desalination or water transfers are seen as the solution. These often highly contentious innovations are seen as a means to maintain intensive production practices, but they also free land managers of the responsibility to change their practices to conserve resources. Technological solutions have in many cases increased the ability of local resources to support larger populations and, perhaps more often, more intensive forms of production, as is shown by the many examples where desalinated water is used to replace a depleted stock of potable ground and surface water to enable development that is not supported by the natural availability of resources (Murad 2010).

In terms of desertification mitigation, both of the above interpretations arguably corroborate any case for investment in technological solutions enabling resource management practice as usual. The wider social and economic implications of this type of commodification of common pool resources remain underexplored. The remaining three interpretations in Juntti and Wilson's analysis are mainly supported by academics and environmental stakeholders, and allocate responsibility for actions to land managers and politicians who need to curb present methods of land use and provide incentives for a change of course, respectively. The lack of political will to undertake economically detrimental policy decisions at the local level, however, poses a significant problem for these alternative mitigation solutions (Juntti and Wilson 2005).

Given that all the five interpretations of desertification were provided by stakeholders operating in the same geographical regions, Juntti and Wilson's findings illustrate some of the barriers faced by the decision-makers who are in charge of designing and implementing the National Action Plans that the UNCCD requires from all designated parties. While the above five interpretations are derived from data in European countries, Adger et al. (2001) highlight similar interpretational differences between global-level definitions of desertification and evidence from

the developing country context. According to Adger et al., policies orchestrating local solutions to desertification and other major global environmental issues flow from global knowledge regimes and are the result of multilevel actions and interactions that rarely reflect the multiplicity of local contexts in a realistic way (see Figure 39.1 on how the UNCCD operates; see Chapter 17). Global discourses are not only guided by a managerialist ideal, where the issues at hand are presumed to be somehow resolvable via global action, but incorporate shared "myths" and blueprints (see also Thomas and Middleton 1994). In terms of desertification, Adger et al. (2001) identify a strong discourse of crisis on which much of the international desertification policy is based. A powerful interpretation is that desertification is the catalyser of underdevelopment and that human causes are the root causes of desertification (for prevalence of this, see WRI 2005). The WRI reports that a political motivation can be identified for the founding of the UNCCD, where the USA acted as an unexpected proponent of the African demands for a global convention on desertification because the USA harboured hopes that African states would support the Rio Declaration in general. The USA may also have been responding to criticism regarding its lack of action on the other multilateral conventions. The establishment of a desertification control unit within the UN Environment Programme (UNEP) further institutionalized the crisis discourse, whereby it became purposeful in order to maintain the existence of the unit (Warren and Agnew 1988, cited in Middleton 2008). Whether more politically motivated or deriving from valid evidence, the crisis discourse shapes much of the managerial approach to combating desertification, embodied by the UNCCD. The UNCCD binds all Parties to the Convention to establishing National Action Plans (NAPs) to combat desertification and encourages a strong regulatory approach to curb land uses that are seen as linked to desertification.

The managerialist discourse is not without critics, however. Adger et al. (2001) outline a competing, populist discourse that corrodes the hegemony of the managerial discourse by implicating global trade relations and colonial and "neo-colonial resource appropriation" and resulting marginalization of smallholders who are thus forced to exploit lands that are prone to desertification processes (for more on this kind of marginalization, see Bryant and Bailey 1997). Neither the managerial nor the populist discourse disputes the notion of a crisis, the idea that desertification is a notable problem and leading to the loss of productivity of the land in vast areas of the globe (Adger et al. 2001). Although increasing empirical examples and scientific evidence are beginning to mount a counter-argument to the crisis discourse, these have not managed to evoke a significant policy response. The following section looks critically at the role of science in the emergence of desertification into the global arena as a significant environmental problem and analyses some of the scientific understandings behind the complex phenomenon and the reasons why these have gained influence in policy.

Causes and consequences of desertification: understanding the role of science

Where the populist and managerialist discourses (Adger et al. 2001) tend to blame international power relations and locally induced resource depletion, respectively, Thomas (1997) identifies a popular culprit in the failure to mitigate and/or respond appropriately to desertification: science itself, or perhaps the unrealistic expectations it is subjected to in reference to desertification. Blaikie and Brookfield (1987) divide the challenges to scientific data posed by land degradation. The first challenge is posed by definition and measurement of the processes of degradation and the availability of data on these. The second challenge has to do with the linking of detected changes in soil physical properties and vegetation with decline in productivity. Thomas (1997) adds the third facet to these primarily physical science challenges, of identifying

appropriate remedial actions to stabilize or recover lands subject to desertification. Finally, an equally complex challenge is posed by the social dimension: how is this to be conceptualized when economic price of produce does not necessarily correlate with nutrient or calorie content, or when changes in socio-economic circumstances are buffered by the plurality of factors influencing land managers' behaviour? Thomas (1997) points out that in many instances where Western science has labelled certain land uses as environmentally degrading a social science understanding of the context in which they are applied has proved otherwise. In short, the acquisition and interpretation of data on desertification is a challenging issue.

According to Thomas (1997) most criticism directed at the inability of physical science to contribute constructively to resolving desertification has to do with the speed of scientific research relative to the nature of societal problems (time-consuming vs. often requiring a swift response); the nature of scientific findings (complex, not easily transferrable); and the manner in which scientific research develops (iterative, sometimes building up to paradigm changes). For instance, much of the crisis discourse identified by Adger et al. (2001) is based on findings related to the series of droughts that plagued the Sahel region in the 1970s and 1980s and caused immeasurable human suffering. Many argue that this evidence became widely misrepresented as proof of a rapidly advancing serious desertification problem and sparked global action, in the form of the UN conference (UNCOD) called in 1977 to address the threat of desertification. Thomas (1997), however, points out that desertification and drought operate at very different timescales, and while drought can be a symptom and a driver of desertification, the expectations of immediate scientific solutions to the social consequences of drought were misguided and underestimated the complexity of the phenomenon of desertification. Human suffering at the scale that took place in the Sahel in the 1970s warrants immediate global relief action, but the resilience of the land and vegetation of the region has proved much higher than expected; understanding the complex nature of the particular dryland ecosystem and devising appropriate management methods demands long-term scientific efforts. While social, political and economic components are complex, differences in terms of soils, vegetation, topography, climatic regimes, land use and agricultural practices render science short of quick-fix solutions that would resolve desertification in any, let alone a range of, environments (Thomas 1997).

Nevertheless, the relatively short-term evidence of drought and related loss of productivity in the Sahel was picked up as evidence of a serious desertification problem in Sub-Saharan Africa, which became institutionalized in various ways. Once scientific evidence achieves political recognition and becomes institutionalized into treaties such as the UNCCD, departure from the received wisdom is often slow and difficult. The political motivations propelling the crisis discourse into such a dominant position have been discussed above, and many scientists have also throughout the history of desertification research supported the view of "marching deserts". Nevertheless, new methods of identifying and measuring the extent of desertification are constantly under development. In the way of an example, Hellden and Tottrup (2008) report on longitudinal data collected by means of an increasingly popular technique called the Normalized Difference Vegetation Index (NDVI) that uses satellite remote sensing to track the production of green biomass at a regional scale, providing evidence that can then be extrapolated to estimate the rate of desertification at a global level. Hellden and Tottrup correlate these data with data on regional rainfall and provide evidence of a positive correlation between rainfall rates and green biomass production. However, their findings point to a process of dryland greening, rather than spreading desertification at a global scale. They connect this evident greening to other notable factors such as the warming in temperatures and carbon fertilization, with additional possible explanations including improved soil and water management, expansion of irrigation, civil unrest causing migration, rural exodus, and land reclamation (see also Thomas and Middleton 1994).

Hellden and Tottrup's (2008) findings are not alone in contradicting the crisis discourse although they have not managed to attract much political recognition. Haas (2004) provides some explanations for the developments that have led to the selective use of scientific evidence in environmental decision-making. In order to qualify as "usable knowledge" for policy decision-making, scientific knowledge needs to be capable of commanding sufficient political support, applicable to the problem at hand and "neutral"; that is, it needs to be produced in conditions free of the influence of non-scientific interests. Particularly in the case of wicked environmental phenomena scientific uncertainty and the complex requirements for interdisciplinary knowledge, political and value-based statements are gaining ground as legitimate arguments in defining environmental problems and policy solutions (Hajer and Wagenaar 2003; see Chapter 17). Unfortunately, obscure decision-making processes and complicated power relationships mean that the evidence–policy relationship is rarely a transparent one (Juntti et al. 2009). The factors discussed above that make the evidence of spreading deserts more politically acceptable remain uncontested, because desertification constitutes an uncertain and complex phenomenon where the need for expert knowledge and committees is linked to low transparency of decision-making procedures, and this potentially enables a combination of bargaining and strategic use of knowledge by policy officials, or, in this case, participants to the COP (see Figure 39.1; see Chapter 17). In cases like this it is possible that policy officials act as brokers, mediating and forging compromises among involved expert groups in an effort to arrive at "optimal" policy solutions (see Radaelli 1999).

Many still complain of the domination of scientific evidence in decision-making relating to the drivers of desertification, and that this ignores the uncertainty of scientific knowledge and the need for understanding of contextual socio-economic as well as physical conditions in order to identify workable and just solutions. For example, soil erosion by deforestation is deemed a problem in South America and African drylands as well as, historically, in Europe (Middleton 2008). Nevertheless, deriving management restrictions and mitigation practices from this scientific understanding faces many complications. Adger et al. (2001) refer to a case study of subsistence farmers in Mali (Benjaminsen 2000 cited in Adger et al. 2001) to illustrate how the presumption that poor subsistence farmers are forced to overexploit forest resources for firewood is oversimplistic and overlooks the methods whereby local subsistence farmers have managed to use local forests for firewood sustainably for centuries (see Gray and Moseley 2005 on many similar myths related to the poverty–environment relationship; see Chapter 38). This renders many of the managerialist solutions to deforestation overly coercive and inefficient or even detrimental to the existing actually sustainable livelihoods. As Thomas (1997) points out, scientific solutions are rarely easily transferrable from one context to another and, where this is done, it is the small variations in physical and environmental factors as well as the socio-economic context that often lead to unexpected and inefficient outcomes and downright rejection by local land managers. For instance, Middleton (2008) describes how the diversity of processes whereby overgrazing encourages desertification, not just by removal of biomass but also through trampling and resulting erosion and changing of soil chemical components inviting an invasion of desert shrubs, are well understood, but nevertheless, the impacts of measures taken to curb overgrazing vary unexpectedly. Where settlement of nomadic pastoralists has in some instances been seen as a good way to curb growing herd sizes, forced settlement has in many cases accelerated desertification processes, particularly near watering holes and in the best grazing lands. Where physical science alone is not able to provide solutions, the engagement of the experiential understanding of many nomadic tribes of how their environments work and respond to management options is seen as crucial by many. A top-down, managerialist approach, by which scientific knowledge holds hegemony, fails to appreciate this. However, as Adger et al. (2001)

point out, the usual suspects identified by the populist discourse, such as cash crops and marginalization through resource appropriation, often also overlook the resource management know-how of local people that has accumulated through generations. Adger et al. (2001) cite a further example from Benjaminsen's research in Mali to show that sustainable cash-crop farming is possible and can even reinforce the ability of the local farmers to undertake sustainable management practices of food crops (see Chapter 40).

The following section explores some practical efforts to understand and combat desertification and discusses the challenge posed by varying policy and planning frameworks, socio-economic conditions and the need to engage local or experiential know-how.

Actors, programmes and institutions: a brief glance at power and scale in desertification

Seely (1998) uses a case study of desertification in Namibia to illustrate what scientists and decision-makers involved in combating desertification have come to realize, that little can be done to reverse desertification processes without the complete involvement of those farmers, pastoralists and other natural resource users being directly affected by desertification in its many forms. While the UNCCD is explicitly supportive of bottom-up action, deeming participation of stakeholders as crucial for achieving workable NAPs, genuine and equitable participation is difficult to achieve. Seely (1998) points to the significance of conductive policy and planning framework, environmental framework and socio-economic framework conditions for achieving full participation.

It is often, however, the policy and planning frameworks themselves that have led to land use changes accelerating desertification and triggered the institutionalization of unsustainable resource management practices. For example, Oñate and Peco (2005) describe how in the semi-arid region of Murcia (Spain), identified as affected by desertification by the UNCCD, high erosion rates were initiated by government policy that promoted cereal growing in the wake of the wars in the 1940s. The situation escalated when in the 1960s markets for "esparto" (*Stipa tenacissima*, a native grass species used traditionally in wickerwork) were flooded by the newly commercialized production of plastic and the native crops were replaced by almonds, carobs and figs, with many slopes ploughed vertically when tractors became available. Severe floods and their effects on lowland settlements made the situation worse and while aggressive preventive methods such as terracing with heavy machinery and conifer plantations were widely introduced, they were clearly out of place in most cases (Chaparro and Esteve 1995, cited in Oñate and Peco 2005). Scientifically, desertification has been linked to overcultivation in the US Great Plains as well as in South America and Europe and the scientific basis of this process is well understood and evidenced in a range of contexts (Faulkner et al. 2003 in Almeria, Spain), but this scientific knowledge is not translated into changes in land management due to high resistance from stakeholders and structural factors. Like in the neighbouring Almeria (in the Andalucian Region), in Murcia irrigated horticultural crops took off in the 1970s, partly inspired by the difficulties faced by growers in the drylands, and irrigation farming begun to emerge as a key driver of the economic boom experienced in these regions since that decade (Tout 1990; Downward and Taylor 2007; Oñate and Peco 2005). This has meant that water management and the implementation of land use policies in these water-scarce regions has since been guided by the needs of the irrigation farming industry rather than by resource availability and sustainable use, constituting a further driver of desertification (Juntti and Wilson 2005; Ripoll et al. 2010).

With such drivers of desertification, where unsustainable land and water uses have become deeply embedded in resource management institutions and practices as well as local economic

fortunes, the implementation of any mitigating measures is extremely difficult as these are perceived by many locals to be detrimental to their livelihoods (see Chapter 34). These are precisely the kind of circumstances where desertification is in local perceptions reduced to a technically manageable water-scarcity issue (Juntti and Wilson 2005). Subsequently, the development and implementation of the Spanish National Action Plan to Combat Desertification has been slow and ineffectual (Oñate and Peco 2005). The Spanish NAP, which was finally passed in 2008 after considerable delay, outlines specific indicators of desertification and measures for combating it for agriculture, forestry and water management sectors (MMA 2008). The ability of the programme to achieve any significant changes remains yet to be seen. Oñate and Peco stipulate strict regulatory policies and education as the only way forward in mitigating desertification in the above regions.

While the Spanish example illustrates how policies and other socio-economic factors can lead to conditions where local management structures as well as resource managers themselves are highly resistant to desertification mitigation measures, Bradley and Grainger (2004) in turn discuss the role of social resilience in aiding the mitigation of and adaptation to desertification in a developing country context where technological fixes are not available. Exploring a case study of two nomadic pastoral tribes in Senegal, Bradley and Grainger demonstrate how land managers have historically adapted their management systems in response to repeated eco-climatic fluctuations or social constraints. While learning from past experience or indigenous knowledge passed from previous generations is significant for continuous sustainable management, it becomes even more crucial when a constraint, such as resource depletion or appropriation, is imposed. In this case land managers must choose between substituting an activity wholly or partially by others that function better under more constrained conditions; adopting new non-extractive or non-land-based activities under severe or prolonged survival conditions; travelling longer distances to avoid place-based constraints; or becoming more reliant on support from other households or on income generated by household members who have moved elsewhere (Bradley and Grainger 2004: 454; see also Dorward et al. 2009 for livelihood strategies). The choice between these alternatives can be made partly through trial and error, and Bradley and Grainger conclude that the social resilience of communities, defined by a cyclical model of learning, could help explain the lack of widespread desertification in the silvopastoral zone of Senegal where the two tribes operate. It is important to understand these kinds of existing strategies in order to devise sustainable desertification mitigation measures for any context.

Many other "social" factors influence the ability of communities to make sustainable decisions regarding resource management and, as Seely (1998) points out, it is also important to identify any weaknesses in these. Insecure land tenure conditions and lack of land policy which permits land-grabbing by those who have the means are often blamed for degrading land management, but evidence from Ghana (Bugri 2008) highlights other factors as significant. One of these is the marginalization of women in decision-making relating to land resources, although women are often in charge of agricultural work. Although the roles of women and men in land management differ widely between regions, women tend to have lower levels of education, and lower participation in community-based organizations (OECD 2002). Pirmoradi et al. (2011) found that there was a positive relationship between the level of literacy, income and participation in training courses, and participation in plans to combat desertification among farmers in Iran; and, indeed, women's position is seen by many as requiring attention in the pursuit of successful desertification mitigation measures. Effective participation requires local-level gender-sensitive understanding of livelihood roles (FAO 2003; OECD 2002).

While the UNCCD does not define exactly what is meant by participation, it makes several references to local populations, communities and nongovernmental organizations (NGOs) and

thus to more empowering and democratic decision-making (Stringer et al. 2007; see Chapter 14 on NGOs and Chapter 26 on public participation). NGOs and community-based organizations (CBOs) play a key role in the UNCCD and have been drafted in to establish a link with land users who, through NGO initiatives, are supposed to help identify and assess cases of desertification and contribute ideas for mitigation measures (see Figure 39.1). However, NGO accountability and ability to enable equal participation opportunities for all communities regardless of socio-economic status has been found to be problematic in many case studies (Stringer et al. 2007). This is particularly problematic where existing inequalities between communities and within communities exist and are linked to the root causes of desertification, as discussed above (Bugri 2008). However, Reed et al. (2008) report on successful collaboration between ecologists and pastoralists in identifying and evaluating a set of indicators suitable for assessing land degradation in three field locations in Botswana by applying a scientific methodology to validate local indicator knowledge. Reed et al. also note that the use of focus groups in the study methodology increased the exchange of information also among the pastoralists, which addressed the initially "thinly spread" indigenous knowledge relating to species and land uses linked to degradation (see Chapter 37).

While Redclift (2005) argues that traditional scientific definitions and categories obscure local meanings of nature and natural resources, the study by Reed et al. (2008) appears to serve as an example of participatory research where, crucially, citizens' experience-based expertise is engaged in the whole research process, from the identification of analytical units to defining the use of findings (Fischer 2002). In participatory planning literature, Booher and Innes (2002) advocate marshalling of "network power" through "authentic communication" which empowers all parties to communicate and contribute to an equal extent so that collaboration is as innovative as possible. This requirement highlights the need to pay attention to the purpose and form of participation; ideally participation is seen not as instrumental for compliance with management prescriptions but intrinsic to the creation of new knowledge, better contextual understanding and achieving innovative new management options. How much of the participation under the UNCCD aspires to these kinds of aims and objectives is open to guesswork but literature seems to suggest that this is not a frequent occurrence (Stringer et al. 2007).

Conclusion

This chapter has illustrated the complex nature of the phenomenon of desertification itself and the implications this has for addressing it. It is evident that the barriers and challenges related to managing desertification are as varied as the contexts and definitions where it manifests itself. A wicked or highly politicized issue, desertification must be addressed through approaches that embrace the complexity of the scientific evidence and the methodologies used to derive this, appreciate the significance of physical and environmental variations for the workability of any scientific solutions and remain awake to the implicitly and inevitably politicized nature of knowledge production, adoption and application in complex and varied socio-economic conditions (see Chapter 17). This is of course a challenging task and the different sections of this chapter illustrate the fault lines but also some positive examples in mitigating desertification.

The 10-year strategy adopted by the COP in 2007 sets the goal of zero net land degradation globally. The UNCCD submission to the Rio+20 conference (UNCCD 2011) sees addressing land degradation and desertification as key to achieving the kind of adaptation capacity and resilience that the impending challenges of population growth combined with climate change will pose to food security and water provision globally (see also CGIAR 2011; see Chapters 40 and 34). The strategy calls for sustainable land management (SLM) that can prevent land degradation

and restore already degraded land, and outlines payments for ecosystem services as a good means of addressing the short-term economic losses that landowners will incur from introduction of the kind of rates of SLM that enable meeting the zero net degradation aim. The Rio+20 submission document laments the failure of initiatives for legally binding instruments for soil management, the inability to pass the EU soil directive being a case in point (CEC 2012). Some of this inability is no doubt attributable to the politics of commissioning and selecting scientific evidence for the use of policy decision-making, and the UNCCD (2011: 5) suggests that a "scientifically credible, transparent and independent assessment of existing, policy-relevant but not policy-prescriptive knowledge [is needed]. This assessment should be provided by a globally recognized, strong and effective science–policy interface, similar to those established for climate and biodiversity (IPCC and IPBES respectively)" (see Chapters 28 and 37).

Another important dimension is the integration of indigenous knowledge and sensitivity to socio-economic and structural context in devising desertification policies and programmes. The participatory approach advocated by the UNCCD would no doubt benefit from better articulation and enforcement (Stringer et al. 2007), and the provision of flexible policy instruments to incentivize and support the shift towards SLM and global zero net degradation poses a significant challenge for research and policy decision-makers alike.

References

Adger, N.W., T.K. Benjaminsen, K. Brown and H. Svarstad (2001) Advancing a political ecology of global environmental discourses. *Development and Change* 32: 682–715.

Benjaminsen, T.K. (2000) The Malian cotton zone: economic success but environmental failure? In T.K. Benjaminsen and C. Lund (eds) *Politics, Property and Production in the West African Sahel*. Uppsala: Nordic Africa Insitute.

Blaikie, P. and H. Brookfield (1987) *Land Degradation and Society*. New York: Methuen.

Booher, D.E. and J.E. Innes (2002) Network power in collaborative planning. *Journal of Planning Education and Research* 21(2): 221–36.

Bradley, D. and A. Grainger (2004) Social resilience as a controlling influence on desertification in Senegal. *Land Degradation and Development* 15: 451–70.

Bryant, R. and S. Bailey (1997) *Third World Political Ecology*. London: Routledge.

Bugri, J.T. (2008) The dynamics of tenure security, agricultural production and environmental degradation in Africa: evidence from stakeholders in north-eastern Ghana. *Land Use Policy* 25: 271–85.

CEC (2012) Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions: the implementation of the soil thematic strategy and on-going activities. COM(2012) 46 final. Available online at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0046:FIN:EN:PDF.

CGIAR (2011) *Farming's Climate Smart Future: Placing Agriculture at the Heart of Climate Change Policy*. Wageningen: Technical Centre for Agricultural and Rural Cooperation (CTA). Available online at: http://ccafs.cgiar.org/sites/default/files/assets/docs/farmings_climate-smart_future.pdf.

Chaparro, J. and M.A. Esteve (1995) Evolución geomorfológica de laderas repobladas mediante aterrazamientos en amobientes semi-áridos. *Cuaternario y Geomorfología* 9: 34–49.

Conliffe, A. (2011) Combating ineffectiveness: climate change bandwagoning and the UN Convention to Combat Desertification. *Global Environmental Politics* 11(3): 44–63.

Dorward, A., S. Anderson, Y.N. Bernal, E.S. Vera, J. Rushton, J. Pattison and R. Paz (2009) Hanging in, stepping up and stepping out: livelihood aspirations and strategies of the poor. *Development in Practice* 19(2): 240–7.

Downward, S.R. and R. Taylor (2007) An assessment of Spain's Programa AGUA and its implications for sustainable water use in the province of Almería, southeast Spain. *Journal of Environmental Management* 82: 277–89.

FAO (2003) *Gender and Sustainable Development in Drylands: An Analysis of Field Experiences*. Rome: FAO.

Faulkner, H., J. Ruiz, P. Zukowskyj and S. Downward (2003) Erosion risk associated with rapid and extensive agricultural clearances on dispersive materials in southeast Spain. *Environmental Science and Policy* 6: 115–27.

Fischer, F. (2002) *Citizens, Experts and the Environment*. Durham, NC: Duke University Press.
Goudie, A.S. (1990) *Techniques for Desert Reclamation*. Chichester: John Wiley.
Government Office for Science (2011) *The Future of Food and Farming: Challenges and Choices for Global Sustainability*. London: Government Office for Science.
Gray, L.C. and W.G. Moseley (2005) A geographical perspective on poverty–environment interactions. *Geographical Journal* 171(1): 9023.
Haas, P. (2004) When does power listen to truth? A constructivist approach to the policy process. *Journal of European Public Policy* 11(4): 569–92.
Hajer, M. and H. Wagenaar (2003) Introduction. In M. Hajer and H. Wagenaar (eds) *Deliberative Policy Analysis: Understanding Governance in the Network Society*. Cambridge: Cambridge University Press, 1–32.
Hellden, U. and C. Tottrup (2008) Regional desertification: a global synthesis. *Global and Planetary Change* 64: 169–76.
IPCC (2007) *Climate Change 2007: Synthesis Report*. Geneva: IPCC.
Juntti, M., D. Russel and J. Turnpenny (2009) Evidence, politics and power in public policy for the environment. *Environmental Science and Policy* 12: 207–15.
Juntti, M. and G.A. Wilson (2005) Conceptualizing desertification in southern Europe: stakeholder interpretations and multiple policy agendas. *European Environment* 15: 228–49.
Mickwitz, P. (2003) A framework for evaluating environmental policy instruments: context and key concepts. *Evaluation* 9(4): 415–36.
Middleton, N. (2008) *The Global Casino*. London: Hodder Education.
MMA (2008) *Programa de Acción Nacional contra la Desertificación*. Madrid: Ministerio de Medioambiente.
Murad, A.A. (2010) An overview of conventional and non-conventional water sources in arid region: assessments and constraints of the United Arab Emirates. *Journal of Water Resource Protection* 2: 181–90.
OECD (2002) *Poverty–Environment–Gender Linkages*. Off-print of the *DAC Journal* 2001, 2(4). Paris: OECD.
Oñate, J. and B. Peco (2005) Policy impact on desertification: stakeholders' perceptions in southeast Spain. *Land Use Policy* 22: 103–14.
Pirmoradi, A.H., S.M. Hosseini and S.J.F. Hosseini (2011) Effective parameters on farmers' participation in plans to combat desertification (PCDs). *African Journal of Agricultural Research* 6(25): 5582–90.
Radaelli, C.M. (1999) The public policy of the EU: wither politics of expertise? *Journal of European Public Policy* 6(5): 757–74.
Redclift, M. (2005) Sustainable development (1987–2005) an oxymoron comes of age. *Sustainable Development* 13: 212–27.
Reed, M.S., A.J. Dougill and T.R. Baker (2008) Participatory indicator development: what can ecologists and local communities learn from each other? *Ecological Application* 18(5): 1253–69.
Ripoll, S., T. MacMillan, M.J.B. Muños, E. Velázquez, C.M. López and L. Levidov (2010) *WP3: Water Scarcity and its Virtual Export from Spain to the UK*. Final Report of the Cooperative Research on Environmental Problems in Europe (CRÊPE) Project (coordinated by the Open University, UK).
Seely, M.K. (1998) Can science and community action connect to combat desertification? *Journal of Arid Environments* 39: 267–77.
Stringer, L.C., M.S. Reed, A.J. Dougill, M.K. Seely and M. Rokitzki (2007) Implementing the UNCCD: participatory challenges. *Natural Resources Forum* 31: 198–211.
Thomas, D.S.G. (1997) Science and the desertification debate. *Journal of Arid Environments* 37: 599–608.
Thomas, D.S.G. and N. Middleton (1994) *Desertification: Exploding the Myth*. Chichester: Wiley.
Tout, D. (1990) The horticultural industry of Almería Province, Spain. *Geographical Journal* 156: 304–12.
Turnpenny, J., I. Lorenzoni and M. Jones (2009) Noisy and definitely not normal: responding to wicked issues in the environment, energy and health. *Environmental Science and Policy* 12: 347–58.
UN (1994) *The Convention to Combat Desertification*. United Nations: New York.
UNCCD (2007) *Report of the Conference of the Parties on its Eighth Session, Held in Madrid from 3 to 14 September. Addendum. Part two: Action Taken by the Conference of the Parties at its Eighth Session*. Available online at: http://www.unccd.int/Lists/OfficialDocuments/cop{8/16}add1eng.pdf.
—— (2011) *Land and Soil in the Context of a Green Economy for Sustainable Development, Food Security and Poverty Eradication*. Bonn: UNCCD Secretariat. Available online at: http://www.unccd.int/Lists/SiteDocumentLibrary/Publications/Rio%206%20pages%20english.pdf.
—— (2012) UNCCD website. Available online at: http://www.unccd.int/en/Pages/default.aspx.
Warren, A. and C. Agnew (1988) *An Assessment of Desertification and Land Degradation in Arid and Semi-arid Areas*. Drylands Paper 2. London: International Institute for Environment and Development.

WCED (1987) *Our Common Future*. Oxford: Oxford University Press.
Wellens, J. and A.C. Millington (1992) Desertification. In A.M. Mannion and S.R.Bowlby (eds) *Environmental Issues in the 1990s*. London: Wiley.
Wilson, G.A. and M. Juntti (2005) *Unravelling Desertification: Policies and Actor Networks in Southern Europe*. Wageningen: Wageningen Academic Publishers.
WRI (2005) *Ecosystems and Human Wellbeing: Desertification Synthesis. A Report of the Millennium Ecosystem Assessment*. Washington, DC: World Resources Institute.

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Food and agriculture

Jennifer Clapp and Sarah J. Martin

The ways in which food and agriculture are organized around the world have enormous implications for the global environment. The industrial organization of agriculture that feeds the dominant food system – including large-scale production methods and intensive livestock operations – is associated with soil degradation (Chapters 39 and 40), biodiversity loss (Chapter 37), pollution (Chapter 30), climate change (Chapter 28) and the depletion of water supplies (Chapter 34). At the same time, international economic forces in the food system – including the international trade in food and global financial activities that add to tensions between food, fuel and land – also contribute to environmental problems including greenhouse gas emissions (Chapter 28) and deforestation (Chapter 38). The environmental effects of industrial agricultural production and the integration of that production system into global food and agricultural commodity markets extend far beyond national borders. The issue, however, has not been dealt with effectively at the global scale. Food and agriculture have a grounded quality because of their intimate relationship with the soil, and because individuals consume food on a daily basis. Individual food choices of course have important implications for how agriculture relates to the environment and politics. But it is not just individual choice that matters on this issue. Political choices about how societies collectively organize agricultural systems are of overriding importance because these choices shape individual food choices in many ways. These issues thus require consideration not just at a local or national scale, but also at the international level.

The environmental dimensions of large-scale industrial agriculture and the rise of a globally organized food system are widely understood, but there is no clear agreement on the pathway forward toward a more sustainable way to feed the world – at least as organized on a global scale. There are vastly different interpretations of what exactly constitutes a more environmentally friendly international organization of agricultural and food systems, and how such a system should be structured and governed. Some argue that agroecological methods and more locally oriented food systems will reduce the environmental damage caused by agriculture and global food trade and finance. But others are skeptical that such methods will be sufficient to feed the world's growing population. Instead, they argue that the use of more sophisticated technologies, such as agricultural biotechnology, as well as the development of more globally integrated markets, are more promising methods to provide the required food at the least environmental cost. This debate has played out in global forums, from the World Bank to the International

Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) process.

In this chapter, we examine the linkages between agriculture, food and the environment on an international scale, and assess the state of the political debate over how best to make global food systems more sustainable. We begin by outlining the development and operation of industrial agriculture and livestock production. This organization of agriculture and food systems has serious environmental impacts. We then highlight some of the less visible impacts of global food and agriculture market dynamics, such as trade and finance. These global market dynamics have been linked to increasing biofuel production and pressure on land, which have important environmental implications. Next, we explore how the linkage between the organization of food and agriculture systems and the natural environment has recently begun to be debated at the international level. We review two recent reports from the World Bank and the IAASTD and their widely divergent visions for sustainable agriculture. Finally, we conclude the chapter with some reflections on how the polarized debate over how to vision sustainable agriculture has stalled progress on international cooperation in this arena of global environmental politics.

Industrial agriculture

The environmental impact of the intensification of agricultural production around the world is being increasingly studied and understood. The sustainability of agriculture has long been a concern, but the widespread adoption of industrial agricultural methods has produced new environmental issues. The adoption of a more "scientific" approach to agriculture in North America and Europe in the late 1800s and the first half of the 1900s was supported by laboratory research. The industrial agricultural model relied on a system of new specialty seeds, chemical fertilizers and pesticides, irrigation, and machinery for both planting and harvesting. Machines saved labor and chemicals saved land, which led to a model of maximum agricultural efficiency with large tracts of land with a single crop, known as "monocropping." The early postwar adoption of this kind of agriculture resulted in enormous production increases per acre for certain crops. The USA and Canada, for example, quickly produced massive surpluses of grain that began to be exported around the world, both commercially and as food aid in the 1950s (Barrett and Maxwell 2005). In Europe, price-supports and agricultural industrialization produced surpluses by the 1960s which resulted in "mountains of butter" and "lakes of milk."

The industrial agricultural production model was promoted not just in North America and Europe, but also globally. The USSR adopted a program of "chemicalization" of agriculture in the 1960s (McNeill 2000) and the developing world in particular was encouraged to adopt a technical and managerial model of industrial production as part of the broader push for a "green revolution" in the 1960s and 1970s (Clapp 2012a; on industry generally, see Chapter 13). In the late 1970s, China also adopted a model of industrial agriculture. International aid programs promoted research, development and adoption of new seeds designed for tropical climates, pesticides, fertilizers, machinery, irrigation and monocropping in many developing countries. While at first the green revolution was hailed as a success in the countries that embraced it fully, including large parts of South Asia, Southeast Asia and Latin America, its negative environmental effects soon became apparent. The industrial agricultural system as it has manifested around the world is considered to be deeply entrenched and difficult to change (UNEP 2012).

A major consequence of the expanding reach of the industrial agricultural model has been the loss of biodiversity. Widespread adoption of specialty varieties of hybrid seeds raised in monocultural fashion meant that fewer traditional crops and crop varieties were planted around the world. The Food and Agriculture Organization of the United Nations (FAO) has estimated

that between 1900 and 2000 around three-quarters of the world crop diversity was lost, with the most rapid decline occurring between 1950 and 2000 (Commission on Genetic Resources for Food and Agriculture 2010). Since the 1960s, there has been a significant decline in the number of varieties planted. Just three crops – rice, wheat and maize – constitute over half of the world's food supply. Today around 90 percent of the world's wheat crop, 70 percent of the rice crop and 60 percent of the maize crop in developing countries are modern varieties (Imperial College of Science and Technology 2002). Looking ahead, the FAO expects that up to 22 percent of the wild relatives of peanut, potato and beans will disappear by 2055 (Commission on Genetic Resources for Food and Agriculture 2010). In addition, public investment in seed production has declined while investment in privately developed transgenic seeds has grown significantly from US$280 million in 1996 to US$7 billion in 2007 (Commission on Genetic Resources for Food and Agriculture 2010: 8). Diversity is necessary for maintaining species viability and if it is lost agricultural systems become more precarious and vulnerable to pests and diseases. If certain vulnerable varieties experience losses, other more robust varieties are often protected and can make up the loss. For this reason, crop diversity is vital for long-term resilience in agriculture and food systems.

The rise of an industrial agricultural model around the world has also contributed to a decline in nature's ecosystem services and functions (see Chapter 13). For example, industrial practices have contributed to a reduction in soil biodiversity (the living organisms in the soil that contribute to its fertility and other services) and some argue that the crucial functions of soil, such as water filtration, carbon fixing, climate regulation and nutrient cycling, are being compromised as a result. These problems are on top of the fact that declining soil fertility is a constraint on increasing food production.

Early in the development of scientific forms of farming, agricultural scientists encouraged the use of synthetic inputs – chemical fertilizers and pesticides – to make up for these lost soil and ecosystem functions caused by intensive agricultural practices. Synthetic chemical inputs can temporarily make up for the loss of soil fertility and can protect against pests. But over time as modern agriculture has become ever more reliant on these chemical inputs their effectiveness has come into question. The reliance on synthetic fertilizer use has increased by fivefold in the past 50 years (Foley et al. 2011: 338). More specifically, the application of nitrogen fertilizer increased sevenfold between 1960 and 1995. Although yields have increased with the rising use of synthetic fertilizers, the yield of grain as a ratio of fertilizer application has declined significantly and overall the responsiveness of crops to these chemicals has been highly uneven (Keating et al. 2010). The use of synthetic fertilizers has contributed to increased crop yields per acre for highly responsive crops, for instance maize, while for other crops the increases have not been nearly so dramatic.

Synthetic herbicides and pesticides often accompany the use of synthetic fertilizers in industrial farm operations. In fact, their use has increased even more sharply than that of synthetic fertilizers. In the USA, for example, the use of insecticides and herbicides increased by a factor of 40 between the mid-1940s and the mid-1970s. Globally, pesticide use increased in the 1970s and 1980s at a rate of around 5 percent per year (Pimentel et al. 1993; Ridgway et al. 1978). Because pests can build up resistance to chemicals designed to control them, there has been an increase in the use of those chemicals, or indeed the use of even more harmful chemicals, just to keep pests at a manageable level. The dramatic rise in chemical use intensified the ecological side-effects of industrial agriculture. Given that less than 1 percent of pesticides reach their target, it is not surprising that pollution of soils, water and air resulted (Lappé et al. 1998). Indeed, agriculture is the source of, for example, 60 percent of all pollution in US lakes and rivers (Mooney 2009). The spread of these chemicals into the environment has far-reaching human and ecosystem health impacts.

Agricultural intensification has also resulted in greater use of energy and water. Modern industrial agriculture is particularly reliant on fossil energy – especially petroleum products – not only to fuel farm machinery but also because they are key ingredients in fertilizers and pesticides. The rate of energy use has outstripped population growth and since the 1970s energy in agriculture use has doubled every 30 years. Pimentel et al. (2008) estimate that every year 2,000 liters of oil (or its equivalent) are required to produce the average US diet, totaling 19 percent of the country's energy use: the largest users included agricultural production, food processing and packaging at 14 percent, with transportation and preparation accounting for 5 percent. Foley et al. (2011: 338) cite the figures that irrigated cropland area has approximately doubled in the past 50 years. Some 70 percent of global freshwater withdrawals (80–90 percent of consumptive uses) are devoted to irrigation and intensive irrigation has led to significant drawdown on groundwater (see Chapter 34). For example, the Ogallala aquifer on the US High Plains which supplies most of US cattle and a significant portion of grain crops has been seriously drawn down (McNeill 2000: 154). Without irrigation it is estimated that cereal production, such as rice, wheat and maize, which draw on the largest amount of water, would decline by 20 percent (Siebert and Döll 2010).

In addition, agriculture not only uses resources such as petroleum and water, it is reported to contribute 30–35 percent of global greenhouse gas emissions, mainly with practices associated with industrial agriculture such as tropical deforestation, methane emissions from livestock (discussed below), emissions from the use of farm machinery and emissions from fertilized soils (Foley et al. 2011). The reliance on synthetic fertilizes, for example nitrogen, has produced a number of unintended consequences such as limiting plants' capacity to act as carbon sinks, which increasingly contributes to climate change (Smil 2001: 84; on climate change, see Chapter 28).

New technological developments since the 1980s and 1990s – especially the development of genetically modified (GM) seeds – have brought new concerns and controversy to studies on the environmental implications of industrial agriculture. The main kinds of GM crops are engineered either to produce their own pesticide, or to be resistant to herbicides. Increasingly, seeds are being engineered to do both. Since they were first commercialized in the mid-1990s, there has been a dramatic increase in the use of genetically modified crops globally. From the mid-1990s to 2012, the number of hectares planted with GM crops grew from practically zero to 170 million hectares (James and ISAAA 2012). Production is concentrated in just a handful of countries (the United States, Canada, Argentina, Brazil and India together account for nearly 90 percent of GM crop production), but the growing use of these crops has raised global concern. Critics argue that GM crops could further weaken genetic diversity, especially if they cross with wild relatives or traditional varieties that hold important genetic traits. Crops that are genetically modified to be herbicide tolerant could potentially cross with wild relatives to create "super weeds" and crops that are engineered to express their own pesticides could potentially be harmful to wildlife, including beneficial insects (Dale 2002).

While critics have expressed concerns about the ecological impact of genetically modified crops, proponents have argued that genetic modification can contribute to a more sustainable agriculture. By reducing the need for pesticide spraying, and making plants tolerant of relatively non-toxic herbicides, some of the environmental problems of industrial agriculture could be mitigated (Conway 2012; Paarlberg 2008). There is also the potential for agricultural biotechnology to develop crops that are resistant to drought and that can thrive in poor quality soils, although research on this front is thus far much less advanced than that for herbicide tolerance and pesticide expression.

The debate still rages over agricultural biotechnology. These crops have been in commercial production for some 15 years, and more in-depth studies of their impacts are now emerging.

The results have been mixed, giving the critics enough to worry about while the proponents continue to declare their safety. It will likely take another decade for a significant enough body of research to give more conclusive results on their ecological impacts.

Industrial meat production

A transformation in livestock production models paralleled the increasing use of industrial agricultural methods. The dramatic rise of surplus grains that accompanied industrial crop production in developed countries such as the USA in the 1950 and 1960s spurred an increase in grain-fed livestock. This surplus, along with new pharmaceuticals and new animal breeds, enabled the growth of large-scale animal operations known as intensive livestock operations (ILOs) or concentrated animal feeding operations (CAFOs). Through these developments, large-scale grain production and large-scale intensive livestock farming became closely linked. As the organization of meat production began to change, so too did consumption of meat. These developments have had enormous environmental impacts on a global scale.

The rise of industrial livestock production and processing brought new methods. Previously, livestock was seasonal, and constrained by weather and the availability of surplus crops and forage. At the turn of the last century, the spread of railways, refrigeration and centralized slaughterhouses and grain storage contributed to industrializing livestock processing in the USA (Cronon 1992). After the Second World War, seasonal limitations on livestock production were eased in the USA when poultry began to be raised indoors in CAFOs. In the 1980s, poultry CAFOs became a model for the expansion of US hog production (Drabenstott 1998; Rhodes 1995). Indoor confinement allowed animals to be raised faster with less feed and the rise of new veterinary pharmaceuticals suppressed diseases previously associated with large-scale animal confinement (Rhodes 1995). The FAO has reported that 50 percent of US antibiotics are used for livestock (FAO 2006b). More recently, the CAFO model has been increasingly established and replicated in countries around the world, especially where there is a surplus of cheap feedgrain such as in Brazil's Mato Grossa, or Canada's eastern prairie. The growth of China's hog industry has outstripped all other countries and now accounts for around half of the world's production (Schneider 2011). Genetically specialized breeds have been developed for CAFOs which, similar to industrial agriculture, has contributed to a narrowing of farm animal diversity. For example, a few commercial breeds provide more than one-third of global hog supply while a handful of commercial layer breeds provide some 85 percent of egg production (FAO 2006a).

The rise of CAFOs has increased the availability of inexpensive meat and poultry which is now globally produced, traded and increasingly available. Unlike the global car that is assembled from parts sourced globally, animals are disassembled and their parts are distributed to specialty markets around the world. Industrial production has led to industrial processing and today 8 out of the top 20 industrial polluters in the USA are slaughterhouses (UNEP 2012). In addition, an associated increase in per capita consumption of meat and poultry, or "meatification" of diets (Weis 2007), has accompanied industrial livestock production, although there are indications that meat consumption in some of the wealthier states is declining (Bittman 2012; on consumption generally, see Chapter 16). The FAO expects global livestock production to double by 2050 (FAO and Steinfeld 2006: 275). This increase, along with the fact that livestock production is a major contributor to increased greenhouse gas emissions, land degradation, water pollution and increased health problems, is worrisome (FAO and Steinfeld 2006).

Since livestock is the single largest anthropogenic user of land (FAO 2006b), ILOs have a significant "ecological hoofprint" (Weis 2007) with global effects. In particular, livestock production has huge climate implications. An indirect result of livestock production is that clearing

of land for cattle grazing has resulted in deforestation that contributes a significant amount of carbon dioxide (FAO and Steinfeld 2006: 91; see Chapter 38). More directly, livestock raising itself is credited with being responsible for 80 percent of total agricultural greenhouse gas emissions and these gases are considered more problematic than carbon dioxide (e.g., methane, nitrous oxide and ammonia which contributes to acid rain and acidification of ecosystems; on acid rain, see Chapter 30) (McMichael et al. 2007: 1253). Finally, livestock's "hoofprint" has a significant impact on energy consumption. Whereas agriculture is estimated to use energy at a 3:1 ratio, meat accounts for a 35:1 ratio (Pew Commission 2009: 9). Not only are there consequences to the production of feedgrains as chronicled above, livestock, especially ILOs, impose significant external costs in the form of manure and waste.

Manure from ILOs exceeds human waste by three times and contributes to a number of environmental problems, including excessive nutrient loads in waterways, which causes eutrophication. Fertilizer and manure are responsible for dead zones in both the Gulf of Mexico and the East China Sea. It is estimated that 15 percent of nutrient pollution in the Gulf of Mexico is directly tied to livestock production (Pew Commission 2009). Large lagoons are constructed to contain the waste. But in a number of cases the lagoons have failed and runoff has killed millions of fish (Union of Concerned Scientists and Gurian-Sherman 2008).

Intensive livestock operations have come under criticism by scholars examining environmental justice (see Chapter 24). In particular, the location of ILOs is in rural areas where the residents are predominantly poor (Stull and Broadway 2004) and/or are unable to gain political support to resist the establishment of ILOs in their communities (Novek 2003). This has meant that conflict often accompanies the establishment of ILOs. For workers, there are serious health concerns caused by the gas and dust produced in confined areas (Thu and Durrenberger 1998) and CAFOs are associated with high rates of respiratory disease (Pew Commission 2009).

Globalized food and agriculture market dynamics

As the world economy has become more globalized in recent decades (see Chapter 22), there has been an accompanying rise in the physical trade of food and agricultural products across borders as well as a sharp increase in the trade in financial derivatives linked to food and agriculture. The globalized food market, as well as its growing ties to financial markets, has sparked increased investment in a new complex nexus of finance, food, biofuel and land that has been associated with myriad ecological effects around the world.

The international trade in food has grown significantly over the past 20 years. In 2008 global food trade reached over US$1.1 trillion, up from just US$315 billion in 1990. The rise has been especially sharp in recent years, with an annual 13 percent increase in the value of food trade over the 2000–8 period. Global food trade has grown more rapidly than production, signaling the growing significance of global markets in the food system (WTO 2004, 2009). The global trade in food has been associated with significant greenhouse gas emissions. Recent studies have shown that in Europe and North America the average distance food travels from farm to plate is approximately 1,500 miles. A number of environmental groups have used the concept of "food miles" to raise awareness of the climate implications of long-distance food trade (Iles 2005; Pirog 2004).

There is some controversy around the notion of food miles, in that it tracks primarily the greenhouse gases associated with transportation of food, and not its production. Some have put forward the case that the production methods matter far more than travel itself (Weber and Matthews 2008). It should be noted, however, that the growing global food market is highly reliant on large-scale industrial agriculture, and as such a growing global food market and

associated trade reinforces an energy intensive system. Moreover, the carbon emissions and pollution from trade are in addition to greenhouse gases from industrial agricultural production. It may be that in some cases more environmentally sound production methods reduce the climate impact of certain foods – for example, an imported organic tomato may be responsible for fewer carbon emissions than a local hot-house tomato. But, at the same time, locally traded foods do not necessarily produce high levels of greenhouse gases whereas internationally traded foods produce additional carbon emissions because of the fossil fuels used in long-distance transportation.

The rise of a globally integrated food market is also linked to the rise in the trade in complex financial derivatives based on agricultural and food commodities. According to a number of analysts, the food system has become increasingly "financialized," meaning that financial actors – investors and financial institutions in particular – have become a significant influence on the sector (see Chapter 13). Their behavior, although geared primarily to financial profit, has an important impact on food system outcomes – including the environment. Given the global nature of agriculture and food markets, this financialization has important implications for global environmental politics (Clapp 2012b).

The increasingly important role of financial actors was highlighted in the aftermath of the 2007–8 food price crisis, as many began to point to the role of financial speculators in driving up global food prices. This concern was sparked by a sharp increase in the speculative trade in agricultural commodity futures contracts and other agricultural commodity derivatives following financial deregulation that allowed them to gain more exposure to these markets. The total assets of financial speculators in agricultural commodity markets increased from US$65 billion in 2006 to some US$126 billion by early 2011 (Worthy 2011: 13). There is a heated debate over whether the growth in financial speculation on agricultural commodity futures markets has been a cause or a response to rising food prices. But whether cause or response, financialization has certainly facilitated further financial investment – both in biofuels and in land – both of which have profound ecological implications, as mapped out below.

Since the early 2000s there has been growing interest in crop-based biofuels as a renewable fuel source. A number of global forces have encouraged biofuel investments. The financialization of commodities more broadly, including not just food and agricultural products, but also petroleum, has facilitated this investment. Like food, oil price rises have also been associated with financialization, which has made biofuels a competitive product in energy markets. In turn, this has led to a further push to invest in land for their production. As food prices also rose, some say in part due to rising investment in biofuels, investment in biofuel operations became even more attractive because both food and oil prices were also rising, making investments in production facilities attractive as a hedge against further rising grain and fuel prices (Clapp 2012b). As a result, biofuel investment is used as a hedge against both agricultural commodity volatility and fuel price volatility. Although the complex nexus of these investments is understudied, it has enormous environmental implications at the global level.

Stoking the role of biofuel investment in this nexus has been the fact that the largest producers of biofuel, including the United States and the European Union, require a certain percentage of fuels to be from renewable sources. Along with subsidies, these policies have attracted an increased interest in biofuel investments. For example, the attractive subsidies and fuel mandates have increased the use of corn for biofuels in the USA steadily from 20 percent of the country's total corn output in 2006 to 31 percent in 2008–9 to 40 percent in 2010–11. Corn-based ethanol increased by a factor of six from 2000 to 2009 (US Department of Energy 2010) and global bio-ethanol production has increased by more than a factor of five between 2000 and 2011 (Balat and Balat 2009; see also OECD–FAO 2011).

Although requiring the use of renewable fuels is aimed at reducing a reliance on the very fossil fuels that create greenhouse gas emissions, biofuel production is far from evenly "green" in its environmental credentials (McMichael 2010). The energy return on investment for corn-based ethanol, for example, is very low when compared with that from sugar-based ethanol. A rise in greenhouse gas emissions results from the production of both types of biofuels, however, on account of industrial farming methods and refining operations (UNESCO–SCOPE–UNEP 2009). Palm oil, a common feedstock for biofuels in developing countries, is notoriously inefficient as a biofuel. A ton of palm oil produces some 33 tons of carbon emissions (primarily due to deforestation; see Chapter 38), 10 times more than a ton of petroleum (Rainforest Action Network n.d.). Critics generally agree that replacing food crops with biofuels will likely worsen climate change (see Chapter 28).

Rising food and fuel prices and the financialization of food have also encouraged and facilitated foreign land acquisition, a phenomenon that has increased sharply since 2006. According to World Bank estimates, at least 45 million hectares of large-scale agricultural land deals were made in the first 11 months of 2009 alone, some 70 percent of which were in sub-Saharan Africa. This compares with an average of only 4 million hectares per year of global farmland investment that took place prior to 2008 (Deininger and Byerlee 2011: xiv). A number of African governments have transferred enormous tracts of land to foreign investors with uncertain outcomes.

While increased investment in land in developing countries is often a goal for these governments, critics have raised warning bells about the possible negative effects of some of these land deals (Behrman et al. 2012; Makki 2012; Lavers 2012). To start, much of this investment is not actually for food production to serve developing countries' food needs, but rather it is to serve the needs of the investors. In some cases, the investment is from foreign governments that are seeking to ensure their own food security, and in these cases the investments often involve the import of large-scale industrial farming methods and the establishment of infrastructure to export the crops. In other cases, the investments serve the needs of financial speculators who have bought into land investment funds seeking profit. There are also cases of investments that are seeking to capitalize on higher global crop prices such as those for biofuel crops. The link between global capital and investment, agricultural land and biofuel development is occurring globally, from Brazil, to Ethiopia and areas in Southeast Asia such as Malaysia.

The ecological impacts of large-scale land investments can be significant, especially if they involve the import of large-scale industrial farming operations in both food and biofuels. In such circumstances, large-scale industrial agriculture can pose serious risks to the ecosystem as noted above. Tropical forests have already been cleared, for example, in many parts of Asia and Africa in order to establish palm oil plantations for the production of biofuel (see Chapter 38). These ecological risks associated with large-scale foreign land acquisition are a particular concern since these investors are seeking short turnaround on returns and longer term environmental impacts are often left off the balance sheet (Clapp 2012b).

The international politics of more sustainable food and agriculture

The environmental impact of food and agricultural systems has received less attention than it deserves within the field of global environmental politics. This is likely due to the fact that, unlike the issues of climate (Chapter 28), ozone (Chapter 29) or hazardous waste (Chapter 33), there is no one international "regime" or agreement that seeks to promote sustainable agriculture on a global scale (on regimes, see Chapter 9). A number of existing regimes do touch on some of the problems – such as biodiversity loss and genetically modified organisms (Chapter 37)

and hazardous pesticides (Chapter 32). But these are not coordinated as "agriculture" agreements; agriculture is but one source of these particular problems. Part of the reason for the lack of a global agreement specifically focused on the environmental dimensions of food and agriculture is the lack of an international consensus on what exactly a more sustainable agriculture should or could look like in practice. There is much agreement that the current situation is not sustainable over the long run. Indeed, the United Nations Environment Program has stressed that a highly diverse agricultural system that is "eco-efficient" is considered more robust and better at ensuring food security (UNEP 2012: 425). While this is widely supported, there are differing views on how to move forward in a way that provides sufficient food for the world's population with the least damage to the environment.

Two views in particular have become prominent in the debate over the topic, and these have shaped the political discussion at the international level on sustainable agriculture. The first is characterized by the work of the World Bank, and is more mainstream in its approach. It takes as a starting point that some patterns in the global food and agriculture system are a given: for example, that meat consumption is likely to increase over time as the world population grows and as the size of the middle class in developing countries grows (see Chapter 16); an outgrowth of this assumption is a resolve that increased food production is essential. The key is to find a way to achieve this goal in the most environmentally sound way. Given this starting point, the World Bank articulates a vision for a more sustainable agriculture in its *World Development Report 2008, Agriculture for Development* (2007).

Written by a group of around 40 analysts, mostly economists, the World Bank report puts forward the case that the current organization of the food system is not the problem per se. Rather, there are areas where science and new technologies need to be applied and supported with proper management to improve efficiency and reduce environmental impacts (see Chapters 17 and 18). From this viewpoint, new technologies, including genetically modified organisms, need to be fully utilized in order for the world to meet the constant and rising demand for food. Newly developed GMOs, which are engineered for resistance to drought and pests, can meet food needs in a changing climate without the need for synthetic pesticides. The World Bank vision also relies on the promotion of more globally integrated food and agriculture markets with more private sector investment, including the development of more agricultural commodity exchanges and the facilitation of foreign direct investment in the sector. Indeed, the World Bank has played an important role in the development of new guidelines for the private sector for "responsible agricultural investment" (World Bank 2010).

Another major international report on the sustainability of agriculture was released on the heels of the World Bank's report. *Agriculture at a Crossroads* (IAASTD 2009) was the final product of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), an international assessment panel that was established in 2004. The IAASTD report aims to represent a far larger and more heterogeneous group of analysts, and included over 400 participants from a number of fields in academia as well as civil society and the private sector. In its own words, IAASTD describes itself as a multi-thematic, multi-spatial, multi-temporal intergovernmental process with a multi-stakeholder Bureau co-sponsored by a number of international organizations.

The IAASTD was an ambitious project to assess "the impacts of past, present and future era cultural knowledge, science and technology" in a wide variety of thematic areas. In contrast to the World Bank report, the IAASTD report's context was multifaceted. It explicitly aimed to examine urbanization, migration, dietary preferences, climate change, environmental degradation, among others, in the context of the future of agriculture. All of these global processes were tied to science, technology and knowledge but in a cultural context, which means that no single

model for agricultural development was presented (see Chapters 17 and 18). The report was careful to provide a balanced view on issues such as agricultural biotechnology and trade policies. But, at the same time, it demonstrated that agroecological methods could provide at least the same if not higher production results with less ecological damage than alternatives of the type espoused by the World Bank (see IAASTD 2009).

Other groups have also promoted an agroecological approach, including La Via Campesina and associated global food sovereignty movements. These social movements support agricultural governance that is decentralized and based on environmental stewardship (Patel and McMichael 2004; Cohn 2006), in contrast to the often large-scale and centralized management of industrial agriculture. The "pillars" of food sovereignty include local control in "environmentally sustainable ways which conserve diversity" and "work with nature" by rejecting energy intensive, monoculture and industrial models (Forum for Food Sovereignty 2007). Although originally seen as somewhat "radical," agroecological methods are gaining support from more mainstream scientific organizations such as the Royal Society, which supports agronomy and agroecological approaches (Royal Society 2009; on science, see Chapter 17). Indeed, much of the food consumed in the developing world is still produced with few, if any, external synthetic inputs and already relies on diverse crops and varieties, often genetically diverse local varieties (Commission on Genetic Resources for Food and Agriculture 2010).

Beyond the debate over the global organization of agriculture is the question of diets. A number of scholars and reports have called for a change in diet as a way to reduce the environmental impacts associated with meat consumption (e.g., McMichael et al. 2007; UNEP 2012). Reduced meat consumption could play a role in future climate change mitigation policies by reducing livestock's contribution to greenhouse gases. It has been estimated that eating 20 percent less meat is equivalent to switching from a standard American automobile to a Prius (Eshel and Martin 2006). Dr Pachauri, chair of the Intergovernmental Panel on Climate Change, has stated that lifestyle changes, including reducing meat consumption, are an important means for reducing emissions of greenhouse gases (Anon. 2010; see Chapter 28). Alternatively, some scholars have called for "de-intensification" – because pastoral systems and mixed crop–livestock systems have significant carbon sequestration potential and the fact that a majority of the global population are dependent on these systems for their livelihoods (Herrero et al. 2009, 2010). This view is somewhat supported by the FAO (2006b) which calls for payment for conservation services by pastoralists.

These various ideas on how to move toward a more sustainable food and agriculture future have only just begun to filter into global political bodies as they seek to respond to questions of food security. The views of the World Bank have been much more influential on bodies such as the G20 and the G8. The ideas of agroecology, while finding a more sympathetic hearing at the Committee on World Food Security, hosted by the Food and Agriculture Organization, and at the 2012 Rio+20 Conference, have less political weight on the global stage. The various global bodies are only just beginning to dialogue on the sustainable food and agriculture question, and it is important for scholars in the field of global environmental politics to keep a close eye on these developments.

Conclusion

The drive to improve agricultural production and efficiency has been met by industrial agriculture over the past century. But as outlined in this chapter, it has come with a significant environmental cost not just at a local level, but also on a global scale. The dominant food system is organized and shaped by industrial agriculture and international economic forces such as the

international trade in food and global financial activities. These complicate and add to the already significant tensions between food, fuel and land. Importantly, these activities can intensify environmental impacts.

These complex and interrelated issues have been dealt with ineffectively at the global scale. Political choices about how societies collectively organize agricultural systems are of overriding importance because these choices shape individual food choices in many ways. But efforts to forge a global cooperative strategy to promote more sustainable food and agricultural systems have been stalled due to a lack of consensus on what constitutes "sustainable agriculture" (on sustainability generally, see Chapter 15). The two leading interpretations of how a more environmentally friendly international organization of agricultural and food systems could be implemented are widely divergent. Some argue that agroecological methods and more locally oriented food systems will reduce the environmental damage caused by agriculture. But others are skeptical that such methods will be sufficient to feed the world's growing population. These two views were exemplified in two reports – the IAASTD's *Agriculture at a Crossroads* (2009) and the World Bank's *Agriculture for Development* (2007).

The lack of agreement on a vision for a sustainable future for food and agricultural systems has meant that current agriculture, food and diet practices – many of which have negative environmental impacts – persist. This situation cannot last indefinitely, so long as the condition of the global environment worsens, and the demand for food from a growing global population increases. There is an urgent need for more explicit global dialogue on sustainability in agriculture. International institutions can promote more sustainable food systems in practice through the development of norms, rules and other incentives that shape collective societal choices on the organization of food and agriculture (see Chapters 8 and 9). To date, however, both scholars of global environmental politics and policy-makers have shown little interest in forwarding a specific vision for sustainable agriculture, much less putting up the financing needed to see it implemented. Although the 2012 Rio+20 document, *The Future We Want* (UNEP 2012), gives a nod to the need for sustainable agriculture, it remains vague on the details and sources of support. It is well past time that this issue be given serious attention, especially since agricultural issues intersect with key issues such as climate change, pollution and energy policy, and directly impact the wellbeing and livelihood of the globe's poorest people.

References

Anon. 2010. Climate change: an interview with Rajendra Pachauri. *The Economist*. Available HTTP: <http://www.economist.com/node/15473066> (Accessed May 11, 2012).

Balat, M. and Balat, H. 2009. Recent trends in global production and utilization of bio-ethanol fuel. *Applied Energy*, 86(11): 2273–82.

Barrett, C.B. and Maxwell, D.G. 2005. *Food Aid after Fifty Years: Recasting its Role*, New York: Routledge.

Behrman, J., Meinzen-Dick, R. and Quisumbing, A. 2012. The gender implications of large-scale land deals. *Journal of Peasant Studies*, 39(1): 49.

Bittman, M. 2012. We're eating less meat. Why? *New York Times*. Available HTTP: <http://opinionator.blogs.nytimes.com/2012/01/10/were-eating-less-meat-why/> (Accessed January 15, 2012).

Clapp, J. 2012a. *Food*, Cambridge: Polity.

—— 2012b. The financialization of food: who is being fed? Paper for the International Society for Ecological Economics Conference, June 16–19, Rio de Janeiro, Brazil.

Cohn, A. 2006. *Agroecology and the Struggle for Food Sovereignty in the Americas*, New Haven, CT: Yale School of Forestry and Environmental Studies.

Commission on Genetic Resources for Food and Agriculture. 2010. *The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture*, Rome: Food and Agriculture Organization. Available HTTP: <http://www.fao.org/agriculture/seed/sow2/>.

Conway, G. 2012. *One Billion Hungry: Can We Feed the World?* Ithaca, NY: Cornell University Press.

Cronon, W. 1992. *Nature's Metropolis: Chicago and the Great West*, New York: W.W. Norton.
Dale, Philip J. 2002. The environmental impact of genetically modified (GM) crops: a review. *Journal of Agricultural Science*, 138, 245–8.
Deininger, K. and Byerlee, D. 2011. *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Benefits?* Washington, DC: World Bank. Available HTTP: <http://siteresources.worldbank.org/INTARD/Resources/ESW_Sept7_final_final.pdf>.
Drabenstott, M. 1998. This little piggy went to market: will the new pork industry call the heartland home? *Economic Review – Federal Reserve Bank of Kansas City*, 83: 79–97.
Eshel, G. and Martin, P. A. 2006. Diet, energy, and global warming. *Earth Interactions*, 10(9): 1–17.
FAO. 2006a. Spotlight: Farm animal biodiversity. FAO Agriculture and Consumer Protection Department. Available HTTP: <http://www.fao.org/ag/magazine/0609sp1.htm> (Accessed June 5, 2012).
—— 2006b. Spotlight: Livestock impacts on the environment. *Spotlight*. Available HTTP: <http://www.fao.org/ag/magazine/0612sp1.htm> (Accessed June 23, 2012).
FAO and Steinfeld, H. 2006. *Livestock's Long Shadow: Environmental Issues and Options*, Rome: Food and Agriculture Organization of the United Nations.
Foley, J.A., Ramankutty, N., Brauman, K.A., Cassidy, E.S., Gerber, J.S., Johnston, M., et al. 2011. Solutions for a cultivated planet. *Nature*, 478(7369): 337–42.
Forum for Food Sovereignty. 2007. Declaration of Nyeleni. *Nyeleni 2007*. Available HTTP: <http://www.nyeleni.org/spip.php?article290> (Accessed July 24, 2010).
Herrero, M., Thornton, P.K., Gerber, P. and Reid, R.S. 2009. Livestock, livelihoods and the environment: understanding the trade-offs. *Current Opinion in Environmental Sustainability*, 1(2): 111–20.
Herrero, M., Thornton, P.K., Notenbaert, A.M., Wood, S., Msangi, S., Freeman, H.A., et al. 2010. Smart investments in sustainable food production: revisiting mixed crop–livestock systems. *Science*, 327(5967): 822–5.
IAASTD. 2009. *International Assessment of Agricultural Knowledge, Science and Technology for Development: Agriculture at a Crossroads*, Washington, DC: Island Press.
Iles, A. 2005. Learning in sustainable agriculture: food miles and missing objects. *Environmental Values*, 14(2): 163–83.
Imperial College of Science and Technology. 2002. *Crop Diversity at Risk: The Case for Sustaining Crop Collections*, Ashford, Kent, UK: Dept. of Agricultural Sciences, Imperial College Wye.
James, C. and ISAAA. 2012. Highlights: Global status of commercialized biotech/GM crops: 2012. International Service for the Acquisition of Agri-biotech Applications. Available HTTP: <http://www.isaaa.org/resources/publications/briefs/44/highlights/pdf/Brief%2044%20-%20Highlights%20-%20English.pdf>.
Keating, B.A., Carberry, P.S., Bindraban, P., Asseng, S., Meinke, H. and Dixon, J. 2010. Eco-efficient agriculture: concepts, challenges, and opportunities. *Crop Science*, 50(Supplement 1): S109–S119.
Lappé, F.M., Collins, J. and Rosset, P., with Esparza, L. 1998. *World Hunger: 12 Myths*, 2nd edn, New York: Grove Press.
Lavers, T. 2012. "Land grab" as development strategy? The political economy of agricultural investment in Ethiopia. *Journal of Peasant Studies*, 39(1): 105–32.
McMichael, A.J., Powles, J.W., Butler, C.D. and Uauy, R. 2007. Food, livestock production, energy, climate change, and health. *Lancet*, 370(9594): 1253–63.
McMichael, P. 2010. Agrofuels in the food regime. *Journal of Peasant Studies*, 37(4): 609–29.
McNeill, J.R. 2000. *Something New under the Sun: An Environmental History of the Twentieth-Century World*, New York: W.W. Norton.
Makki, F. 2012. Power and property: commercialization, enclosures, and the transformation of agrarian relations in Ethiopia. *Journal of Peasant Studies*, 39(1): 81–104.
Mooney, H. 2009. Biodiversity, climate change, and ecosystem services. *Current Opinion in Environmental Sustainability*, 1(1): 46–54.
Novek, J. 2003. Intensive livestock operations, disembedding, and community polarization in Manitoba. *Society and Natural Resources*, 16(7): 567–81.
OECD–FAO. 2011. *OECD–FAO Agricultural Outlook 2011–2020, Biofuels*. Available HTTP: <http://www.agri-outlook.org/dataoecd/23/56/48178823.pdf> (Accessed June 23, 2012).
Paarlberg, R.L. 2008. *Starved for Science: How Biotechnology is Being Kept out of Africa*, Cambridge, MA: Harvard University Press.
Patel, R. and McMichael, P. 2004. Third Worldism and the lineages of global fascism: the regrouping of the Global South in the neoliberal era. *Third World Quarterly*, 25(1): 231–54.

Pew Commission. 2009. *Putting Meat on the Table: Industrial Farm Animal Production in America*. A Report of the Pew Commission on Industrial Farm Animal Production. Executive Summary. A Project of the Pew Charitable Trusts and Johns Hopkins Bloomberg School of Public Health.

Pimentel, D., McLaughlin, L., Zepp, A., Lakitan, B., Kraus, T., Kleinman, P., et al. 1993. Environmental and economic impacts of reducing US agricultural pesticide use. In D. Pimentel and H. Lehman (eds) *The Pesticide Question*, New York: Springer US: 223–78. Available HTTP: <http://www.springerlink.com/content/q7177j3064613057/abstract/> (Accessed June 16, 2012).

Pimentel, D., Williamson, S., Alexander, C.E., Gonzalez-Pagan, O., Kontak, C. and Mulkey, S.E. 2008. Reducing energy inputs in the US food system. *Human Ecology*, 36(4): 459–71.

Pirog, B.R. 2004. Food miles: a simple metaphor to contrast local and global food systems. *Environmental Nutrition*: 1–5.

Rainforest Action Network. no date. *Getting Real about Biofuels*, San Francisco, CA: Rainforest Action Network. Available HTTP: <http://ran.org/getting-real-about-biofuels> (Accessed June 23, 2012).

Rhodes, V.J. 1995. The industrialization of hog production. *Review of Agricultural Economics*, 17(2): 107–18.

Ridgway, R.L., Tinney, J.C., MacGregor, J.T. and Staler, N.J. 1978. Pesticide use in agriculture. *Environmental Health Perspectives*, 27: 103–12.

Royal Society (Great Britain). 2009. *Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture*, London: The Royal Society.

Schneider, M. 2011. *Feeding China's Pigs*. Washington, DC: Institute for Agriculture and Trade Policy.

Siebert, S. and Döll, P. 2010. Quantifying blue and green virtual water contents in global crop production as well as potential production losses without irrigation. *Journal of Hydrology*, 384(3–4): 198–217.

Smil, V. 2001. *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production*, Cambridge, MA: MIT Press.

Stull, D.D. and Broadway, M.J. 2004. *Slaughterhouse Blues: The Meat and Poultry Industry in North America*, Belmont, CA: Thomson/Wadsworth.

Thu, K.M. and Durrenberger, E.P. 1998. *Pigs, Profits, and Rural Communities*, Albany: SUNY Press. Available HTTP: <http://search.ebscohost.com/login.aspx?direct=trueandscope=siteanddb=nlebkanddb=nlabkandAN=5535> (Accessed May 10, 2012).

UNESCO–SCOPE–UNEP. 2009. *Biofuels and Environmental Impacts: Scientific Analysis and Implications for Sustainability*. Paris. Available HTTP: <http://unesdoc.unesco.org/images/0018/001831/183113E.pdf> (Accessed June 23, 2012).

Union of Concerned Scientists and Gurian-Sherman, D. 2008. *CAFOs Uncovered: The Untold Costs of Confined Animal Feeding Operations*, Cambridge, MA: Union of Concerned Scientists.

United Nations Environment Programme (UNEP). 2012. *Global Environment Outlook 5 (Geo 5)*, United Nations Environment Programme. Available HTTP: <http://www.unep.org/geo/pdfs/geo5/GEO5_report_full_en.pdf>.

US Department of Energy. 2010. *2009 Renewable Energy Data Book*. Available HTTP: <http://www1.eere.energy.gov/maps_data/pdfs/eere_databook.pdf>.

Weber, C.L. and Matthews, H.S. 2008. Food-miles and the relative climate impacts of food choices in the United States. *Environmental Science & Technology*, 42(10): 3508–13.

Weis, A.J. 2007. *The Global Food Economy: The Battle for the Future of Farming*, London: Zed Books.

World Bank. 2007. *World Development Report 2008: Agriculture for Development*, Washington, DC: World Bank.

—— 2010. Principles for Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources, a discussion note prepared by FAO, IFAD, UNCTAD and the World Bank Group to contribute to an ongoing global dialogue. Available HTTP: <http://siteresources.worldbank.org/INTARD/214574–1111138388661/22453321/Principles_Extended.pdf> (Accessed June 16, 2012).

Worthy, M. 2011. *Broken Markets: How Financial Market Regulation Can Help Prevent Another Global Food Crisis*, London: World Development Movement. Available HTTP: <http://www.wdm.org.uk.proxy.lib.uwaterloo.ca/sites/default/files/Broken-markets.pdf>.

WTO. 2004. *World Trade Report, 2004*, Geneva: World Trade Organization.

—— 2009. *International Trade Statistics*, Geneva: World Trade Organization.

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