Mauro Galluccio, Ph.D.

Science and Diplomacy

Negotiating Essential Alliances

Springer

Science and Diplomacy

Mauro Galluccio

Science and Diplomacy

Negotiating Essential Alliances

Springer

Mauro Galluccio
EANAM (European Association for Negotiation and Mediation)
Brussels, Belgium

ISBN 978-3-030-60413-4 ISBN 978-3-030-60414-1 (eBook)
https://doi.org/10.1007/978-3-030-60414-1

© Springer Nature Switzerland AG 2021
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

To Laura, Michele, Lorenzo, and Gabriele

Foreword

It may sound as a provocation to say that science might be considered as "useless" in some instances. However, any scientific finding is indeed invisible if it is not properly known, explained, implemented, and/or trusted. Science is about facts and observations that may or not corroborate theories; it is generally driven by humans, although the reverse may also occur when humans are driven by science for the best or the worst science is not understood the same way by politicians, policymakers, diplomats, practitioners, scientists, industry stakeholders, and citizens. Facts and knowledge are confronted by different angles of views, expectations, and beliefs that are anchored in people's mind. In addition, science may be manipulated by other interests than seeking the truth, in particular when it is driven by economic considerations. While it is recognized that science is obviously developed by researchers and academics covering many different disciplines, sometimes leading to silo-thinking, it is an illusion to think that it can work in isolation. Even an eminent professor, a genius in his or her discipline, will not master the overall world complexity when dealing with any kind of crisis. Ideally, interactions with many different actors will be required, in full dialogue and transparency, with verifiable facts and figures, tangible demonstrations, and knowledge sharing. In this respect, science will be challenged to effectively support policymaking and implementation, and match practitioner's needs, in the light of available state-of-the-art tools, methods and technologies and innovation-driven solutions of potential interest to industry (thus with possible market outputs), while being trusted by the general public. This places humankind at the heart of science with an obvious motto which is the need to work together.

This ideal situation of working together is however confronted by a number of conflicts for reasons expressed above. They may concern disputes about costly/drastic decisions to be taken in the event of a crisis, insufficient consideration of emotional impacts on people, incapacity to share views owing to egocentric behaviours, personal interests being placed before the interests of the community, inability to tackle uncertainties, etc. Transparency and established dialogue in all disciplines, sectors and society, may be a way to limit the number of situations where our societies are "taken by surprise" by unexpected events, e.g. a disaster of

natural or man-made origin, a terrorist attack, or a pandemic. This "surprise effect" is often due to the fact that politicians, scientists, and the overall society have lost memories about past events, or are affected by cognitive biases which give them the feeling that they "know better", or are experiencing a deaf ears syndrome. As correctly pointed out by Mauro Galluccio, the COVID-19 crisis will bring us an overwhelming number of lessons in this regard. When it started, conflicting views immediately occurred not only in people's "non-scientist" debates but also within the overall scientific community, notwithstanding the total lack of consensus among politicians at international or even national levels. The fact is that nobody knew what would happen; even the most famous epidemiologists were wrong in their assessment of the contamination spread. The surprise here is that very few remembered that similar pandemics took place in 1957 and 1968–1969, with a more or less equivalent number of losses, meaning that protection measures taken at the time were forgotten with all the lessons learned, and this in less than two generations. Asiatic countries such as China and Korea were certainly better prepared than other countries because their memories were "still fresh", i.e. linked to the SARS outbreak in 2003. When dealing with disaster risk management, it has become obvious that science, while being at the heart of progress, cannot develop in isolation. The Disaster Risk Reduction Sendai Framework for Action recognizes the need for evidence-based policies, which are developing throughout the world. In Europe, the Union Civil Protection Mechanism is establishing close links with the scientific community to enhance capacity-building of first responders for the prevention, preparedness, and response to disasters. The policy framework does not, however, allow for effective cooperation to take place without a well-structured dialogue. This has given the idea to the European Commission to develop a "Community of Users on Secure, Safe and Resilient Societies" (CoU) which is gathering different actors expressing their needs, expectations, doubts, and certainties, in open and sometimes conflicting debates, in order to find—together—the best compromise to move forward. Above all technical or legal considerations, such compromise can only be reached if it is driven by humankind, and this is what the CoU offers. Thinking out of the box may often bring new perspectives and nourish our own knowledge. In this respect, speaking with researchers in various natural or CBRN scientific disciplines, historians, psychologists, first responders, SME/industry representatives, etc. has opened new windows of thinking.

It is in this context that I met Mauro Galluccio, both political scientist and clinical psychologist, who since the early 1990s has been instrumental in promoting conflict transformation. I was honoured by the invitation to preface his book "Science and Diplomacy: Negotiating Essential Alliances", which is at the heart of these considerations. In discussing the needs for multidisciplinary cooperation among many different actors and the ability to share information from international to local levels, he puts the accent on trust and credibility about science which form a strong foundation for diplomacy. The book questions how interpersonal negotiations take place among scientists and politicians/policymakers to achieve a sound and evidence-informed policy framework. Above all political, technical, and scientific considerations, the fact is that all people involved are men and women who

need to listen to each other and express their views while trying to avoid a kind of "chapel-thinking". They need to be ready to accept that they may change their views on the basis of knowledge that they do not master, in order to find the best compromise between the science reality, the implementation feasibility, and the general acceptation of the facts and findings that will influence policymaking and hence the daily life of citizens. This is only possible in a team working motion where all are able to listen and mutually respect each other's views while keeping their roles and turning their efforts in serving the community. This book will bring the reader into issues related to perception and misperception (or misinterpretation) in science diplomacy and related (global) communication drawbacks and it highlights the needs and ways to strengthen the cooperation process between scientists and diplomats/politicians. Certainly, a motto of this unique volume is a highlight about the strength of the scientific language to bring together people from different regions, cultures, ideologies, and social backgrounds and to enable consensual approaches to be developed to tackle global issues. The chaotic crisis management that the world has faced with the COVID-19 is the most speaking indication about the efforts required to reconcile science, politics, and diplomacy, and this book is about how they should and could work together. It will be of interest to a wide range of readers from different scientific and political/policymaking spheres, both for professionals involved in crisis management and university curricula, and will undoubtedly generate future research developments at international level with the hope that science diplomacy will be recognized as an essential discipline for tackling any crisis occurring at global, national, or even local levels.

Policy and Research Programming Officer Philippe Quevauviller
European Commission, DG HOME
Brussels, Belgium

Foreword

Mauro Galluccio's new book provides a foundation for a new multidisciplinary field at the intersection of science and diplomatic policy. He makes clear in his Preface and Introduction both the need for the field and the challenges likely to be encountered on this journey. With regard to need, there would seem to be little doubt that national and international policies would benefit from taking into account evidence from a variety of scientific fields. Climate science and virology are among the physical and natural sciences that address current global problems. Progress in these fields is essential if we are to develop a vaccine to combat COVID-19. But the social and economic sciences are equally important, particularly micro (consumer behaviour) and macroeconomics (the study of markets and labour); political economy; social, political, and clinical psychology; and study of political institutions and electoral processes. Insights from studies in these fields contribute to our understanding of economic collapses and human coping with a bleak present and future. While the need for scientific evidence would seem imperative, there have been barriers that have stood in the way of embracing the knowledge. This book opens a window on the barriers and provides advice on how they may be overcome.

Mauro Galluccio puts at the centre of debates, on the value of science for political leaders and diplomats, the clash between beliefs, emotional processes, and evidence as well as miscommunication. How often have we heard that "faith is not evidence?" While there may be wide agreement on this aphorism, the behaviour of a number of current political leaders flies in the face of its meaning. As I write this foreword, US Vice President Pence is announcing that "we are well on our way to beating this virus". A CNN scientist rebuked this statement, saying that it is very dangerous and will lead to irresponsible behaviour that is likely to contribute to a second wave of cases. Other political leaders, notably the president of Brazil, have downplayed the seriousness of the disease despite overwhelming evidence to the contrary and massive increase of positive tests by citizens in their own countries. This example raises a question about the compatibility of evidence with beliefs. This question turns on beliefs about the value of science. It faces what I call a *flexibility dilemma* characterized by hardened positions that reflect values and interests. Our research has shown that conflicts are intensified when values or ideologies are

invoked. Through time and repeated interactions, the contending parties become more polarized due in large part to identity threats. However, this knowledge is produced with scientific methods and the experiments are conducted by investigators who share the same epistemic world view. They are likely to be dismissed by those who share a faith-based belief system. Questioning the fundamental tenets of empirically generated knowledge does not bode well for a science-policy discipline.

Mauro Galluccio presents four dilemmas throughout the book. One is referred to as an *uncertainty dilemma*. Uncertain or probabilistic knowledge is part of scientific cultures; it is shunned by policymakers and diplomats eager to be confident about their decisions. Another is referred to as the *complexity dilemma*. Scientific knowledge is qualified by circumstances of data collection, time period, population differences, and methods used. It is also presented in a jargon difficult for non-scientists to absorb. Third, cooperation between scientists and policymakers is hampered by the *outsider dilemma*. Time and again, I have been told that only those of "us" working in the trenches can understand the dimensions of the problems. This is a complexity dilemma in reverse: only insiders can appreciate the implications of policy-driven interventions and the crises that occur in the real world. Fourth is a *time urgency dilemma*. Scientists and policymakers operate on different timescales. The former must tolerate the slow pace of data collection, analysis, and peer review. The latter are intolerant of this pace. Decisions about dealing with crises cannot wait for results to emerge. Note in this regard the rush by governments to loosen restrictions on their citizens despite little scientific progress on conquering the COVID-19. The key US medical advisor warns about the dire consequences of an anti-science bias in the American population, which I referred to above as a conflict over tenets.

Mauro Galluccio's quest in developing a multidisciplinary field that connects science to diplomacy has many implications highlighted throughout the book. One is to match the relevant scientific fields with particular policy areas and initiatives: medical sciences for health policy, economic science for labour policy, and political science and sociology for institutional reform. Another implication is to encourage research that sheds light on the relationship between evidence and beliefs. Studies of world views that lead people to resist taking seriously scientific evidence would be a priority. A third thread is to address each of the four dilemmas discussed above: uncertainty, complexity, outsider, and time urgency. Uncertainty and complexity are features of the scientific enterprise often difficult for non-scientists to appreciate. The outsider dilemma is an unfortunate characterization used by policymakers to shut scientists out of the conversations. Time urgency is a feature of the policy process that preferences quick rather than carefully considered solutions. But even if progress is made in each of these areas, the field is unlikely to prosper without a fourth recommendation. This consists of designing institutional channels that allow for collaboration between scientists and policy practitioners as timely explained by Mauro Galluccio. Each community needs to understand the other's challenges and modus operandi. This understanding would enable them to properly situate science within the fabric of policy.

Mauro Galluccio's book provides the foundation needed to spark scientists and policymakers to join together in fostering this exciting multidisciplinary field. It is a very innovative contribution to the field which aims to formulate proposals on how to best optimize the use of science and diplomacy structures throughout training programs. This volume follows the ongoing debate in the European Union and the world in providing a better understanding of the tools that can be deployed to improve communication and cooperation between scientists, politicians, and diplomats. This is an area that uses cognitive and affective processes to shape important judgements and critical decisions and will be used significantly in widening and understanding the relational abilities of individuals facing uncertainty and decision-making. By analysing the way in which scientists and politicians engage with each other all over the world, Mauro Galluccio gives us valuable insights into the process of interpersonal negotiation, as we try to transform the practice of science diplomacy to meet the needs of international cooperation in this century.

Public and International Affairs
George Mason University,
Arlington, VA, USA

Daniel Druckman

Preface

In early January 2020 I was finishing the draft of this book. My publisher had been very patient until then as I was supposed to complete the draft in the first part of 2019. I was late due to a huge clinical workload in 2019. As usual, every morning, I was reading the news. One item particularly struck me: Wuhan Municipal Health Commission, China, reported a cluster of cases of atypical pneumonia in Wuhan, Hubei Province. A novel coronavirus was eventually identified (SARS-CoV-2). An invisible enemy that could provoke world chaos was an unpleasant thought. I wondered how scientists and policymakers would react and interact to a crisis that destroys the certainty of statistical models and lab-created simulations. We live in a world which is overpopulated, where a web of networked connections is huge, information is overwhelming, and globalization of societies is a fact. Also, the essence of risk has been continually changing, to such a degree that it is systemic and takes main actors and decision-makers by surprise. This is due to the non-linearity, ambiguity, and uncertainty of the events' main characteristics, magnified by the speed of events. In such circumstances, established risk management institutions and approaches would fail to respond in a comprehensive and sustainable way.

Could something be done to foster sound interpersonal negotiations between scientists and diplomats/politicians for policymaking? Would those involved be able to work together, manage problems, and engage in necessary interactions for policymaking? Would they be able to manage the tension between individualism and requirements of a team effort? Will peer-review papers produced by academicians and scientists be enough for policymaking facing an unknown problem? Will they be able to ask each other the right questions to mutually understand their reasons and work with mutual respect and mutual esteem in an uncertain and ambiguous environment? And most of all, could they maintain a cooperative attitude, respecting each other's roles in the interest of the community?

In January 2020, world leaders at the beginning failed to understand that the crisis was a global problem, not a regional problem. Politicians and diplomats were taken by surprise as were scientists. They did not know too much about this new virus, and as they began to study and research it the disease was rapidly spreading. Data were collected and all over the world scientists began to work on it. But at the

beginning it seemed a dialogue of deaf people, and many experts (not all) seemed to minimize the problem. Politicians perhaps accepted this minimization in order to avoid taking drastic decisions. Unfortunately, when situations are complex, ambiguous, and uncertain, there is a tendency to find heuristic shortcuts to simplify the problem and to exert control through limited consultations and conflict avoidance among different parties. In a crisis situation, negative cognitive and emotional processes increase the perception of uncertainty, and in the specific case of the COVID-19 they were highly influenced by the shadow side of the pandemic (unknown trajectory and knowledge). Health was at stake; social, economic, and environmental consequences were paralyzing, puzzling, "expanding" space and time for the people and around policymakers, increasing the delayed response. The latency of responses to crisis could also be due to politicians' fear of losing power due to unpopular decisions taken in a time of crisis. Empirical evidence confirms that politicians who are not facing imminent election are keen to try different decision-making paths.

The failure of communication in this planetary crisis has not been about whether or not objectives have been achieved, but about the ability of major actors to cooperate to forge links with people. Scientists' and diplomats' working relationship building may be a matter of the process they use to resolve their differences. However, competence in their respective fields with the accumulation of experience and tacit knowledge and the ability to reflect realistically on what can and cannot be achieved are essential skills for both politicians and scientists. Anything that undermines this prospective ability can do considerable harm to the people. The way policymakers and scientists will manage this ability and their interpersonal negotiations as a whole will be of great importance in fostering international cooperation and coordinated problem-solving behaviours. Otherwise, science diplomacy will lose sight of its most important purpose: that of helping to solve problems, conflicts, and diplomatic processes for the sake of humanity.

This book aims to reinforce the groundwork for a new field of study and research in the intersection between science and diplomacy. It seeks to promote a multidisciplinary approach, generating study, research, and networking that will respond to the unprecedented demand and opportunity for international cooperation. Improving "science diplomacy" will require a more effective and coherent ability to share information at the international level. I am very keen about this volume. It is a first step in the direction of developing a psychological approach to science diplomacy through interpersonal negotiation. A second step will be to integrate the approach towards a larger vision of interpersonal negotiation and related attempts to improve coordination between scientists and politicians/diplomats, and, most importantly, to sustain the essential alliances for global changes. It is very satisfying to see this volume in print and have an opportunity to expose people from many parts of the world to these ideas.

Rome, Italy
Brussels, Belgium

Mauro Galluccio

Acknowledgements

My heartfelt gratitude goes to the special contributors to this volume: Dr. Aaron Tim Beck, Ambassador Robert Gallucci, Dr. Lodovica Gullino, and Dr. Laura Vivani, all of them with strong experience and a balanced mix of theory and practice. They have all been extremely enthusiastic about the book project and have prepared very real experience-informed valuable contributions. They have been cooperative, friendly, and dedicated to their writing. It has been a pleasure and an honour working with them in acquiring a practical "naturalistic" experience in the field.

The search and striving for truth and knowledge are one of the highest of man's qualities - though often the pride is most loudly voiced by those who strive the least. And certainly, we should take care not to make the intellect our god; it has, of course, powerful muscles, but no personality. It cannot lead, it can only serve; and it is not fastidious in its choices of a leader. The intellect has a sharp eye for methods and tools but is blind to ends and values. So, it is no wonder that this fatal blindness is handed from old to young and today involves a whole generation.

Albert Einstein, Out of My Later Years, 1957:260

Another Ebola epidemic or a new influenza pandemic are likely and almost certain. The only unknowns are when and where they, or a new but equally lethal threat, will emerge.

UNDRR, 2019:105

Contents

Part I Perception and Misperception in Science Diplomacy

1 Introduction to the Book 3
Science Diplomacy in Time of Uncertainty 3
Science and Politics 4
COVID-19 Crisis and Sustainable Scientific Advices 4
Organisation and Contents of the Book 5
Concluding Remarks. 7

2 Adaptive Decision-Making Process in Crisis Situations 9
Introduction. 9
Negotiating a Cooperation Process. 9
Perception and Misperception in Crisis Situations. 10
The COVID-19 Crisis and Evidence-Informed Policymaking 12
Cognitive Biases and Psychosocial Mechanisms 13
Emotional Communication in Action 15
Metacognitive Functions and Emotional Styles 17
Adaptive Decision-Making. 19
Concluding Remarks. 20

Part II Science Diplomacy: Negotiating a Joint Engagement

3 Science and Diplomacy. 25
Introduction. 25
Defining Science Diplomacy 26
Science Diplomacy: History and Achievements. 28
Science Diplomacy as Soft Power Exercise 35
Multilateral Science Diplomacy in Action 38
Cooperative Advisory Mechanisms 44

4 Science Diplomacy and the European Union 47
Introduction. 47
Science Diplomacy and the European Union: A Brief History 48

Scientific Advice in the EU Institutions 54
Responsible Research and Innovation 56
The EU's Strategy Under Commissioner Moedas 59
The Cutting-Edge Year: An Insight on the EU's Actions 60

5 Evidence-Informed Policymaking 65
Introduction 65
Brief History of Evidence-Based Policymaking 67
Evidence-Informed Policymaking in the European Union 68
The Relation Between the Scientist and the Diplomat:
Recommendations 69
Evidence-Informed Policymaking in Action 70
Standardization vs. Experience-Based Approach 71
Evidence-Informed Policymaking: Leading from the Shadow 73

6 Climate Change and Extreme Hazards 75
Introduction 75
Evidence-Based Medicine and Clinical Practice 75
Climate Change and Hydrometeorological Extreme Hazards 78
Negotiating Global Agreements with Incomplete
Evidence-Informed Policies 79
Climate Change: Citizens' Resilience and Well-Being 81

7 Evidence-Informed Policymaking: The Way Forward 83
Concluding Remarks 86

Part III Biosecurity and Environmental Disaster: Adaptive Decision-Making in Time of Uncertainty

8 A Major Challenge to the Uncertainty of Modern Times 91
Introduction 91
Crisis Management 92
Knowing How to Give a Feedback 94
Risk Management 95
Bioterrorism After September 11, 2001 96
Potential Global Economic Impact of Agricultural Bioterrorism 98
Environmental Disasters: A Major Challenge to Biosafety 99
Hyogo Framework for Action 101
Biosafety and Resilience Processes 102

9 Crisis Management and Risk Assessment in the EU: A General Outline 103
Introduction 103
Main Operational Mechanisms in the EU Institutional Framework 104
The European Agenda on Security 105
Risk Assessment System in the EU 106
A Brief History of the EU's Comprehensive Approach 107

The EU's Green Paper on Bio-Preparedness 108
Chemical, Biological, Radiological and Nuclear (CBRN) Task Force. 109

10 Feeding the Sendai S&T Road Map on Capacity Development and Resilience. 111
Introduction. 111
European and International Projects on Risk Assessment and Crisis Management. 111
Stakeholders' Training Strategy 112
UNDP Global Risk Identification Program (GRIP) 113
Risk Communication 114
Implementing Biosafety and Biosecurity Preparedness in the EU 115
Development and Resilience. 117
The Expected Impact on the European Society 118
Concluding Remarks. 119

Part IV Theory, Research, and Practice for Science Diplomacy: An Insight on the Cooperative Process

11 International Alliance for Science Diplomacy: Interpersonal Skills as a Predictor of a Sound Negotiation Process—American and European Self-Perception. 123
Mauro Galluccio and Mattia Sanna
Introduction. 123
Purpose of the Research 124
Materials and Methods 125
Data Set. 125
Results. 126
Descriptive Statistics. 126
Discussion. 141
Conclusions. 143

12 Evidence-Informed Policymaking: An Innovative European Multi-actor Project 145
Maria Lodovica Gullino and Laura Vivani
Introduction. 145
The EMPHASIS Project 146
The Multi-actor Approach Within Horizon 2020 147
The Multi-actor Approach Adopted in the EMPHASIS Project. 151
Multi-actor Supporting Activities 151
Analytical Framework. 151
Learning Platform and Socio-Technological Learning Labs (SLL) . . 152
Decision-Making Surveys. 152
Decision-Making Workshop 153

On-Farm Demonstrations 153
Call for Early Adopters 153
HabiThreats Toolkit 154
Use of EMPHASIS Scientific Evidence to the EU's Policymaking 155
Emphasis on Key Messages for Policymakers 158
Conclusions 161
Appendix 162

13 Misunderstanding the First Nuclear Crisis with North Korea: The Inconvenient Science in Negotiations 165
Robert L. Gallucci
Introduction 165
The First Misunderstanding: Special Inspections 166
The Second Misunderstanding: The Significance of the North's Abandonment of Graphite-Moderated, Gas-Cooled Reactors 168
The Third Misunderstanding: The Cause of the Crisis in June, 1994 170
The Fourth Misunderstanding: The Non-proliferation Benefits of the Deal 172
Conclusions 174

14 Scientists Meet Diplomats: A Cognitive Insight on Interpersonal Negotiation 177
Mauro Galluccio and Aaron Tim Beck
Introduction 177
The Scientist and the Diplomat: Opposing Figures? 178
Scientists and Diplomats' Communication 181
Cognitive and Emotional Processes in Interpersonal Negotiation 182
Emotional Competence 184
Conclusive Remarks 186

Afterword 189

References 193

Index 203

About the Author

Mauro Galluccio, PhD is a political scientist, psychologist, and cognitive behavioural therapist. He completed his *post-doctoral* fellowship at the Johns Hopkins University, SAIS in Washington, DC. Dr. Galluccio is the president of EANAM (European Association for Negotiation and Mediation) based in Brussels. He is an advisor to the Joint Research Centre (JRC) on evidence-informed policymaking and a seasoned expert evaluator and peer reviewer to the ERC (European Research Council) and REA (Research Executive Agency) for founding projects and programs of the EU. Dr. Galluccio has worked for many years within European institutions as political analyst and advisor. He has been a public speaker and professorial lecturer for more than 20 years to the European Commission of the EU (DG COMM—EC Presidency), in charge of the EU institutions and policymaking. He has been an advisor to the UNDP (United Nations Development Programme) on mentoring programme for trainers. He is the editor and author of the *Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives, 2015, Springer, New York.* He is the co-author of *Psychological Processes in International Negotiations: Theoretical and Practical Perspectives* (with F. Aquilar, Springer, New York, 2008) and co-editor of *Psychological and Political Strategies for Peace Negotiation: A Cognitive Approach* (with F. Aquilar, Springer, New York, 2011).

About the Contributors

Aaron Tim Beck, MD is Professor Emeritus of Psychiatry at the University of Pennsylvania and founder of the cognitive therapy. He has authored more than 600 publications and has received numerous honours from professional and scientific organizations, including the "Lasker Clinical Medical Research Award" and "America's Nobel", often considered America's Nobel Prize.

Robert L. Gallucci is Professor at Georgetown University where he teaches graduate and undergraduate seminars on nuclear weapons and international security. He was President of the MacArthur Foundation, Dean of the School of Foreign Service at Georgetown, and served for 20 years with the Department of State, including as Ambassador at Large and Assistant Secretary of State for Political-Military Affairs. He was also Deputy Director General of the Multinational Force and Observers and Deputy Executive Chairman of the UN Special Commission on the Disarmament of Iraq. He has taught at the National War College, Swarthmore College, and Johns Hopkins SAIS.

Maria Lodovica Gullino is Full Professor in plant pathology and the Director of the Centre of Competence for the Innovation in the Agro-Environmental Sector (AGROINNOVA) of the University of Torino. She has coordinated and managed many international research projects and has been a pioneer in the EU on biosecurity research applied to agriculture. Prof. Gullino coordinated CROPBIOTERROR, PLANTFOODSEC (FP7), and H2020 EMPHASIS European projects. She has obtained several awards worldwide and written more than 750 research papers, 250 feature articles, and 23 books.

Mattia Sanna is Assistant Professor in the Master's Program in Global Health and Development at Taipei Medical University, Taiwan. He holds a Ph.D. on climate change. His extensive postdoctoral research activity focused on sustainable water management in agriculture, environmental impact of agricultural practices, and cropping system modelling. After working for 10 years in agricultural research, in 2015 he moved to Taiwan to apply his expertise in data analysis, geographic information systems, and simulation modelling to global and public health.

Laura Vivani is the Managing Director and one of the founders of MOVERIM sprl based in Brussels for more than 25 years. She is MSc in Economics and holds a MA in Science Communication from the International School of Advanced Scientific Studies (SISSA), Trieste, Italy. Dr. Vivani has a seasoned field-based experience in science diplomacy. As a partner in several projects financed by the EU, she is in charge of the scientific evidence-informed dissemination activity, stakeholders' consultation and engagement, organization of events, workshops, and webinars for transfer of knowledge. In the EMPHASIS project, Dr. Vivani has worked on strategic decision-making analysis and applied processes, dissemination activities for policymakers, scientific communities, and general public at large.

Contributors

Aaron Tim Beck, MD Cognitive Therapy, University of Pennsylvania, Philadelphia, PA, USA

Psychiatry, University of Pennsylvania, Philadelphia, PA, USA

Robert L. Gallucci Georgetown University, Washington, DC, USA

Maria Lodovica Gullino UNITO, Turin, Italy

Mattia Sanna Global Health and Development, Taipei Medical University, Taipei, Taiwan

Laura Vivani MOVERIM sprl, Brussels, Belgium

Part I
Perception and Misperception in Science Diplomacy

Chapter 1
Introduction to the Book



In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed.

Charles Darwin

Science Diplomacy in Time of Uncertainty

Recent years have seen an increasing interest in applying scientific knowledge towards the improvement of diplomatic and political decision-making processes. To this end, researchers have sought to provide suggestions and evidence-informed strategic advice to policymakers on matters of global interest. Sometimes it works; other times it falls on deaf ears. In the discussion about the interaction between science and diplomacy, different definitions have been proposed, each providing a wide variety of concepts from diverse disciplines. These concepts include soft power, public diplomacy, preventive diplomacy, etc. However, the origin of science diplomacy should be found in the field of international relations, where the interests of science and policy come together and science is employed by policymakers to facilitate and mediate issues of global concern, as well as to resolve the increasing number of conflicts around the world.

This book follows the ongoing debate in the EU and the world in providing a better understanding of the tools that can be deployed to improve communication and cooperation between scientists, politicians, and diplomats in this field. To this aim we would need to improve interpersonal negotiating skills to manage evidence-informed policymaking processes. A basic fact about interpersonal negotiation is that people have different backgrounds, core beliefs, held values, cognitive biases, assumptions, emotional processes, metacognitive abilities, and behaviours, and they

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_1

are unpredictable. The working relationship capacity building may profoundly impact present and future interactions and negotiating outcomes. It is possible to be tough but respectful, and still establish a good relationship with high levels of credibility.

Science and Politics

Modernity is a challenge which puts to the test principles and values that have traditionally ruled relationships between individuals and populations, the control of the planet's resources, and the survival of humankind. May we still trust the human mind's creative potential? In light of the new identified coronavirus (SARS-CoV-2) and the recent COVID-19 crisis, the question arises almost spontaneously as to whether science and politics are parallel activities, and whether the communication channel between these two spheres is effective. An important feature of the scientific method is valuing doubt over certainty. In politics having doubts is seen as a form of weakness. Science is based on years, sometimes decades, of studies, experiments, tests, and examinations, to arrive at concrete, reliable results and solid conclusions. However, by its nature, science cannot itself make influential decisions, let alone ones legally binding on the population. Politics, for its part, has the important and delicate role of directing the fate of an entire country, or rather of an economic-political area, through a democratic legislative process for the common good of its citizens. However, in order to legislate most wisely, it is essential that political decisions are based on solid scientific foundations and that, at the same time, they carefully consider all the varying interests involved (public health, right to work, economic factors, etc.). It often happens, however, that politics finds itself making decisions, not necessarily supported by scientific evidence, to respond to a higher good that does not always coincide with the absolute good, for example, as happened with COVID-19 measures. In complex situations and environments, what we need is not to be waiting too much for the right information, but the right way to understand the information we already have and act as fast as possible.

COVID-19 Crisis and Sustainable Scientific Advices

Close association of humans and wildlife (handling and consumption of unmanaged wildlife by humans increase the opportunity for cross-species transfer) has created a "perfect storm" that has greatly altered global disease dynamics. Evidence-informed policymaking may be the gold standard for crafting policy—the question is how that gold standard copes with messy and uncertain reality. Decisions are influenced by a wide variety of factors. This means that even in individual policy areas the evidence-informed policymaking must be both broad enough to develop a wide range of policy options and detailed enough for those options to stand up to intense scrutiny. As stated by Ambassador Robert Gallucci, policymakers are faced

with irreducible complexity and radical uncertainty—and they must often rely on inadequate information. Policymakers think practically, are prepared to do anything that looks as if it might succeed, and are reluctant to take big bets if not forced to do so. Reality is still a long way from perfection, as clearly highlighted by the events that have taken place since the beginning of this "strange" year 2020. But both science and politics now more than ever are willing to improve the situation by learning from past mistakes and weaknesses. Cognitive behavioural interventions have proven effective in altering mindsets from a "fixed" entity perspective to a "growth" incremental perspective. Scientists and politicians/diplomats could structure interventions that educate individuals and groups as to the ways that stress influences decision-making, especially under conditions of time pressure, uncertainty, and ambiguity. This could be done together with the increase of the awareness of the interconnectedness between core beliefs, cognitive biases, sacred values, thinking traps, and adaptive decision-making processes. This book presents a breakthrough in thinking that can lead to better understanding and foster these transformative processes for the individuals involved as well as people generally. At the end of the day, science diplomacy is a catalyst for political and social change.

Organisation and Contents of the Book

The chapters of this book are organised into four different parts. Part I is titled *Perception and Misperception in Science Diplomacy.* In Part I, Mauro Galluccio highlights the importance of a communication in crisis situations such as the COVID-19. A sustainable science diplomacy requires the capacity for empathy and compassion, an ability to build and foster working relationships, and an awareness of the importance of cooperation between scientists and politicians/diplomats. Scientists and politicians together need to develop and apply a public information strategy in support of their common efforts to manage crisis and solve problems. We need to restructure concepts, constructs, techniques, and strategies of public policy and diplomacy, adapting them to this new era of global communication that shapes the public context within which events unfold as the COVID-19 experience has showed.

Part II is titled *Science and Diplomacy: Negotiating a Joint Engagement.* In Part II, Mauro Galluccio explains why the most important issue for the years to come is represented by a strengthening of the cooperation process between scientists and diplomats/politicians. Science diplomacy has a huge potential as a "soft power tool" for preventive diplomacy and conflict resolution. It could help to build bridges where formal diplomacy has failed. In this sense, it is an attractive option for foreign policy strategies throughout the international community. The European Union can use its potential to consolidate its normative power on the international scene while using its strength in research and development to help countries achieve their sustainable goals. If science is properly channelled in domestic policy advice and external relations, its transformative power could lead to a world of better

understanding, respect, and collective well-being. At the end of the day, the greatest winner from progress in science diplomacy will be all of us, both in the future and in the present.

Part III is titled *Biosecurity and Environmental Disaster: Adaptive Decision-Making in Time of Uncertainty.* In Part III, Mauro Galluccio highlights how recent events like the COVID-19 have shown the heightened uncertainty of the contemporary world. Climate change, terrorism, health issues, and political instability have all contributed to threats to security and safety in a complex environment where analysis is based on a "post-normal science". In a world of great uncertainty, threats to biosecurity and biosafety have become a challenge to the integrity of populations. It is evident that building resilience will be important for the future.

Part IV is titled *Theory, Research, and Practice for Science Diplomacy: An Insight on the Cooperative Process* and it is composed of four chapters written by different authors. In Chap. 11, Mauro Galluccio and Mattia Sanna focus their joint attention on a multidisciplinary research project conceived and directed by Mauro Galluccio on two sides of the Atlantic, the United States, and the European Union. The main objective was to better understand how highly trained negotiators and diplomats reason, feel, and behave in complex negotiation processes under conditions of uncertainty and ambiguity, and if interpersonal skills could be a predictor of a sound negotiating process. Our findings suggest that there is a variability in negotiation outcome that can be linked to an individual negotiator and it appears that a portion of this variability can be related specifically to negotiators' interpersonal skills rather than to other variables. Research in this area has the potential to improve both negotiation research and evidence-informed training for negotiators.

In Chap. 12, Lodovica Gullino and Laura Vivani explain how the European Union promotes and finances the reinforcement of the food security system in Europe with the protection of the biodiversity and ecosystems in the frameworks of agriculture, horticulture, and forestry. The EMPHASIS (Effective Management of Pests and Harmful Alien Species—Integrated Solutions) project played an important role in defining a new approach to agricultural risks' effective management while respecting the environment and human health. EMPHASIS has been a pilot *participatory research project* where stakeholder engagement went beyond the simple dissemination of results at the end of the project. End users were involved in setting up research objectives, gathering and processing data, and interpreting results, in line with the *multi-actor approach* promoted by the European Commission of the EU.

In Chap. 13, Robert Gallucci highlights the review of one negotiation and agreement, which had political, technical, and scientific elements to it, which were poorly understood, when policy was being debated. He suggests that the same may be true of other such agreements, be they bilateral strategic arms control agreements with the Russians or multilateral agreements of the kind negotiated with Iran. To draw useful lessons from the history of the first nuclear crisis with North Korea, we need to understand the scientific and technical issues that drove the negotiations between the DPRK and the United States in 1993 and 1994. But at four critical points during the negotiations, neither the press nor senior officials seem to have understood the

technology upon which decisions and assessments were being made. Complex issues were distorted to produce a simpler, more convenient narrative. This suggests that we should be careful in our analysis of this and other negotiations that turn on scientific calculations.

In Chap. 14, Mauro Galluccio and Aaron T. Beck explain how the area of research on cognitive biases has made clear that the kinds of judgements people are likely to make may well be affected by their own baggage in the form of various biases and perceptual predispositions. Politicians and scientists, like the rest of us, may be affected by various biases. Cognitive biases anchor our understanding. We need to investigate social-cognitive biases, because even if we have a lot of experience, if we are "trapped" in biases we will miss the insights sitting right in front of us. As in every policy, scientific evidence must be weighed alongside numerous interests and considerations in order to find balanced and appropriate policymaking for the people. Always remember we are all in the same boat and be careful not to be taken hostage by deeply held core beliefs, misperceptions, misunderstandings, and competitive behaviours.

Concluding Remarks

The tension between cooperation and competition is inherent in interpersonal negotiation. It has been shown that it is precisely cooperation and not competition that has allowed complexity to evolve. We need an implemented cooperation between scientists and politicians/diplomats. The act of willing to cooperate together implies the ability to perceive the other as fundamentally similar to oneself in intentionality: therefore, the joining with another in really sharing the object of attention establishes an essentially equal interpersonal perception, which is the fundamental characteristic of cooperative motivation. At this point, scientists could be able to manage the tension present in policymakers (and in themselves as well) between hard-core beliefs and world views at large, and the adaptation process of those beliefs and views to dissonant evidence. By using the language and benefits of science, people from very different regions, religions, ideologies, and social backgrounds can develop negotiating consensual approaches for tackling global issues, achieving development goals, and reducing risks, vulnerabilities, and violence. It has never been more important to communicate the way science, politics, and diplomacy should work together. The two spheres, which might seem to be discordant and distant, are in fact linked, to a more careful analysis, by an intrinsic complementarity, necessary to achieve solid and lasting policymaking goals in the long term.

Chapter 2
Adaptive Decision-Making Process in Crisis Situations



The human understanding when it has once adopted an opinion draws all things else to support and agree with itself.

Francis Bacon

Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.

Marie Sklodowska-Curie

Introduction

Over the years, science has been deeply investigated to understand how it could help policymakers on issues of global concern affecting humanity by providing evidence-informed strategic advices. This chapter provides an outlook on how psychological tools could be deployed to strengthen interpersonal skills and improve the cooperation between scientists and diplomats. More precisely, the focus will be on science diplomacy as a useful means to give a strategic impetus to international relations and on how the science of applied cognitive psychology could help shed new light on adaptive decision-making and have an effective impact on connecting the worlds of science and diplomacy.

Negotiating a Cooperation Process

The COVID-19 crisis has mercilessly shown the lack of a coordinated and sustainable public information strategy to support the joint efforts of scientists and politicians to address the crisis. As a matter of fact, recent major events around the world have dem-

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_2

onstrated the tremendous power of global communication in shaping for better or worse the public context in which events take place. Nowadays, coordination and collaborative attitude among actors are important processes to effectively adapt to and influence diverse forms of communication. The joint engagement of scientists, policymakers, and diplomats in this process could help to restructure concepts, constructs, techniques, and strategies of public policy and diplomacy to adapt them to this new era of global communication (the blogosphere, journalistic and propagandistic websites, video transmissions, and so forth) (Solomon 2010).

International challenges require a flexible mindset, effective knowledge, heightened creativity, improved "teamwork" cooperation, emotional competence, and mindful communication. The context and the environment where politicians and diplomats act are often very stressful. Especially in time of crisis (like the COVID-19), the tyranny of time causes undue pressure on cognitive and emotional processes, influencing adaptive decision-making. Scientists and policymakers must negotiate a common, not too impervious, path between them, where they can walk together. They need to develop together more effective tools that can really help to communicate an advice that goes in one ear and stays there. A smooth negotiating process of evidence-informed policies can produce a psychological commitment to mutually satisfactory results. Over time, interactions built upon trust, understanding, respect, and mutual esteem tend to maximise long-term mutual benefit making new interactions smoother and more effective (Fisher et al. 1991). The human links that are fostered, for better or worse, profoundly impact interpersonal negotiations and future interactions (Aquilar and Galluccio 2008; Pruitt 2002). Believing that relationships improve without a "mindful" individual effort is a mere "desire". Believing that relationships can deteriorate exclusively because of the "other side" is a demonstration of emotional incompetence (Galluccio 2005). Politicians and diplomats need to know when to wait and when to act decisively for the situation to evolve. Scientists, who have significant experience in research and specific fields, must also rely more on their intuitive gear, helping them to make sense of the situation (because the "team crisis" may ignore weak signals that individuals notice). In complex environments and unfamiliar situations, what diplomats/politicians really need is not to wait too long to get the right information, but to get the accurate way to read and understand the information in their possession (Klein 2009) and act as quickly as possible to define the problem in the possible way to facilitate adaptive decision-making.

Perception and Misperception in Crisis Situations

In January 2020, world leaders and diplomats were taken by surprise, as were scientists, by the discovery of a new coronavirus (SARS-CoV-2) and the consequential COVID-19 crisis. They experienced an unknown situation where explicit knowledge did not work very well at first and where procedure lists did not necessarily improve performance in such a complex scenario. Scientists knew little

about this new coronavirus (SARS-CoV-2) and as they started to study and research it the disease was spreading rapidly. They collected data and began to work on it relentlessly. Anyway, the politicians had to make decisions as soon as possible. Unfortunately, when situations are complex, ambiguous, and uncertain, there is a tendency to use heuristic shortcuts to simplify problems and to exercise control through limited consultations and conflict avoidance between different parties (Aquilar and Galluccio 2008; Kahneman et al. 1982). However, the models and recommendations should not oversimplify complex problems. This can be a great challenge in time of crisis, given the pressure to establish "easily understandable" solutions. As summarised by Albert Einstein: "Everything should be as simple as possible but not simpler". The politicians seemed to have minimised the problem perhaps because they wanted to avoid making drastic decisions. This initial minimisation delayed the deployment of early preventive policy actions, such as sustainable strategic plans to tackle the crisis; adequate allocation of physical and financial resources; international cooperation with other governments; and coordination of knowledge and plans. The more scientists were collecting data, the more you could see that this virus was particularly contagious and lethal. At that point, drastic and unpopular measures began to be taken. Countries and local authorities applied unprecedented blocking measures (lockdown), recommended "stay-home" protocols for citizens other than key workers, and banned public and private meetings for many weeks. Social distancing became a common phenomenon throughout the world. Travel outside local areas was reduced or interrupted almost everywhere, as was the production and purchase of many non-essential products. Education, work, and recreational facilities were shut down, and the global economy struggled to cope with this sudden transformation in production, delivery, and sales through supply chains in all sectors. This was the case with the COVID-19 crisis. The spread of contagion has been a history of misperception, misunderstanding, miscommunication, overconfidence, and lack of preparation. After a *first phase* of apparent concealment of the problem (the problem was simply not accepted and therefore it could not be given the right attention), in the *second phase*, the political actors were "overtaken" by the crisis. An alarmed anxiety made them focus mainly on the threats that this new coronavirus represented together with the fear that the problem was unsolvable. Then, in the *third phase*, the actors began to doubt their own ability to deal successfully with the problem, extremely frustrated in the face of the problem and tormented by their emotions and negative thoughts. They were emotionally overwhelmed. The perception of uncertainty associated with the dark side of the pandemic (unknown trajectory and knowledge) influenced the adaptive decision-making. Health was at stake, and social, economic, and environmental concerns were staggering. The whole situation broadened the perception of space and time around policymakers (as around people in general), increasing the late response. The latency of responses to the crisis could also be due to politicians' fear of losing power due to unpopular decisions taken in times of crisis. Empirical evidence confirms that politicians who are not facing imminent elections are eager to try different decision-making paths (Druckman and McDermott 2008; Sheffer et al. 2018).

The COVID-19 Crisis and Evidence-Informed Policymaking

In increasingly complex environments, policymakers are required to consider scientific evidence together with the values and interests of society when managing a crisis, making predictions and designing new policies to manage for instance the impact of a pandemic disease on health, economy, environment, and society at large. Crisis is a word semantically linked to situations of uncertainty and discontinuity. Conflict and crisis are typically driven by threats to fulfil basic needs. These needs not only are material (food safety, physical safety, and physical well-being), but also include psychological needs such as identity, security, resilience, and a sense of justice (Burton 1990). The balance of these needs poses a major challenge to the resilience of policymaking processes.

Although there have been other serious pandemics throughout history, COVID-19 has outperformed all others in its rate of infection, global spread, and alarming reaction to the disease. The consequences of the pandemic on the world economy have been severe. Many elements have characterised this crisis situation:

1. *Newness*. Many attempts to manage the crisis failed, and then it was recognised that the problem was very serious (surprise, denial of the real existence of the problem, emotional upheaval, fear, sadness, sense of powerlessness, desperation).
2. *Complexity* and *ambiguity*. The multicausal dynamics that caused the pandemic (confusion, irritation, hostility to the state of the art).
3. *Unpredictability*. The known methods and procedures seemed not to work or did not fully adapt to the situation (anxiety, fear, lack of control, helplessness, hopelessness).
4. *Conflicting goals*. Differences of opinion between experts/scientists and politicians (anger over competition and ranking role; shame, humiliation).
5. *Communication impairment*. Communication difficulties between scientists and experts and between scientists and politicians/diplomats (anxiety/fear, shame, sadness, contempt, pride, sense of superiority).
6. *Lack of resources.* Financial difficulties to afford the political, economic, and social constraints of the crisis and delay in drawing up appropriate action plans to tackle it (anxiety, distrust, sense of guiltiness, remorse).

Uncertainty is an important element in all crises. It is linked to a lack of predictability because the information we have may be relatively scarce at first. But it may also be fuelled by a lack of understanding of available information. It may be that decision makers do not have clear ideas or "stable" objectives, or simply do not have idea what the components of uncertainty are. Policymakers and scientists, in order to address these nebulous and ambiguous situations, refer to certain professional standards for the representation of uncertainties such as procedures/norms (emergency and crisis plans); risk prevention/risk management; academic knowledge; best practices; evidence-informed advice; community resilience strategies; and communication.

Evidence-informed policymaking is the gold standard for policy formulation—the question is how this gold standard deals with disorderly reality because, of course, policymaking processes, especially in crisis situations, take place far from controlled environments. Decisions are influenced by a wide variety of factors (including politicians' values, their experience, and political judgment). This means that even in individual policy areas the evidence-informed policymaking must be sufficiently broad to develop a wide range of policy options and sufficiently detailed to be able to withstand intensive scrutiny. It is understood that in the case of a new crisis the mere application of procedures/norms will not be sufficient. This is precisely the definition of a crisis, as it has found us unprepared, and could suddenly send the decision-making machine into chaos. "Policy makers are faced with irreducible complexity and radical uncertainty—and they must often rely on inadequate information. Policy makers think practically, are prepared to do anything that looks as if it might succeed and are reluctant to take big bets if not forced to do so" (Gallucci 2012). In addition, policymakers face real problems. They would benefit from a multiple and integrated view of the same issue in order to capture all the consequences and likely interdependencies of a course of action. Policymakers need management tools, and they need help to link cause and effect (Gallucci 2012; George 1993; Maliniak et al. 2020).

Cognitive Biases and Psychosocial Mechanisms

The political world is complex, uncertain, ambiguous, and intrinsically subject to continuous "mutation". Instead, human beings have limited capacities to perceive, process, and organise information. Policymakers and advisers may adopt a series of cognitive shortcuts through heuristics that can be helpful in a variety of situations. Heuristics can help to achieve a certain degree of simplicity but can also be a source of significant errors and cognitive bias (Kahneman et al. 1982). In this model of cognitive shortcuts, people *on the stage and behind the scenes* may act within a simplified mental representation of the reality. Politicians (and scientists), like the rest of us, may be affected by various cognitive biases. We could be "directed" by cognitive dissonance, normality bias, or a syndrome of personal invulnerability. The theory of cognitive dissonance[1] is especially relevant to this topic.

[1] In 1957, Leon Festinger advanced his classic theory of cognitive dissonance, which describes how people manage conflicting cognitions about themselves, their behaviour, or their environment. Festinger posited that when a person experiences a sense of inconsistency or contradiction represented by the conflict among such cognitions (which he termed dissonance) it will make that person uncomfortable enough to actually modify one of the conflicting beliefs to bring it into line with the other belief. Thus, the main issue addressed in cognitive dissonance research has been that of how people deal with thoughts or information implying that they have made a wrong decision. According to Cooper and Fazio (1984), dissonance should be thought of more as an emotional reaction to the knowledge that one has been responsible for an action that has produced unwanted consequences. Cognitions that reduce this sense of responsibility (e.g. that one acted

We can then often observe "gaming the system" motivational strategy, i.e. the manipulation of information through which the governmental decision-making process may be prone to a "guided selection" and the framing of information by "proactive members of the staff", altering the different opinions of advisors as well, in order to deliberately distort the information that will be taken into account by the final decision maker (Gellman 2008; Sunstein 2007). This behaviour could be strictly linked to the phenomenon observed and described by Janis (1982) as "groupthink", in which few members of the team of decision makers could act as *mind-guards* in a way to co-opt the process of decision-making, so as to exclude experts, mass media, and outside critics in order to retain unity and *esprit de corps* (Aquilar and Galluccio 2008). Both in "gaming the system" and "groupthink", the danger is that the final decision could be flawed. Incomplete investigation and acquisition of information jeopardise the adaptive decision-making and alternative courses of action.

Leaders and politicians in general should also be aware of their own and other side's core beliefs and cognitive distortions (thinking errors) (i.e. dichotomous thinking, selective abstraction, overgeneralisation, arbitrary inference, labelling, minimisation, maximisation, tunnel vision, to name but a few) (Aquilar and Galluccio 2008; Galluccio and Beck 2015). Moreover, they should be aware of human cognitive interpersonal cycles (Galluccio 2011; Galluccio and Safran 2015; Safran 1984, 1998); metacognitive function "deficit" (Aquilar and Galluccio 2008; Galluccio and Safran 2015; Di Maggio et al. 2007); and social mechanisms of selective moral disengagement (Bandura 2002). The selective moral disengagement is a social mechanism described by Bandura (2002, 2004) and it is the result of different social-psychological mechanisms (influenced by personal relationships, media, and communication processes in general), which allow a person to act, tolerate, or support morally censurable behaviours, temporarily deactivating, in a selective way, some of the cognitive-emotional functions of the self-regulatory moral system (which is active in every person) (Aquilar and Galluccio 2009).

The moral disengagement may operate on restructuring the definition of harmful conduct as honourable by moral justification, exonerating social comparison, and sanitising language. It can also help to minimise feelings of guiltiness through a mechanism of diffusion and displacement of responsibility.

Last but not the least, I would also like to mention the phenomenon of the "intoxication of power" caused by the "hubris syndrome" described by David Owen (2007) as when power has gone to the heads of political leaders (but we can certainly say the same for scientists, governors, experts), wherein for many political leaders, the very experience of holding office and substantial power for a certain period of time could affect their balance and undermine their mental stability and

---

under compulsion, or that the consequences could not have been anticipated) will reduce the extent to which one "feels bad" about one's behaviour, and hence the motivation to re-examine one's belief. However, this "feeling bad" depends on the consequences of one's behaviour rather than on the holding of contradictory beliefs (Eysenck 1990, p. 56).

behaviours. This could lead to a consequent "hubristic incompetence" in the implementation of a policy, or in carrying out evidence-informed policymaking.

This brief state of the art makes it clear that cognitive, emotional, and motivational elements can shape critical decisions, as it seems particularly important to recognise their impact on political judgement and decision-making. Therefore, it may be interesting to better understand and improve the interpersonal skills of policymakers, diplomats, and scientists who work under pressure to facilitate effective cooperative behaviour and adaptive decision-making.

Emotional Communication in Action

It seems that improving the intrapersonal and interpersonal communication skills between main actors can be the real challenge for science diplomacy. People can communicate emotions without being fully aware of it. Empirical evidence (Argyle 1994, 1995; Ekman 1985, 2003; Ekman and Davidson 1994; Ekman and Rosenberg 2005; Russell and Fernàndez-Dols 2002) has shown how different emotions play an important role in interpersonal communication. Emotions are linked to different expressive-motor behaviours and can be revealed through non-verbal communication cues without awareness. Even if people focus their attention on your verbal language they react automatically to your bodily signals. Ekman (2003) has reconciled studies that demonstrate the existence of universal facial emotional expressions with the findings that *display rules* differ from one culture to another. *Display rules* are socially learned and culture based. Thus, the different aspects of emotional expression are both universal and culture specific.

Scientists and diplomats should be more aware about their own emotional expressions in interpersonal negotiations. They may be sending non-verbal signals without being aware of them. We have all experienced in several occasions how an incorrect assessment of body language may exacerbate a conflict, along with a *dysfunctional* expression of situation-related emotions. I remember very well an Agenda 2000[2] negotiation round on regional policy and aid to the European Union

[2] Agenda 2000 was an action programme which main objectives were to strengthen community policies and to give to the European Union a new financial framework for the period of 2000–2006 with a view to enlargement. It was launched in 1999 in the form of 20 legislative texts relating to the following priority areas:

- Continuation of the agricultural reform along the lines of the changes made in 1988 and 1992 with a view to stimulating European competitiveness, taking great account of environmental considerations, ensuring fair income for farmers, simplifying legislation, and decentralising the application of legislation.
- Increasing the effectiveness of the structural funds and the cohesion fund by greater thematic and geographic concentration of projects on specific objectives and geographical areas and thus improving management.
- Strengthening the pre-accession strategy for applicant countries by setting up two financial mechanisms: a pre-accession structural instrument (ISPA) to support improved transport and

islands. There was an expert, a European scientist, who showed a certain *seriousness* mixed with *contempt* in his non-verbal cues, looking angry at a politician, who was explaining certain political issues. Some politicians from different member states and the European institutions were annoyed by his non-verbal communication because they perceived this attitude as disrespectful and arrogant and started to act with hostility towards him (I spoke to all of them separately and they shared their perceptions with me). On the other side, I knew and perceived this scientist from a different perspective because I had met him at a dinner a few weeks before this negotiation round. On that occasion from our conversation, I had the feeling that he was overwhelmed by all these political issues for the simple reason that he was a scientist with a strong background on the environment policy and urban cities, but not on regional policy in general and especially not on policymaking processes (in this case also linked to agriculture). He seemed angry and almost disgusted because he was afraid of the difficulties of the matter and above all he did not know if he would be able to master it well and communicate to the audience the evidence-informed policies regarding the negative potential of the proposed amendment to a EU's law they were negotiating about (i.e. in truth I must admit that this scientist always seemed serious and slightly *disgusted* when he listened carefully to someone: it was his way of paying attention to someone). In such cases, I think the best way to help the counterparts in expressing their emotions is to "advise" them at first to be aware of such dynamics and then to work on decoding problems as well. For example, we could introduce this dialogue: "I feel that you are critical of this discussion and feel uncomfortable. Am I right? Or am I wrong? Perhaps you would like to give us your explanation and your interpretation of the topic and of our perception of your non-verbal communication, which seems rather hostile to me. Am I wrong? Can we clarify that point before we continue our interpersonal exchange?" Then, the negotiator can creatively work towards a mutually satisfying framing and reframing of a text of compromise. This means to take into account all available technical and emotional information, which may indicate that there is a problem for my counterpart at some point in the process. The actors involved in the negotiation can make a series of moves to resolve possible conflicts *together*. In this way we will try to avoid the negotiation *ruptures* encouraging the working relationship building. By following this path two important results will be obtained: first, actors will feel on the same level, perceiving a mutual respect for their identities and professions. Secondly, they will improve the sustainability of such a working relationship for future interactions, because they now know each other better and have experienced

---

environmental protection infrastructure and a pre-accession agricultural instrument (SAPARD) to facilitate the long-term adjustment of agriculture and the rural areas of the applicant countries.

- Adopting a new financial framework for the period of 2000–2006 in order to enable the Union to meet the main challenges of the beginning of the twenty-first century, in particular enlargement, while ensuring budgetary discipline.

(Source: The European Commission, Brussels).

feelings of *trust and confidence*, and above all have experienced *positive-effect* harbingers of future smoother interactions.

Metacognitive Functions and Emotional Styles

Cognitive is about knowledge and covers the following mental processes: making sense of events/situations, identifying and diagnosing problems, prioritising and exchanging objectives, managing attention, anticipating future states, performing workarounds, making decisions, and finally adapting (Klein and Militello 2001). These cognitive functions are related to each other. Making decisions, choosing what to do, is the most direct and visible challenge. The choices we make, in fact, depend on how we size the situation. Adaptation to events is based on how we understand those events and reflects our decisions and our ability to learn.

Cognitive processes are the ways in which every human being constructs knowledge of himself/herself and of the world, and are permeated by emotions and meaning. These cognitive processes can be grouped into the following categories:

1. Sensation and perception
2. Consciousness and attention
3. Memory
4. Learning
5. Thought
6. Language

Moreover, it has been widely demonstrated that our perception of an event influences our physiological, emotional, and behavioural responses to it (Liotti, 2001, 2007; Panksepp 1998, 2003). Emotions are involved in all aspects of cognition and behaviour, including attention, perception, reasoning, and memory, as well as attitude change, decision-making, and interpersonal and inter-group relations (Aquilar and Galluccio 2008). Thinking, feeling, and acting are embodied and all attempts to really understand the behaviour without taking into account cognitive, emotional, and motivational processes will lead to "incomplete" results.

Metacognition (cognition of cognition) refers to the set of knowledge and control of one's own cognitive functioning carried out with awareness by individuals (Semerari 2000). Metacognition is a permanent activity used at more or less complex levels to regulate daily behaviour (Di Maggio et al. 2007). *Metacognitive functions* are mental activities aimed at solving cognitive tasks, mastering mental states, predicting, and explaining intrapersonal and interpersonal behaviours. The ability of people to *monitor* the contents of their conscious experience in order to recognise them as mental states (emotions, feelings, bodily sensations, thoughts, memories, ideas, opinions, expectations, fantasies) seems to be the implementation of the theory of mind that begins to develop in childhood (Di Maggio et al. 2007; Liotti 2001). The *five metacognitive functions* as defined and explained by Di Maggio et al.

(2007) and adapted by Aquilar and Galluccio (2008) and Galluccio and Safran (2015) are:

1. Identification
2. Decentring
3. Differentiation
4. Integration
5. Mastery

It is quite clear that what we need is qualitative and quantitative research to understand how people can make important, vital decisions under extreme pressure of time and uncertainty. In practice, it is considered of great importance to investigate in the field the way decision makers work and master their cognitive and emotional processes. Our interest at the moment is in *affective neuroscience* and the focus is in particular on emotional style (ES), which can be considered the foundation of our emotional and cognitive life. Emotional style comprises six dimensions (Davidson and Begley 2013):

1. *Resilience*: how you face the crisis and how you recover slowly or quickly from adversity.
2. *Outlook*: how long you are able to sustain positive emotion and be focused on current issues.
3. *Social intuition*: how skilfully you are to grasp and integrate the social signals of people around you into your reasoning while interacting.
4. *Self-awareness*: how well you reflect on your integrated knowledge and how well you perceive the related bodily feelings reflecting emotions.
5. *Sensitivity to context*: how good you are at regulating your emotional responses to take account of the context in which you find yourself and to improve your information and decision-making processes.
6. *Attention*: how sharp and clear is your focus to the context, people, and issues you are examining.

These six dimensions have been empirically validated by research in affective neuroscience around the world as emotional style has a solid foundation in the brain. This is something that other personality trait and temperament classification schemes do not have (Davidson and Begley 2013; Panksepp 2003). Each of the six dimensions has a specific identifiable neural signature, a good indication that they are real and not just a theoretical construct, as they describe an integrated continuum (Davidson 2003). Although emotional style is ordinarily stable over time, it can be altered by conscious, intentional effort at any point in life on each or few of the six dimensions, through the intentional cultivation of specific mental qualities or habits (Begley 2007; Lowenstein and Parent 1999). Research has shown that people can develop and acquire new specific skills through training tailored on the interpersonal skills they need and would like to learn (Davidson and Begley 2013). Therefore, we are working on effective ways to increase specific interpersonal skills developing tailor-made training programmes. This means improving interpersonal negotiating skills, through the strengthening of important cognitive and emotional

processes to help main actors to better cooperate (i.e. self-awareness, attention, memory, empathy, outlook, to name but a few). This is done through the fostering of the metacognition functions (the ability to think about our memory and our judgments), regulation of emotions, and problem-solving modalities in the face of stress. We are willing to generate a longer term research and training agenda on the importance of psychological processes in interpersonal policymaking negotiations.

Adaptive Decision-Making

As already mentioned, the crisis can come as a complete surprise. The time frame in which to react appears limited, and the threat to life and values is strongly perceived. These factors provoke a strong emotional stress that could undermine policymakers' attempts at rationality. Intense stress can aggravate mental rigidity and impair the cognitive abilities, including creativity and ability to cope with complexity, because dysfunctional core beliefs, cognitive biases, and psychosocial mechanisms deteriorate interpersonal skills, the ability to solve problems, to make adaptive decisions, and to compromise on possible achievements. Limits on "rationality" may occur because of:

1. Cognitive overload (limits on the individual's ability to receive, process, and assimilate information about the situation)
2. Misperception and misunderstanding
3. Biased cognitive information processing (negative automatic thoughts, poor self-efficacy beliefs, negative mood-congruent autobiographical memories)
4. Strong emotional arousal
5. Limited motivation due to feelings of hopelessness
6. Impairment in metacognitive functions and the ability to regulate emotions
7. Inability to generate the entire set of alternatives
8. Inability to prevent possible consequences
9. Ineffective problem-solving modalities
10. Dis-adaptive behaviours

The accompanying limits may be fuelled by the impossibility to:

1. Deal effectively with abstractions and uncertainty
2. Perceive not only blacks and whites, but also to distinguish from the many subtle shades of grey that fall in between
3. Distinguish valid analogies from false ones, and sense from nonsense
4. Enter into the frame of references of others
5. Establish logical links between present action and future goals
6. Produce appropriate responses to unexpected events
7. Search effectively for relevant policy options
8. Communicate complex ideas and solutions to peers and to the citizens

In such conditions, experience based on accumulated knowledge could mitigate the shock that calls to action in introducing an element of credibility and predictability. Learning from experience is the most powerful way to lead. It produces the tacit knowledge that is crucial in a crisis (Nye 2008). Experience is not a simple accumulation of knowledge, but it is *how* we use our knowledge to adjust our attention. Joint attentional skills and attunement are features of prepared minds willing to cooperate. Their efforts and their interests have prepared them to notice things others miss (Klein 2013). But as explained before we also need to investigate core beliefs, because rigid beliefs anchor our understanding. Even if we have a lot of experience, if we are "trapped" in fixed mindsets we will miss the insights sitting right in front of us (Klein 2013). Of course, experience and intuition can be supplemented by analytic skills. The joint focus of scientists and policymakers on working on cognitive biases and emotional regulation in cooperative brainstorming could help to initiate an interactive process to assess what works in the policymaking process and what does not, to the extent that efforts are made to improve communication and change policy formulation as soon as possible. This self-awareness on adaptive decision-making in crisis situations could add room for manoeuvre to implement the results and support new courses of action. In time of crisis, traditional models of evidence-informed policy and procedural mechanisms could be complemented with adaptive decision-making models because crises (such as the COVID-19), characterised by radical uncertainty and suffocating ambiguity, lack scientific knowledge. Decisions in this case require rapid and provisional assessment of the situation and immediate action. Action taken on the ground will represent matter for future feedback only ex post facto. Metacognitive function improvement is a useful tool to manage complex situations. All the actors from scientists to politicians to diplomats will benefit from self-reflexivity, becoming aware of dysfunctional beliefs, cognitive biases, and importance of trusting more their tacit knowledge and the profound value of peer cooperative processes.

Concluding Remarks

The post-traumatic COVID-19 growth (PTCG) will need a tremendous multidisciplinary effort on behalf of all people in the world, and a sustained effort for the months and years to come to manage uncertainty more than to reduce it. However, to manage uncertainty, we should know how to seek and prioritise information and to coordinate a common action. There is a need to cooperate and interface with all operators in the field: doctors, nurses, sanitary operators, scientists, experts, policymakers, diplomats, communicators, entrepreneurs, managers, stakeholders at the large, etc. Very often it is important to receive feedbacks from someone whose role in the process could be summed up by these words: "if you want to know if the elephant at the zoo has a stomach ache, don't ask the veterinarian, ask the cage cleaner". People who clean up messes become attuned to circumstances that change the amount of mess there is (Sapolsky 2004, p. 329). This brings with it the necessity

to listen, motivate, influence, and cooperate, a set of interpersonal skills with which leaders (in all fields) are generally not very familiar. Instead, in order to set up policy formulation and policy evaluation mechanisms we have to involve the people with a bottom-up approach. There is a need to understand how people think, feel, and are motivated and this requires awareness and empathy skills on behalf of policymakers. It is precisely cooperation and not competition that has allowed complexity to evolve. Science diplomacy really needs an implemented cooperation at first between scientists, policymakers, and then stakeholders. The act of willing to cooperate implies the ability to perceive the other as fundamentally "similar" to oneself in the intentionality. Therefore, the joint engagement on a problem establishes an essentially equal interpersonal perception, which is the fundamental characteristic of cooperative motivation and implemented results (Liotti 2001). Without a serious reflection on ourselves, the world, and our interaction with the world, we cannot hope to produce sustainable evidence-informed policymaking. An interaction between people requires joint attention, a common concentration; otherwise we risk communicational chaos. Herbert Simon (1977), writing about the new world saturated with information, warned us more than 40 years ago of how this information consumes the attention of those who receive it, so that a wealth of information produces a poverty of attention. Unfortunately, the very volume of information we deal with every day leaves us too little time to reflect on its real meaning. In a period of crisis like the present one, the proliferation of sources of information in and of itself leads people to peaks of anxiety precisely because there is no time to reflect. The problem is that too much information disperses attention and gets the opposite effect: people do not understand well and the message you want to send is not received or is misperceived. Policymakers are themselves overwhelmed by the information and under constant pressure and in time of crisis this state of the art is compounded. We live in an ambiguous and uncertain world with lights and shadows. There are people who see very well in the light, but those with real experience are able, because of their inherent knowledge, to look, understand, and act even in the shadows. Here it comes to the fore the tacit knowledge that is the ability to do things without being able to explain how. It is about perceptual skills, workarounds, pattern matching, judging typically, and mental models (Klein 2009). Tacit knowledge is critical for the way we design and use procedures in complex situations. But tacit knowledge resists scrutiny and evaluation. Therefore, it is susceptible to biases. And this in politics, as in the private sector, influences planning and risk management, problem-solving, and adaptive decision-making processes. Decisions depend on how we perceive situations, how we explain them, and how much we learn from events (our experience). Experience together with the ability to mentalise (the awareness that our and other people's behaviour is not detached from intentional mental states) makes us more resilient and allows us to store situations and experience in our brain, as it makes us more efficient in the future in solving problems and making decisions. This is where experience is irreplaceable. Most of the *advice* offered is about how to think and decide when the issues are straightforward. But we do need to explore how we think and decide in the world of shadows, the world of ambiguity. New generations should be aware of statistical and analytical methods'

limits to recognise the value of experience and credibility that comes with age, and to "take advantage" of the tacit knowledge that "seasoned" experts have and that no book or article can ever give them. Cooperation can help us all build something new together and share knowledge on the field: from the leader to the scientists, to the operators, and to the normal citizen. This is the era of greater individual and shared responsibility to rebuild a more resilient and stronger community.

Part II
Science Diplomacy: Negotiating a Joint Engagement

Chapter 3
Science and Diplomacy



In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed.

Charles Darwin

Introduction

In the last decades, science has been more and more employed in decision-making processes providing evidence-informed advice to policymakers on matters of global interest. The term *science* covers the concepts of "methods to produce and certify knowledge by accumulating it" as well as of "set of cultural values", whereas *scientific research* more precisely designates the process of production of new knowledge. Nowadays, the global background of science is progressively changing along four trends (Ruffini 2015:4–5):

- The growth of the weight of research and development (R&D) in the global context
- The increase of coordination of scientific research development throughout international collaborative programs and projects
- The shift of the global production centre to Asian countries
- The awareness that global issues can be tackled only through joint scientific consortiums and international political and diplomatic engagement

The term *diplomacy* implies dialogue, negotiation, and representation in international relations to defend and promote one country's interests and values without the use of force or coercion. The main trends through which diplomacy is changing are (Ruffini 2015:6):

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_3

- *The multilateralization*: the diplomacy of international organizations and international conferences
- *The strengthening of the* role played by non-state actors
- The *diplomacy of influence* and *soft power*, which employs the use of non-coercive means in contrast to *hard power*
- *The widening of the intervention scope*: the diplomat is an expert in negotiation and mediation regardless of the area concerned

The question concerning the relation between science and diplomacy is open to dispute and not yet thoroughly studied. As a field, science has become heavily involved in attempts to solve pressing issues on a national and international stage. For politicians, diplomats, philosophers, and scientists, science diplomacy has been a difficult construct to define and has been associated with concepts such as soft power, public diplomacy, and preventative diplomacy. Policymakers have used evidence-informed scientific strategic advice on many issues, ranging from climate change to terrorism, epidemics and pandemics, diseases at the large, migration, and conflict resolution. As stated by Dr. Nina Fedoroff (2009:8), "Science diplomacy is the use of scientific collaborations among nations to address common problems and to build constructive international partnerships". Using science diplomacy to bridge divides between nations has historically proven to be very effective. Not only did it ease tensions between the United States and the USSR for instance, but it also improved relations with North Korea, Cuba, and Iran. The universal language and benefits of science can bridge divides between nations even when their governments are incapable or unwilling to do so. As stated by Dr. Pastrana, Foreign Secretary of the Academy of Sciences of Cuba, "scientists can talk in spite of differences between nations, in spite of political tensions" (in Galluccio and Vivani 2015), meaning that people-to-people diplomacy through scientists can be essential for reaching consensus, bridging divides, and tackling global issues.

Defining Science Diplomacy

The Royal Society/AAAS (2010:5) provided the most convincing definition of science diplomacy, analysing the relations between the specific areas of intervention. It is divided into three branches: science in diplomacy, diplomacy for science, and science for diplomacy:

1. *Science in diplomacy*: To use scientific information to make better decisions in foreign policy. This has become especially relevant in recent years due to the surge of issues requiring technical expertise such as climate change, renewable energies, space, and global health issues. Science has become a reliable and unavoidable source of advice for policymaking processes in international negotiation concerning global issues.
2. *Diplomacy for science*: To coordinate the advancement of scientific cooperation and exchanges throughout the use of diplomacy to foster resource international-

ization, network development, and infrastructure building. All participating countries must benefit and improve the scientific research facilitating progress in areas such as technology, medicine, and agriculture to name but a few. International science cooperation is facilitated by diplomatic and consular networks gathering different countries around specific projects, such as the International Experimental Reactor (ITER) and the Large Hadron Collider (LHC), promoting the national scientific community on the international stage. In order to develop a scientific bridge between countries not previously bounded by historical, institutional, or cultural links, "scientist may require diplomatic assistance, whether in contract negotiations, intellectual property agreements, or visa regulations" (Royal Society/AAAS 2010:9).

3. *Science for diplomacy*: To employ cooperation agreements with the aim of benefitting one's country. Those agreements are agreed and signed by governments and institutions and can facilitate joint ventures. This third branch of science diplomacy underlines the signature of several science cooperation agreements, the creation of new institutions (for instance, the European Organization for Nuclear Research, CERN, instituted in 1954), and the involvement of stakeholders at large with the establishment of educational scholarships and the organization of science festivals and exhibitions promoting cooperation at international level.

   Given that science diplomacy is closely bounded to the topic of global cooperation, we have a fourth area of intervention devoted to gain global equality and sustainable development:

4. *Science and diplomacy for the people*: To ensure that strategic evidence-informed advice is used in diplomacy while combining it with a strong ethical dimension. Both science and diplomacy tools should be deployed without losing sight of ethical guidance and societal and public engagement. Public engagement in diplomatic processes is essential within this context for the general progress of mankind.

While it is true that science diplomacy can be used for the benefit of all, there are cases in which it is used to achieve geopolitical ends, especially when it comes to its use in public diplomacy. The Public Diplomacy Association of America (PDAA) defines public diplomacy as "the strategic planning and execution of informational, cultural and educational programming by an advocate country to create a public opinion environment in a target country or countries that will enable target country political leaders to make decisions that are supportive of advocate country's foreign policy objectives".[1] In a world where improvements in technology guarantee high degrees of interconnectedness and where non-state actors and stakeholders at large have important roles in this process, receiving support from national and international public opinion, it is as arguable as important to foster positive relations between governments. In this sense, public diplomacy is complemented with the notion of soft power. Coined by the American political scientist Joseph Nye (2004),

[1] https://www.publicdiplomacy.org/.

it refers to the ability of states to shape institutions and debates by setting agenda and using norms to attract and spread values. Agenda-setting, normative power, and attracting values, ideas, and talent through cooperation and persuasion are political means that are compatible with an interconnected and multilevel world and can assist countries in expanding their national power. It follows that there could be an underlying tension in science diplomacy: it is a way to achieve international progress, while it is also used to increase national power. Science diplomacy essentially has three main goals:

1. To ensure mutual benefits by exchanging domestic and foreign scientific and technological knowledge
2. To promote national R&D achievements to attract foreign scientists and international prestige
3. To communicate the importance of science and its values to reinforce tolerance, rationalism, critical thinking, and consensus among all peoples and nations, especially when diplomatic relations between states are strained or hostile

Throughout this Part II we will analyse science diplomacy's potential from a historical and contemporary perspective. We will begin by showing how it has been used as a means to ease geopolitical tensions as well as advance national power in international relations. In addition, this will be followed by an analysis of the EU foreign policy, past and current initiatives, and how the EU uses science diplomacy to advance its economic, geopolitical, and security objectives. We will then assess current initiatives and determine further steps to be taken.

Science Diplomacy: History and Achievements

Historically speaking, science diplomacy has been used in cases where official cooperation between governments was difficult due to either geopolitical, ideological, religious, ethnic, or national rivalries. In this case science in diplomacy, diplomacy for science, and science for diplomacy have been effective ways to warm relations and build trust through informal and alternative approaches. These approaches also referred to as Track II Diplomacy tools helped rivalling states bridge the divide created or maintained by political leaders. Track II Diplomacy through science diplomacy was used by the United States in the Cold War. As George Kennan (Deputy Chief of Mission of the United States to the USSR between 1944 and 1946) famously stated in his "Long Telegram" on how to present an alternative to communism:

> *We must formulate and put forward for other nations a much more positive and constructive picture of [the] sort of world we would like to see than the one we have put forward in the past. It is not enough to urge people to develop political processes similar to our own… After all, the greatest danger that can befall us in coping with this problem of Soviet Communism, is that we shall allow ourselves to become like those with whom we are coping*.

In July 1955 some of the world's most prominent scientists signed the Russell-Einstein Manifesto, calling to attention the threat of nuclear weapons in the context of the Cold War. In the tragic situation that confronted, humanity scientists felt they had to assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction, and to discuss a resolution in the spirit of the appended draft (Lowenthal 2011). As can be seen, in a time period dominated by the Mutually Assured Destruction Doctrine (MAD Doctrine) scientists from the international community (including many from the communist world) attempted to build dialogue and reduce the risk of nuclear war. In the final year of the Vietnam War (1974), Secretary of State Henry Kissinger gave an interview to *Science* magazine where he defended that military and economic power were not enough to advance the United States' geopolitical objectives, stating, "America's ability to contribute money and run the world in the old fashion way…is now over. What we can contribute—and what the world wants—is our technological capabilities" (Turekian et al. 2015:10). Science diplomacy was to be one of the means with which both superpowers reduced tensions. In July 1975 the United States and the USSR organized the Apollo-Soyuz Test Project where American and Soviet spacecrafts would dock (join) in orbit, visit their respective crafts, and conduct experiments together, officially signalling the end of the Space Race (Turekian et al. 2015). Beyond the Soviet Union, the United States signed a Science and Technology agreement with the People's Republic of China in 1979, just 1 month after restoring diplomatic relations. Jimmy Carter and Deng Xiaoping were clear that their intent was to encourage cooperation and warm relations between both countries, especially through exchanges of scientists and other personnel. This approach showed the willingness of both the Carter administration and reformist elements of the Chinese Communist Party to bridge the ideological divide between both nations. After the first meeting between President Ronald Reagan and Soviet President Mikhail Gorbachev in 1985, the former stated, "we can find, as yet undiscovered, avenues where American and Soviet citizens can cooperate fruitfully for the benefit of mankind … in science and technology, we could launch new joint space ventures and establish joint medical research projects" (Turekian et al. 2015:8). In 1987, the President's Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs (OES) John Negroponte added before Congress, "we cannot forget that we are dealing with a closed society, and that these exchanges often give us the only access to significant circles in that society with whom we would otherwise have little or no contact. It would be short-sighted of us not to recognize that it is in our national interest to seek to expand scientific cooperation with the Soviet Union" (Turekian et al. 2015:8). Most historians and analysts agree that science diplomacy was essential in building bridges between both powers, especially when it came to discussing the terms of nuclear disarmament. During the decade-long discussions that led to the Strategic Arms Reduction Treaty (START I) in 1991, the inclusion of scientists from both sides in the discussions and negotiations contributed essential added value. Soviet and American scientists working with nuclear weapons were able to develop trust and mutual respect due to the strikingly similar profile they shared. For one, scientists from both countries shared the bond of study-

ing and developing the same forms of weaponry in addition to working in solitary confines due to military secrecy and hoping that the weapons they developed would never be put to use. Analysts at the time were impressed by the fact that these groups of scientists, working for geopolitical and ideological rivals, were able to find ample common ground leading to constructive discussions. Their shared profiles, combined with the universal nature of scientific language, were key in building personal relationships that led to the trust and confidence of peers and colleagues. This proved to be essential in advancing negotiations and establishing a treaty for long-lasting peace in light of the Cold War. Paul Robinson, who was the head of delegation and chief negotiator for the United States in the nuclear negotiations with the Soviets, explained the importance of the human dimension in the progress of negotiations (Lowenthal 2011:8):

> *The lesson of the importance of human nature, of people working together on a common goal, also is a key takeaway from this. When we started, the tensions of the Cold War made everybody nervous about every step of the way. When we finished, we not only understood the material and the capabilities of the verification measures, but we understood the people who had been working in great secrecy on the other side. And that mutual respect that grew, I think, has led to a lot of other areas, such as lab-to-lab collaborations, and the initial efforts on safe, secure dismantlement, and I believe it can continue on to bolster future efforts as well.*

It should be stated nevertheless that these relationships took time to build. Some of the main obstacles during the discussions included culture and language, especially when it came to complex technical discussions and ideological rivalries. Even with competent interpreters, as in any translation effort the assumptions and contexts of words did not always align between Russian and English, complicating the task of amending joint texts. The nature of scientific language (based on empirical findings that are independent from observer and practitioner) was essential in making discussions advance. The START I was a clear example of how scientists could bridge the divide created by ideology and geopolitics through the shared language and objectives of science and personal relationships.

After the Cold War, science diplomacy became a great focus of American international relations (Runde and Zargarian 2014). Given the shift from a bipolar to unipolar international context, the United States sought a way to guarantee its status as a superpower and find new sources of stability that were not based on military equilibrium. Dr. Nina Federoff, who served as Science and Technology Adviser to the Secretary of State, Hillary Clinton, attempted to recruit and encourage scientists from the former USSR, an initiative supported by scientific leaders, national academies, the American Association for the Advancement of Science (AAAS), and the National Science Foundation given the benefits it could accrue to the United States and to the world. This was especially important in the aftermath of the USSR's collapse where many of the states that inherited Soviet nuclear weapons (Ukraine, Kazakhstan, Belarus, and Russia) were unstable, increasing security risks on a global level. Senators Sam Nunn and Richard Lugar sponsored the Nunn-Lugar Cooperative Threat Reduction (CTR) Program that gave American support to safely transport and safeguard nuclear weapons to the Russian Federation and eventually

destroy them. While the US Department of Defence and the Russian Ministry for Atomic Energy (Minatom) controlled the CTR programs, scientists from American and Russian nuclear laboratories established the "lab-to-lab partnership" to address new nuclear dangers. An initiative taken exclusively by scientists, in 1994 it was supported financially and politically by the US Undersecretary of Energy Charles Curtis and evolved into the lab-to-lab nuclear material protection, control, and accounting (MPC&A) program with Russian nuclear institutes (Hecker 2011). Despite a strain in relations and increased mistrust, MPC&A programs have been running successfully for over two decades and have allowed hundreds of American scientists, engineers, and technicians from the nuclear laboratories of the US Department of Energy to work with their counterparts in Russia, involving several civilian-run institutes exchanging personnel to learn how to secure, control, and account nuclear materials such as plutonium and uranium (Hecker 2011).

In addition to exchanges with the former USSR, the United States has also established efforts to use science diplomacy with other difficult actors such as North Korea, Cuba, and Iran. In the case of the Democratic People's Republic of Korea (or DPRK), science diplomacy has been limited to the science engagement category (that is, constructing and maintaining bilateral relations between universities for the sake of science) (see Ambassador Robert Gallucci's chapter in this book). The aim was to build trust and eventually collaborate in other areas, be they scientific, technical, or political. North Korean scientific and technological progress has suffered from the country's extreme isolation in the international community, meaning that the possibility of learning from American scientists is of great interest for its socio-economic development. In addition, American scientists can encourage the DPRK to develop a more open attitude to ideas and diplomatic relations, meaning that both countries have the potential to benefit from science diplomacy. Syracuse University (SU) and the Kim Chaek University of Technology (KCUT) signed a research collaboration agreement in information technology (Thorson 2012). Said agreement would not have been possible without the mediation of the President and Vice President of the Korea Society, who sat alongside the representatives of SU in their negotiations with DPRK authorities at their UN Mission in New York. It should be stated that a mutual benefit clause was included in the agreement between both universities, meaning that both SU and KCUT scientists had to benefit from research collaboration (Thorson 2012). This was a way of establishing an equal footing between both parties and avoiding a deal that would essentially allow the DPRK to freeride on its new access to information technology. Organizing exchanges between American and North Korean scientists, the positive personal relationships built between SU and KCUT personnel encouraged both parties to involve other universities and institutes in cooperation discussions. This led to the creation of the US-DPRK Scientific Engagement Consortium in 2007, which was founded by the original collaborators (SU and KCUT) in addition to AAAS, CRDF Global, and later the Pacific Century Institute. Creating a Consortium offered significant advantages. For starters, it increased the number of scientists, universities, and institutes available to work with North Korea. In addition, positive working relationships could lead to discovering best practices that could provide information on how to

proceed and deal with the DPRK. Beyond academia, this information was invaluable in establishing indirect bridges between two countries with very poor relationships. It is clear in any case that the experience of SU-KCUT collaboration was an essential added value in developing personal and institutional capital for future agreements with the DPRK (Thorson 2012).

In addition to the DPRK, science diplomacy has been invaluable in improving relations between the United States and Cuba. Despite a periodical easing of tensions and the recent warming of relations, science diplomacy between both countries has historically been unstable since the Cuban Revolution led to a communist government. Nevertheless, since 1997 the AAAS and the Cuban Academy of Sciences have organized five visits to the island. Under the Obama administration the US Department of the Treasury released new regulations on travelling to Cuba that authorized universities to sign cooperation programs with Cuba in 2011, allowing students, faculty, staff, and other academic stakeholders to study abroad, take courses, or organize conferences and projects with Cuban institutions and universities (Johnson 2012). One area in which science diplomacy would be beneficial for both countries is in tackling joint challenges in biodiversity loss. A mere 90 miles from one another, the United States and Cuba share numerous ecosystems in the Gulf of Mexico and the Straits of Florida that are affected by native species migration, invasive species, and extinction of rare species because of the ecosystem degradation due to pollution (oil spills, toxic releases) and hydrometeorological hazards such as Hurricane Katrina and Hurricane Ike to name but a few. Cuban and American scientists have made it clear that they deemed bilateral cooperation essential for tackling these issues. While science diplomacy in this regard still faces numerous diplomatic obstacles, positive developments in bilateral negotiations between the Obama administration and the Cuban Government led to optimism. In the 2010 US-Cuba Conference on Hurricane Cooperation technical experts and policymakers from both countries concluded that, in addition to improving the already effective hurricane communication infrastructure, bilateral cooperation on damage reparation needed to progress if crisis management capacities were to drastically improve (Boom 2012). Despite the potential for greater cooperation on common issues, science diplomacy in other areas has already led to improvements in US-Cuban relations. Both the Cuban Academy of Sciences and the AAAS signed a historic agreement in 2014 to establish medical cooperation in fields such as infectious disease, cancer, resistance to antimicrobial drugs, as well as neurological and neurodegenerative diseases. In addition, an updated agreement signed in 2015 expanded cooperation to include autism and left the door open for future joint research on chikungunya, Zika virus, and other mosquito-borne viruses (Earl 2016). The advantage of science diplomacy between Cuba and the United States is that, while cooperation with the DPRK was mostly an investment on future relations, in scientific terms both American countries clearly benefitted from this relationship. Ever since the Revolution, Cuba's leaders heavily invested in education and science, meaning that the country had elevated levels of human capital through highly qualified pharmacists, doctors, and nurses, many of which were key in reducing the spread of Ebola in West Africa. In addition to human capital, Cuban investment in research

and development has led to a powerful domestic pharmaceutical industry, leading to exports in vaccines, drugs, and other biomedical technologies. While civil society-led initiatives through the AAAS and the Cuban Academy of Sciences helped bridge the divide between both countries, President Obama's visit to Cuba in 2016 and the drastic improvement of relations present an array of future opportunities that could create a "virtuous circle" of improved science diplomacy efforts that can lead to even closer bilateral ties. Stakeholders on both sides of the Straits of Florida are eager to explore further opportunities in biomedical sciences, public health, and environmental research (Earl 2016).

Science diplomacy between the United States and the Islamic Republic of Iran has also been beneficial in building bridges through finding solutions to issues shared by both countries. The Department of State, as well as the Iranian Government and many members of the scientific communities in the two countries, has taken the position that science-related engagement could contribute to solutions of global problems and also help to improve the understanding of each country's society and politics (Schweitzer and Neureiter 2008). Despite the difficulties faced in US-Iranian relations, scientists from both countries have historically insisted on collaborating even after the deposition of the pro-American Shah during the Iranian Revolution of 1979 that led to the establishment of the Islamic Republic. On the American side, several civil society and government institutions such as the AAAS, the National Academy of Science (NAS), and the National Institutes of Health (NIH) have been at the forefront of negotiations and exchanges with Iranian scientists, clinicians, bioethicists, and other professionals in different fields of science. In the case of the NAS, this civil society institution established a program whereby American and Iranian scientists would tackle challenges common to both countries in the fields of engineering, science, and health. While earthquake science and higher education were part of the program, the NAS decided to prioritize prevention and solutions to food-borne diseases (Jillson 2013). Workshops, joint planning meetings, exchanges, and a 3-year pilot project on food-borne disease surveillance were organized in Iran, involving over 500 scientists from 80 institutions in both countries. In addition, thousands of scientists from both countries attended related lectures, visits, and conferences on the issues at hand, organized both in Tehran and Washington, DC. Science diplomacy was essential in building personal bonds not only between scientists but also between government stakeholders on both sides. Scientists and technical experts from one country were able to meet policymakers from the other, building personal connections and trust through the expertise given on issues like food-borne diseases. Such events, while not solving the issues of strained relations, certainly reduced the divide between both countries and contributed towards informal relations through the common issues dealt by science. In addition to the NAS' initiative, between 2005 and 2007 the Research Institute for Gastroenterology and Liver Diseases at Shahid Beheshti University of Medical Sciences in Iran developed a joint project with the Oregon Department of Human Services to study and analyse the incidence, aetiology, and detection of diarrhoea at the outskirts of Tehran (Jillson 2013). Another area in which US-Iranian science diplomacy has been active is in the field of neuroscience. For starters, between 2002 and 2008 the most fruitful co-

author partnership for science publications between developed and developing countries was that of US-Iranian cooperation, especially with regard to neuroscience (Jillson 2013). Said publications involved studies on Parkinson's and Alzheimer's disease, in addition to psychotic disorders, addictions, and other issues in mental health. Most stakeholders agreed that science diplomacy between Iran and the United States has been a constructive way of bypassing the difficult relationship that governments in both countries have had since the Iranian Revolution, especially given the determination and trust developed by scientists and personnel associated with the non-governmental organizations such as the AAAS, the NAS, universities, and the NIH, in addition to indirect contacts with the US Department of State. The trust, personal relationships, and goodwill developed by collaborators show once again that the people-to-people dimension of science diplomacy can be effective in circumventing the failures of conventional diplomacy, especially when science is used to solve issues common to both countries. The results attained from science diplomacy between the United States and Iran not only are valuable to both countries but can also lead to positive developments in other parts of the Middle East, causing a paradigm shift where violence is not used as a means to political ends. Collaboration through health and medical sciences can be an effective way of improving living standards and quality of life and building the goodwill necessary for future warmer diplomatic relations and negotiations. In essence, science diplomacy's innate potential to contribute towards ecological and socio-economic progress could encourage a new form of international relations, where consensus and dialogue on these issues replace traditional "might is right" attitudes associated with building large armies and language of force (Jillson 2013).

Paradigm changes through science diplomacy are essential when it comes to nuclear disarmament negotiations between countries, and scientists can be essential in building bilateral cooperative attitudes. In this case, tensions between the United States and Iran have historically been high. David Albright, who is President of the Institute for Science and International Security (ISIS), published satellite imagery of nuclear test sites to create public pressure that would force Iran to be open to negotiations. This strategy was based on a non-cooperative approach because Albright considered, "you almost have to have conflict with them to have an honest discussion … you have to be extremely careful in interacting with the Iranians on nuclear issues" (Lowenthal 2011). While this may reflect the traditional attitudes of the Iranian Government, the Joint Comprehensive Plan of Action (JCPOA) signed by Iran, members of the UN Security Council, Germany, and the European Union on nuclear stockpile reduction would not have been possible without the cooperative atmosphere generated by science diplomacy. US Secretary of Energy Ernest Moniz and the head of Iran's Atomic Energy Organization Akbar Salehi were essential in creating the necessary trust and personal relationship necessary to advance negotiations between both countries. Both had studied at the Massachusetts Institute of Technology, Moniz being a member of the physics faculty and Salehi being a graduate student in nuclear engineering in the 1970s. Beyond their common acquaintances, spending time at the same university and using science as a language for mutual understanding were pivotal factors when discussing issues such as cen-

trifuges and plutonium production. In an interview for *Science* magazine, Salehi stressed the importance of speaking scientist-to-scientist given that "we tried to be logical and fair. We understood each other" (Stone 2015:674). Salehi further defended that their ability to dialogue through science and rationality did not imply that they placed aside the national interests of the countries they represented. Richard Stone stated, "thanks to their scientific track records and their personalities, they respected each other and could ultimately reach compromises on a number of sensitive technical issues—compromises that had eluded the political negotiators" (Wolfe 2015). Once again, it is clear that involving high-level scientists in diplomatic negotiations is an immense added value in generating consensus and building bridges. Since both parties had the political will to reach an understanding, indirect and unconventional methods such as science diplomacy proved highly effective. Despite being key in advancing negotiations, Iranian and American scientists were also important in setting the basis for negotiations on nuclear stockpile reduction. Rush Holt, former CEO of the AAAS (retired in 2019) and a former Congressman from New Jersey, stated (Wolfe 2015):

> *In the months leading up to the agreement, unofficial American scientists were proposing in print and in private discussions with Iranian and American leaders specific proposals, such as changing the core of the plutonium-generating reactor and limiting not only the number of uranium-enriching centrifuges but a combination of centrifuges and uranium supply.*

Not only did this help both sides prepare to negotiate, but the proposals also ended up becoming a part of the above-mentioned JCPOA agreement.

Science Diplomacy as Soft Power Exercise

While science diplomacy can be used to reduce tensions, avoid risks, improve policies, and establish indirect relations between countries, scientists, and politicians, it can also be used through public diplomacy to consolidate a state's international power. Foreign policy analysts have often debated on what constitutes political power. For many centuries, diplomats and statesman believed that a state's position in international relations was dependent on their ability to conduct hard (or coercive) power. Hard power is when strong states control or impose their preferences on a weaker country, meaning that strength is at the centre of their relationship. It should be noted that, while physical strength such as military might is a branch of hard power, other areas such as command over resources or economies can also coerce weaker states into accepting a stronger party's commands (Nye 2004). As can be seen, hard power is very much focused on establishing a unilateral relationship between one or several states at the expense of weaker ones. In this sense, hard power falls neatly within the realist vision of international relation (Nye 2011). Political realism sees nation states as actors in permanent competition over national interests and power. Despite its popularity in different ideological circles, prominent philosophers, diplomats, and intellectuals have questioned the coercion-centred

world of political realism throughout the twentieth century. As Hannah Arendt stated (1972:113):

> *I am probably in disagreement with nearly everybody in that I do not believe that power grows out of the barrel of a gun. I know that from Mao to the ultra-right everyone thinks so. But I think that out of the barrel of a gun grows violence, and immediate obedience, which then immediately ceases when the gun is removed. This is not power.*

The idea that coercion was the law of international relations, while questioned during fiascos such as the Vietnam War, was strongly discredited in the post-Cold War international order. Rapid advancements in technology led to higher speed, larger scale, and increased efficiency for political communications and economies. In addition, the globalization of productive chains left national economies much more exposed to the risks of mobile capital and investment. This led to an inevitable rethinking of traditional concepts in diplomacy such as sovereignty, security, dependence, competitiveness, and power (Ramsbotham et al. 2011a). American foreign policy experts began analysing the importance of science and technology as a way to compete for influence, power, and markets in the international arena. In a world where these issues dominate, the United States had to strive to use its scientific, technological, research, and development capabilities to have a competitive advantage over other countries by attracting innovation, ideas, resources, and talented individuals (Skolnikoff 1993). Technological and scientific breakthroughs, especially during the Digital Age, are often the result of several combined individual discoveries that "add up" over a period of time. Given that they could happen in any part of the globe, attracting talent and ideas to national economies was a way for states to be the first to benefit from this progress, making them more competitive in the international economy. Should countries not offer the competitive environment for companies or people to thrive, they could risk suffering from phenomena such as the offshoring of certain sectors to more productive or innovative countries. Channelling national and international talent and innovation was deemed essential when states wished to exert economic, political, social, cultural, and scientific power. Science and technology, while different, are profoundly interrelated given that the former is knowledge obtained by the systematic study of the structure and behaviour of the natural world and the latter is the practical application of technical knowledge (Weiss 2005). In large part, this new "attraction doctrine" aiming to supersede classical notions of hard power was analysed by Thomas Friedman and explained through the "war of ideas" concept. For Friedman, the conflict was not about cultural essentialism but about multiple contesting narratives in an increasingly complex multipolar world (Friedman 2004). Given that soft power, as Joseph Nye (2011:23) stated, is about "the ability to affect others through the co-optive means of framing the agenda, persuading, and eliciting positive attraction in order to obtain preferred outcomes", in a world with fast communications, social media, stronger civil society, and well-educated and informed public opinions, the war of ideas for liberal democracies is about persuading actors in the international scene on the benefits of openness, consensus, understanding, dialogue, and tolerance (Nye 2002, 2004). Coercion between states is no longer the source of influence and domi-

nation, but rather the ability of any given state or society to attract, influence, and "convert" others to their dominant narratives (in this case liberal democracy, human rights, peaceful conflict resolution, open societies and markets, etc.). Such soft power inevitably stems from the states' politics, culture, institutions, civil society, and science, which can be wielded through foreign policy in order to advance their soft power. The importance and potential of focusing persuasive power on public opinions should not be underestimated. Traditional diplomacy's elitist and coercive nature has given way to a doctrine whereby persuading better educated and informed people is vital for the national interest. This allows global citizens to observe, engage, react, and become active members of international politics, meaning that power relations have evolved in ways that are much more "democratic" and accessible to ordinary people. The velocity of changing opinions and information exchange makes governments and leaders much more vulnerable to the opinions and narratives of civil society and non-state actors, from NGOs to terrorist groups. This means that progressing in the war of ideas through soft power is not just about agenda setting, but also about leading by example (Galluccio 2011). If a national government is coherent with values such as transparency, justice, equality, and democracy then the attractiveness and credibility of its influence could be reinforced (McClory 2010). Public diplomacy is linked to these objectives given that it encompasses the strategic planning and execution dimension of policies that generate favourable foreign public opinion to a country's foreign policy objectives. It is, in other words, the "how" of soft power. With this in mind, science diplomacy could be seen as a subsection of public diplomacy's nature and objectives given its potential as a source for soft power due to reputation and "branding". In addition, scientific values such as rationality, transparency, and universalism are widely shared by many international actors, transcending ideology, religion, and cultural, national, or ethnic divisions (The Royal Society 2010). To this end, diplomacy for science and science for diplomacy are essential for soft power goals. The former aims at establishing cooperation and exchange agreements between scientists through diplomacy, while the latter establishes cooperation agreements that can benefit the host country (through scholarships, conferences, joint research ventures, etc.). While spreading the ideals and values of liberal democracy and open societies is positive in itself, the combination of openness, credibility, and prestige along with policies that attract and train high-quality scientists makes science diplomacy an essential public diplomacy tool for consolidating soft power for an economy as well as advancing inclusive narratives in an international order plagued by the dangers of different forms of extremism (Copeland 2011). Foreign scientists not only benefit host countries through research and technical knowledge, but also provide opportunities for international dialogue, understanding, and socialization which, combined with the ideas received from experiencing life in open societies with liberal democracy, can lead to influence in civil society on their return to their countries of origin. This not only reduces tensions but also helps to open societies that were much more closed to the national and social narratives of the host state.

Multilateral Science Diplomacy in Action

Today's global society has an unprecedent need for proper and reliable scientific advice and, thus, science diplomacy is required to assess several issues—climate change, energy crisis, food security, and epidemics—at the same time, leading different countries to the consensus on key global issues. These priorities should be faced from several points of view at the same time, employing cross-sectoral, transformational, and science-based methodologies (Copeland 2015) to advance development prospects, resolve differences, overcome boundaries, and reduce inequalities. According to the AAAS Meeting (Royal Academy/AAAS 2010:vii), there are three immediate areas of opportunity for science diplomacy:

- Scientific partnerships with the Middle East and wider Islamic World for which it was signed the Atlas of Islamic-World Science and Innovation
- Confidence building and nuclear disarmament, for instance through the large-scale International Thermonuclear Experimental Reactor (ITER) program, which gather together scientists from China, India, Russia, Korea, Japan, the European Union, and the United States to develop fusion energy for peace scopes
- Governance of international spaces beyond national jurisdictions

Despite the underlined differences between the scientist and the diplomat, it should be taken into consideration the fact that the "way of doing science" is something strictly bound not only to national schools of thinking, but also to national regulations and funding opportunities, which determine scientific results, their dissemination, influence, and application. Time and time again we see the benefits that scientists can bring to trust, understanding, and consensus building even when dealing with difficult diplomatic relations. Science diplomacy can go beyond building bridges between countries and contribute to international governance. In the late twentieth and early twenty-first centuries many risks and vulnerabilities have increased. These include bioterrorism, cyberterrorism, climate change, disease, nuclear proliferation, and transnational crime networks to name but a few, as well as unstable food security, clean water supplies, and spread of epidemics, pandemics, and infectious diseases at large (Dehgan and Colglazier 2012). Establishing agreements, mechanisms, and cooperation processes through science can allow national and international stakeholders to determine the causes and consequences of these issues. University exchanges, conferences, debates, programs, projects, joint actions, and initiatives at large can allow experts and policymakers to meet and establish comprehensive approaches to these risks, many of which stem from degrading ecological, socio-economic, and resilience conditions that subsequently lead to outbursts of violence and conflict. The necessity of avoiding ruptures and conflict has made *preventive diplomacy* an essential tool in international relations. While this concept is not new—Dag Hammarskjöld, former Secretary-General of the United Nations, had coined the term over half a century ago—the increasing complexity of world affairs and the emergence of dangerous non-state actors have made this approach necessary. Preventive diplomacy refers to "the diplomatic action

taken, at the earliest possible stage, to prevent disputes from arising between parties, to prevent existing disputes from escalating into conflicts and to limit the spread of the latter when they occur" (United Nations 1992). It was originally developed in the second half of the twentieth century as a way of resolving conflicts during the Cold War and thus avoiding proxy wars between the allies of China, the USSR, or the United States (observed in conflicts such as the Korean War, the Congo Crisis, or the Vietnamese invasion of Cambodia under the Khmer Rouge) (Galluccio 2015a). The end of the Cold War and the atrocities committed during the 1990s made preventative action necessary in the international community. Such atrocities stemmed from the Rwandan genocide, ethnic cleansings in the former Yugoslavia, and the ensuing chaos from the collapse of Rule of Law in Somalia. In addition, the decreased likelihood of conventional warfare between states gave way to a higher probability of conflict between smaller non-state actors such as rebel and terrorist groups. Despite not posing a true risk in terms of escalation into conventional warfare, these groups can inflict international violence while being solidly established in their regions of origin. The rise of globalization has led to great changes in the nature and structure of international relations. While nation states are still essential actors for diplomacy, international organizations, NGOs, multinational corporations, high-profile individuals, and non-state actors such as drug trafficking and terrorist organizations now influence the agenda, stability, and future of international politics. Given the multilevel nature of the global order, traditional approaches to diplomacy are perceived to be insufficient in tackling international issues (Galluccio 2011). The traditional definition of diplomacy as a means of conducting negotiations and maintaining relations between nations is clearly insufficient to cope with the complexity of contemporary international relations. Exclusive focus on bilateral or multilateral relationships between sovereign states does not address the plethora of actors that have emerged since the end of the Cold War. Greater complexity in the international arena implies greater risks and uncertainty whereby understandings between states are not necessarily conducive to stability, peace, and security. In light of these issues, preventive diplomacy came to the forefront of discussions on security and peace. The United Nations' Agenda for Peace in 1992 began to analyse all possible factors that could lead to national or international conflict. Several issues were listed including ethno-religious tensions, different forms of socio-economic exclusion, and consequences of ecological degradation and climate change. Not only was the Agenda a landmark for introducing ecology as a factor for conflict, but it also left very clear that the classic international system of sovereign states was outdated, making it necessary to take "actions to prevent disputes from arising between parties, to prevent existing disputes from escalating into conflicts and to limit the spread of the latter when they occur" (United Nations 1992). Boutros Boutros-Ghali (Secretary-General of the United Nations from 1992 to 1996) stressed that trust and confidence were essential pillars for effective preventive diplomacy, in addition to early warning systems and mediation structures. In the 2001 United Nations' Report of the Secretary-General "Prevention of Armed Conflict", states, regional organization, civil society, and other actors were encouraged to conduct a paradigm shift whereby crisis and conflict reaction were

substituted with a culture of prevention. Additional threats to security, peace, and stability were included in the 2004 report of the High-Level Panel on Threats, Challenges and Change. Disputes over resources, transnational criminal networks, and increased migration patterns came to be at the forefront of preventive diplomacy discussion (Muggah and White 2013; Ramsbotham et al. 2011a). Several regional organizations have adopted preventive diplomacy structures into their inner functioning. For example, the African Union's traditional doctrine of non-interference was substituted by the principle of "non-indifference" to potential threats to peace, security, and populations, which include threats to the democracy and unconstitutional changes in government. The Peace and Security Council, the Panel of the Wise, the African Standby Force, the Southern African Development Community, and the Economic Community of West African States (ECOWAS) have taken active roles in preventive measures, assisting the UN when mediating in Ghana in 2009 (United Nations 2011). In addition, the Organization of American States (OAS) passed a resolution whereby crisis prevention was to be a priority, leading to mediation that reduced political tensions in El Salvador, Guyana, and Honduras. The Biketawa Declaration of the Pacific Island Forum (2000) developed a framework for emergency situations and was used successfully in Fiji, along with reforms to the 2007 Charter of the Association of Southeast Asian Nations (2007), the Charter of the Organization of the Islamic Conference (2008), and development of a Comprehensive Crisis and Operations Management Centre in NATO (2012). In addition, both the Arab League and the Gulf Co-operation Council (GCC) have begun to focus on preventive diplomacy approaches in the wake of conflicts and crisis emerging from the Arab Spring. Mediators have been sent to Syria and Yemen to attempt to build bridges in polarized situations (United Nations 2011). Given that there is a link between higher risks, development issues, and violent non-state actors, science diplomacy can be an important contributor to preventive diplomacy and mediation. The effects of climate change and the rise of hydrometeorological hazards have a large impact on the escalation of these issues (Galluccio 2019). Low social resilience to these phenomena has statistically been correlated to increases in vulnerability, death, and violence. In the case of rising temperatures, heat-related hazards can cause delirium, altered consciousness, agitation, restlessness, unconsciousness, and strokes. The same phenomenon is statistically correlated to higher rates of robbery, assault, rape, and larceny due to higher stress levels that can lead to anger and frustration, especially if they lead to droughts that prevent farmers from growing food (Jyotsana 2013). Forced migration due to hydrometeorological hazards is expected to displace approximately 200 million people by 2050, leading to more negative psychological responses such as sense of loss, displacement, anxiety, anger, frustration, depression, and even PTSD, which could possibly lead to more violence and conflict (Centers for Disease Control and Prevention 2010; Galluccio 2019). For example, in a study conducted between 1950 and 2004 incidences of violence were measured in regions suffering from El Niño. After gathering and consulting data from 175 countries and on 234 conflicts it was concluded that the chances of violence in said regions had doubled. This meant that hydrometeorological hazards such as El Niño could have led to over 21% of civil wars in the

time period studied (Centre for Disease Control and Prevention 2010). As such, vulnerabilities generated by climate change, coupled by massive gaps in economic development, can lead to conditions whereby violence becomes the answer for populations and groups affected by low resilience, mental health, and different forms of poverty and exclusion (Galluccio 2019). Given the security risks that climate change and poverty pose to the international community, the achievement of the United Nations Sustainable Development Goals (SDGs) should be an essential part of the larger strategy of preventive diplomacy. World leaders established these goals through the 2030 Agenda for Sustainable Development, which was built upon the Millennium Development Goals (MDGs) adopted in 2000 with the intention of drastically reducing poverty, hunger, disease, and gender inequality as well as radically increasing access to water and sanitation by 2015. While significant advances were made in attaining the MDGs' objectives, insufficient efforts and changing external conditions showed that there was much room for improvement. To this end, the SDGs present a more ambitious agenda that wants to tackle poverty and development at its roots and includes 17 sustainable development goals in areas such as sustainable development, democratic governance, peacebuilding, climate, and disaster resilience. Of these, the first goal (poverty reduction), the tenth goal (low inequality), and the sixteenth goal (good governance) are priorities for the United Nations Development Programme and involve many current and long-term projects (United Nations 2016a). It is clear that successfully implementing the SDG's targets implies maximizing the efficiency and effectiveness of existing social and physical infrastructure, in addition to heavily investing in new technologies that can solve structural issues in agriculture, ecological resilience, access to clean water, housing, and lives free from deprivation. This, in turn, inevitably implies large and ambitious transfers of technological knowledge and capital from developed countries towards developing countries, which will also imply training technical experts, workers, and scientists in using these technologies and encouraging innovation. Science diplomacy can play an essential role in spreading the benefits of industrialization and knowledge economy to achieve the UN's Sustainable Development Goals and improve social, economic, and ecological standards, especially in the world's least developed countries (whose number has risen from 24 in 1971 to 47 today). For example, exchanges between economists, sociologists, and biologists through university programs in developed and developing countries can introduce fresh concepts into micro- and macroeconomic policy such as the social economy, solidarity economy, circular economy, One Health concept, and cooperative enterprises. These can generate essential added value in developing countries due to the ways they combine targets such as economic growth with fairness, equality, sustainable use of resources, resilient ecosystems, and even social capital and collective efficacy building. Other alternatives for sustainable approaches to social development are being explored in the Transformation to Sustainability Program sponsored by UNESCO (United Nations Educational, Scientific and Cultural Organization), creating a common space for social scientists from developed and developing countries to discuss and establish methodologies and priority areas to contribute towards the SDGs. Using science diplomacy within preventive diplomacy to advance SDG

objectives can not only reduce the likelihood of conflicts from happening due to poverty and exclusion, but also be taken as a sign of goodwill between countries whose diplomatic relations are deteriorating due to disputes. New discoveries and technologies have massive potential for tackling the social, economic, and ecological dimensions of sustainability, poverty reduction, and human well-being (Saner 2015; United Nations 2019). Such programs should also be tailor-made to each country's cultural, political, geographic, and economic backgrounds. In a speech delivered at Cairo University in 2009, the US former President Obama declared that he wanted a "new beginning" between the United States and Muslim-majority countries, creating a new focus on bilateral partnerships to address development, education, science, and technology issues. As he stated in his speech:

> *All of us share this world for but a brief moment in time. The question is whether we spend that time focused on what pushes us apart, or whether we commit ourselves to an effort—a sustained effort—to find common ground, to focus on the future we seek for our children, and to respect the dignity of all human beings* (Galluccio 2011; Obama 2009).

To this end, he proposed three initiatives for science diplomacy:

1. Establishing a fund supporting technical developments and job creation
2. Creating "centres of excellence" to encourage high-quality scientific and technological research in Africa, the Middle East, and Southeast Asia
3. Appointing "science envoys" for Muslim-majority countries that could develop partnerships and cooperation opportunities between the United States and the countries involved

It should be stated that the National Security Strategy developed by Obama's administration was completely in line with preventative action, leading to the creation of the Bureau of Conflict and several stabilization operations (Muggah and White 2013). President Obama wanted to create a new beginning with countries in the Muslim world that have difficult relations with the United States (Prodi 2015), leveraging the United States' power in scientific and technological leadership for cooperative purposes. In addition to the ambitions of the Cairo speech, the Presidential Global Development Policy was in favour of placing American investments in technologies and inventions that could solve long-standing development challenges. Said policy was focused on investing in research and development and assisting developing countries on science and technology use. In addition, the Department of State and the US Agency for International Development (USAID) combined science, development, and diplomacy to encourage dialogue and moderation between countries and disputing factions. USAID's current "star" program in science diplomacy is the Partnerships for Enhanced Engagement in Research (PEER), which was launched in 2011.[2] Administered by the US National Academy of Sciences, the PEER programs use federal funds to finance scientists and researchers from developing countries and the United States with the aim of furthering bilateral and regional cooperation, leading to the advancement of human capital. Areas

[2] https://sites.nationalacademies.org/PGA/PEER/index.htm.

of collaboration include research, capacity building, grants, and other forms of project financing. The program is currently operative in 87 countries, including Pakistan and Egypt. Science and health are two of the main dimensions of the PEER program. To this end, the National Academy of Sciences gives grants to scientists and engineers that excel in their fields to further their research and conduct capacity-building activities in collaboration with the National Science Foundation and the National Institutes of Health. Since 2012 new funding opportunities have been opened for development in Indonesia, natural resource management in the Philippines, water access in the Middle East and North Africa, biodiversity in Brazil, and climate change in the Maldives (Dehgan and Colglazier 2012). In addition, new science diplomacy initiatives tied to the PEER program have been organized in Tunisia, Libya, and Myanmar. The nature of said aid in these three countries is to tackle the challenges posed by destabilizing events such as the Arab Spring in the former two and the gradual transition from military rule in the latter. Science diplomacy in these cases can be invaluable in making competing actors in developing countries sit down and negotiate if funding and expertise are given to solve national development issues. It is clear that, both domestically and internationally, using science in diplomacy as well as science for policymaking is essential when tackling global issues. In 2015 the OECD published a policy paper on science, technology, and industry called *Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists*. The paper outlined how the scientific community has increasingly been called to advise governments in highly technical issues such as climate change and health emergencies, especially if said issues have a crisis and/or long-term component. Scientific advice can be key for adequately framing and communicating policy issues to public opinions and other stakeholders, including potentially interested parties. It should be stated nevertheless that using scientific advice does not necessarily imply developing an "apolitical" or technocratic stance from the part of governments, but merely means providing greater depth in the realm of decision-making. Like in every policy, scientific evidence must stand and be weighed alongside numerous interests and considerations in order to find balanced and appropriate policies for countries. Balancing science with other interests is especially important in an international order where communication technologies allow quick access to information, making public opinion much more sensitive and reactive than in the past. In this sense, policymakers are held much more accountable to political debates in civil society. Scientific debates have also come under public scrutiny, especially when they encompass issues such as climate change and epidemics. Evidence of a "scientific" nature is used in these political debates to validate and reinforce one's views (although not always in an honest way in the case of climate change to name but one). This shows the degree in which science and scientists are at the forefront of many of today's issues in international politics and shows the potential danger of the implicit politicization of science.

Cooperative Advisory Mechanisms

Another task for the international science diplomacy is enhancing and supplementing the constitution of scientific advisory systems in even those countries where the connection between science and policymaking is not still well developed (Sato et al. 2014). Scientific and technological cooperation offers a chance to turn adversity into opportunity by fostering solidarity, cooperation, and action in concert among all peoples and nations. Efforts for international dialogue on scientific advice have just begun and the extent of the possible harmonization among national systems is not yet forecastable. However, a full-scale global effort is now needed to allow national and international systems to work more effectively as a whole. "In working toward such a goal, all relevant international bodies should first pursue mutual understanding and recognition" (Sato et al. 2014) by promoting mutual agendas and joint visions. In order to face the major global challenges—such as climate change, increased poverty, and gender inequality—in 2013 the United Nations decided to give a stronger base to move forward its core mission by setting up its own Scientific Advisory Board. The UN appointed 26 members (13 men and 13 women) from a broad range of backgrounds, cultures, fields, and disciplines to provide advice on science, technology, and innovation (STI) for sustainable development. "The fields will span a broad spectrum, from the basic sciences, through engineering and technology, social science and humanities, ethics, health, economic, behavioural, and agriculture sciences, in addition to the environmental sciences, which are more commonly associated with sustainability" (United Nations 2016b:9). The aims of the Scientific Advisory Board are developing a sustainable and people-centred agenda, targeted at alleviating poverty, creating jobs, reducing inequalities, increasing incomes, and enhancing health and well-being, as stated in the Sustainable Development Goals (SDGs) agreed by the UN General Assembly in 2015. It is believed that basic science and applied science, which are strongly interconnected between them, are the sole tools to efficiently respond to the global issues and, thus, according to the UN, all member countries should improve their effort in research and development, investing here at least up to 1% of their GDP (United Nations 2016b:12). Science is fundamental to measuring outcomes, establishing causalities, and encouraging the development of the most effective strategies to be implemented. In this context, great attention is paid to the "science-policy interface" because, as many times already stressed in the previous chapters, science without policy is fruitless and policy without science usually fails to accomplish immediate goals. "When policy and science unite, the chances of success increase greatly" (United Nations 2016b:17) even because the decisions, which are proposed individually, are discussed and implemented collegially in order to reach the common goals. To engage the world community to this kind of decision-making framework, which implies not only a strong correlation between science and policy but also a bottom-up approach and a strong involvement of local and indigenous communities, a powerful pattern of communication and exchange of information is needed: "this means not only better communication within the scientific community, or among policy-makers, or

between politicians and citizens, but among all those with a stake in the outcomes" (United Nations 2016b:19). The OECD's (2015) policy paper analyses the generic structures of science advisory systems that have been established at local, national, and global levels. Four types of structures are generally combined and used for national advisory systems. The first are statutory-mandated committees that advise governments on policymaking for science, technology, and innovation. The second are permanent scientific or technical advisory systems created to assist governments for concrete issues (e.g.: health and climate change). The third includes universities, think tanks, and other academic institutions that produce papers and reports of relevance for policymaking independently of a government's request. The final structure is much more individual in nature and focuses on individual advice given by specific scientists and consultants. Said structure can have varying degrees of formality. Governments using science in policymaking have developed general guidelines and principles, as well as steps for the advisory process. These are separated into several parts:

1. Framing the question: this is especially important when the issue is complex and is assessable from different perspectives.
2. Selecting advisors: making sure that appropriate experts are chosen to ensure quality and legitimacy and avoid conflicts of interest.
3. Producing the advice: ensuring that selected advisors can conduct independent work, especially from a political perspective.
4. Communicating and using the advice: transparency is an essential step, meaning that conclusions should be disseminated in a clear manner with appropriate timing. In addition, policymakers must also be clear on when, how, and why they used advice produced by scientists. This is especially important in instances where the final decision contradicts scientific findings.
5. Making sure that trust is built with civil society stakeholders and public opinion.
6. Impact assessment.

Establishing advisory systems to gather scientists and policymakers can also be essential in developing short- and long-term risk assessment and crisis management structures. In the OECD's opinion, several lessons can be drawn from past crises and advisory systems, especially in maintaining credibility and dividing competences among risk and crisis stakeholders. All advisory systems in crisis management and risk assessment should:

1. Have a clear division of competences and know the limit between advisory and decision-making functions. Proper boundaries and competences will drastically improve the legal, logistical, and communicative dimensions of the developed structures.
2. Make sure that the relevant expertise and actors are used in the risk or crisis at hand. The process should be as transparent, multidisciplinary, and organized as possible. In the case of transparency, civil society stakeholders are an essential part of framing and generating advice.

3. Generate sound, unbiased, and legitimate advice by using the best available information, recognizing and communicating uncertainties, and avoiding non-scientific interference.

All of these guidelines should be used by national and international actors when using science for policymaking and science in diplomacy. Given the highly technical and complex issues facing the international community, it is essential that scientists, diplomats, politicians, and civil society converge in order to establish a comprehensive approach to solutions, using international organizations and cooperation mechanisms between national, regional, and global advisory structures. Given the international nature of such collaborations, it is evident that science diplomacy will be at the centre of its development (OECD 2015). Science and technology advice are within the mandate of several international organizations. The OECD established the Global Science Forum as a subcommittee of the Committee for Scientific and Technological Policy (CTSP). It is used as a consultative body where government stakeholders and scientists gather to develop national and international solutions for shared issues. In addition to the OECD, the United Nations has several adjacent organizations and specialized agencies in health, agriculture, labour rights, telecommunications, education, food, and meteorology, such as the World Health Organization or the World Meteorological Organization. In addition, in 2013 Secretary-General Ban Ki-moon established the Scientific Advisory Board with the explicit aim of bridging the gap between scientists and policymakers, especially in the field of sustainable development. Several associations of academies have also provided space for both actors to meet. Such is the case of the International Council for Science (ICSU), a network of academies and scientific unions that attempt to present science in a socially useful manner. Other international organizations include the InterAcademy Panel (IAP) and the InterAcademy Council (IAC) and have similar functions to the ICSU as academic networks. For example, the IAC was asked by the UN to review the Intergovernmental Panel on Climate Change (IPCC) due to controversy on the reliability of its fourth Assessment Report following the Climate Research Unit email controversy of 2009. Sought for its independence, the IAC published a report confirming the validity and reliability of the IPCC's data (Sato et al. 2014). However, as it was reported by the Guardian in 2016, the so-called paradox of scientific advice is becoming more acute and visible: "expert advice is being sought with growing urgency across a proliferating array of policy and public questions. At the same time, and often on the same issues, the legitimacy of evidence and expertise has rarely been so fiercely contested".[3] In order to avoid this paradox, in 2014 the International Network for Government Science Advice (INGSA) was set up with the aim of assisting the development of effective advisory systems for bringing evidence into policy through meetings, workshops, conferences, and case studies.

[3] For further information, please refer to https://www.theguardian.com/science/political-science/2016/sep/28/scientists-are-giving-advice-but-are-governments-listening.

Chapter 4
Science Diplomacy and the European Union



I do not pretend to start with precise questions. I do not think you can start with anything precise. You have to achieve such precision as you can, as you go along.

Bertrand Russell

Introduction

One global actor that extensively applies soft power is the European Union (EU). A curious polity, it does not have a clearly defined central authority, "demos", or geographical, administrative, economic, and cultural border. In addition, its foreign and security policies are often a combination of bilateral and multilateral initiatives with mixed amounts of participation willingness on the part of member states. The foreign policy strategy of this polity is mostly centred on promoting the values and principles outlined throughout European integration in its international relations. Many international relations scholars consider the EU to be a polity that uses its economic weight, financial rewards, and "punishments" to push its normative agenda on third countries, using persuasive soft power instruments in its public diplomacy (Michalski 2005). The EU is in a strong position to exert influence in international relations given its economic, geographical, and demographic size. Its 27 member states have a total population of more than 400 million, and the Euro is the second most important international reserve and trade currency, meaning that the economic weight of the EU allows it to exert great power through norms and regulations. From a "hard power" perspective, the EU's normative power rests on the attractiveness of its markets in international trade. This leads to considerable leverage on third countries interested in conducting commerce with European countries. However, from a soft power perspective the EU defends and promotes its

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_4

normative power through other means. Not only do many countries consider Europe as a role model for democracy, human rights, stability, and social policy, but also the EU is considered one of the most effective actors in the field of humanitarian intervention through the Humanitarian Aid and Civilian Protection department of the European Commission. In addition, it is the largest development donor when it comes to aid and has considerable influence in tackling development issues on the ground, especially through its 140 delegations and offices around the world. The "enlargement fatigue" felt by many sections of the EU's public opinion made many of its leaders and policymakers become increasingly focused on consolidating the polity's place in international relations.

Science Diplomacy and the European Union: A Brief History

The EU embarked on an ambitious project to use its normative power in the defence and expansion of food safety, environmental standards, human rights, democracy, labour standards, sustainable development, poverty eradication, free and fair trade, international law, and multilateralism, to name but a few. The EU attempts to advance the universal benefits of these values and norms while simultaneously using its normative power to keep economic leadership through free trade agreements and persuasion in an effort to attract innovators, scientists, and other talented, educated, and ambitious individuals. According to the Treaty on the Functioning of the European Union (TFEU) the external action objectives of the EU (The European Union 2016:28–29) are to:

1. Safekeep European values, fundamental interests, independence, integrity, and safety.
2. Consolidate and uphold democracy, the rule of law, human rights, and principles of international law.
3. Preserve the peace, prevent conflicts, and strengthen international security.

Given the increasing uncertainty of international relations, it is very important for the EU to be able to adapt to new conditions. Despite the fact that many international stakeholders view the EU's multilateralism positively, in bilateral terms many consider that the EU is not sufficiently coherent; making the aggregation of both seems eclectic. This can be problematic given that international diplomats and other policy stakeholders often see great potential in the EU's diplomatic activism despite its frequent lack of vision (because of difficult coordination among members states) in areas such as global security. It is essential that the Union continue to develop and promote comprehensive strategies for international governance so that the EU is clear on how it wants to achieve its foreign policy objectives. These strategies should be solid while also leaving room for flexibility given the uncertain and fluctuating nature of international relations in the twenty-first century. To this end, science diplomacy is an essential opportunity for the EU (European Union 2016). Recent interest in science diplomacy between the EU and third countries reflects the history of its practice between European countries since the end of World War

II. Some of the world's most prominent scientists left the Continent during the War, meaning that conditions for their return had to be developed. In addition, higher technological costs and post-war financial difficulties made it difficult for the European countries to pursue scientific projects on national lines. These conditions led several scientific communities to push for the establishment of the European Organization for Nuclear Research (CERN) in 1954. Twelve European countries (including France, Germany, Italy, and the United Kingdom) were signatories to this organization in order to establish science as a unifying force for peace, in addition to pooling resources to reduce the individual cost of research. We can see through this example how science was used to reduce tensions as well as solve pragmatic issues (Moedas 2016). Science cooperation has always been an important part of the European integration as it has a potential for reducing the likelihood and escalation of armed conflict. The European Commission and member states also established the Joint Research Centre in 1957, European Cooperation in Science and Technology (COST) program in 1971, and the Eureka network in 1985. Of the last two, the former established a pan-European network of researchers of all scientific fields while the latter combined universities, research institutes, small and medium-size enterprises (SMEs), and large firms in order to foster an innovative economy. Ten European countries also agreed to the establishment of the European Space Research Organisation in 1962 through the initiative of prestigious scientists such as Pierre Auger (French) and Edoardo Amaldi (Italian)—both of which had been key in establishing the CERN—followed by its successor the European Space Agency in 1975. Collaboration with non-community countries was first officially mentioned in the Single European Act of 1987 despite the fact that it had begun in 1983 with the Science and Technology for Development program. One of the landmarks of European international prestige and soft power in science is the CERN, especially when it began to build the Large Hadron Collider in the 1990s. Completed in 2008, the Collider was successfully built with the help of more than 10,000 scientists from over 100 countries, showing how combining international talent could lead to great advancements in science (the Higgs particle was discovered through the Collider in 2012). Other experiments and instruments were constructed within the Large Hadron Collider such as the Toroidal LHC ApparatuS (ATLAS), Compact Muon Solenoid (CMS), and A Large Ion Collider Experiment (ALICE), all of which further extended the CERN's influence in the global scientific community. In addition to the CERN's European dimension, its positive reputation has provided opportunities to collaborate with countries and projects that are not directly linked to the organization. The EU's connection to the CERN and the positive reputation of research in Europe have led to the EU becoming an observer for Jordan's Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME). SESAME's goal is to gather the brightest and most talented scientists of the region, especially during the current climate of conflict, to boost regional networks for innovation and learning. Several opportunities have arisen for science in Europe due to the rise of the Information Age. It should be noted that Tim Berners-Lee, an English scientist employed at the CERN, invented the World Wide Web in 1989 and wrote the world's first web browser. Following this revolutionary advancement in communication, ideas were able to flow much more quickly and

freely across national borders. In addition, technological advancements developed by inter-European research and development initiatives further improved communications through the introduction of low-cost air travel. Another area in which European integration drastically improved the spread of ideas and mobility was through the Erasmus program (1987) that allowed millions of students to conduct exchanges in the universities of the signatory countries. All in all, it is clear that the EU has historically been very focused on science as a vehicle for integration, understanding, and intercultural dialogue. Scientists and researchers have been able to push for a EU's policy whereby European research is recognized through a "brand of excellence". To this end, the European Research Council (ERC) was established in 2007 to encourage, maintain, and further the EU's ability to launch cutting-edge research, especially when providing grant funding that has a foreign dimension. Such efforts were reinforced with the mandate of the Treaty of Lisbon in 2009, especially when it came to funding research and innovation that could provide economic and social benefits across the continent. As Section 1 of Article 179 of the Treaty on the Functioning of the European Union (TFEU) (The European Union 2016:128) states:

> *The Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry, while promoting all the research activities deemed necessary by virtue of other Chapters of the Treaties.*

Reinforcing the Union's scientific mandate through Article 179 of TFEU not only legitimized investing in new infrastructure and institutions, but also reinforced and validated much of the work done in the long and near past. For example, the creation of the European Research Area (ERA) was also mentioned in the Treaty and was founded in 2000 in order to foster further integration of research and resources from a multinational perspective. Popular among scientists, it focuses on cooperation in research areas such as medicine, industry, socio-economic issues, and the environment. Today, several EU institutions are responsible for developing science diplomacy with third countries. From the European Commission's perspective this falls under the competence of the DG for Research and Innovation (DG RTD). Given the foreign policy dimension of science cooperation, DG RTD works also with the European External Action Service (EEAS). On an intra-EU level, the Council's Strategic Forum for International Science and Technology Cooperation (SFIC) is responsible for developing and organizing the European Research Area (ERA) and the European Research Area and Innovation Committee (ERAC), also advising the Commission when necessary. Member states are represented through the SFIC's structure which allows them to discuss and develop the frameworks and objectives necessary to develop the ERA on an international level. Opinions and decisions are then communicated to member states and to the European Commission (EC). In May 2015 the Council decided to place "international cooperation" as a priority within the ERA's mandate. After the European Commission proposed a strategy for scientific cooperation in 2012, a 2014 report on its implementation

stated that common principles and frameworks had to be developed, as well as the EU's strength in multilateralism should be maximized to advance the strategy's two main approaches: openness and targeted activities. EC's former President Juncker (2014–2019) has established science diplomacy as a top priority for his term in office in order to foster economic growth, employment, and development and overcome international issues such as climate change, climate, migration, international conflicts, and energy security. This has led Carlos Moedas (then Commissioner for Research, Science, and Innovation, 2014–2019) to develop an active and visible role for European Science Diplomacy on the international scene:

> *Using the universal language of science to maintain open channels of communication in the absence of other viable Foreign Policy approaches, ensuring the EU maintains its presence at the highest level of international scientific endeavour, and ensuring the EU has access to research performed outside Europe* (Moedas 2016).

We can deduct from this statement and from EU foreign policy that the goals of scientific cooperation in the European Union can be reduced to three objectives:

1. Maintaining and strengthening excellence and attractiveness for European research, innovation, and industries to remain competitive in this era of globalization
2. Addressing issues such as higher systematic risk in the different dimensions of international security
3. Furthering the soft power potential of European science and research in its external dimensions (The European Parliament 2015)

The strategy was approved by the Council of Ministers during the preparation of Horizon 2020 (Prodi 2015). Many of the targeted countries were within the grasp of the European Neighbourhood Policy (ENP) and included future enlargement candidates as well as the European Free Trade Association (EFTA) members. Under this category, the long-term objective of the EU is to establish a Common Knowledge and Innovation Space for the sake of diplomacy for science and science for diplomacy. On the other hand, the other targeted groups in the strategy are emerging economies and industrialized countries. In the former group the EU targeted Brazil, Russia, India, China, and South Africa, while in the latter group the targets were Canada, South Korea, Japan, and the United States. Finally, the last target group were developing countries as a part of science diplomacy's efforts to solve global issues such as exclusion, poverty, conflicts, and environmental issues. The EU disposes of three policy instruments for science diplomacy: international agreements, science counsellors, and cooperation schemes. In brief, agreements are implemented through DG RTD and are mostly indefinite. Several activities can be included in these agreements, ranging among joint projects, seminars, research exchanges, pooling resources, and managing intellectual property rights, all of which are generally managed by steering committees that are established upon ratifying the agreement. Science counsellors in the EU answer to DG RTD but also work with the EEAS. They are responsible for policy analysis, development, representation, and communication. One cooperation scheme is that of associated country. This allows

the third country to enjoy the same rights and obligations as a member state for the framework program in question. Only EFTA, candidate, and potential candidate countries are allowed to become associated countries. In addition, under the openness strategy other third countries are eligible to participate in the framework program. However, unless essential to the running of the research project, high-income countries are barred from receiving the EU funds. Emerging countries such as Brazil, Russia, India, Mexico, and China are no longer automatically eligible to receive funding under the Horizon 2020 program (now Horizon Europe). Actions to extend the international scope of science have also been supported by the European Parliament in 2008 and 2011, promoting higher degrees of cooperation for third countries within existing frameworks. It is important to remember that international agreements for scientific cooperation fall under the consent procedure since the Lisbon Treaty. It is understandable that the European Parliament (EP) has stated its "intent to request the Council, where appropriate, not to open negotiations on international agreements until Parliament has stated its position" (The European Parliament 2015): This makes the European Parliament an essential actor in European Science Diplomacy.

Horizon 2020 (now Horizon Europe) was one of the largest research programs in the world and one of the reasons behind the Commission's efforts to expand science diplomacy. Open to both public and private research organizations across the globe, it also focused on key development research in fields such as food scarcity, nutrition, and sustainable infrastructure to name but a few. It replaced the Seventh Framework Programme for Research (FP7) with a budget of almost €80 billion, €25 billion more than previously. Of these, over €6 billion was reserved for providing career development opportunities for researchers and innovators through the Marie Skłodowska-Curie (MSCA) actions. They provide grants for an array of research profiles and encourage exchanges between European and foreign scientists from research-based universities, companies, and institutions. Fostering relations with innovation-driven countries is a strong part of the EU's science diplomacy strategy. To this end, its delegations in Asian countries have established a research and innovation section. Established in India, China, and Japan, these sections provide logistical and communication assistance between the delegation and the countries in question. Over 6000 Asian researchers conducted research in the EU through the Marie Skłodowska-Curie actions during the Seventh Framework Programme of Research and Development (2007–2014). The 2012 ASEAN-EU Year of Science, Technology, and Innovation (STI) provided an opportunity to advance science diplomacy with Southeast Asia, organizing 50 events in 13 countries and establishing partnerships between 40 institutions in both regions. Networking and cooperation were promoted on a bilateral and multilateral level (Vandewalle 2015). The Erasmus+ program has also invested €14.7 billion for the 2014–2020 period to allow European and non-European students and staff to enter exchange and training programs with an EU grant, seeing an opportunity to attract and develop human capital and intensify the internationalization of higher education.

In order to promote mutually beneficial cooperative and fruitful relationships, the EU has embarked on a number of science diplomacy programs. For example,

inter-European exchanges and research through the European Space Agency (ESA) led to the launching of the Rosetta Mission in 2004, making this the first successful landing of a lander module on a comet in orbit. In addition to inter-European cooperation, the ESA has also established partnerships with China and the United States to develop human spaceflight ventures and satellite collaborations. Commissioner Moedas made it clear upon assuming his post in 2014 that he would use the history of post-war science diplomacy in Europe as a model to be extended to third countries in an effort to bridge divides, foster dialogues, and attract human capital to the EU. For example, the European Research Council (ERC) has placed seven implementing arrangements in agreements signed by the EU and third countries on matters of science, technology, and innovation. This would allow scientists early in their careers to be a part of research projects and teams run by ERC grantees in Europe. In addition, at the Biennial Summit between the EU and the Community of Latin American and Caribbean States (CELAC) all parties agreed to establish a Common Research Area (CRA) for these regions, encompassing over 1 billion people, 61 countries, and one-third of the United Nations' members. Areas of particular interest for research and science diplomacy included health research, renewable energies, marine sciences, green economy, and sustainable models for urbanization, and mobility, funding, and research opportunities were allowed for scientists from any of the involved countries. In addition to bilateral agreements between countries and world regions, the EU has had a leading role in the Intergovernmental Panel on Climate Change (IPCC), sending scientists to educate international policymakers and other stakeholders in solving this issue. As EC's former President Juncker claimed, the EU's technological and knowledge resources are of immense added value in raising the awareness of international politicians and citizens on climate change. The European Commission has also used multilateralism with NATO, G7, and UN members on security issues such as nuclear proliferation and rise of terrorism. As previously mentioned in this section, climate change, exclusion, and rise of non-state actors intersect when explaining the rise of risks, vulnerabilities, and conflict in the international community. President Juncker made this clear at the State of the Union in September 2015:

> *In some parts of the world, climate change is changing the sources of conflict – the control over a dam or a lake can be more strategic than an oil refinery. Climate change is even one [of] the root causes of a new migration phenomenon. Climate refugees will become a new challenge – if we do not act swiftly* (Juncker 2015).

In a speech delivered at the Chinese Academy of Social Sciences, Federica Mogherini, the former High Representative of the European Union for Foreign Affairs and Security Policy 2014–2019, re-emphasized the EU's commitment to multilateralism and the prevention of conflict. During her analysis of the EU Global Strategy of 2016 she stated:

> *[International] cooperation is vital and partnership is essential. And this is particularly true for partnerships among the world powers. A confrontation between global players would lead us nowhere. This is a world of win-win or lose-lose situations. And it is maybe the first time that the European Union states this so clearly in a strategic document. Only cooperation can make us stronger, the both of us. And it is our intention to invest in the*

> *strength of our partners worldwide. This is one of the key lessons of our European integration and also of our European history … this is the European way of foreign policy. Investing in partnerships, cooperation … in the framework of international rules and international norms … for us in the European Union it is vital to build cooperation on the world scene* (Mogherini 2016).

One of the areas in which High Representative Mogherini wished to expand cooperation was international crisis management, emphasizing prevention and post-crisis scenarios. One of the main objectives of the Strategy was (it is still so) to strengthen the resilience of states and societies in regions such as sub-Saharan Africa and Asia given that "peace is not just about military operations and blue helmets". Mogherini emphasized the essential role that employment, growth, good governance, open societies, human rights, and climate change prevention play in guaranteeing resilient and prosperous regions. She made it clear that achieving Sustainable Development Goals (SDGs) was linked to crisis prevention and lower international risks, stating that initiatives such as the Asia Infrastructure Investment Bank were positive developments in achieving these goals (Mogherini 2016). Mogherini's speech highlighted the priority given by the EU to multilateralism and solving international issues through comprehensive approaches. It showed once again the value that European scientists and technical advisors can have in diplomacy and risk prevention/reduction.

Scientific Advice in the EU Institutions

Science diplomacy cannot succeed in the EU's foreign policy if domestic institutions and stakeholders do not use scientific advice in policymaking. To this end, the European Commission defined guidelines in 2002 for the use of science advice. Directorates and departments are expected to use intra-institutional expertise unless external sources are needed. The Joint Research Centre (JRC) provides evidence-informed and independent expertise through different institutes divided into subject areas. These include environment, energy, security, health, and measurement standards. In addition to the JRC, other directorates and departments also have their own expert groups and committees that provide advice in more specific areas. The EU also disposes of several specialized agencies that can give advice to policymakers in several institutions. They can also coordinate technical expertise between national associations. For example, the European Academies' Science Advisory Council (EASAC) allows national institutions to create common platforms, projects, and advice to the EU institutions through workshops and studies in energy, biosciences, and environment to name but a few. The European Parliament's science advice comes from the Scientific Foresight (STOA) Unit of the European Parliamentary Research Service (EPRS). It detects emerging issues within current policy debates and provides potential courses of action for Members of the European Parliament (MEPs) and their assistants. The Unit can produce reports and briefings on its own initiative as well as on request from Members of the European Parliament.

In addition to the STOA, the committees, inter-parliamentary delegations, and other subgroups are permitted to seek advice and research externally. Said expertise mostly comes from the Policy Departments of the DGs for Internal and External Policies.

In addition, the position of Chief Scientific Advisor (CSA) was established in 2010 to give advice, establish networks with other science advice entities, detect future issues in foreign policy, and promote European science across the world. One of the first creations at the CSA's request was the President's Science and Technology Council (STAC) in 2013 with the intent of promoting European evidence-informed policymaking and fostering knowledge and awareness of the importance of science and technology in society. It also set up the European Science Advisors Forum (ESAF) in 2014 that acts as a network of individual national government advisors for the member states, allowing them to discuss strategies and issues in order to indirectly Europeanize frameworks and approaches. Despite the relatively recent creation of both the CSA and the STAC, both bodies were dismantled under President Juncker because some European actors feared competence overlap and an excess concentration of power into few hands. This led to the creation of the European Political Strategy Centre (EPSC) in 2014 outlining future policy strategies exclusively to the President of the European Commission. However, the most important recent development in light of using science for policymaking is the creation of the Scientific Advice Mechanism (SAM) in 2015 under President Juncker "to make sure that Commission proposals and activities are based on sound scientific evidence and contribute best to our jobs and growth agenda" (Reillon 2015). The SAM has the overall objective to ensure a high-quality scientific advice to the European Commission. In line with the Better Regulation Agenda, the Mechanism was set up in 2015 through the European Commission's decision C(2015) 6946[1] and its core is the High Level Group of Scientific Advisors, composed by seven experts identified by an independent committee and appointed for the first time by Carlos Moedas. Their tasks are:

1. Providing the Commission with independent scientific advice on specific policy issues (such as renewable clean energy, ocean protection, new techniques in agricultural biotechnology, cybersecurity, to name but a few) where such advice is needed for the development of the EU policies or legislation
2. Supporting the European Commission in identifying those policy issues where scientific advice is strongly required
3. Providing recommendations for improving the overall interaction between the European Commission policymaking processes and independent scientific advice concerning any field of the EU's policymaking process

Being one of the most rationalized science advice mechanisms to date, having introduced the SAM helps solve several logistical and information issues in the EU's current advisory framework. As we have seen, European institutions and

[1] https://ec.europa.eu/research/sam/pdf/c_2015_6946_f1_commission_decision_en_827417.pdf.

member states have their own sources of scientific advice for policymaking. In the former case these models are extremely diverse and have a range of all the structural possibilities outlined by the OECD's technical report. In the case of institutions such as the European Commission we have seen that science advice policymaking essentially stems from external experts, the Joint Research Centre, and programs financed by Horizon 2020. Despite attempts outlined in this chapter, logistically speaking, national and European efforts have not been sufficiently coordinated to always provide adequate timely, independent, and high-quality science advice across all policy fields. To this end, the SAM's aim is to provide a unified structure and coordination mechanism between the scientific advisory bodies of member states and introduce an additional European layer of science advice to policymaking. Said additional layer is the High-Level Group of independent eminent scientists (The European Commission 2015a, b). These experts can be European or non-European and are logistically supported by DG Research and Innovation with a 20–25-person secretariat. Commissioner for Research, Science, and Innovation acts as an intermediary between the High-Level panel and the other Commissioners, including the President of the European Commission and the President of the EU. Coordination between national bodies and the High-Level panel falls under the competence of a new unit within DG Research and Innovation staffed by almost 25 people (EURAXESS 2015; European Commission 2015a, b).

Responsible Research and Innovation

The Responsible Research and Innovation (RRI) is an approach integrated in the Framework Programme Horizon 2020 that foresees and evaluates potential implications and societal expectations of the outcomes produced by research and innovation, aiming at fostering the design of inclusive and sustainable research and innovation. Despite the increasing policies based on populist narratives rather than evidence, RRI was born with the scope of aligning research and innovation by employing mutual values, needs, and expectations, and by assuring greater cooperation among stakeholders, researchers, and citizens. The DG RTD of the European Commission, indeed, aims at bridging the gap between science and European citizens. RRI engages society, integrates the gender and ethical dimensions, ensures access to research outcomes, and encourages formal and informal science education (European Commission 2017:8). The final scope is to guarantee research integrity, open access to scientific results, and gender equality in every research content. In 2007, under the Seventh Framework Programme (FP7), the label "Science and Society" became "Science in Society" to underline the importance of the public engagement in the scientific world and the two-way dialogue between science and civil society. This aim was completely developed under Section V "Science with and for Society" (SwafS) of Horizon 2020. The need of forming RRI arose from the assessment that present research and innovation systems were undergoing several changes driven by globalization and proliferation of digital technologies. The big

societal challenges that lie in our future path would have a better chance of being tackled if all societal actors involved are fully engaged in the co-construction of innovative solutions, products, and services. It was in 2011 that the first public statement about the significance of RRI was made. Octavi Quintana, Director of the European Research Area (ERA), stated: "*We need your help to define responsible research and innovation. After several years of research on the relation between science and society, we evidenced that we need to involve civil society very upstream to avoid misunderstanding and difficulties afterwards ...*" (Owen 2012:752).

The Responsible Research and Innovation framework consists of six dimensions (European Commission 2014:2):

- *Choose together*: The first dimension, multi-actor and public engagement (PE), is about co-creating the future by bringing together the widest possible diversity of actors, including researchers and innovators, industry and SME, policymakers, non-governmental organizations (NGOs), civil society organizations, and citizens, that would not normally interact with each other, on matters of science and technology, in particular to tackle the grand societal challenges that lie before us. Public engagement implies a two-way, iterative, inclusive, and participatory process of multi-actor exchanges and dialogues (also involving minorities, considering gender and multiple generations). Public engagement in research and innovation fosters more societally relevant, desirable, and creative research and innovation actions and policy agenda, leading to wider acceptability of science and technology outcomes.
- *Unlock the full potential*: The second dimension is gender equality. Engagement means that all actors—women and men—are on board. The under-representation of women must be addressed. Research institutions, in particular their human resources management, need to be modernized. The gender dimension must be integrated in research and innovation content.
- *Creative learning fresh ideas*: The third dimension is science education. The world is changing rapidly and the responsibility for addressing societal challenges needs to be shared through the engagement of all societal actors across Europe. However, the key for co-creation within the research and innovation process is one of enabling sustained dialogue. But before this can happen, the language and tools of science need to be available to everyone. Science education is essential to making this happen. Children and young people enter the education systems with natural curiosity and creativity; recognizing and nurturing this will require changes in both the values and governance of science education.
- *Share results in advance*: Science has always been open, unlike the processes for producing research and diffusing its results. It is widely agreed that making research results more accessible contributes to improving research and innovation. As new challenges need to be addressed, we move decisively with this fourth dimension from open access into the broader landscape of open science.
- *Do the right "think" and do it right*: The fifth dimension is ethics. European society is based on shared values. In order to adequately respond to societal

challenges, research and innovation must respect fundamental rights and the highest ethical standards. Beyond the mandatory legal aspects, this aims to ensure increased societal relevance and acceptability of research and innovation outcomes. Ethics should not be perceived as a constraint to research and innovation, but rather as a way of ensuring high-quality results.

– *Design science with and for society*: Policymakers also have a responsibility to anticipate and assess potential implications and societal expectations with regard to research and innovation, with the aim of fostering the design of inclusive and sustainable research and innovation. Through this last dimension we will develop harmonious governance models for responsible research and innovation that also integrate public engagement, gender equality, science education, open access/science, and ethics.

At European level, in 2015 Commissioner Moedas identified three strategic priorities, described in Open Innovation, Open Science, Open to the World (the three O's strategy) (EC 2017:5) and this program, together with the perspective of opening science to citizens, responds to the fourth area of intervention of science diplomacy identified as *science and diplomacy for the people* (Galluccio and Vivani 2015:415). The Work Program 2018–2020 of Horizon 2020 has been designed to respond to these priorities by opening science to society and supporting the 3 O's strategy through the implementation of five strategic directions (The European Commission 2017:6) oriented to the execution of the "Science with and for Society" (SwafS) challenge:

1. Accelerating and catalysing processes of institutional change
2. Stepping up the support to gender equality in Research and Innovation policy
3. Building the territorial dimension of SwafS partnerships
4. Exploring and supporting citizen science
5. Building the knowledge base for SwafS

Moreover, SwafS emphasizes the role of gender equality, science education, open access and data, and public engagement in RRI and the attractiveness of the research profession (EC 2017:7–8) to face global issues such as climate change, sustainable development, and biodiversity in an international cooperation with third countries. The main topics funded in the last round of Horizon 2020 respond completely to the previous requirements:[2]

- Open schooling and collaboration on science education
- Innovative methods for teaching ethics and research integrity
- Encouraging the reuse of research data generated by publicly funded research projects

[2]The complete list can be read on http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-swafs-2018-2020.html#c,topics=callIdentifier/t/H2020-SwafS-2018-2020/1/1/1/default-group&callStatus/t/Forthcoming/1/1/0/default-group&callStatus/t/Open/1/1/0/default-group&callStatus/t/Closed/1/1/0/default-group&+identifier/desc.

- Grounding RRI practices in research and innovation funding and performing organizations
- Supporting research organizations to implement gender equality
- Exploring and supporting citizen science
- Taking stock and re-examining the role of science communication

The EU's Strategy Under Commissioner Moedas

Commissioner Moedas has summarized the EU's strategy for science diplomacy with his "three O's" strategy: Open Innovation, Open Science, Open to the World. The *Open Innovation* is broadly associated with establishing a "Seal of Excellence" that can link Horizon 2020 and other funding programs to ensure high-quality initiatives, potentially leading to the establishment of a European Innovation Council. The European Innovation Council will become a full-fledged reality from 2021 with a proposed €10 billion budget under the next EU research and innovation program called *Horizon Europe*. This has been the first goal of the EU's science diplomacy strategy given the logistical difficulties often faced in channelling Europe's existing talent in a large-scale, quick, and effective manner. The second objective is *Open Science* and aims at establishing a European Open Science Cloud (EOSC) that allows for wider access to scientific data and research developed by Horizon 2020 initiatives. An engagement process was initiated with a first EOSC Summit in June 2017, producing the EOSC Declaration endorsed by more than 70 institutions.[3] Finally, *Open to the World* is about expanding the EU's soft power and global weight in science, research, innovation, and technology in order to increase economic attractiveness and contribute towards facing the challenges of the international community (The European Commission 2016a, b). As we have previously stated, the EU has attempted to develop its presence and credibility in international affairs for several years, often resorting to soft power and implicitly science diplomacy. Policy-wise, science and technology are a shared competence between the EU and the member states. Horizon 2020's €80 billion budget for the 2014–2020 period involved an important external component meant to advance the "three O's" of the European Commission science diplomacy strategy. As stated by Commissioner Moedas in a 2015 speech given at the European Institute in Washington, DC, "Science Diplomacy [can] play a leading role in [the Union's] global outreach for its uniting power", referring to its long-known ability to build bridges between nations that have failed to establish more classical forms of diplomatic relations (collaboration with Russian scientists through Horizon 2020 being a contemporary example) (Balazs 2016). Moedas further delved into the strategic framework with which science diplomacy should operate in the EU's foreign policy. Beyond his "three O's" objectives he stated that self-interest (soft power) and global progress

[3] https://ec.europa.eu/research/openscience/pdf/eosc_declaration.pdf.

(science for the people) should be placed in accordance to the foreign policy goals established in the Lisbon Treaty. Said objectives should be:

1. Using science and technology to improve regional security in the European neighbourhood
2. Using science and technology to improve the EU's trade position in the global economy
3. Using science and technology to address international issues

With regard to the first objective, science diplomacy's potential lies in the trust that it can generate between the EU and its neighbours by connecting their scientific communities. Science diplomacy should be a component of the EU's peace and security strategy and be coordinated by both the EEAS and DG RTD. The second objective is tied to the EU's normative power approach to international relations due to its focus on establishing global agendas on technical standards. Scientists and researchers influenced by European research can lead to regulations that benefit the EU's comparative advantage in trade. DG Trade and DG RTD should coordinate efforts on this front. The third objective is an essential step for an effective "science for the people" approach to science diplomacy in the EU. Many of Horizon 2020 research initiatives focused on global issues such as health, demographic change, well-being, food security, energy, climate action, risk reduction, and security to name but a few. The EU should improve the program's coordination and alignment with the United Nations' sustainable development agenda. The EEAS should better coordinate efforts with other departments, such as DG RTD, and the member states' diplomatic activities if coordinated can add process value to the progress on this front (Balazs 2016). One example of science diplomacy for the people—due to its impact on other international issues—is climate change and alternative energy sources. The EU has led by example with regard to emission reduction, decarbonization, and fight for ambitious international initiatives through effective multilateralism (see Part III in this book).

The Cutting-Edge Year: An Insight on the EU's Actions

The EU has been very active in its global efforts to bridge divides and find common solutions to the issues of the international community and the year 2016 has been very important to this regard. During the World Economic Forum meeting in Davos (Switzerland) on 20–23 January 2016, the main theme was the Digital Revolution, but other topics were also present, such as the refugee crisis. Both the European Commission and the European Research Council (ERC) were represented during this event. Alongside then Commissioner Moedas was the then ERC President Jean-Pierre Bourguignon, 13 ERC grantees, and 2 Nobel laureates (Christopher Pissarides and Konstantin Novoselov). All members of the European delegation participated in the 16 discussions that were organized and stressed the importance of coordinating cutting-edge research on a global level. Partnerships in the Middle East were also

reinforced. On February 8, 2016, the European Commission and the Egyptian Ministry of Scientific Research established an "EU-Egypt Innovation Day" in the presence of Cristina Russo (Director for International Cooperation at DG RTD), Ambassador James Moran (Head of the EU Delegation to Egypt), and Dr. Essam Khamis (Deputy Minister of Scientific Research of Egypt). Three hundred stakeholders from different fields and positions were present, including researchers, academics, NGOs, SMEs, and institutional representatives and industrial and financial entrepreneurs. In addition to the EU and Egypt, Spain, France, Germany, Austria, Czech Republic, and the United Kingdom were also present and introduced their research and innovation programs to provide cooperation opportunities between European and Egyptian stakeholders. In addition to Egypt, the EU organized its second Joint Science and Technology (S&T) Coordination Committee (JSTCC) on 8 March 2016 with Algeria since both groups signed a cooperation agreement in 2012. Director Russo and Ali Mokrani (member of the Algerian Ministry of Foreign Affairs) co-chaired the meeting and discussed the priorities that the JSTCC should have. One of the priorities established was on the Commission's High-Level Policy Dialogue (HLPD) with Africa as a part of the RINEA mobility scheme funded by Horizon 2020. HLPD will also further cooperation with regard to the Mediterranean Science, Policy, Research and Innovation (MEDSPRING) program also funded by Horizon 2020. Another meeting was organized on 9 March with the Algerian Ministry of High Education and Scientific Research to promote EU-Algerian Exchange programs in research and innovation through Horizon 2020 and the Euro-Mediterranean partnership (EUROMED).

In addition to the Middle East, the EU science diplomacy activities have also been fruitful in the Americas. The ERC organized its ninth annual meeting with the AAAS in Washington, DC on "Global Science Engagement" in the presence of the ERC President and the EU Ambassador (Mr. O'Sullivan) and discussed future collaboration prospects between European scientists and American counterparts in the National Institutes of Health (NIH) and the National Science Foundation (NSF). All of this was discussed within the topic "US-EU science outlook and the ERC perspective" and the meeting also included several Canadian participants, particularly due to their interest in pooling efforts to fight the Zika virus. Efforts to fight the Zika virus also led to a meeting on 26 January 2016 between the Brazilian Minister of Science, Technology and Innovation (Celso Pansera) and diplomats from the EU delegation in Brazil. The European delegation stressed the Union's €10 million financial commitment in Horizon 2020 for Zika and microcephaly-related projects and priority-setting on the virus, its vectors, and programs for contaminated families. Brazil and the EU have also joined efforts for a call for proposals on advanced lignocellulosic biofuels on 9 March 2016, in order to reduce global reliance on fossil fuels and consequently fight climate change.

As we have highlighted above, Asia is another regional priority for the EU in its science diplomacy efforts. The European Commission and the Japanese Science and Technology Agency (JST) organized the third EU-Japan Joint S&T Committee meeting in May 2015 to develop co-funding mechanisms to increase cooperation between both polities, especially in innovation projects under Horizon 2020 that

combines universities, research institutes, SMEs, and other companies. The EU has also promoted the Chinese Co-funding Mechanism (CFM) in Shanghai and presented Horizon 2020 at Shanghai Jiao Tong University, sparking interest and dialogues with over 60 researchers, faculty members, and heads of department in one of the leading innovation universities in China. Local government officials were present in addition to European member states and industrial representatives. Co-funding mechanisms in Asia are also an important component of European Science Diplomacy's strategy to fight climate change and improve the environment. The EU delegation to China, the Chinese Ministry for Environmental Protection, and the Chinese Research Academy for the Environmental Sciences (CRAES) organized a workshop called the "China-EU Workshop on Water and Air—Challenges and Opportunities" on 14–15 March 2016, in order to foster a bilateral dialogue between policymakers, scientists, and additional stakeholders on their approaches and strategies. Research, legislative frameworks, implementation, monitoring, cleansing, enforcement, and harmonization strategies were discussed, and further cooperation was envisaged.

The EU has been keen on using science diplomacy with its eastern neighbour given its delicate relations with Russia. The EU delegation in Russia and the then French Minister for the Economy, Industry and Digital Affairs (Emmanuel Macron) launched French Tech Hub Moscow on 25 January 2016, in the presence of entrepreneurs and companies from both countries. Established in New York and Tokyo, the French Tech initiative was developed to increase the attractiveness of France for talent and investments for knowledge-driven SMEs. Another initiative between Russia and the EU was the Helmholtz Winter Dialogues organized by Germany on 9 February 2016 in Moscow to allow German and Russian scientists to explore additional cooperation opportunities between both countries in the field of research and development.

March 10, 2016, was an important date for science diplomacy on the African continent because it was the anniversary of Bourguignon's first visit as President of the ERC to promote African research at the Next Einstein Forum. In his speech he stressed the EU's desire to develop mobility schemes between African and European researchers, academics, scientists, and policymakers in light of the "three O's" principle of the European Commission's science diplomacy strategy. To this end, the *Open to the World* "third O" has pushed the ERC to increase its diplomatic efforts to provide grants for nationals of third countries to conduct research in the EU or associated countries. Over 6400 research projects led by 66 nationalities have been funded thanks to the ERC's efforts. In addition, around 17% of the ERC's team members are non-European students, technicians, and researchers working for this body on short-term and medium-term initiatives. This allows the EU to benefit from talent abroad while developing human capital that will eventually return to third countries, thus creating a scenario whereby everybody gains from brain circulation (The European Commission 2016a, b). In addition, approximately €240 million has been spent by the Juncker's Commission on emergency research for Ebola. Thirteen projects were launched as a result of these funds, leading to one of the most viable Ebola vaccines currently available. Both the European scientific community and

civil society have also been involved in sociocultural issues such as coping with the stigmatization of Ebola victims, especially orphans. Making it clear that international collaboration is essential in dealing with new and re-emerging diseases, Commissioner Moedas called for the Commission to develop a Global Research Collaboration for Infectious Disease Preparedness (GloPID-R) founded in 2013 (Moedas 2016). GloPID-R is the only alliance of its kind to bring together research funding organizations on a global scale to facilitate an effective and rapid research of a significant outbreak of a new or re-emerging infectious disease with epidemic and pandemic potential.[4]

Nowadays, the European Commission is coordinating a common EU's response to the COVID-19 outbreak. It is taking action to reinforce the public health sectors and mitigate the socio-economic impact in the EU. The European Commission is mobilizing all means at its disposal to help member states coordinate their national responses and is providing objective information about the spread of the virus and effective efforts to contain it. The European Commission's President von der Leyen has established a COVID-19 response team at political level to coordinate the response to the pandemic.[5]

More information on the COVID-19 outbreak, current actions, and related funding opportunities could be found on the European Research Area (ERA) corona platform.[6]

[4] https://www.glopid-r.org/.

[5] https://ec.europa.eu/info/live-work-travel-eu/health/coronavirus-response_en.

[6] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/sc1-hco-15-2019.

Chapter 5
Evidence-Informed Policymaking



This report, by its very length, defends itself against the risk of being read.

Winston Churchill

If you have an important point to make, don't try to be subtle or clever. Use a pile driver. Hit the point once. Then come back and hit it again. Then hit it a third time - a tremendous whack.

Winston Churchill

Introduction

The concept of evidence-based policymaking has been developed from the scientific method applied to medicine, and then extended to several other fields concerning topics where public policy decisions should be advised by rigorously established evidence. This good practice reflects the belief that rigorous and scientific evidence is an essential tool to help bring sustainable information to decision-making process especially in the interest of social actors. It is commonly accepted that "evidence-based/informed"[1] decision-making and public policy development are the hallmarks of good governance and responsible public administration. As it is often remarked, "policy without science is gambling" (Copeland 2015). The aim is to use unbiased reasoning to guide social interventions and spend public funds more effectively. In an era where the truth seems dispensable to some politicians, evidence-informed policymaking champions the importance of getting the facts right. However, the quantitative methods commonly employed in the scientific field (randomized con-

[1] We introduce the evidence-informed term (but evidence-based will continue to be used with a certain logic). SAPEA report (2019:101), "Politicians make evidence-informed decisions, not evidence-based decisions, because the decision will be influenced by his/her political values as well as economic constraints and social acceptability". Politicians often need to be re-elected and this influences decision-making process.

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_5

trolled trials, data gathering, statistical analysis, replication of results, generalization of concepts, causal relationship investigation, construction of statistical models, etc.) and qualitative research methods (designed to investigate behaviour and perception of targeted samples with reference to different topics, i.e. in-depth interview, focus groups, case studies, content analysis) should be implemented by ethics, philosophical reasoning, psychological approaches, and more structured stakeholders' involvement on an issue or a set of issues. "Evidence-based policymaking has two goals: to use what we already know from program evaluation to make policy decisions and to build more knowledge to better inform future decisions" (Urban Institute 2016:2).[2] It can assume many forms: use of research findings to inform new policies or improve the effectiveness of existing programs; support of data collection and analysis for research and management; development of policies that incentivize the use of evidence, etc. One form to improve governmental effectiveness "is evidence to promote improvement through more effective policies and programs—evidence of how well such policies and programs 'work' in different circumstances. Here we are talking about knowledge of how policy interventions achieve change in social systems. Conventionally, we assume that reliable knowledge provides a sound basis for effective action; it is explanatory and theoretical, providing an understanding of how policies work" (Sanderson 2002:3). A more "structured" position is taken by Ruggeri et al. (2020:2) as they propose "standard guidelines to support communicating evidence to policymakers. Such standards benefit scientific progress and policymakers while encouraging wider appreciation for empirical evidence". Nowadays, we have many interdependent factors that have the potential to negatively influence policymaking on a global scale especially in time of crisis (Galluccio 2019; Ruggeri et al. 2020):

1. Profusion of scientific evidence
2. Ambiguity of available data and difficulties of cross-country comparability
3. Abundance of information and misinformation
4. Difficulty on behalf of scientists and experts to fully understand the complexity of political decision-making processes
5. Lack of cooperation and joint attention on behalf of main actors into the process
6. Confusion of roles, sometimes, between scientists and politicians/diplomats
7. Lack of communication between and among main actors
8. Lack of ability, on behalf of the scientists/experts and politicians/diplomats, to forge links with people

On the face of it, maybe the final aim of evidence-informed policymaking could be that of helping to strengthen the cooperative attitude in working relationship between the scientific and political world to enhance, boost, and assess the direct and efficient application of research findings to the society throughout political decision-making processes.

[2] Principles of Evidence-Based Policymaking, evidencecollaborative.org, 2.

Brief History of Evidence-Based Policymaking

Evidence-based policymaking seemed to emerge with a new decisive awareness in late 1990s with the election of Tony Blair's government in the United Kingdom, which aimed to produce better policy outcomes on the basis of scientific evidence in order to "deal with problems that are forward-looking rather than a response to short pressures" (Government of the United Kingdom 1999:15). Indeed, one of the priorities of the new Labour Government was concretely promoting the work of policymakers as this was clearly emphasized in its agenda for modernization: "More new ideas, more willingness to question inherited ways of doing things, better use of evidence and research in policy making and better focus on policies that will deliver long-term goals" (Government of the United Kingdom 1999:16). The slogan adopted was "what matters is what works" and ten What Works Centres targeted on specific sectors were founded to meticulously evaluate policies in their area of expertise. The path followed in the United Kingdom foresighted inclusive, forward-looking, fair, and integrated programs, which aimed at providing "public services of the highest quality", ensuring "that government is responsive to the user" and making "certain that citizens and business will have choice about how and when to access government services" (Government of the United Kingdom 1999:10). Prime Minister Tony Blair's primary concern was committing his government to public service and, to obtain this result, he needed to design policy around shared goals, carefully defining solutions for cross-cutting issues by employing external highly qualified advisors.

At the same time, also the European Commission of the EU was working on that political direction as in the White Paper, released in 2001, it was stated: "Scientific and other experts play an increasingly significant role in preparing and monitoring decisions. From human and animal health to social legislation, the Institutions rely on specialist expertise to anticipate and identify the nature of the problems and uncertainties that the Union faces, to take decisions and to ensure that risks can be explained clearly and simply to the public" (European Commission 2001:18). This political-legislative new direction was mainly motivated (but not only) by the fact that the EU had to renew the community method due to the lack of faith expressed by EU citizens, who did not feel to be actively part of the EU's political decision-making process. The new implemented method started to follow a less top-down approach, complementing the EU's policy tools with a more efficient non-legislative instruments which required a simplified regulatory pathway: up-to-date and online information on the preparation of policy formulation and consent; stronger dialogue with regional and local governments through national and European institutions and associations; establishment of partnership arrangements; and published guidelines on collecting and using expert advice for policy formulation. This final point was crucial in the EU's role in defining risk assessment and risk management by strengthening its system of scientific committees set up in 1997 (European Commission 2001:2).

Evidence-Informed Policymaking in the European Union

The first step in the direction of building a European evidence-based/informed policymaking (today the new construct is evidence informed) was the creation of a coherent and solid European group of scientific diplomats coordinated by the European Council with the scope of harmonizing national actions. This was a great priority because only by putting together member states' national resources and coordinate efforts for an implemented effectiveness of the common action it would have been possible to create long-term strategies in the common interest of the EU's citizens. The primary concern of the EU was then that of implementing different policy tools, such as legislation processes, social dialogue, structural funding, and action programs, to name but a few, in order to open up "policymaking to make it more inclusive and accountable" (European Commission 2001:6). Five principles were established for legislation and policymaking processes: openness, participation, accountability, effectiveness, and coherence. Furthermore, the legislation of the EU were given new tools to be able to react more rapidly to changing market conditions, and to new problems created by globalizations in all the fields, by reducing the long delays associated with the adoption and implementation of the EU's rules. This had to be developed on an effective analysis of the scale and appropriateness of the intervention which often included a solution, as a part of a broader approach, also involving third countries' actors. We understand that the question of involving different actors in the policymaking process is a central objective of the EU's action. In 2008 the Directorate General for Research and Innovation released a document titled *Scientific evidence for policy-making* which underlined the importance of the "dialogue between policy-makers and researchers in order to maximize the policymaking impact of projects in the social science which are funded within the Framework Programmes" (European Commission 2008:7). Project coordinators were encouraged to put the policy usefulness of their research findings to the forefront of their objectives and work programs in order to open up the innovation to a broader non-specialized public with whom a broad dialogue had to be ensured. They had also to include partners from the world of policymaking to ensure that the chosen subject, as well as the scope of the research, would have responded to the areas of interest. The task of broadening the research findings in enhancing their application was also a task of the DG Research and Innovation itself. It needed to strengthen its strategic cooperation across the European Commission by developing a targeted communication in those areas that had major economic, social, and scientific relevance to the EU ensuring that the news about project outcomes would have arrived to the European Commission President's advisors. In order to overcome the communication barriers existing in both areas, it was deemed of main importance the enhancement "within Member States' administrations of 'strategic intelligence units' development acting as interface for communicating, cooperating, and debating with the scientific community" (European Commission 2008:12). Indeed, the complexity of the policymaking environment required interdisciplinary approaches which had to be integrated from a different range of areas: social,

economic, scientific, political, and diplomatic. On the international level, this strategic focus was already introduced in 2001, looking beyond the European borders in order to contribute to the debate on global governance. The principles of good governance and good international relationships were set up as key points to boost the cohesion, coherence, and coordination (3 Cs) for the effectiveness and enforcement of international institutions as the European Commission set a series of scopes for its mandate (European Commission 2001:3–4):

- Improve the dialogue with third countries' governmental and non-governmental actors when developing policy proposals with an international dimension
- Propose a review of the EU's international representation to allow it to speak more often with a single voice
- Reinforce attempts to ensure policy coherence and identify long-term objectives
- Bring forward to the next Intergovernmental Conference proposals to refocus the Commission's executive responsibility

The Relation Between the Scientist and the Diplomat: Recommendations

The document adopted by the European Commission, DG Research in 2008, was developed starting from the analysis of the material provided by interviews to policymakers, senior policy advisors, and knowledge transfer specialists who identified three groups of obstacles (experienced in relation to scientists vs. policymakers) (European Commission 2008:13–14).

- *Contextual*: As it has been already highlighted, the diplomat and the scientist are two very different figures who work in two very different disciplines and environments, and they use "two different languages" to describe their experiences and needs. The challenge for researchers is understanding the constraints of policymaking and translating their research finding into useful and applicable material for policymaking.
- *Structural*: The working environment and the methodologies implied are different. The scientist, generally, achieves results which usually have no immediate impact on everyday society, whereas the politician/diplomat requires to think not only on the long term, but also on the short and middle terms, in order to efficiently and immediately respond to the rapidly evolving political and societal challenges. Moreover, policymakers have to interact with a wide range of figures to develop solutions based on consensus model, while the scientist interacts in peer-to-peer relationships.
- *Cultural*: At the very end, the relationship between scientists/researchers and diplomats/policymakers is also built on the national tradition of encouraging (or not) this communicative bridge between the two very different worlds.

The path followed to enhance the connection between these two worlds implies not only a *full mutual respect* and a *better communication* from the researchers to the policymakers, but also a wider importance to be given by the policymaking decision-making process to the research findings. For example, the "European Commission should facilitate more interactive small-scale events and policy-learning type meetings that involve a number of policy-makers. ERA-NET type activities should be continued as they provide a useful learning experience for policymakers" (European Commission 2008:17). In order to assure and strengthen this connection, the DG Research stated its willingness to use scientific evidence both in the definition of the policies (*ex ante*) and in the policy choice evaluation (*ex post*) to ensure transparency at every single stage of the policymaking process. According to the abovementioned European Commission's paper released in 2008, the most appropriate intermediary bodies are scientific academies, research councils, scientific and technological bodies, foundations, and national parliaments which spread the European voice within national borders. Nowadays, the European bodies concretely working in this direction are the *Joint Research Centre* (JRC) running within the European Commission, the *European Research Centre* (ERC) established in 2007, and the *Scientific Advisory Mechanism* (SAM) established in 2015.

Evidence-Informed Policymaking in Action

Evidence-informed policymaking may be the gold standard for crafting policy—the question is how that gold standard copes with messy reality. Obviously, in policymaking decisions are influenced by a wide variety of factors (including ministers' values, principles, experience, and expert and political judgements). This means that even in individual policy areas the evidence-informed policymaking must be both broad enough to develop a wide range of policy options and detailed enough for those options to stand up to intense scrutiny. It is commonly argued, however, that evidence-informed policymaking process gives too many times too much power to scientists/researchers and to diplomats/policymakers who know little about the concrete sector and leaves stakeholders out of the decision-making process. The first step towards an efficient evidence-informed policymaking is highlighting problems and needs that really require public policy intervention in setting reliable policy options, instead of dissipating energy and money on useless legislative (and non-legislative) projects: "a better understanding of the specific nature and incidence of social problems is fundamental to improving the effectiveness of policy responses" (Sanderson 2002:4). It seems there is a strong necessity of strengthening evaluation processes to provide up-to-date and relevant information for actual performances. This could be done by building the capacity of taking action to modify policy designs, and effectively implementing processes on the light of such fundamental evaluation processes. Pilot projects are frequently launched. The first problem concerns the time needed for the effects of the new policies to be manifested and to become evaluated, in isolating factors such as social rather than economic

factors. It may take considerable time for pilot projects to become fully established as far to represent the conditions under which a policy would be fully implemented. Moreover, when policy initiatives arise from political commitments, policymakers are understandably impatient to receive results that will provide support for present and further implementations. However, "such a political interest potentially conflicts with the interests of evaluation research, the interests of which are served by long-term, in-depth analysis of the effects of pilots" (Sanderson 2002:11). The second problem arises from the difficulty to isolate the effects of pilot programs from exogenous changes and effects derived from other initiatives that may also influence the same set of problems as that addressed by the pilot program. This may lead to a significant problem: the size of the impact may not be substantial and therefore it may be difficult to measure the provided data. "Thus, we need to recognize that policies are essentially 'conjectures' based upon the best available evidence" (Sanderson 2002:19). At the end of the day, evaluation processes are necessary to assess and understand how policies have been carried out and implemented in the social and economic field, how they have worked, and which kind of lessons could be learned to enhance further improvements.

Standardization vs. Experience-Based Approach

The question that arises now is how evidence-informed policymaking can rely on standard patterns while handling the reality which often presents emergencies that cannot be forecasted. Of course, it is impossible to trait every situation as an emergency. Standard procedural strategies, on which we all depend upon, just help us to reach "everyday" goals. Ruggeri et al. (2020) proposed a standard procedure for evaluating evidence in policy contexts as they developed the Theoretical, Empirical, Applicable, and Replicable Impact rating system (THEARI). They referred to the "evidence as scientifically produced insights or conclusions reported through peer-review or other recognized specialist dissemination channels, though there are certainly other forms" (Ruggeri et al. 2020:4). THEARI could be applied to "visible ratings of a study for compilation of inputs in policy decisions". There is no rating for opinions, commentaries, or editorials. It seems that *unreliable* insights and biases will be overcome: "the ultimate benefit we envision is setting a common framework as a starting point for utilizing evidence in policy discussions, overcoming biases and the effects of inconsistent definitions or unreliable insights" (Ruggeri et al. 2020:9). While we are waiting to better understand the meaning and framing of "common framework" and "standards" in practical terms, we think this is an interesting paper: a common currency for evaluating papers from different domains in terms of their suitability for public policy seems like a necessary, if not sufficient, step.

However, we can become vulnerable if we hold too rigid mindsets because they can impede us to adjust to changing conditions. In this case we are supposed to bring to the fore the "experience" and relate on it. We have to implement it in our

decision-making processes because "we need both mental gears": one for using the standard procedures and the other for improvising when situations became unsettled (Klein 2009:5). This means that the statistical analysis that seems so impressive under stable conditions often turns out to be insensitive to surprises. Nowadays, instead it seems that we like to transform skills into procedures to be applied to different contexts, because following checklists or frameworks (or evidence-informed policies at large) is simpler and clearer, as it avoids the problems that could occur due to lack of experience, expertise, or attention. In the political/diplomatic context, evidence-informed strategies seem to be "neglecting" too much heuristics, intuition, and expertise without appreciating their strengths. However, this pathway could be overcome as soon as people become more proficient. A researcher, politician, or diplomat develops the ability to detect "by intuition" (tacit knowledge) of unexpected problems that procedures and rules cannot forecast due to their bond to working schemes. Procedures, including checklists, are tools. Every tool has limitations because they cannot cover and predict the entire spectrum of possibilities that might arise. People will have to use their own judgment and expertise to overcome unexpected events. Moreover, working schemes and demands keep evolving faster and faster while certain frameworks, standards, and procedures become obsolete and, thus, even counterproductive. Relying rigidly on procedures, rules, checklists, and fixed schemes could provoke the erosion of the expertise instead of its improvement (Klein et al. 2016). This does not mean that standardization and procedures have to be banned from evidence-informed processes, but this means that only by appreciating their limitations we will be able to make better use of them. They are a useful tool to reduce uncertainty and workload and make it easier to attend critical aspects of the task without losing focus on it, to safeguard against interruptions, and to coordinate teamwork by imposing consistency. Procedures could be the best ally during normal worktime if they are used with criteria and implemented by knowledge and expertise. An important role in decision-making process is played by tacit knowledge. Indeed, although we tend to rely more on standardized procedures, what really makes the difference in our work is *what we know* and *how we use it* to bear difficult and unexpected situations. The COVID-19 crisis has showed this mercilessly! The concept of "tacit knowledge", here emphasized together with intuition, describes the basis for our skill acquisition and the self-reflection on our inner experience in different fields. It lays under the surface of our consciousness, hidden behind the facade of our lives, but it is critical for the way we design and use procedures in complex situations. It includes major abilities such as acquiring perceptual skills (with experience we learn to see things that others do not notice); developing mental models; learning pattern matching (every expert has built up a repertoire of patterns to quickly understand and give fast responses); judging typicality and anomality; and generating workarounds (Klein et al. 2016). Another crucial point at stake is the relation between statistical analysis and intuitive expertise. Numerous researchers claim in their papers and textbooks that for any important judgment (on long time) we should call in the statistical analysis, meta-analysis, and frameworks, instead of relying on the intuition of experts. However, it is more correct to state that maybe we need both analysis and statistics. Indeed, before producing an analytical

response on a prediction, people should *collect* and *combine* data from a changing context, two operations that require expertise and a little bit of intuition. The role of the context is also pregnant in people's decisions because it helps them in taking fast and functional choices without overthinking. The only solution to this harsh relation is *blending* systematic analysis and intuition. Intuition includes tacit knowledge: our ability to recognize patterns stored in memory (Klein 2009). It is not very necessary to underline that the ultimate decision that we take is the result of a selection among several options that have been compared. However, when the solutions are very similar to one another, the choice becomes harder and people must relate on their own intuition, experience, and expertise. Klein et al. (2016) described this strategy as "Recognition-Primed Decision (RDP) model" which combines intuition with analysis. The pattern matching is the intuitive part, and the mental simulation is the deliberate analysis. For policymakers, on the other hand, there are no "too close" solutions, because they "are likely to look for more options, or shift from decision making to problem solving, trying to find ways to make some options work better" (Klein 2009:95). Scientists and advisors should be able to manage the tension present in policymakers (and in themselves as well) between a held belief and world views at large and the adaptation process of those beliefs and views to dissonant evidence (Galluccio 2011; Tetlock 2005).

Evidence-Informed Policymaking: Leading from the Shadow

One of the most ambiguous themes is whether or not policymakers should receive evidence-based/informed advices on everything they are going to decide. Moreover, who should be in charge (and dare) of giving those kinds of advices to them under conditions of uncertainty and stress? Beyond the sustainability of political decisions, it is important to consider that the communication channel between science and politics could be impaired by basic misunderstanding and cognitive biases. The way HOW advices are communicated is of fundamental importance. Just try to make it simple; first of all, any proposal addressed to policymakers (be it a draft from scratch, a legislative amendment of an existing text, etc.) must be based on reliable evidence-informed policymaking. This requirement is indispensable for science credibility. Each thesis must be supported by solid basis, whether studies, research, data, and scientific evidence must be irrefutable. It must be borne in mind that a politician, should he or she decide to adopt a certain position, will make it his or her own in all respects and, as it is normal, this will involve his or her public exposure to judgments and criticisms. Therefore, it is absolutely necessary that the thesis be "attack-free from political counterparts" who, in turn, could have consulted other scientists. Another element closely related to scientific credibility is represented by the necessary independence of scientists from private subjects, bodies, companies, etc. The more independent the scientist, the greater his or her credibility will be in the eyes not only of the individual politician but also of the community at large. Further element to keep in mind is that scientific data by their

intrinsic nature are complex and technically difficult to understand for non-experts, as they are often supported by a series of extensive documents that are not always easy to read for those who do not have a technical-scientific background. As often happens, policymakers do not have enough time to read through evidence-based studies. Therefore, in order to facilitate interpersonal negotiations between the two spheres it may be important to adopt some communication cues, both in oral and written forms to simplify the understanding of scientific evidence-informed policies without distorting their contents. Oral language is one of the primary vehicles to help to get to the heart of policymakers and in order to be effective, it must be simple, clear, and concise without frills and should go straight to the point. In this sense, it is advisable to adopt a simplified technical register that avoids acronyms, technicalities, or references to cases that non-experts are unfamiliar with. Rather, it is preferable to personalize as much as possible the arising data, bringing to the fore concrete cases and examples that can be traced back to everyday life. In this way the policymaker can identify himself or herself with the thesis that has been proposed and with the problem to be solved. In this process of linguistic simplification, it is advisable to have a hand copy of the substantial and necessary scientific evidence (which is, and will always be, the linchpin of each meeting) and to complete the file with a very short summary of the file with a clear guidance (summary, main message, recommendations, and defensive points). Finally, it is important to be aware that the communication channel could be flooded by "dysfunctional" behaviours of either party. An attitude of arrogance and superiority assumed by either party could generate friction in the communication process and provoke an interpersonal negotiation rupture. For example, an expert denigrates just with a non-verbal communication or a lack of technical knowledge on behalf of a policymaker, or an expert is surprised a policymaker asked trivial questions (instead of blindly appreciating the superiority of scientific knowledge). This could bring a distinct risk of losing sight of the other side and the overall working relationship. It is important to keep in mind that nothing is really impossible to explain. It is necessary just to simplify, but the advice must always be scientifically exact. Policymakers, on their part, have a moral duty to listen to all sides involved in the legislative process, as well as to investigate the many facets of a problem and study the topic in depth (in crisis situations it gets a lot more complicated as time constraints do not allow this process to unveil this way). As already mentioned, it may be useful to have the support of specific technical-scientific committees composed by selected independent experts with a specific *cursus honorum*, who can be assembled into small and functional teams.

Chapter 6
Climate Change and Extreme Hazards



The chessboard is the world, the pieces are the phenomena of the universe, the rules of the game are what we call the laws of Nature. The player on the other side is hidden from us.

Thomas Huxley

Introduction

There is a growing popularity of data-driven best practices in various fields—such as climate change, biodiversity, and pollution; ensuring nutritious, healthy, and sustainable food; and societal transformations due to the rise of artificial intelligence and other next-generation digital technologies (European Commission 2019b). A best practice is a technique or methodology that is generally accepted as superior to any alternative because, through experience and research, it has proven to be reliable leading to a desired result through evidence-based approach. Despite the fact that data and research are very important, it is simplistic to conclude that they are sufficient to improve practice. Expertise and intuition, as claimed in the previous chapter, are fundamental to reach the best solution to the problem. This is the reason why we give space to explain in the next paragraph why evidence-based and experience are so important in medicine. As a matter of fact, evidence-informed for policymaking has been borrowed from medicine and we hope it can still be borrowed from medicine, but with a more mature awareness to move faster from theory to practice on the ground.

Evidence-Based Medicine and Clinical Practice

"The Evidence-based approach to clinical practice is to identify a treatment of interest; conduct carefully controlled studies, ideally using a double-blind paradigm; determine the effectiveness of the treatment; and disseminate the results in the form

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_6

of best practices in the form of rules, such as 'If X, that do Y'" (Klein et al. 2016:244). For physicians working in a complex, dynamic environment with high time pressure, uncertainty, and risk, evidence-based medicine (EBM) may appear as a salvation. However, Klein and his colleagues (2016) identified six cognitive challenges for clinicians, who want to apply EBM in their daily practice:

1. *Characterizing problems*: Applying without criteria the EBM may lead to an inadequate detection and identification of the problem. Not paying attention to the variability offered by certain condition categories and to the nature of other interacting problems, conditions and treatments may result in an undervaluation of the diagnostic expertise of the physician that is an essential trait of the healthcare system. The best practices implied by physicians in their work rely on categorizations to organize knowledge, but these are limited when a practitioner is confronted with reality (variety, time course, treatments, interactions across various diseases).
2. *Gauging confidence in the evidence*: "too often the choice of treatment depends on judging the quality and relevance of the evidence, judgments that often depend on experience and are made under uncertainty and time pressure" (Klein et al. 2016:245). Evidence can also be misleading: the moment of data collection may have been influenced by variables that were not understood or not "correctly treated". Researchers may be unaware of the variables that may interact with the results and, thus, the medical community must be ready to discuss and revise its solid faith in evidence.
3. *Best practice in conflict with expertise*: The medical community is thought to develop over years expertise and acquire pattern-based repertoires to judge the ongoing situation. Occasionally, this may cause a conflict between best practice and professional judgment because a fail due to the misleading of a best practice causes a greater stir. Rather a good outcome could be produced by taking a personal decision based on judgment instead of blindly following a procedure.
4. *Applying simple rules to complex situations*: It goes without saying that complex situations contain variables that cannot be predicted by simple set of rules. "Rules and evidence are about populations, but physicians have to treat individual patients" (Klein et al. 2016:247). The variables, that the single patient present, interact and vary over time as the patient's status changes and the physician has to take all the conditions into account (comorbidities, low blood pressure, diabetes, asthma, etc.), performing trade-offs that also reflect the characteristics and the lifestyle of the single patient.
5. *Revising treatment plans that do not seem to be working*: As the patient status changes over time, developing additional symptoms or problems, the treatment should be changed consequently. "Plan revisions places great demands on expertise in understanding the treatment regimen and the individual patient so that revisions can be made quickly and effectively" (Klein et al. 2016:248). This also requires that the physician should have the ability to understand when the plan is not working, when more time has to be given in order to give it a chance to

work, or when the plan has to be changed before the patient's conditions are worsened.

6. *Considering remedies that are not best practices*: For example, the medical community should be ready to apply also the results produced by the metadata of certain unsuccessful studies as these data reflect a particular subpopulation to which the patient belongs with whom they are currently working. "Although one would like to make decisions based only on the most rigorous evidence, in the real world, there are always constraints from limited resources and time pressure" (Klein et al. 2016:249). A related challenge is the primary role played by practitioners themselves, who contribute to the progress of medicine by being enough brave to test new solutions in extreme situations without initial randomized control trials.

The current list of six challenges underlines that expertise cannot be expressed in the form of strict, acritical set of rules, but it has to be supported by rules to properly function. "Evidence … does not speak for itself. It has to be interpreted, revised, and tailored to specify context and conditions, all of which takes expertise" (Klein et al. 2016:250). EBM works smoothly when the evidence is clear and directly applicable to the patient, but in challenging situations, the practitioner has to rely on his or her own judgment and expertise in order to solve the problem. In order to help physicians/clinicians with their struggle between best practices and expertise, the cognitive engineering community developed methods to nurture decision-making processes to improve patient care without falling in the trap of blindly applying best practices. It focuses on layering best practices with experiential knowledge of different situations to handle and resolve different kind of problems regardless of variability, uncertainty, and change. The cognitive engineering research suggests eight directions for strengthening best practice strategies (Klein et al. 2016):

1. Develop and sustain expertise.
2. Support adaptation.
3. Combine evidence with experience.
4. Balance generic evidence with experiential evidence.
5. Represent evidence.
6. Appraise evidence.
7. Share evidence.
8. Support collaborative decision-making.

Best practices are an important opportunity for any community, category, disciplines, organization, etc., because they enable actors to behave in consistent and coherent ways. They also provide evaluation, discussion, and advancement. However, best practice approaches may oversimplify the cognitive, emotional, and motivational challenges when confronting specific complex situations under uncertainty and ambiguity (Galluccio 2011, 2019; Klein et al. 2016).

Climate Change and Hydrometeorological Extreme Hazards

The challenges posed by climate change are enormous. The increasing frequency of climate extremes has many consequences. One area where these conditions manifest themselves is hydrometeorological hazards (Galluccio 2019). Climate change is one of the main priorities of the EU's global agenda. The repercussions raise geopolitical questions, and have implications for livelihood and development. Climate change requires a strategic coordinated *One Heath* concept's response from international and national bodies to ensure heath security, sustainable development, territorial integrity, and access to resources (water, food, energy to name but a few). Scientists and policymakers around the world are in agreement to state that climate change is acting as a multiplier and even as a main trigger for threats to international peace and security. Climate change has been identified as the "ultimate threat multiplier" by the G7 held in 2011[1] and seven compound climate-fragility risks have been identified:

1. Local resource competition
2. Livelihood insecurity and migration
3. Extreme weather events and disasters
4. Volatile food prices and provision
5. Transboundary water management
6. Sea-level rise and coastal degradation
7. Unintended effects of climate policies

The only efficient way to manage this multilevel threat is integrating policies and programs to help strengthen resilience to climate-fragility risks and realize significant benefits for the world population. The international agenda should implement cooperation at international level through the science diplomacy pattern. The European Environment Agency underlines that human health and well-being are intimately linked to environmental quality and, thus, environmental policies are strongly required to improve the state of public health and well-being (European Environment Agency 2014). After having renewed its votes with the signature of the Paris Agreement in 2015, the EU is struggling to accomplish its aim of drastically reducing its carbon emissions. The Sustainable Development Goals (SDGs) aim at limiting the global temperature increase by 1.5 °C above pre-industrial levels by integrating effective responses to climate security risks across policy areas: climate action, resilience building, preventive diplomacy, improved risk assessment, and risk preparedness. The European Council of the EU, moreover, recognizes "the commitment of the EU to cooperate and to exchange experiences and lessons learnt with its partners in accelerating effective policy implementation, including through initiatives such as the NDC[2] partnership, while stressing the EU's engagement to

[1] For further information, refer to: https://www.newclimateforpeace.org/#report-top.

[2] Nations have their commitments to the Paris Agreement through Nationally Determined Contributions (or NDCs)—each country's strategy to cut its own greenhouse gas emissions and

deliver its pre-2020 climate change commitments" (EU Council 2018:4). In the same document it is stated that the EU is continuing to scale up the mobilization of international climate finance "as part of the collective developed countries' goal to jointly mobilize USD 100 billion per year by 2020 through to 2025 for mitigation and adaptation purposes, from a wide variety of sources, instruments and channels in order to assist developing countries in implementing their climate change adaptation and mitigation plans" (EU Council 2018:5). Moreover, the Council highlighted the critical role of non-state actors as recognized by the Paris Agreement through the Global Climate Action Agenda and by the 2030 Agenda for Sustainable Development.

Negotiating Global Agreements with Incomplete Evidence-Informed Policies

Oceans represent a great challenge for coping with hydrometeorological hazards and ecological issues. Not only are they important due to economic and population considerations, but they also absorb and recycle most human waste products. Industrial quantities of nitrogen and phosphorus waste produced by agricultural fertilizers and human and animal excrement exceed most of the absorbing ability of ocean ecosystems. In addition, oceans regulate the distribution of heat and moisture through ocean circulation, and most of the rain seen in human fields and settlements stems from the moisture and evaporation of oceans. This makes humans inherently dependent on the ecosystems and distribution patterns of the world's oceans, especially when it comes to rainfall and access to freshwater, which is negatively affected by climate change. Acidification due to CO_2 emissions has also contributed to difficulties of skeleton growth and reproductive disorders in marine animals and some fish. This all leads to the deterioration and fragility of ocean ecosystem resilience. Richard Smith states in his book *Negotiating Environment and Science*, "agreements dealing with global environmental issues often must be concluded on the basis of incomplete and uncertain information to avoid waiting until environmental damage becomes irreversible" (Smith 2009:150). This condition of course claims for a higher effort from negotiators, who need to be convinced "that the commitments being undertaken are based on sound science as it is understood at the time of negotiation, while recognizing that in most instances the relevant scientific knowledge is still evolving" (Smith 2009:150). Moreover, in this context major scientific ventures were recognized to receive higher benefit from a cooperative international approach which should include as many countries as possible. Smith (2009, 2015) recollects his almost 10-year experience as the principal deputy assistant secretary in the State Department Bureau of Oceans and International Environmental and

build resilience against the negative effects of a changing climate. https://ndcpartnership.org/about-us.

Scientific Affairs (OES) of the United States through the analysis of eight successful negotiations. The aim of the author is to show the potential of diplomacy as a profitable tool for dealing with specific environmental issues, such as the deterioration of the ozone layer that could be solved only by a coordinated action by all the major developed and developing countries (Montreal Protocol (1987, in Smith 2015)) or the control of the sulphur and nitrogen dioxide-driven acid rains between Canada and the United States (Air Quality Agreement (1991, in Smith 2015)), or with broader scientific matters, such as the global scientific improvements driven by the basic scientific research (US-URSS Science Agreement (1988, in Smith 2015)), which was also a signal of the more relaxed relations between the two opposing blocks. A negotiator of environmental issues has to bear in mind also the substantial role played by stakeholders, who, under certain circumstances, should be included in the discussion of the issues. The negotiator should—at least—listen carefully to the people at the very end affected by the negotiation, to their representatives, and to the related non-governmental organizations (NGOs) in order to put all the interested parties on the same path leading to the success of the agreement. The agreement should be implemented on certain yearly basis because due to the continuous changes occurring in the environment, there should be constant modifications after the implementation of certain regulations. Such agreements must not only make sense in the light of the existing state of scientific knowledge but also include a process for the regulation. Moreover, in order to reach a successful agreement, during the negotiation with foreign partners, it is necessary to involve all of them in the idea that they are working all together to deal with an issue that concerns them all (Smith 2009:149). The chance to achieve this result will increase if negotiators are able to organize informal work meetings instead of overusing plenary sessions, where counterproductive restatements of entering positions are encouraged. Smith (2009:156–157) leaves us a legacy of a man that knows what he is talking about (he negotiated with diplomats, politicians, and scientists) with a gentle but assertive behaviour, with the hope that if we cooperate all together we will be able to face these challenges step by step in a sustainable way:

> *The world will be facing some serious environment and science challenges in the years ahead. In addition to global warming, developments in such fields as nanotechnology and biotechnology will pose new problems. More will need to be done to limit emissions of individual pollutants, such as ground-level ozone and particulates. Desertification and the loss of tropical forests, biodiversity, and coral reefs will remain on the agenda. A continuing and alarming collapse of fisheries around the world will have to be addressed. Further, we will need to find ways to continue moving forward with cooperation on major science projects, such as space research, the development of fusion power, and advanced supercolliders. Moreover, we can be sure that other environment and science issues not now environment and science issues not now envisioned will arise. In many cases, the challenges to be faced will require a coordinated multilateral response. On the basis of what has been accomplished, there are some grounds for optimism that those challenges can be met* (Smith 2009:156–157).

Climate Change: Citizens' Resilience and Well-Being

Many of the consequences of hydrometeorological hazards are psychosocial, especially when it comes to human well-being. Tying the individual and social responses to hydrometeorological hazards from a psychological standpoint is important to measure the potential loss of emotional, cognitive, and motivational well-being in the case of environmental disaster. Given the stress potential generated by these hazards, a cooperation between scientists and policymakers is deemed of vital importance to produce evidence-informed studies and research on how to assess and deal with vulnerability and resilience to help a population's ability to cope with hazards (Galluccio 2019). Resilience is essential to minimize vulnerability in a world increasingly affected by hydrometeorological hazards. Developing resilience in communities is tied to ecological, psychological, and social concerns that must result in solid natural, mental, and social capital, and collective efficacy. Communities and individuals react differently to these events in relation to their frequency and intensity. In addition, factors of emotional styles such as personal outlook, resilience, social intuition, self-awareness sensitivity to context, attention, and location, class, gender, ethnicity, and age also determine an individual or community's degree of vulnerability to the stress in these risk situations. Key policymakers are increasingly seeing mental health as an important component of the psychological resilience in the face of extreme hazards, as scientists have been persuading them with strong evidence-informed policymaking. International actors and the EU are beginning to tie mental health to physical health, education, regeneration, crime reduction, community cohesion, sustainable development, employment, culture, and sports. As a matter of fact, cultural and social narratives heavily influence the impact of hydrometeorological hazards on stress and well-being. Trauma is intergenerational. In contemporary societies media narratives and information technologies facilitate sensationalism and negative reactions even in resilient communities physically unaffected by hazards (we witnessed same negative effects during the COVID-19 crisis). In the latter case, social media can produce instant and vivid images from disaster areas and lead to feelings of anxiety and fear. Climate extremes have a strong psychological impact in direct and indirect ways. Directly, extremes can cause mental and physical health injuries due to the intensity of hydrometeorological hazards. Indirectly, cognitive responses such as anxiety towards future risks and world phenomena, as well as hopeless mental states, could bring depression and post-traumatic stress disorder (PTSD) which can be just as devastating for the human mental capital and well-being (Doherty and Clayton 2011; Galluccio 2019). Resilience is also a prime concern for many of the EU's regions given the high likelihood of hydrometeorological hazards. Both financial and non-financial costs such as loss of life and well-being are at the centre of these concerns. Over the last few decades, the EU has faced an increasing number of economic, geopolitical, social, and climate challenges, forcing member states to find common solutions. At a European level, working groups exist for the most relevant hydrometeorological risks such as floods, droughts, and adaptation. True to the principle of subsidiarity, the Commission's activities place member states as the primary and

initial responders in the event of a crisis or disaster. The EU scientists and politicians/diplomats have heavily influenced international initiatives in Disaster Risk Reduction (DRR) such as the Hyogo and Sendai Frameworks. Given its importance in Europe 2020 objectives, the EU has incorporated resilience into 16 different policy areas. These include frameworks for civil protection and disaster risk due to hydrometeorological hazards, food security and humanitarian issues, and structural reforms that will guarantee financial and economic stability in the event of a crisis. The EU has also established projects to combine responses to pandemics and endemics within and outside its borders. Despite efforts, there is a widespread view that investment and policymaking are currently insufficient to cope with resilience and vulnerability challenges. New comprehensive approaches should have even larger multilayer approaches, further combining psychological, social, economic, and environmental concerns with scientific findings. The Commission's Joint Research Centre (JRC) has been working hard to ensure that scientific data and evidence are available for resilience policymaking. It is developing pilot programs for risk reduction, analysis, scenario building, and impact assessment for the EU to be better prepared for future events using a multidisciplinary approach, as systemic risks tend to need. Regional vulnerability in the EU is understood as a territory's exposure sensitivity and response capacity to events related to climate extremes and natural hazards. To put it more clearly, this implies detecting degrees of exposure by calculating:

1. *Sensitivity*: the economic, social, and ecological potential damage calculated by regional GDP per capita financial damage potential, how many people can be affected by events, and the extent of exposed environmental assets
2. *Response capacity*: the ability to react and mitigate
3. *Exposure*: calculated by the degree, duration, and/or extent to which the system is in contact with, or subject to, a disturbance such as climate change
4. *Susceptibility*: the extent to which a system is affected by events

Throughout this brief analysis we have focused our attention on the importance of resilience and vulnerability issues from ecological, social, and psychological perspectives as they pertain to hydrometeorological hazards. It is clear from international, national, and regional actors that disaster preparedness and response coordination must be handled by scientists and politicians/diplomats together working elbow to elbow focusing on strengthening local communities both in Europe and abroad. Developing resilience in local communities means assessing their mental and social capital, and collective efficacy in the creation of networks and cultural narratives on hydrometeorological hazards and extremes. The strengthening of collective leadership during the prevention, response, and post-crisis phase of hazards could be extremely important. Natural disasters represent potential traumatic events; not only do hydrometeorological hazards threaten the global economy and societies at large, but they can also heighten stress levels compromising populations' well-being. Moreover, strengthening platforms for psychologists, anthropologists, sociologists, meteorologists, ecologists, and other resilience stakeholders in hydrometeorological hazards could be a great action to develop a people-centred prevention, response, and disaster risk reduction.

Chapter 7
Evidence-Informed Policymaking: The Way Forward



The only thing that will redeem mankind is cooperation.

Bertrand Russell

The consortium S4D4C (Using Science for/in diplomacy for addressing global challenges) organized the First Global Meeting on Science Diplomacy titled "EU Science Diplomacy Beyond 2020" in Madrid in December 2019. As a result of this meeting, the *Madrid Declaration on Science Diplomacy*[1] was signed by a group of high-level experts who contributed to the conference. The Madrid declaration states a common vision of science diplomacy, highlights the added value that science diplomacy can bring to fostering international relations in addressing global challenges, and shapes good principles to foster science diplomacy worldwide. Science and technology are dimensions to be taken into account in foreign policy and international relationships at different political levels. The Global Policy Perspective Report on Science Diplomacy states (Riordan and Torres Jarrín 2020:10): "The essence of science diplomacy is not that scientists should act as diplomats or replace diplomats. Rather it is that science is becoming increasingly central to international relations and foreign policy… In its fundament we can see science diplomacy operating in two related ways. Scientists providing the expert information that diplomats need to enable them to engage effectively with scientific agendas at an international level, and diplomats applying the skills and mindsets of diplomacy to the international problems either revealed or generated by science."

From the analysis of the last updated reports and papers published by the European Commission[2] we could infer a way forward for next years to generate

[1] https://www.s4d4c.eu/wp-content/uploads/2019/04/madrid-declaration-1.4.pdf.

[2] https://ec.europa.eu/info/sites/info/files/research_and_innovation/groups/sam/ec_rtd_sam-scientific-advice_092019.pdf; https://ec.europa.eu/research/sam/pdf/topics/masos_consultation_meeting_summary_032019.pdf; https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/understanding-our-political-nature-how-put-knowledge-and-reason-heart-political-decision.

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_7

high-quality scientific advice for the European policy process. In this paragraph we will especially refer to the publication of the European Commission in September 2019 (European Commission 2019b) titled the Scientific Advice to European Policy in a Complex World, prepared by the Group of Chief Scientific Advisors, Directorate-General for Research and Innovation. Another interesting work is the publication by SAPEA,[3] Making Sense of Science, Evidence Review Report (SAPEA 2019). It will be a simple review of these texts as my ideas and constructive critics on actions to take are proposed above and throughout this book.

Nowadays, in the European Commission's words, evidence synthesis takes notably the following forms (European Commission 2019b:31–32):

1. Synthesis offered by the Joint Research Centre in its role as the EC's science and knowledge service, whereby the demand for knowledge is coordinated with EC policy departments (JRC 2018). In addition, through its competence centres, the JRC works with the EC policy clients to develop primary evidence.
2. Evidence review reports commissioned by scientific advisory bodies from public organizations.
3. Evaluations and studies commissioned by the European Commission's policy departments from external contractors.
4. Synthesized outcomes of the EU-funded research projects relevant to the policy.
5. Area in question (Projects for Policy—P4P27).
6. Other available review reports (e.g. World Bank, OECD, the European Parliament).

Unfortunately, we do not have a EU uniformity of practice for scientific advice. Under former President Juncker (2014–2019), the European Commission has committed to putting better regulation principles and scientific evidence at the heart of policymaking. In 2015, the European Commission set up the Group of Chief Scientific Advisors, as well as the Regulatory Scrutiny Board. The idea was to foster the role of scientific evidence and advice as a core value of the EU policymaking, especially nowadays when scientific uncertainty is often manipulated to nurture general distrust of science and to often pursue hidden agendas that ignore evidence. The inner and intrinsic ambiguity of the European Commission's mission on backing evidence-informed policymaking approach is highlighted in practice by the societal issues the EU policies seek to address that are highly complex (European Commission 2019b). The scientific evidence is consequentially equally complex. As scientific advice acts as an intermediary between science and policy (SAPEA 2019:56), we understand how values and emotions strongly influence not only political behaviour but also perceptions of facts and advices' formulation (Aquilar and

[3] SAPEA brings together knowledge and expertise from more than 100 academies and learned societies in over 40 countries across Europe. Funded through the Horizon 2020 program of the EU, the SAPEA consortium comprises Academia Europaea (AE), All European Academies (ALLEA), the European Academies Science Advisory Council (EASAC), the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE), and the Federation of European Academies of Medicine (FEAM).

Galluccio 2008; Galluccio 2011; Galluccio and Safran 2015; Mair et al. 2019). Cooperation and working relationship building between scientists and policymakers are fundamental never-ending human processes, which together with characteristics such as credibility, availability, clarity, relevance, and reliability of research findings (and actors on both sides as well) may facilitate the use of evidence by policymakers (Oliver et al. 2014). However, a very dangerous but real state of the art is represented by the inadequate understanding of how policymaking and politics work on behalf of scientific experts. The situation is made more complicated when, as it happened during the COVID-19 crisis (but not only), some scientists are caught up with the public debate about which policy option could be correct. If scientists cede to the seduction of the politics (or that of communication star system) and assume the attitude of politicians, they "sell their soul to the devil" insofar as devaluing the scientific evidence they claim to present (Boyd 2013; Aquilar and Galluccio 2008). Developing scientific advice on complex policy issues typically requires expertise from different scientific perspectives (SAPEA 2019:124). Insofar, implementation of multi- and interdisciplinary approaches when advising the European Commission is hoped for and very welcome. SAPEA has been financed by the European Commission's program Horizon 2020 to investigate how sustainable science advice could be better provided to the European Commission's policymakers, based on available evidence, under conditions of scientific complexity and uncertainty. According to SAPEA's report, *Making Sense of Science*, research on advisory processes shows that the following 13 points are important to implement (SAPEA 2019):

1. Science advice can help to anticipate future challenges and assist in designing coping strategies or interventions.
2. The focus of science advice must be on a critical review of the available evidence and its implications for policymaking.
3. Scientific advice should not prescribe but inform policies.
4. The purpose and significance of scientific advice depend on the issue and the context.
5. Form and function are vital when designing appropriate policy-science interfaces.
6. Science advice for policymaking involves many legitimate perspectives and insights.
7. Scientists, as well as policymakers, should be sensitive to various biases and interests when drawing inferences from data and information.
8. Science advice is always affected by values, conventions, and preferences.
9. The effectiveness of scientific advice depends on the right composition of advisors and the quality of the dialogue between advisors and policymakers.
10. The relationship between science advisors and policymakers relies on mutual trust.
11. The most highly recommended science advice process combines analytic rigour with deliberative argumentation.
12. Stakeholders and citizens should be integrated into the process.

13. Science advice is not limited to policymakers but includes science communication to the wider society.

A question arises spontaneously: How could we translate from theory to practice all these interesting recommendations? The economic theory and the games theory show through logic-mathematical experiments that the cooperation could be the most effective if parties jointly take into account the mutual benefit of it. Unluckily, the cooperative solution is rather a long process where contextual as well as cognitive, emotional, motivational, and relational factors come into play. As previously explained, expert's and politicians' judgements are prone to cognitive shortcuts and heuristics among others. There is an idiosyncrasy between knowing to have cognitive biases and avoiding them (Aquilar and Galluccio 2008; Kahneman 2011). There is an inner tension in politicians/diplomats between keeping their world views and adapting their decision-making processes to dissonant evidence (Tetlock 2005). Evidence-informed policymaking does not mean leaving all the power to the scientists/experts. Especially in time of uncertainty when we come to social values, risks, and priorities we do need politics and diplomacy to take the lead for making critical choices in the interest of the citizen. Scientists and experts deserve respect, policymakers and diplomats deserve respect, democratic governance deserves respect, and citizenry deserves respect and a more central role in shaping its own future. Everybody must play his or her role in science diplomacy and evidence-informed policymaking. Everybody needs to take the responsibility to link evidence-informed to sustainable policymaking actions.

Concluding Remarks

The tendency to create new bodies and organizations into the field may lead to confusion, unevenness, and competence duplication. This situation will not only limit the inner potential of science in policy but also undermine the efforts, credibility, and unity of science diplomacy as a EU's foreign policy strategic tool. Problems arise when it comes to coordinate the EU and its member states given the diversity of structures, approaches, and best practices. In order to improve the EU's science diplomacy and advisory system the following steps could be supported:

1. *Member States' science advice*: Encourage more intergovernmental discussions between Member States both within the EU's European Council and through other international organizations such as the Organisation for Economic Co-operation and Development (OECD). Common standards and approaches at this level can further strengthen coherence, effectiveness, and improvement of the use of science and of the quality of scientific advice in the EU and abroad. Better practices should be shared with third countries and other regional blocs in order to facilitate and coordinate common efforts in science diplomacy.
2. *Challenge the "mantra" of best practice*: Best practices are important opportunities for any community, category, discipline, or organization, because they

enable actors to behave in a consistent and coherent way. They also provide evaluation, discussion, and advancement. However, best practice approach may oversimplify the cognitive, emotional, and motivational challenges when confronting specific complex situations under uncertainty and ambiguity. A strict reliance on evidence-informed policymaking does not mean strengthening the experience and skills of practitioners. It could mean just to provide a substitute for experience rather than implementing and calibrating experience, skills, and expertise. Better practices should be constantly scrutinized and evaluated especially in case of crisis situations such as the COVID-19. It is important to monitor the spread of knowledge and the amount of misinformation to enable governments, international organizations, and the media at large to foster adaptive responses in the interest of the civil society at large.

3. *Attention to fixed mindsets*: Scientists could be able to manage the tension present in policymakers (and in themselves as well) between a held core belief and world views at large and the adaptation of those beliefs and views to dissonant evidence. The monitoring of interpersonal relations will help scientists and politicians/diplomats to be less vulnerable to close-mindedness in dismissing too quickly dissonant evidence, which challenges held core beliefs (Tetlock 2005). Clinical practice is based on scientific evidence. But intuition and tacit knowledge are fundamental to avoid thinking about horses and not zebras when you hear hoof noises in the street.
4. *Pooling global financial and scientific advice mechanisms*: Using Horizon 2020 (Horizon Europe) as a better practice model, the EU should provide models and frameworks that unify existing financial mechanisms in order to generate economies of scale and provide further leadership in coordinating, clarifying, and simplifying evidence-informed policymaking.

Science diplomacy has a huge potential as a "soft power tool" for preventive diplomacy and conflict resolution. It could help to build bridges where formal diplomacy has failed. In this sense, it is an interesting tool for the foreign policy of the entire international community. In using the language and benefits of science, people from very different regions, religions, ideologies, and social backgrounds could develop coordinated approaches for tackling global issues, achieving development goals, and reducing risks, vulnerabilities, and violence. Science diplomacy's importance during the Cold War and the European integration process shows how the EU can use this potential to consolidate its normative power on the international scene while using at the same time its strength in research and development to help countries achieve their sustainable goals. If science is properly channelled in domestic and international policy advice its transformative power could lead to a world of understanding, respect, and collective well-being. At the end of the day, the greatest winner from progress in science diplomacy will be all of us, both in the future and in the present.

Part III
Biosecurity and Environmental Disaster: Adaptive Decision-Making in Time of Uncertainty

Chapter 8
A Major Challenge to the Uncertainty of Modern Times



The man thinks he wants freedom. He's actually very afraid of it, because freedom forces him to make decisions and decisions involve risks.

Erich Fromm

Introduction

Recent events have shown the heightened uncertainty of the contemporary world. Climate change, terrorism, health issues, and political instability have all contributed towards threats to security and safety in a complex environment where analysis is based on a "post-normal science". In this environment facts are uncertain, truisms are disputed, and high stakes make adaptive decisions a matter of great urgency (Funtowicz and Ravetz 1993). In a world of great uncertainty, threats to biosecurity and biosafety have become a challenge to the integrity of populations. Biosecurity can be defined as the "[prevention of] the deliberate diversion of deadly pathogens for malicious purposes" (Tucker 2003). Biosafety is slightly—but crucially—different, given that it aims to "prevent losses to biological integrity and public health due to accidental releases of pathogens from research laboratories or other facilities" (Tucker 2003). The former deals with deliberate threats to well-being, while the latter copes with preventing accidental releases of hazards. In contemporary terms, biosecurity deals with potential state and non-state actors attempting biological attacks to further political, social, or religious goals. It is implemented through a strategic and integrated approach that encompasses policy and regulatory frameworks, and analyses risk management in food safety, animal life and health, plant life, and human health sectors, including associated environmental risks. At large, biosafety can be tied to the challenges of environmental disasters given its potential

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_8

effects on ecosystems and human health. These potential threats to physical and psychological security and biological safety make the study of crisis situations and risk extremely important. The construction of structures of meaning (patterns of memory and thought) largely depends on variations in emotional experience, which in turn depend on motivational processes. Understanding human thinking, emotions, and mind structures is essential to develop adequate risk assessment and crisis management systems for biosafety and biosecurity.

Crisis Management

Crisis is a word that is semantically tied to situations of uncertainty and discontinuity. Crises are typically driven by threats to fulfil basic needs. These needs not only are material (food safety, physical safety, and physical well-being), but also include psychological needs such as identity, security, resilience, and a sense of justice (Burton 1990). Balancing these needs poses a major challenge to the resilience of policymaking processes. It is understandable that in crisis situation leaders try to make decisions under pressure in a short period of time, trying to avoid as much as possible all bureaucratic and legislative steps that in a certain way could undermine the leadership through the length of time employed. The leader will trust individuals or groups that he or she believes are the top figures to help to handle the crisis and of course to maintain the government in power (Ramsbotham et al. 2011b). It is vital to know that the way these individuals or groups perceive and interpret crisis will define a state's reactions. The main aim of crisis management is to try to keep the situation under control. It is important to identify crisis; obtain information; evaluate possible solutions; select solutions; implement the chosen response; and cope with the feedback (Aquilar and Galluccio 2008). While there are many forms of crisis management, the general objectives of such form of systems may include:

1. Protecting and preserving the life of citizens
2. Minimizing damages to property, peoples, and/or the environment
3. Managing communication and information effectively
4. Avoiding the deterioration of social relations
5. Ensuring trust between stakeholders

In brief, crisis management could be divided into three phases: preparedness before crisis, responses to limit damages during a crisis, and feedback after the crisis occurred. Preparedness implies gathering knowledge and logistical capacity to potentially cope with all phases. Four fundamental pillars are (a) risk assessment, (b) early warning systems, (c) emergency response, and (d) clear institutional/competence structures. The first implies identifying and analysing potential threats, hazards, and related vulnerabilities; the second aims at building effective contingency plans in the case of threat detection; the third establishes stockpiles, maintains equipment and supplies, and trains emergency forces to strengthen preparedness capacity. Finally, clear institutional structures and competences through legislation and logistics building facilitate fast and fluid preparedness given that stakeholders

are aware of their responsibilities, budgets, and role in crisis management systems. There are many ways of detecting a crisis, beyond monitoring networks, public authorities, and early warning systems, and also citizens, media, and stakeholders can be crucial in activating response procedures. With several sources to monitor crisis development, response actors should be able to create a "big picture" of the event with the help of appropriate intelligence infrastructure. This will in turn facilitate the development and choice of tailored contingency plans and emergency response networks, which will consistently require adequate coordination and strategic planning at the macro and crisis cell level. All crisis response operations should have a solid standard operating procedure (SOP) as a guideline. SOPs should include protocols facilitating information exchange and communication, in addition to scaling-up mechanisms should additional resources be necessary for emergency responses. Strong leadership is also essential in any emergency response situation on a logistical and psychological level with a particular importance in the latter case. This importance is based primarily on the fundamental role of the communication process in the event of a crisis. Communicating with the media and the general public on the development of emergency response is vital to establishing *trust* towards and between stakeholders, especially emergency responders and elected officials. Trust not only reassures citizens but also facilitates the smooth running of response operations by avoiding the chaos of hostile mass and general panic. Officials must therefore be trained on the importance of crisis leadership and communication. To this end, several steps are key: On very common terms, when speaking to the media, spokesmen and scientists/diplomats/policymakers should avoid evasive responses given that they can be interpreted very negatively. Both the media and the public might think that officials are hiding information or do not know how to respond to crisis, increasing both distrust/hostility and general panic. Secondly, jargon and difficult wording should be avoided consistently as it obscures understanding in crisis situations. Lack of clarity distances stakeholders and citizens at large from policymakers as they may interpret jargon as a way of giving "empty answers", or they may have the perception that public actors are out of touch with the general public and the severity of a crisis. None of these interpretations are beneficial to building trust among stakeholders. In terms of presentation, correct body language and habits are key to reassure the public in the event of a crisis; strong eye contact and clear language help a lot to get a message across, as this is key in building trust and reassuring people. Evidently, it follows that all effective crisis communication includes briefing spokesmen and policymakers on the latest evidence-informed policies to be transmitted to citizens and other stakeholders. Beyond trust, solid briefings improve response coordination and decrease the risk of misinformation, misperception, and contradictory statements by public actors. These should include pre-drafted messages in preparation for crisis in providing cohesive, coherent, and coordinated narrative through clear guidelines for communication. Statements, news releases, and website modifications are all part of a solid pre-drafted message package. Given the unexpected nature of a crisis, pre-drafted messages should be taken as templates to crisis reaction instead of strict step-by-step guidelines. Good templates leave room for "blank spots" where information is

inserted once a crisis occurs. In the European Union (EU), but not only, effective crisis communication includes two additional dimensions: multiculturalism and multilingualism.[1] So far, attempts to create a European framework for crisis communication have encountered several problems.

Knowing How to Give a Feedback

Once a crisis winds down main actors should be able to effectively communicate the end of a crisis, reduce anxieties, and stimulate return to normality in the general public. The final phase of crisis management is coping with the feedback. Actions during every phase should be discussed and analysed between stakeholders to highlight best practices and learn from any limitations or mishaps. Should the feedback conclusions be properly incorporated, preparedness and response processes will be evaluated and improved with cognition of cause and crisis management strategies and actions will be implemented in the event of a future crisis. This is especially important when it comes to maintaining and strengthening trust among citizens, media, crisis responders, and policymakers. Large-scale crises, as it was that of COVID-19, with severe damage strongly impact trust in governments. If stakeholders and citizens at large believe that politicians took wrong decisions or performed mediocrely, said trust may severely decrease. Such perception can intensify if the public thinks that the government was not transparent, hiding vital information, or refusing to admit failures during crisis management. In order to avoid internal political crisis, open feedback between policymakers/diplomats and stakeholders could clarify how decisions were made and ensure accountability. Even if there were significant failures, a serious and transparent feedback is an effective tool to undergo damage control on a government's deteriorated reputation. All crisis management phases and levels should be included in the feedback phase. The importance of the feedback phase of crisis management is strengthened in the context of an international crisis. While classical routines within nations may imply reducing warning levels, this may not be the case if the issue has a transboundary dimension. It will certainly be more difficult to cope with and conclude these crisis situations due to difficult intergovernmental logistics. Communication-wise attitude facilitates disseminating contradictory information to the media and to the general public. When international crises end, stakeholders from all countries should provide feedback to analyse limitations and best practices in order to avoid future setback and build a new response mindset (Baubion 2013).

[1] https://www.ecdc.europa.eu/sites/portal/files/documents/use-of-evidence-in-decision-making-during-public-health-emergencies_0.pdf.

Risk Management

The United States Environmental Protection Agency defines risk as "the chance of harmful effects to human health or to ecological systems resulting from exposure to an environmental stressor. A stressor is any physical, chemical, or biological entity that can induce an adverse response" (EPA 2020). The World Health Organization (WHO) defines risk assessment as "the scientific evaluation of known or potential adverse health effects resulting from human exposure to … hazards".[2] In its most basic form, assessing risk deals with the question of when, where, and how the potential threat could become a reality. Coping with risk therefore includes a tension between the chances of "clear and present" and "potential" threats. To this end, it is important to differentiate between the "uncertain" and the "unlikely" elements of risk: an uncertain but plausible risk is one that is usually complex and conceivable, but not necessarily guaranteed. This does not however make it unlikely. Uncertainty can be managed through investigation, dialogue, procedures, experience, and insight in order to make risk more bearable. The Scientific Council for Government Policy of the Netherlands identifies five "reference points" when it comes to dealing with uncertainty and risk (KNAW 2013):

1. Intertwining opportunities and threats
2. Including the sociological and psychological elements of dangers
3. Using risk comparisons
4. Accepting and managing uncertainty
5. Organizing stakeholder's approaches to dealing with uncertainty

While most countries may have solid risk assessment approaches, the increasing international dimension of systemic risk complicates scenarios in which governments can act alone. Flexibility, adaptability, all-inclusive behaviour, and comprehensive approach are therefore essential elements to be integrated to new frameworks of risk assessment. Sectorial risk assessment has traditionally been used to identify qualitative and quantitative emergency support for local populations. In order to minimize the impact of natural hazards, pandemics, industrial accidents, or terrorist attacks a coordination is required of vaccine stock assessment, hospital preparedness, road evacuation safety, or containment measures in the case of Chemical, Biological, Radiological and Nuclear (CBRN) attacks or hazards. For such threats, risk assessment must use expertise from relevant agencies to determine a population, infrastructure, or territory's level of exposure. Such expertise should eventually provide access to findings so that local authorities and emergency services can develop solid emergency plans. Generally speaking, the availability and accessibility of information for risk assessment and mapping have increased alongside improvements in monitoring networks, databases, archives, modelling, and mapping tools. Solid institutional frameworks are vital in guaranteeing information exchange at all levels of risk assessment stakeholders, from central authorities to local actors. In

[2] https://www.who.int/foodsafety/micro/riskassessment/en/.

addition, integrated guidelines allow authorities and emergency services to work on preparedness, relevant methodologies, and standards. The ultimate goal is to ensure a fluid multilevel organization of risk assessment both on a national and international level, developing capabilities for plans and large-scale emergencies that are both global and sectorial in their approach. To this end, the increased potential of international crises should force governments to tackle a series of questions:

1. Territorially: how to develop a multi-hazard/multi-risk approach to include new and emerging threats. This should include, for instance, the use of frequent data updates, horizon timescale, cascading effects, and tipping points for analysis.
2. Efficiently: disseminating risk assessment data to relevant stakeholders in emergency response, including private actors such as NGOs, media, and international actors and relevant third countries. Solid cooperation mechanisms are essential to combine science, intelligence, expertise, and knowledge at large in an understandable and accessible manner. This may imply empowering national authorities with the task of ensuring coordination, cooperation, and data accessibility.

On an international level, countries should share methodologies and tools to create common standards in risk assessment when it comes to borders. Such initiatives will not only increase effectiveness but also prove to reduce costs. The annual Global Risk Report of the World Economic Forum, as well as the European Emerging Risk Radar Initiative, references possible ways through which countries can improve international risk assessment. Conditions to do this have vastly improved given progress in science, technology, and information. These improvements have helped stakeholders make a better use of risk assessment for a more comprehensive and strategic approach through prevention policies and mitigation programs. On an international level, 168 countries adopted the Hyogo Framework for Action 2005–2015 (HFA) during the Second United Nations World Conference on Disaster Risk Reduction in Kobe (Japan). Stressing broader approaches to risk and crisis management, it led to the establishment of risk management cycles in many countries. This included early recovery and reconstruction in addition to feedback.[3] Crisis management and risk assessment are essential tools for guaranteeing biosecurity and biosafety in the event of biological attacks or environmental disasters. These issues have become increasingly relevant for national and international actors, especially due to increases in terrorism and unstable environmental conditions.

Bioterrorism After September 11, 2001

Bioterrorism could be defined as “the use of biological agents to further the political objectives of the perpetrators” (Tucker 2003). The urgency of bioterrorism responses came to the forefront following the September 11, 2001, attacks. Bioterrorism is

[3] https://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf.

accessible to terrorist groups with a minimum amount of expertise in isolating and enriching pathogens. Even when terrorist groups do not have access to expertise, they could purchase biological agents from sources such as state and non-state actors. Many countries have historically developed biological weapons for the purposes of warfare. Given the deterioration of the rule of law in many states associated with such programs it could be plausible for terrorist groups to benefit from these situations to acquire biohazards. Beyond corruption, deterioration of safety and security standards facilitates security breaches in laboratories containing dangerous diseases and pathogens. Significant advances in biotechnology exacerbate such threats given that progress in genetic engineering has the potential to be used to the detriment of global security. Examples on the dangerous use of such technologies include altering disease agents to make them deadlier, inconspicuous, and quicker in contaminating populations and spreading contagion. In addition, genetic engineering can manufacture pathogens resistant to drugs and vaccines. The threat of bioterrorism has increased due to regional turmoil and enemy groups seeking opportunities to further geopolitical objectives (Khalil and Shinwari 2014). Of the many outlets for bioterrorism, attacks on agriculture could be of great strategic interest for terrorist groups. In practical terms, most antipersonnel agents available to non-state actors are relatively ineffective in terms of scale. Agents such as anthrax are poorly transmitted among humans and require large amounts in order to significantly impact populations. This is not only costly, but also difficult to operationalize into a terrorist attack. Beyond difficult logistics, improving diffusion of antipersonnel agents could mainly be achieved by creating breathable aerosol. This is not only technically difficult but also dangerous for perpetrators attempting to reduce agents to particle size unless they opt for the costly solution of vaccines or prophylactic antibiotics. As a result, while terrorists may attempt to use antipersonnel agents, the consequences are likely to be psychological and not focused on death tolls (unless groups acquire sophisticated means of contagion and large amounts of biological agents) (Khalil and Shinwari 2014). Attacks on agriculture have the potential to be much more effective. Chalk (2003) defined agricultural bioterrorism as "the deliberate introduction of a biological agent or bio-toxin, either against livestock or into the food chain, for purposes of undermining stability and/or generating fear. Depending on the disease agent or vector chosen, it is a tactic that can be used either to generate mass socio-economic disruption or as a form of direct human aggression". Agricultural bioterrorism is effective for several reasons. On a logistical level, animal and plant diseases are mostly safe to handle by perpetrators and can rapidly spread throughout specific areas, affecting millions of people consuming agricultural products. Animal virus preparations can be diluted and disseminated with a simple atomizer in close proximity to targeted animals or smeared directly into their nostrils or mouths. In addition, infectious samples can be extracted through rudimentary methods. Scarping from mucosa of FMD-infected animals, ASK-infected animal blood, or wheat infected by stem rust pathogens can cause epidemics (Sherwood et al. 2003). Infectious material can also be smuggled easily across borders given that only small samples are needed. Possible infection areas include rural rounds, animal auctions, or barns. When introducing plant diseases, exposure can be

facilitated by upwind in a targeted field. Should environmental, weather, and seasonal conditions favour the transmission of an infection, combining upwind with a mass of sporulating fungi can be an effective way of infecting crops. This is also facilitated by the fact that, logistically, the large land extension of industrial farming makes it difficult to effectively monitor crops. Humans are not the only vulnerable group given that biodiversity can also be severely affected. Potentially successful attacks have the probability to eliminate the entire species from regions, leading to ecological imbalances that can cause further extinctions as a domino effect (Wheelis et al. 2002).

Potential Global Economic Impact of Agricultural Bioterrorism

So far, we have briefly analysed potential damages to health and ecology. Beyond these vital areas for security, agricultural bioterrorism can severely impact economic conditions on an international level. Given the devastating potential of agricultural bioterrorism, the United States took an early interest in it. The FBI (Federal Bureau of Investigation), the Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Department of Homeland Security organized two international symposiums in 2005 and 2006 on agricultural bioterrorism with about 1000 participants. Participants came from a wide array of biosecurity stakeholders including legislators, agronomists, academics, researchers, businessmen, police representatives, and military officials. The USDA's Food Safety and Inspection Service requested its inspectors to incorporate agroterrorism dimensions to their inspections, overlapping the terms "food defence" and "health safety". Awareness campaigns were also developed in numerous federal agencies in addition to user guides for farmers and businessmen. Public-private programs were also developed on a voluntary basis to strengthen prevention and response in agricultural bioterrorism (Suffert et al. 2008). This was done through the Strategic Partnership Program Agroterrorism (SPPA).

In the EU, both agriculture and the food industry remain critical to the social, economic, and political stability of the 27 member states. In addition to providing food and clothing, agribusiness provides many raw materials used in other industries. This makes both the primary sector and other areas of the economy highly vulnerable to any form of biological disruption (Hassler and Oman 2003). The effects of such disruptions were seen in the 1990s during the bovine spongiform encephalopathy (BSE—also known as mad cow disease) outbreaks in the United Kingdom, which not only led to the deaths of 177 people but also caused a $4.2 billion loss in international markets from direct cattle death/sacrifices. In addition, preventative measures against classical swine fever (CSF) outbreaks led to the slaughter of millions of pigs. Costs related to such practices are not the only ways in which biological agents may damage economies. When plants and animals risk

carrying diseases, members of the World Trade Organization reserve the right to impose phytosanitary restrictions and ban imports from affected countries. In the case of the United Kingdom, both mad cow disease and CSF led to the suspension of beef, sheep, and swine product exports to the EU member states and other countries. The United States offers an interesting example on the consequences of biological agents on crops. When there was an outbreak of Karnal bunt of wheat (caused by fungus *Tilletia indica*) over 80 countries banned wheat imports from affected regions of the United States. Disease issues in plants and animals can lead to billions of dollars in lost trade and severely affect countries with important agricultural sectors (Khalil and Shinwari 2014). Additional cost challenges are found in the prevention of agricultural bioterrorism. Preventative measures for crops and livestock tend to be expensive given that veterinarians and agronomists usually recommend chemotherapeutants. When adding diagnostic kits, chemical reagents, and antibiotics costs are further increased for producers in a sector that deeply impacts a country's economic production (Sherwood et al. 2003). Given the economic consequences of agricultural bioterrorism, it is useful to understand the psychological reaction of consumers to the risk of biological attacks on their food. By definition, risk is also a perception and that can lead to inaccurate readings of reality. For example, consumers can overstate risks in certain foods, which will lead to economic losses for producers and lost welfare for consumers. On the other hand, underestimating risk can lead to health exposure and problems for producers through accusations of gross negligence. All in all, accurate information and proportional psychological responses to agroterrorism risks are an important part of any crisis and risk management operation, especially given the severe economic consequences that extreme forms of panic or ignorance can have on producers and populations (Just et al. 2009). This is also necessary when considering the negative consequences of environmental disaster from an economic, psychological, and resiliency standpoint.

Environmental Disasters: A Major Challenge to Biosafety

According to the United Nations Environment Programme (UNEP 2008), a disaster is "A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses, which exceed the ability of the affected community or society to cope using its own resources. It is a function of the risk process, and results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk". As a consequence, disaster risk reduction is "the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development" (UNEP 2008). Several environmental issues are making disaster risk an increasingly relevant issue to biosafety. These issues are

mostly of significance to climate change, which is defined by the United Nations Framework Convention on Climate Change (UNFCCC)[4] as a phenomenon attributed "directly or indirectly to human activity that alters the composition of the global atmosphere. It is in addition observed over comparable time periods". To this end, most scientific studies point to a rising in global temperatures beyond their averages, consecutively surpassing five centuries of climate data in a few decades. Consequences of such changes are grave for biosafety as was confirmed by the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report in 2007.[5] According to the report's estimates, by 2100 earth would see:

1. 1.1–6.4 °C rise in average global surface temperatures
2. 18–59 cm rise in average sea levels
3. Increase in ocean acidity levels, deteriorating ecosystems
4. Increased frequency of heat waves
5. Increased frequency of tropical cyclones (typhoons and hurricanes)

Changing climate conditions are also affecting water, food, economy, settlements, and health. Given the rise in global surface temperatures, certain regions are seeing an increase in droughts, decreasing water availability in mid-latitudes: dry tropics and regions that depend on meltwater from mountain ranges. This is grave from a water-access standpoint, as one-sixth of the world's population depends on meltwater for its water supply. Higher temperatures leading to droughts and floods will also impact food production, increasing the risk of hunger and forced displacements due to homelessness. Livelihoods will also be affected given that many key economic sectors are placed in coastal areas. The prospect of floods and typhoons can therefore disrupt activity with worrying ease. Human health will also suffer due to higher temperatures given that floods, storms, fires, and droughts are directly correlated to higher death, disease, and injury rates (ISDR 2008). It is important to remember that, while climate change is not a phenomenon deliberately caused by certain actors, this does not mean that the prospects of environmental disasters due to climate change are not man-made. Greenhouse gases such as carbon dioxide, methane, nitrous oxide, and ozone are emitted by fossil fuel consumption and agriculture in addition to advancing through deforestation. These are all practices that degrade environmental conditions. The UNEP (2008) defines environmental degradation as "the reduction of the capacity of the environment to meet social and ecological objectives and needs. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards". Tying environmental degradation to negative social, political, and economic consequences is essential given the summary of evidence. Not only are most environmental disasters the consequences of man-made issues, but they are also felt by earth's poorest inhabitants, especially those in small and developing countries (UNEP 2008). Degraded environments caused by man-made activities are clearly detrimental to

[4] https://unfccc.int/.

[5] https://www.ipcc.ch/assessment-report/ar4/.

biosafety and to economic and human development. Climate change increases the likelihood of environmental disaster. This does not mean, however, that policy frameworks have not facilitated the ability for such events to take place. Stakeholders in biosafety often focus on response than prevention when it comes to disaster risk. Not only does this make populations potentially face severe consequences, but it is also ineffective from a cost-benefit standpoint. Disasters have high costs from all perspectives (political, psychological, social, economic, etc.) and consequences that last for years. To this end, strong risk management measures must be implemented on all policy levels (Oppenheimer et al. 2012).

Hyogo Framework for Action

Prevention in disaster risk reduction is therefore much more effective from a cost-benefit perspective than the response phase of a crisis management cycle. To this end, stakeholders must adopt precautionary and comprehensives approaches to protect vulnerable communities and strengthen preparedness in crisis management. Biosafety depends on the combination of environmental science, information exchange, technological innovations, and good governance. These are challenges that were recognized by the Hyogo Framework for Action, the Millennium Declaration, and the United Nations Millennium Ecosystem Assessment when they linked environmental degradation, poverty, and disaster risk. Of these, the most important in developing a framework for environmental disaster risk reduction was the Hyogo Framework for Action. Developed in 2005 at the World Conference on Disaster Reduction in Hyogo (Japan) it related the notions of environmental degradation, vulnerability, and man-made hazards in the development of a disaster. To this end, the Action Plan recommended:[6]

1. Encouraging a sustainable ecosystem use and management in land planning and development. This should reduce vulnerabilities and risk.
2. Integrating natural resource and environmental management with disaster risk reduction. Structural and non-structural measures such as flood management and managing fragile ecosystems are strongly recommended to this end.
3. Adopting risk reduction measures within the larger context of climate change by identifying local climate-related disaster risks and creating tailor-made risk reduction programs. Access to climate information and expertise should be facilitated.
4. Building a strong national and local institutional framework and awareness in order to increase the sense of urgency for disaster risk reduction.
5. Strengthening all phases of the crisis management cycle for environmental disasters (UNEP 2008).

[6] https://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf.

Biosafety and Resilience Processes

Stakeholders in biosafety have also been working on the concept of resilience. Applied to risk and crisis management, the UNISDR defines resilience as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions".[7] Resilience is extremely relevant to prevention and preparedness as it focuses on the durability of peoples and systems in the face of threats and disasters. It is conceptually useful on many different levels, from community organization to national and international policymaking. Strong resilience guarantees that core functions of institutions persist during disasters and recover as quickly as possible. Given the rising risks of bioterrorism and environmental disasters, the EU has taken steps to ensure that biosecurity and biosafety are met with strong preparedness, response, and feedback mechanisms to protect citizens in an uncertain world.

[7] https://www.undrr.org/.

Chapter 9
Crisis Management and Risk Assessment in the EU: A General Outline



No one can whistle a symphony. It takes a whole orchestra to play it.

H.E. Luccock

Introduction

Due to regional deteriorations of state power, the European Strategy for Security (2003) claimed that difficulties in maintaining order within certain countries would increase regional instabilities and the probability of terrorist attacks on European soil. Crisis management in the Common Foreign and Security Policy (CFSP) has a similar structure to that of generic models, albeit adapted to the nature of the EU objectives. The first phase for CFSP crisis management is prevention, meaning that efforts are spent on preventing internal conflicts and deterioration of the state's monopoly of force. Secondly, intervention seeks to end internal conflicts should they have begun. Thirdly, the stabilization phase comes right after an intervention in order to minimize turmoil. Finally, the reconstruction phase attempts to rebuild and consolidate the legitimate authority of the state over a territory. The EU has so far focused international crisis management efforts on prevention. Agreements have been signed with third countries to establish policy dialogue, macroeconomic support, economic and trade agreements, cooperation development, emergency response, and reconstruction aid. All agreements are required to respect the European Commission's guidelines on good governance and can be suspended if sanctions must be imposed. Stabilization and reconstruction require strong tools to manoeuvre unstable political environments. To this end, a rapid decision-making system has been developed using four instruments: exceptional and financial assistance, long-term financial instruments, Rapid Reaction Mechanism (MRR), and a

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_9

Civil Protection Mechanism (Perret 2006). After the European Council conclusions of 19–20 December 2013 (EUCO 217/13)[1] emphasizing "the importance of supporting partner countries and regional organizations, through providing training, advice, equipment and resources where appropriate, so that they can increasingly prevent or manage crises by themselves", there were several technical meetings in 2014 and 2015 between member states, the European Parliament, and other stakeholders. This led to the Joint Communication of April 2015 where the European Commission and the High Representative stated their commitment to enhancing coherence and coordination between the EU security and development policy.[2] In this way, the foreign policy dimension of European crisis management expanded beyond the strict confines of the rule of law: economic and social development was to be a pillar of a solid and present nation.

Main Operational Mechanisms in the EU Institutional Framework

Given the array of crises that could affect Europe, the EU has established a crisis management structure to tackle such situations. It should be stated that member states are primarily responsible for dealing with emergency situations in their territories, in addition to deciding whether they require external assistance. This framework was clearly insufficient to cope with crises surpassing national borders, resulting in the adoption of the European Internal Security Strategy for the 2010–2014 period.[3] Aiming at strengthening resilience to crises and disasters, the strategy required solidarity in crisis response and a responsible approach to prevention and preparedness. This implied improving risk assessment and management at the European level. To this end, the Directorate-General for Home Affairs (DG HOME) of the European Commission is responsible for assessing intentional man-made risks, including environmental disasters and agricultural bioterrorism. While the Treaty on the Functioning of the European Union (TFEU) established a solidarity clause (Art. 222 TFEU)[4] forcing the European Union and member states to mutually assist each other in case of crisis, the Internal Security Strategy established the institutional structure necessary for its implementation. To this end the EU Emergency and Crisis Coordination Arrangements (EU-CCA) were established to define the interaction rules between the institutions and affected member states in the case of crisis. These arrangements are complemented through integrated EU arrangements for crisis management with cross-border effects (EU-ICMA). These facilitate information exchange and general cooperation between the EU member states and give a generic framework for all forms of crises. In terms of the European Commission, a rapid alert system (ARGUS)

[1] http://data.consilium.europa.eu/doc/document/ST-217-2013-INIT/fr/pdf.

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015JC0017&from=EN.

[3] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0673:FIN:EN:PDF.

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12016E222.

was created to coordinate response capacity within this institution by including all relevant internal actors. This should improve the effectiveness of efforts in times of emergency.[5] The EU also established the Civil Protection Mechanism in 2001[6] to further implement the solidarity clause of Article 222 of TFEU. Operating in the case of natural or man-made disasters, the Civil Protection Mechanism responds to official requests for assistance from member states by providing support to local emergency units and relevant civilian authorities. It is important to stress that this mechanism is activated if the member state deems it necessary. European responders assist member states' authorities without interfering in internal crisis management systems. In addition to responding in times of crisis, the Civil Protection Mechanism strengthens preparedness in Europe and internationally by providing training, simulation exercises, exchange of expertise, modules, programs, and projects. Establishing risk assessment guidelines and maintaining efforts to integrate the EU's diverse systems also strengthen prevention. While active within the EU, participants of the Civil Protection Mechanism also extend to non-EU countries such as Norway, Iceland, Liechtenstein, and the Republic of North Macedonia. Responding to the Humanitarian Aid and Civilian Protection Department (ECHO) of the Commission, the Civil Protection Mechanism has an Emergency Response Coordination Centre (ERCC) that operates on a 24/7 basis to receive aid requests and guarantee immediate member states' coordination in the event of a crisis.[7] The ERCC's effectiveness is strengthened through access to satellite imaging, experts, and transport operation co-financing in case of relief operations (Dussart 2014).

The European Agenda on Security

For the 2015–2020 period, the European Agenda on Security replaced the Internal Security Strategy of 2010–2014 and is based on three priorities:[8] The first focuses on terrorism and radicalization since, as recent events show, there has been an increase in the number and severity of terrorist attacks on the European soil. Beyond immediate domestic concerns, the first priority also concerns the deterioration of security and rule of law in countries close to the European neighbourhood, which it seems may contribute to the terrorist/radicalization issue. Secondly, the new Security Agenda focuses on organized crime due to its massive human, social, and economic costs to the EU. The EU aims at narrowing enforcement gaps both internally and in its neighbourhood. The final priority of the Security Agenda is coping with cybersecurity in the context of digitalization of terrorist networks. The Security Agenda puts great emphasis on information exchange and reinforced borders. To this end, it aims at:

[5] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52005DC0662.

[6] https://ec.europa.eu/echo/what/civil-protection/mechanism_en

[7] https://erccportal.jrc.ec.europa.eu/About-ERCC.

[8] https://www.europarl.europa.eu/legislative-train/theme-area-of-justice-and-fundamental-rights/package-european-agenda-on-security.

1. Facilitating information exchange between law enforcement authorities and agencies of the EU. A practical outlet of this objective has been adding additional alert categories to the Schengen Information System (SIS) and coordinating such efforts with Interpol's Stolen and Lost Travel Documents (SLTD) database. This will be complemented by including convicted non-EU nationals in the European Criminal Records Information System (ECRIS).
2. Increasing operational coordination and cooperation between law enforcement officials of different member states through joint investigation teams (JITs). Gathered for fixed time periods, these multinational officials will be tasked with investigating assigned subjects in cross-border issues. Not only does the Commission want to increase the use of JITs by member states, but it also aims at including third countries from the European neighbourhood.
3. Increasing training and funding for security issues at the European level. A practical outlet of this objective includes the European Commission's efforts to reinforce the European Police College (CEPOL)'s ability to prepare police officers in effective cooperation. Such cooperation efforts will also be seen in national police academies through more EU-funded programs on cross-border issues. The aim is to guarantee the success of these programs in order to incorporate them into standard policy work, thus internalizing the European dimension of security issues in member states' police forces.[9]

In addition to tackling border strength and law enforcement cooperation, Europe's civil protection dimension to crisis and risk management faces a unique set of challenges. For starters, projects must ensure strong and well-developed risk management plans on a member state level. In addition to building new national structures, member states and institutions should identify the current strengths and assets of civil protection systems, so as to establish best practices as a foundation for improvements. On a European level, projects should be able to determine where complementary Union assets can maximize civilian protection, including direct EU funding under special criteria. This should be accompanied by improvements in current transportation systems to fasten the pace of Union deployments should assistance be requested by a member state (Dussart 2014).

Risk Assessment System in the EU

In addition to crisis management, the EU has also developed a risk assessment system in which independent scientific bodies advise relevant stakeholders. The Directorate-General for Health and Food Safety (DG SANCO)[10] manages three scientific committees: the Scientific Committee on Consumer Safety (SCCS), the

[9] https://www.europarl.europa.eu/legislative-train/theme-area-of-justice-and-fundamental-rights/package-european-agenda-on-security.

[10] https://ec.europa.eu/knowledge4policy/organisation/dg-sante-dg-health-food-safety_en.

Scientific Committee on Health and Environmental Risks (SCHER), and the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). In addition, the European risk assessment systems include other bodies, such as the European Food Safety Authority (EFSA), the European Medicines Agency (EMA), the European Chemicals Agency (ECHA), the European Centre for Disease Control and Prevention (ECDC), the European Environmental Agency (EEA), and the Scientific Committee on Occupational Exposure Limits (SCOEL). Evidently, the diversity and complexity of risks for the EU security require these bodies to work closely together and with members states. Many chairs and coordinators shared this view and decided to increase collaboration in quality, communication, and added value assessment. Since 2005 Directorate-General for Health and Food Safety (DG SANCO) has launched regular meetings on risk assessment with the Chairs and Secretariats of the Scientific Committees. Said initiative served as an embryo for establishing common approaches and general principles in coordinating with risk and crisis management stakeholders, including essential communication issues, terminology, and frameworks for technical cooperation. DG SANCO has also taken the responsibility to organize frequent information session with members and staff of the European Parliament and other stakeholders. "Risk Assessment Days" present non-food scientific committees to stakeholders by providing information on their activities and latest findings in order to spark interest and discussions on risk assessment issues.[11]

A Brief History of the EU's Comprehensive Approach

In addition to generic risk and crisis management systems, the EU began actions to prevent and prepare for biosecurity and biosafety challenges. As we have previously stated, biological agents can easily surpass the confines of national borders and damage health, social cohesion, and economy. This has pushed the EU into adopting a comprehensive approach to crisis management structures that includes member states, private sector, institutions, and relevant agencies. Establishing the Health Security Committee (HSC) in November 2001 was the first concrete action taken to tackle these issues.[12] Its aim is to ensure coordination and information exchange between member states should biological agents be released. This equally implies coordinating health preparedness systems and emergency response plans as well as alert systems should EU public health be under threat. In addition to concrete actions, the European Commission has released several Communications over the last years. While it is true that they are not legally binding, their influence stems from outlining key orientations in EU policy and giving guidelines to member states. Bioterrorism cooperation has been strongly encouraged by, among others,

[11] https://www.enisa.europa.eu/publications/nlra-analysis-report.

[12] https://ec.europa.eu/health/sites/health/files/preparedness_response/docs/hsc_factsheet_en.pdf.

Communication 2003/320 in June 2003,[13] Communication 2004/701 in October 2004[14], and Communication 2005/605 in November 2005.[15] The Commission has requested that national health authorities adopt measures that would facilitate rapid detection and identification of intentional biological agent releases. This request should translate towards improvements in surveillance and information systems. Related to previous discussions on secure borders, the Communications also stress the importance of fast and effective information exchanges in the Schengen Area should biological agents be detected. Over the years, these Communications have had a tangible effect through the creation of programs, projects, and centres all over EU. In light of the European Commission's orientations, the community program of cooperation on preparedness and response to biological and chemical agent attacks (BICHAT program) was born. Along with the Rapid Alert System (RAS-BICHAT) these tools have vastly improved incident notification in the case of biological and chemical agent release, especially since all are connected to Rapid Alert Systems for the ERCC, health threats, and nuclear accidents (ECURIE), in addition to situation rooms (Dussart 2014). In line with the solidarity clause (Article 222 of TFEU) and the 2015–2020 Security Agenda, the European Commission has established the Monitoring and Information Centre (MIC)[16] to receive assistance requests from member states affected by a disaster so as to receive aid from other member states. Other RASs have also been established for radiological emergencies (ECURIE) and communicable diseases (EWRS).

The EU's Green Paper on Bio-Preparedness

While these are all essential pillars for biosecurity and biosafety, the EU's Green Paper on bio-preparedness of 11 July 2007 marked a turning point in the scale of the EU's response.[17] A comprehensive approach was established with all stakeholders, including public health authorities, law enforcement officials, academia, and the private sector. The goal was to discuss legislative measures that would improve preparedness and response capabilities to any biological threat. To this end, the European Commission suggested that stakeholders adopt an all-hazards approach that would imply enhancing preparedness and response capabilities regardless of the origins of the risk. The Green Paper did not propose legislation, much to the contrary: the European Commission considered that efforts had be focused on strengthening existing mechanisms and tools. These included peer evaluations, awareness-raising campaigns, and supportive financial programs. Collaboration and information

[13] https://eur-lex.europa.eu/legal-content/LT/TXT/?uri=celex:52003DC0320.

[14] https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX%3A52004DC0700.

[15] https://eur-lex.europa.eu/legal-content/en/LSU/?uri=CELEX:52005DC0607.

[16] https://www.eubusiness.com/topics/finance/mic/.

[17] https://ec.europa.eu/commission/presscorner/detail/en/MEMO_07_289.

exchange were also stressed in the Green Paper, albeit adding the private sector as an additional stakeholder in bio-preparedness. Economic actors, such as the food industry, the pharmaceutical industry, and small and medium-size enterprises (SMEs), should exchange best practices and share information with each other to improve prevention and response practices. In addition, both the biotechnology industry and bio-researchers are considered vital to the advancement of European crisis management tools in biosecurity and biosafety. The Green Paper defends bio-preparedness through a crisis management system common to both biosecurity and biosafety concerns. To this end, biosafety improvements include enhancing the security of laboratories containing pathogens and setting minimum standards among member states. A European professional code of conduct and the setting of minimum biosecurity and biosafety guidelines for health authorities and law enforcement officials have been followed, especially when it comes to the use and localization of pathogens for scientific research. This approach was corroborated by the 2007 Council's conclusions on addressing CBRN risks and on bio-preparedness.[18]

Chemical, Biological, Radiological and Nuclear (CBRN) Task Force

Following the Green Paper, in 2008 a CBRN task force was formed to establish a series of measures for both the European Union and the member states to take to reduce the risk of CBRN attacks. This was the basis for the European Commission's CBRN Action Plan, centred on prevention, detection, preparedness, and response. According to the European Commission's 2012 progress report the 124 initiatives taken in light of the Green Paper and the Action Plan evolved very unevenly between the member states. This was expected given the scope and limited timing of the initiatives and more time would be needed to foster implementation. Communication COM/2014/0247 of May 2014 added explosives to the CBRN-E Action Plan.[19] The 2015 progress report claimed that vast improvements were made in the implementation phase, with greater evenness between member states and a clearer framework for preparedness.[20] It is clear that the biosafety and biosecurity preparedness are fields with large room for joint cooperation between scientists and policymakers/diplomats in order to aid faster improvements. Both the EU and the international organizations have drafted recommendations and initiatives to enhance risk and crisis capabilities.

---

[18] https://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2016589%202007%20INIT.

[19] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2014:0247:FIN:FR:PDF; https://www.europarl.europa.eu/RegData/etudes/BRIE/2015/545724/EPRS_BRI(2015)545724_REV1_EN.pdf.

[20] https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI%282016%29581996.

Chapter 10
Feeding the Sendai S&T Road Map on Capacity Development and Resilience



The world is so empty if one thinks only of mountains, rivers and cities; but to know someone here and there who thinks and feels with us, and though distant, is close to us in spirit – this makes the earth feel like an inhabited garden.

Johann Wolfgang von Goethe, Wilhelm Meister's Apprenticeship

Introduction

Stakeholders should be trained in biosafety and biosecurity response by including planning and preparedness scenarios. This should foster logistical, cognitive, emotional, and communication skills. The National Veterinary Institute (SVA) of Sweden attempted to strengthen these skills through mock anthrax, Q-fever, and food and mouth disease scenarios; exercises included training in decision-making and in determining the likelihood of a terrorist attack using Bayes' theorem. Local authorities participated in the SVA's exercises to enhance their abilities in threat assessment, quantitative risk assessment, and surveillance system on all aspects of bioterrorism (Andersson et al. 2013).

European and International Projects on Risk Assessment and Crisis Management

Pioneer EU projects on biosecurity research applied to agriculture were CROPBIOTERROR,[1] prevention and management of biological threat of plant pathogens as weapons against crops; then EMPHASIS (Effective Management of

[1] https://cordis.europa.eu/project/id/6403/fr.

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_10

Pests and Harmful Alien Species: Integrated Solutions)[2] (see Gullino and Vivani's Chap. 12 in this book); and PLANTFOODSEC,[3] a project with a focus on biological threats having the potential to affect and damage agriculture, infect plants, and ultimately affect the food and feed at any stage in the food supply chain. All these projects were coordinated by Prof. Lodovica Gullino, Universita' degli Studi di Torino (UNITO), who is a distinguished contributor to this book. There have also been projects focusing on other areas of biosecurity and biosafety. Both the ISIS and SECUREAU projects have been centred on water security (prevention) and decontamination (response) in the case of intentional contamination. BIO-PROJECT aimed at creating fast, user-friendly devices to detect airborne bacteria, spores, viruses, and toxins. SNIFFER developed capabilities to secure all parts of the food chain from major CBRN attacks. On the quality and technical side, CAST wanted to assess the comparative quality of security-centred training curricula for first responders during disaster management. Bridge attempts to develop a system that supports technical and social interoperability in large-scale emergency management. TARGET created a pan-European "serious gaming platform" with tools, techniques, and content that train and assess the skills and competences of agents, border guards, counterterrorism units, and first responders in the event of a CBRN attack. TOXI-triage developed instruments to detect and trace CBRN contamination victims. All of these projects were part of the broader Horizon 2020 framework for EU-funded research and innovation projects.[4]

Stakeholders' Training Strategy

International organizations have also been active in training stakeholders on risk and crisis management. The United Nations Environment Programme (UNEP) organized its first Massive Open Online Course (MOOC) in 2015 on Disasters and Ecosystems: Resilience in Changing Climate. The Global University Partnership on Environment and Sustainability (GUPES) and the Cologne University of Applied Sciences (CUAS) collaborated with UNEP in order to increase experts' and policymakers' awareness on advances in disaster risk reduction. Objectives included increasing knowledge and skills on resilience, transformation, and relations between sustainable development, ecosystem management, and risk reduction. Beneficiaries of the UNEP's MOOC were disaster managers, development planners, and project implementers by providing new training tools that were accessible through an online course. Subjects included disaster trends and statistics, disaster risk reduction fundamentals, climate change, disasters and environmental linkages, tools for ecosystem-based disaster risk reduction and adaptation, and global, national, and

[2] http://www.emphasisproject.eu/.

[3] https://cordis.europa.eu/project/id/261752.

[4] https://ec.europa.eu/programmes/horizon2020/en.

local processes of disaster risk reduction.[5] Such initiatives provided a useful guide for potential training courses in the European Union, expanded to biosecurity issues.

UNDP Global Risk Identification Program (GRIP)

The United Nations Development Programme (UNDP) with the help of the EU has also been active from a risk assessment standpoint. It established the Global Risk Identification Program (GRIP) in 2017 to reduce the impact of natural disasters by providing risk information for policymakers.[6] Officially launched as an ISDR thematic platform for risk identification at the first GRIP session, it was adopted by the UN-ISDR system to support international initiatives that identify and monitor disaster risk. Three steps are essential for the GRIP system to function:

1. Developing the ability and capacity of initiatives to fulfil their objectives.
2. Basing all information and guidelines on evidence-based approaches. In addition, past disaster information should contribute to understanding present research and studies.
3. Establishing international monitoring and evaluation mechanisms to measure the effectiveness of risk assessment strategies. GRIP supports a country-by-country approach to this issue.

The GRIP's target groups are decision makers and technical professionals related to risk assessment. Four comprehensive solution packages have been developed for these stakeholders: A Country Situation Analysis for Risk Assessment, a National Disaster Observatory, a National Risk Assessment, and an Urban Risk Assessment. Like the UNEP's MOOC, training is included in the solution packages. This includes training on applying risk information in decision-making and establishing international networking for projects and financial support. For further information, the program has created an interactive website called GRIPWeb (www.gripweb.org) that provides knowledge management tools. Stakeholders that join can access professional networks in disaster risk from the international community. This will facilitate best practice exchanges and development of joint tools and methodologies. All of this should empower stakeholders to find solutions to local and global threats. Training courses are divided into introductory, intermediate, and advanced. For the introductory level, beneficiary stakeholders are expected to develop conceptual knowledge on disaster risk assessment by:

1. Being introduced to GRIP's disaster risk assessment solution
2. Developing country-specific action plans for disaster risk assessment
3. Developing skills in planning, facilitating, and coordinating disaster risk assessment activities

[5] https://elearning.unep.org/moocs/courses.

[6] www.gripweb.org.

The intermediate level is focused on technical skill development through modelling, mapping, and disaster risk assessment profiling. In addition, beneficiary stakeholders participate in data and information management courses. The course content includes:

1. Hazard-specific disaster risk modelling and scenario building
2. A hands-on approach towards specific tools
3. Designing information management systems

Finally, the advanced level of the GRIP aims at developing beneficiary stakeholder's ability to analyse risk data and information, as well as developing the ability of translating said data into evidence-based knowledge for policies and decision-making. The course content includes:

1. Uncertainty analysis, using disaster risk information for decision-making
2. Setting priorities for disaster risk reduction and establishing effective cost-benefit analysis
3. Analysing risk information from a spatial and thematic perspective[7]

Risk Communication

European and international academics have also been active in defining the role that scientists should play in biosafety and biosecurity issues, especially when it comes to risk assessment and crisis management. This debate has extended beyond the technical realm and to discussions on how the scientific community may provide added value in communication issues to the general public. To this end, stakeholders agree that communicating risk and crisis concepts in accessible language is essential to improve average scientific literacy among citizens. Scientists are key in transmitting said knowledge, and there are many ways in which this can be done. Beyond rethinking education systems, scientists can conduct outreach activities on the practical implications of technological advances and scientific discoveries. The British Royal Society, which also stressed the importance of avoiding academic "ivory towers" often present in research centres and universities, developed this approach. Policymakers should also benefit from accessible language and there should be exchanges between and among these stakeholders on mutual concerns, perspectives, and priorities. One way of giving access to academia was through an open-access journal subscription model guaranteeing access to publications by researchers while combining classic quality controls such as peer reviews. In order to improve risk assessment, stakeholders should also focus on five major points:

1. Improving understanding of the probabilistic frequency-size distribution of hazard events, aggregate development impact of small events compared with large

[7] https://www.globalhand.org/en/browse/global_issues/7/resource/document/27883.

disasters, and their interaction to lead towards a revision of risk management priorities.
2. Finding new ways to look at risk and loss in a globalized world.
3. Finding ways of communicating and reassuring the general public in cases of high uncertainty.
4. Training scientists to understand how social-environmental systems learn and change behaviour over time, space, and scale.
5. Combining ethics, political philosophy, and scientific research to establish vision for a sustainable and inclusive risk assessment. For example, stakeholders can develop models to improve the understanding on decision-making, chains of command, and critical reflexes.

In light of these considerations, the British Royal Society also recommended three ways of approaching these points:

1. Addressing communication challenges through participatory visualization, scenario planning, and novel forms of training.
2. Structuring and institutionalizing exchanges between academics, technicians, and policymakers to narrow the gap between universities, government departments, and NGOs both on national and international scales. This also includes rethinking both academic and public servant career structures in order to allow individuals to "jump" from one world to the other one.
3. Encouraging research-led training for postgraduates through networks of associated universities, national institutes, etc. This should extend to professional training in an integrative way, combining practical scenarios with social science education in civil defence, development, and humanitarian aid (UKDC Resilience 2015).

Implementing Biosafety and Biosecurity Preparedness in the EU

We have talked about the importance of crisis management and risk assessment in avoiding the psychological, economic, social, political, and environmental degradations of population and world regions. We have also talked about how the internationalization of risk and crisis potential has complicated the ability of governments to prepare for these threats on a unilateral basis. Adding contemporary threats to biosafety (environmental disaster, climate change, health, etc.) and biosecurity (bioterrorism, agroterrorism, etc.) we see that discussions, recommendations, and coordination on a European and international level are essential to minimize risks and maximize the well-being of people. Initiatives such as the UNEP's MOOCs and the UNDP's GRIP certainly help in this direction. Risk assessment and crisis management development in the EU through solidarity clauses, security agendas, green papers, civil protection mechanisms, and CBRN action plans have also been

contributing to strengthening preparedness and resilience. Several points could be stressed to continue towards an implementation of biosafety and biosecurity preparedness in the EU from a resilience and psychosocial perspective:

1. Raising awareness and training stakeholders in the psychology of risk perception in the case of a biosecurity or biosafety crisis. Tying this to the psychological perception of biological risk and its economic and mental consequences on European societies.
2. Ensuring that policy actors understand the populations' perceptions and negative psychological reactions to a crisis and how this can affect crisis management. This should aim at maximizing the effectiveness of the European crisis response systems and building emotional and logistical resilience among actors, especially on climate change issues, epidemics, and pandemics.
3. Offering community-based and tailor-made risk and crisis education programs on biosecurity and biosafety, especially for agricultural and environmental stakeholders. An important focus of these training sessions should be on developing rational attitudes to risk perception and panic-minimizing behaviours in the case of a crisis.
4. Establishing tailor-made, sectorial, multilingual, multicultural, and country-specific communication programs on risk and crisis in biosecurity and biosafety. This should aim at minimizing potential panic and maximizing stakeholder trust and resiliency processes.
5. Educating local actors and populations on the benefits and possibilities of environmental risk reduction from a cost-benefit standpoint. Costs and benefits should go beyond economic notions including ecological, social, and psychological measurements provided by case studies of areas fitting similar disaster risk profiles.
6. Using past experiences of environmental disasters to train European and national policymakers through best and worst practices from a psychosocial and resilience perspective. This should lead to dialogues between stakeholders in order to establish minimum standards for disaster preparedness and to enhance actors' disaster resilience.
7. Establishing a framework for constructive post-crisis and disaster feedback based on the psychology of building trust and emotional budges. Such initiatives should focus on coping with powerful emotions that might cause resentment and lead to defensive attitudes among stakeholders. The ultimate objective is improving future frameworks on risk assessment and crisis management in order to make them understand the behaviour of themselves and others in exceptional situations.

Development and Resilience

Biological hazards had been included, for the first time, in the Sendai Framework for Disaster Risk Reduction (United Nations, March 18, 2015). The United Nations' Global Assessment Report on Disaster Risk Reduction (GAR 2019) presaged about the rising risk of biological hazards, particularly epidemics and pandemics: "Another Ebola epidemic or a new influenza pandemic are likely and almost certain. The only unknowns are when and where they, or a new but equally lethal threat, will emerge" (UNDRR 2019:105). COVID-19 crisis is a real example of how interconnected we are in this global village and it could represent, despite all the sufferance it has provoked, an opportunity for scientists and policymakers/diplomats to strengthen resilience joining their attention on negotiating preventive strategies. To this end, it will be decisive to strengthen their interpersonal cooperation processes to adaptive decision-making under conditions of uncertainty and increased risk potential. The complexity and interdependence of natural hazard in specific environment combined with man-made errors is what makes many disasters particularly dangerous and spread throughout communities, societies, environments, and economies increasing potential risks. International community should carry on working (at organizational level) on capacity building with multidimensional and multidisciplinary methodologies, implementing cohesive, coherent, integrated, and coordinated comprehensive approaches. We live in a multi-hazard era of systemic risk. Actions aiming at reducing the risk of cascading disasters involve complex processes and should be studied and researched as a whole as they cannot be analysed as isolated, randomly assessed actions within development processes. Few interdependent variables for instance are strategic planning, local institutional frameworks, local law-making processes, native traditions and appropriate use of local resources, participation of key actors (all), tailored training aimed at strengthening capacity building and human resilience, strategic preparedness plans, prevention and alleviation activities, emergency preparations and management, and post-disaster rehabilitation and reconstruction long-term programs. In practice, we should continue to strengthen strategic societal challenges to identify, assess, and monitor disaster risks; to enhance early warning mechanisms; and to strengthen human personal and collective development. Resilience and mental capital capacity building should be the core strategic elements on which to focus behind the post-COVID-19 recovery for instance. When we talk about resilience we talk about human development, and then capacity building is essentially the HOW we can apply this comprehensive approach. Do not forget that we work in fragile environments for the most part of times and that societies touched by disasters are traumatized societies (i.e.: PTSD, anxiety, depression, hopelessness to name but a few) (Galluccio 2019). The international community needs to work with and within those environments so as to integrate tailored intervention policies to local community interventions. Training is only one methodology and it should not be conducted in isolation. At the end of the day we need to use knowledge, innovation, and education to build a culture of safety and resilience at all levels. Certain challenges must be tackled such as potential

coordination strategy between national and European actors. Internationalization of risk and crisis is also a challenge to be undertaken along with the psychological and physical demands of citizens. This is the only way to build, foster, and nurture sustainable resilient societies.

The Expected Impact on the European Society

Biological threat reduction (BTR) is at first instance the responsibility of national authorities in the EU. However, the nature of bioterrorism makes supranational and intergovernmental solutions inherently desirable. For starters, biological agents are very mobile between national borders. This is especially the case in the EU, where high population density is combined with the free movements of goods, services, and citizens. In light of the need for multilateral solutions, programs have been launched to tackle issues specific to bioterrorism yet have often been divided due to how BTR crosses sectorial boundaries. This is often seen in institutions such as the European Commission. Health security initiatives, including monitoring and coordination, take place within DG Health and Food Safety. The Commission's ECHO department is in charge of preparing effective responses to civil protection. Research activities related to vaccines and detection techniques can be found in DG Research and within the semi-autonomous European Medicines Agency (EMEA). Border control and export regulation issues related to bioterrorism are dealt with in DG Migration and Home Affairs and DG Internal Market (respectively). Finally, all bioterrorism issues with an external component fall under the competence of the Common Foreign and Security Policy (CFSP) (Bengtsson and Rhinard 2018). As can be seen, bioterrorism's cross-sectorial nature has resulted in a scattered division of competences between DGs of the European Commission. When adding national authorities as first responders to such a crisis, it becomes easy to envisage difficulties in making different bureaucracies coordinate, cooperate, and communicate. Unfortunately, such difficulties are not just limited to logistical questions. Psychologically speaking, counterproductive assumptions on the "real motivations" between stakeholders can lead to an atmosphere of mistrust and competition. This is problematic, as crisis management under bioterrorism needs efficient interactions between all stakeholders.

Advisory skills should be strengthened in order to assist the EU and international institutions and organizations in supporting human resilience in biosecurity, and in helping place the EU security-related decision-making on a strong evidence-informed footing within the context of the longer term. The European Commission, DG Home, in the wake of the new Global Strategy for the EU's Foreign and Security Policy, is strengthening a multidisciplinary Community of Users on Safe, Secure and Resilient Societies[8] for disaster and crisis management. Its key objective in the

[8] "Strengthening capacities in disaster risk and crisis management and increasing resilience form

field is to identify the most promising tools and methods that have the potential to be taken up by practitioners to improve adaptive decision-making processes. Along the same line, the International Network for Government Science Advice (INGSA)[9] aims to enhance the global science-policy interface to improve the potential for scientific evidence-informed policy information at both national and transnational levels. Then, the United Nations Science and Technology group[10] on the implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030 (Royal Society 2015; United Nations 2015)[11] is working on bridging the gap between scientists-researchers and policymakers/diplomats. We hope the European Commission of the EU will continue the good work it is doing to foster ideas and tools to improve science diplomacy strategic cooperation among main actors and the scientific communication at large.

Concluding Remarks

In addition to well-functioning institutional levers, bioterrorism responses cannot be successful without effective communication strategies. Policymakers, spokesmen, and responders at large must do their best to anticipate what psychological effects the population will experience in order to use appropriate Crisis and Emergency Risk Communication (CERC). Some negative behaviours could be due to (but are not limited to) denial, stigmatization, fear, hopelessness/helplessness, PTSD, grief, and occasionally cognitive bias. Discourse under crisis management must therefore include strong knowledge of cognitive and emotional responses in populations (Galluccio 2019). All of this makes us to focus efforts on comprehensive and strategic approaches to reduce exposure and vulnerabilities. It is evident that resilience-building process will be a strong concern for the future. Policymakers and key decision makers are not neutral as they bring to the "table" their own set of perceptions, cognition, feelings, attitudes, and behaviours, which are of course influenced by events. Biosecurity is a policy area involving several disciplines: psychology, sociology, and political sciences, but also agricultural, environmental, and health sciences (referring to One Health concept). In a biosecurity threat scenario,

---

the backbone of key EU policy and research challenges. Therefore, effective coordination and interaction are essential between the various EU's stakeholders involved. Exchanges between the stakeholders, ranging from policymakers, research, industry, and practitioners in the EU Member States, are facilitated by targeted research projects commissioned by the EU. The complexity of the security domain thwarts identification and dissemination of relevant information. This results in a lack of awareness about policy developments and research outputs. The Community of Users aims to address this issue by making the latest policy updates and research outputs, accessible and more visible via its events, its webpage and its annual mapping document" (https://www.security-research-cou.eu/).

[9] http://www.ingsa.org.

[10] https://sustainabledevelopment.un.org/majorgroups/scitechcommunity.

[11] https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf.

for improving sustainable functioning of policymaking mechanisms, it is important to understand how decision makers perceive, think, feel, and behave when they analyse complex environments under conditions of expanded ambiguity and high uncertainty. Learning from experience is the most powerful way to lead. It fosters tacit knowledge that is crucial in a crisis (Nye 2008). However, a simple accumulation of knowledge in a field is not an example of specific experience. The experience is represented by the way our cognitive and emotional processes and metacognitive functions guide us to use our knowledge to tune our attention. In such conditions, experience based on accumulated knowledge could mitigate the shock that calls to action in introducing an element of effectiveness and predictability for sustainable policymaking processes (see Chap. 2, this book).

Part IV
Theory, Research, and Practice for Science Diplomacy: An Insight on the Cooperative Process

Chapter 11
International Alliance for Science Diplomacy: Interpersonal Skills as a Predictor of a Sound Negotiation Process—American and European Self-Perception

Mauro Galluccio and Mattia Sanna

If we knew what we were doing, it would not be called research, would it?

Albert Einstein

Diplomacy is the art of telling people to go to hell in such a way that they ask for directions.

Winston Churchill

Introduction

Negotiation and mediation always occur in social and cultural contexts. International negotiators are often putting pressure on one side or the other. That pressure usually reflects home country and domestic preferences where votes may be gained or lost. Most countries openly acknowledge that they negotiate from positions of competitive self-interest—be it in terms of trade, addressing climate change, or resolving aggressive disputes between nations—getting the best deal for their home team, group, country, and nation. For example, in case of democracies, governments and their negotiators need to claim that they are seeking the best deals for their home group to avoid electoral disadvantage. In some cases, it can be specific sections of the population they need to appease—especially when political funds can be depen-

M. Galluccio (✉)
EANAM (European Association for Negotiation and Mediation), Brussels, Belgium
e-mail: mauro.galluccio@eanam.org

M. Sanna
Global Health and Development, Taipei Medical University, Taipei, Taiwan
e-mail: msanna@tmu.edu.tw

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_11

dent on those sections (Thompson et al. 2001). The literature on psychology applied to international negotiation has been progressing at a theoretical level, but we know much less about how to master interacting cognitive and affective processes to shape judgements and decisions among parties (Aquilar and Galluccio 2008; Galluccio 2011; Galluccio and Safran 2015; Morris and Keltner 2000). To us, it is important *how* people negotiate: as such our approach is unequivocally concerned with issues of process. Our research aimed to shed light on the way in which individual interpersonal skills can affect processes in international negotiations. Interpersonal skills are important tools to manage intrapersonal and interpersonal processes. We think they are broad based and are related to general negotiator's competencies than to specific techniques (Galluccio and Safran 2015). It is important to research a variability in negotiation outcome that can be linked to an individual negotiator and we think that a portion of this variability can be related specifically to negotiators' interpersonal skills rather than to other variables. Interpersonal skills are important and may produce differences in negotiators' styles influencing conduct and outcome of negotiations. Finally, we would like to better understand if facilitative interpersonal skills similar to those examined in this study could be employed in the selection and training of negotiators.

Purpose of the Research

This is a multidisciplinary research project developed on two sides of the Atlantic, the United States and the European Union (EU). We intend to analyse the impact of a large set of interpersonal skills and specific experience-based mindset on the negotiation process, as they were perceived by high-ranking professionals with seasoned experience in the field, such as foreign ministry officers, diplomats, civil servants, scientific consuls, and ambassadors. The aim is to expand knowledge and public awareness on interdisciplinary, interpersonal, intercultural, and diplomatic perspectives of international negotiation (Galluccio and Safran 2015). We framed the study and the research process from a different perspective than the dominant explanation in the field of international negotiations. We focused our attention on the decision-making process modalities without devaluing the interpersonal skills of the negotiator as a determining factor in the outcome. Our research investigated experience-informed processes (situations, interpersonal dynamics, and skills) of a rather wide sample of scientists/diplomats within the US administration (Department of State and White House) and the EU administration (European External Action Service (EEAS), the Council of Ministers of the EU, the European Commission of the EU). Unlike most studies and research on international negotiation, our research emphasized processes, not simply outcomes, or even tools, but the way in which tools could be used by actors to achieve better outcomes especially under the pressure of stressful events. Moreover, this research highlights the message that global challenges must be met in cooperation and not in unconstructive competition or even open conflict, with an emphasis on *peace seeking* and a balanced approach to the different and at times conflicting interests among international actors. Our

scientific and political interest was focused on how negotiators' interpersonal skills could help to frame situations influencing decision-making (within a given mandate). This research represented a broader clinical attempt to better understand the reality of international negotiation as it was perceived by negotiators (themselves) and different continents. Its novelty lied in its strictly quantitative approach, which allowed us to draw statistically based conclusions on a naturalistic research process. Our goal was not to proclaim "winners" and "losers" in a forecasting contest but rather to study how highly trained scientists/professionals and diplomats reasoned and felt about complex real-world processes under conditions of stress and uncertainty, and if interpersonal skills mattered and could influence the process. Moreover, the aim was to try to better understand European and American negotiation thinking in its evolution, and to provide a benchmark for future comparison and discussion with practical and operational/clinical implications for interpersonal negotiations on the international stage.

Materials and Methods

Data Set

First, a self-assessment questionnaire was developed including 17 items that could affect the negotiation process (interpersonal skills and experience-based mindset contexts). Respondents were asked to rate their degree of usefulness on a 5-point Likert scale from "Very Dangerous" to "Very Useful". The questionnaire was then submitted to 42 participants from the United States (US data set) and to 39 participants from European countries (EU data set). Interviewees were guaranteed anonymity. A numerical value was assigned to the degree of usefulness, as follows: Very Useful = 2, Useful = 1, Neutral = 0, Dangerous = −1, Very Dangerous = −2.

Composition of the Sample and Research Procedure

The participant sample was composed by senior scientists and diplomats' negotiators of the EU (the EEAS, the Council of the Ministers, and the European Commission, which within the EU institutional framework has the power to negotiate on behalf of member states) and of the US Department of State and the White House. Chosen subjects had strong backgrounds and proven experience in negotiation practice on the international stage.

The testing session was divided into three contingent phases and it was developed in the *period* from 2012 to 2014. We used semi-structured interviews and structured questionnaires. First, *participant*s answered questions that probed their professional backgrounds. *Then*, each *of them* completed the above-mentioned 17 interpersonal skill item questionnaire. Finally, we had 2 h of interview with each participant of the research process. It is worth emphasizing that all data

were collected with strict guarantees of confidentiality to both individuals and international organizations or governments to which they were affiliated.

Statistical Analysis

Interviewees' answers were first *processed* through descriptive statistics, computing all the indicators starting from the numerical conversion mentioned above, to yield an accessible overview of the main outcomes of the survey. Subsequently, we examined the questionnaire results through a hierarchical cluster analysis with the average between groups as the linkage criterion and the squared Euclidean distance as the metric. Lastly, we applied to our data set multidimensional scaling (MDS), a technique originated in psychometrics that displays the structure of distance-like data as a geometrical picture (Young 1985). Let us assume that, for a given data set, it is possible to define, between each pair of objects, a measurement of their "dissimilarity". Hence, MDS can be described as the search for a low-dimensional space, usually Euclidean, in which points in the space represent the objects and such that the distances between the points in the space match, as well as possible, the original dissimilarities (Cox and Cox 2000). We adopted the absolute difference between the sum of the scores obtained by two *items* as the dissimilarity measurement, since it was a good global indicator of the opinions expressed by the interviewees and suitably reflected the "distance" between the rating of two personality *items*. A classical scaling was then performed, selecting a two-dimensional model and using the PROXSCAL algorithm (Commandeur and Heiser 1993). Answers from American and European samples were kept separated for the sake of comparison. Statistical analyses were carried out, using IBM® SPSS® (Statistical Package for Social Science) Statistics—Version 21 for Windows® 7.

Results

Descriptive Statistics

Descriptive statistics calculated for each interpersonal skill and experience-based mindset are reported in Table 11.1 (US data set) and in Table 11.2 (EU data set). Recalling that a missing value occurred when one of the interviewees did not express any opinion about the corresponding interpersonal skills, it *was* interesting to observe that the American data set contained only four missing values, while the European data set 13.

The range of an array of data is the difference between the largest and the smallest value. Thus, in our case, the value 4 was assumed for a given interpersonal skill when at least one interviewee rated it as "Very Useful" (2) and, at the same time, at least another interviewee rated it as "Very Dangerous" (−2). Those skills and contextual

Table 11.1 Descriptive statistics—US data

Interpersonal skills	Valid/ total	Mean	Std. error of mean	Median	Std. deviation	Variance	Range
Hostility	42/42	−1.17	0.13	−1	0.82	0.68	4
Creativity	42/42	1.55	0.10	2	0.63	0.40	2
Expectations	42/42	0.86	0.14	1	0.90	0.81	3
High expectations	42/42	0.00	0.19	0	1.25	1.56	4
Aggressiveness	41/42	−0.73	0.16	−1	1.03	1.05	3
Rigidity	41/42	−1.05	0.16	−1	1.00	1.00	3
Assertiveness	42/42	0.57	0.14	1	0.91	0.84	4
Empathy	42/42	1.48	0.10	2	0.63	0.40	2
Ambiguity	42/42	−0.05	0.15	0	0.96	0.92	4
Uncertainty	42/42	−0.62	0.15	−1	0.96	0.92	4
Deceit	41/42	−1.63	0.09	−2	0.58	0.34	2
Suspicion of deceit	42/42	−1.10	0.16	−1	1.05	1.11	3
Attention to the emotions	42/42	1.45	0.09	2	0.59	0.35	2
Human communication	42/42	1.90	0.05	2	0.30	0.09	1
Point of breakdown in the negotiation process	41/42	0.59	0.13	1	0.81	0.65	3
Right time taken between the breakdown and restart of the negotiation	42/42	1.26	0.12	1	0.80	0.64	3

scenarios (experience-based mindset) that received at least two completely opposite scores were "Hostility", "High Expectations", "Assertiveness", "Ambiguity", "Uncertainty", and "Mass Media and Communication Triangle"[1] in the US data set, and "Expectations", "Aggressiveness", "Assertiveness", "Empathy", "Attention to the Emotions", and "Point of Breakdown in the Negotiation Process" in the EU data set. Interestingly, "Assertiveness" was the only element common to both lists. The median *is* the numerical value that separates the higher half of a data set from the lower half. In our case, the median was zero when, for a given skill, the number of positive scores ("Useful" or "Very Useful") was equal to the number of negative scores ("Dangerous" or "Very Dangerous"). This happened for "Ambiguity" in both data sets, and for "High Expectations" in the EU data set.

The standard deviation measures the amount of variability (or dispersion) around the average and the heterogeneity of the answers provided by the negotiators was investigated. This information *was* interesting because the standard deviation was expected to be somehow connected to the degree of ambiguity the interviewees perceived about what they were asked to rate. Interpersonal skills *and experience-based mindset* which standard deviations were similar in both samples *were* "Mass Media and Communication Triangle", "Aggressiveness", "Ambiguity", "Expectations",

[1] Here "communication triangle" is intended as the context-based scenario where parties in the room try to strategically involve media to influence the negotiation process.

Table 11.2 Descriptive statistics—EU data

Interpersonal skills	Valid/ total	Mean	Std. error of mean	Median	Std. deviation	Variance	Range
Hostility	39/39	−1.13	0.13	−1	0.80	0.64	3
Creativity	39/39	1.79	0.08	2	0.47	0.22	2
Expectations	39/39	0.51	0.14	1	0.88	0.78	4
High expectations	37/39	−0.54	0.14	−1	0.84	0.70	3
Aggressiveness	37/39	−0.70	0.18	−1	1.08	1.16	4
Rigidity	38/39	−0.92	0.13	−1	0.82	0.67	3
Assertiveness	38/39	0.76	0.15	1	0.94	0.89	4
Empathy	38/39	1.29	0.17	2	1.04	1.08	4
Ambiguity	37/39	0.08	0.15	0	0.89	0.80	3
Uncertainty	37/39	−0.76	0.12	−1	0.72	0.52	3
Deceit	38/39	−1.24	0.14	−2	0.88	0.78	3
Suspicion of deceit	38/39	−1.16	0.11	−1	0.68	0.46	3
Attention to the emotions	39/39	0.97	0.13	1	0.84	0.71	4
Human communication	39/39	1.72	0.08	2	0.51	0.26	2
Point of breakdown in the negotiation process	39/39	0.72	0.15	1	0.92	0.84	4
Right time taken between the breakdown and restart of the negotiation	39/39	1.33	0.10	1	0.62	0.39	2
Mass media and communication triangle	39/39	0.72	0.15	1	0.92	0.84	3

and “Hostility”. American negotiators provided more heterogeneous answers about “High Expectations”, “Suspicion of Deceit”, “Rigidity”, “Uncertainty”, “Right Time Taken Between the Breakdown and Restart of the Negotiation”, and “Creativity”, while Europeans expressed dissenting opinions especially about “Empathy”, “Attention to the Emotions”, “Deceit”, and “Human Communication”. In general, the judgement on “Mass Media and Communication Triangle”, “Aggressiveness”, “Ambiguity”, “Assertiveness”, and “Expectations” was conflicting, as shown by their high standard deviations. On the other hand, all the interviewees tended to agree on the usefulness of “Human Communication” and “Creativity”.

Focusing our attention on the mode (i.e. the most frequently occurring value), some relevant differences could be detected between the two samples (see Figs. 11.1 and 11.2). “Ambiguity” in both data sets was zero, meaning that it was recognized as a neutral characteristic by the relative majority of US and EU interviewees. The relative majority of the European participants also classified “Mass Media and Communication Triangle” as a neutral item, whereas American participants predominantly rated it as “Very Useful” (mode = 2). “Attention to the Emotions” and “Right Time Taken Between the Breakdown and Restart of the Negotiation” were evaluated as “Very Useful” by the relative majority of the American participants, while the European participants considered them just as “Useful”. Similarly,

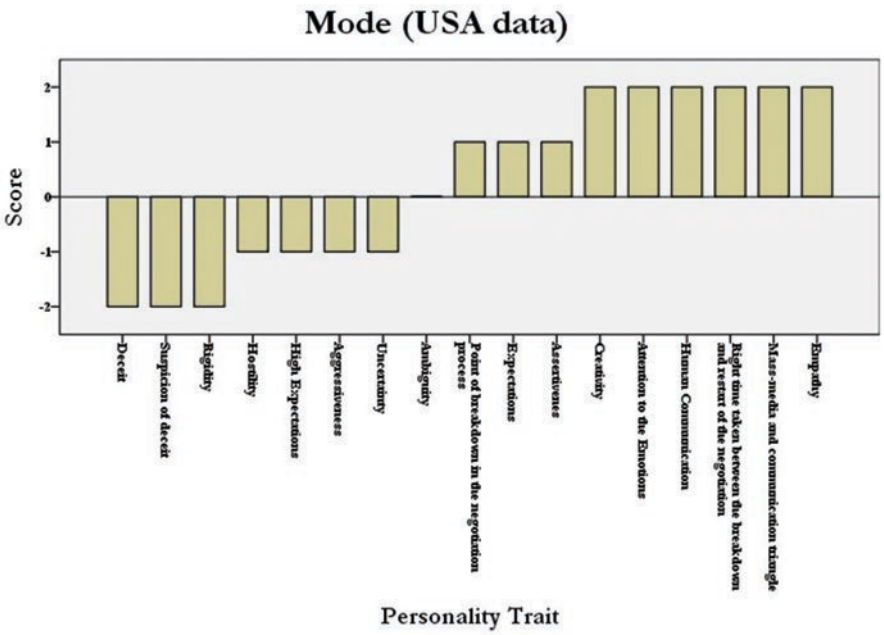


Fig. 11.1 Mode ranked in descending order—US data

"Rigidity" and "Suspicion of Deceit" were predominantly rated as "Very Dangerous" by Americans and "Dangerous" by Europeans. In general, the number of interpersonal skills, the most frequently occurring value of which was "extreme" ("Very Dangerous" or "Very Useful"), was higher in the American sample (3 + 6 = 9 skills/mindset) than in the European sample (1 + 3 = 4 skills/mindset). In other words, American participants seem to be inclined to express more polarized opinions, in comparison with European colleagues.

Looking at the frequency distribution displayed in Tables 11.3 and 11.4, we first focused our attention on those frequencies greater than 50%, since they identified those interpersonal skills which usefulness was agreed upon by the absolute majority of the interviewees. More than half of the American participants gave the same evaluation score to only six skills/mindset, namely "Attention to Emotions—Very Useful", "Creativity—Very Useful", "Deceit—Very Dangerous", "Empathy—Very Useful", "Hostility—Dangerous", and "Human Communication—Very Useful", the last combination showing the highest degree of agreement (90.5%). By contrast, the answers provided by European interviewees highlighted more assenting opinions, as in only four cases the frequency of the most recurring score fell below 50%, namely "Aggressiveness", "Ambiguity", "Expectations", and "Mass Media and Communication Triangle". In the EU data set, "Creativity—Very Useful" was the category with the highest degree of agreement (82.1%). Furthermore, considering both data sets, none of the participants assigned a negative evaluation ("Dangerous" or "Very Dangerous") to "Creativity" and "Human Communication". The same

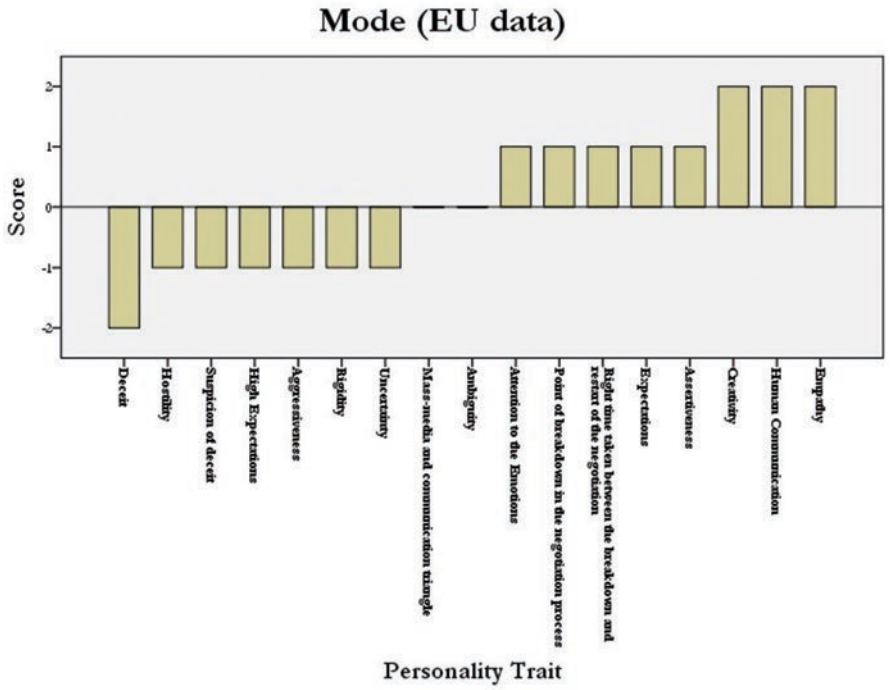


Fig. 11.2 Mode ranked in descending order—EU data

happened for "Attention to the Emotions" and "Empathy" in the US data set and for "Right Time Taken Between the Breakdown and Restart of the Negotiation" in the EU data set. In the end, "Deceit" did not get any positive score ("Useful" or "Very Useful") from the American interviewees.

The global degree of usefulness of each interpersonal skill was assessed by calculating the sum of its scores (see Table 11.5). The idea of using the average was dismissed, because we would have obtained non-integer values, which does not make any sense when dealing with non-numerical variables. The sum of the scores ranged between −84 and 84 for the US data (42 interviewees) and between −78 and 78 for the EU data (39 interviewees), the extreme values ideally indicating a skill unanimously evaluated as "Very Useful" or "Very Dangerous".

Looking first at the similarities between the two groups of negotiators, we can observe that "Uncertainty", "Aggressiveness", "Rigidity", "Suspicion of Deceit", "Hostility", and "Deceit" were largely considered as negative, their sums ranging between −26 and −67. Moreover, the opinions about "Ambiguity" seemed to balance each other, resulting in a sum of the scores equal to −2 in the US data and to 3 in the EU data. On the other hand, "Human Communication", "Creativity", "Empathy", "Attention to the Emotions", "Right Time Taken Between the Breakdown and Restart of the Negotiation", "Expectations", "Mass Media and Communication Triangle", "Point of Breakdown in the Negotiation Process", and

Table 11.3 Frequency table—US data

USA data	Frequency (%)				
Interpersonal skills	−2	−1	0	1	2
Aggressiveness	24.4	41.5	17.1	17.1	0.0
Ambiguity	7.1	23.8	38.1	28.6	2.4
Assertiveness	2.4	9.5	28.6	47.6	11.9
Attention to the emotions	0.0	0.0	4.8	45.2	50.0
Creativity	0.0	0.0	7.1	31.0	61.9
Deceit	68.3	26.8	4.9	0.0	0.0
Empathy	0.0	0.0	7.1	38.1	54.8
Expectations	0.0	9.5	19.0	47.6	23.8
High expectations	9.5	31.0	26.2	16.7	16.7
Hostility	33.3	57.1	4.8	2.4	2.4
Human communication	0.0	0.0	0.0	9.5	90.5
Mass media and communication triangle	7.1	4.8	26.2	28.6	33.3
Point of breakdown in the negotiation process	0.0	9.8	31.7	48.8	9.8
Right time taken between the breakdown and restart of the negotiation	0.0	2.4	14.3	38.1	45.2
Rigidity	39.0	39.0	9.8	12.2	0.0
Suspicion of deceit	47.6	26.2	14.3	11.9	0.0
Uncertainty	16.7	42.9	28.6	9.5	2.4

Table 11.4 Frequency table—EU data

EU data	Frequency (%)				
Interpersonal skills	−2	−1	0	1	2
Aggressiveness	21.6	48.6	10.8	16.2	2.7
Ambiguity	0.0	29.7	37.8	27.0	5.4
Assertiveness	2.6	7.9	18.4	52.6	18.4
Attention to the emotions	2.6	2.6	12.8	59.0	23.1
Creativity	0.0	0.0	2.6	15.4	82.1
Deceit	50.0	26.3	21.1	2.6	0.0
Empathy	2.6	7.9	2.6	31.6	55.3
Expectations	5.1	2.6	35.9	48.7	7.7
High expectations	8.1	51.4	27.0	13.5	0.0
Hostility	33.3	51.3	10.3	5.1	0.0
Human communication	0.0	0.0	2.6	23.1	74.4
Mass media and communication triangle	0.0	7.7	35.9	33.3	23.1
Point of breakdown in the negotiation process	2.6	7.7	20.5	53.8	15.4
Right time taken between the breakdown and restart of the negotiation	0.0	0.0	7.7	51.3	41.0
Rigidity	23.7	50.0	21.1	5.3	0.0
Suspicion of deceit	28.9	60.5	7.9	2.6	0.0
Uncertainty	13.5	51.4	32.4	2.7	0.0

Table 11.5 Sum of the scores for each skill ranked in descending order—US and EU data

US data		EU data	
Interpersonal skills	Sum	Interpersonal skills	Sum
Human communication	80	Creativity	70
Creativity	65	Human communication	67
Empathy	62	Right time taken between the breakdown and restart of the negotiation	52
Attention to the emotions	61	Empathy	49
Right time taken between the breakdown and restart of the negotiation	53	Attention to the emotions	38
Expectations	36	Assertiveness	29
Mass media and communication triangle	32	Mass media and communication triangle	28
Point of breakdown in the negotiation process	24	Point of breakdown in the negotiation process	28
Assertiveness	24	Expectations	20
High expectations	0	Ambiguity	3
Ambiguity	−2	High expectations	−20
Uncertainty	−26	Aggressiveness	−26
Aggressiveness	−30	Uncertainty	−28
Rigidity	−43	Rigidity	−35
Suspicion of deceit	−46	Hostility	−44
Hostility	−49	Suspicion of deceit	−44
Deceit	−67	Deceit	−47

"Assertiveness" were globally perceived as useful skills/mindset, since the sum of their scores falls between 20 and 80. Some slight differences can be stressed as well. First, the values associated to "Human Communication", "Empathy", "Expectations", and "Attention to the Emotions" were remarkably greater among the American negotiators than among Europeans. Vice versa, "Deceit" was less negatively rated by European negotiators than by their American colleagues, adding up to −47 and −67, respectively. Furthermore, "High Expectations" was the item the two groups mostly disagreed upon: Europeans mainly considered it as a negative characteristic (sum of the scores = −20), while Americans expressed conflicting and balancing opinions (sum of the scores = 0).

Cluster Analysis

All the information presented in the previous subsection were confirmed and in a way summarized by the hierarchical cluster analysis (Figs. 11.3 and 11.4).

Focusing our attention on the clustering of the US data set, it was interesting to observe that the sums of the scores for each skill (see Table 11.5) were ranked almost in the same way as the clustering algorithm did, while such correspondence only occurs for the first ten skills in the EU data set. Moreover, three big clusters could be clearly distinguished in the first dendrogram (Fig. 11.3), based on the sign

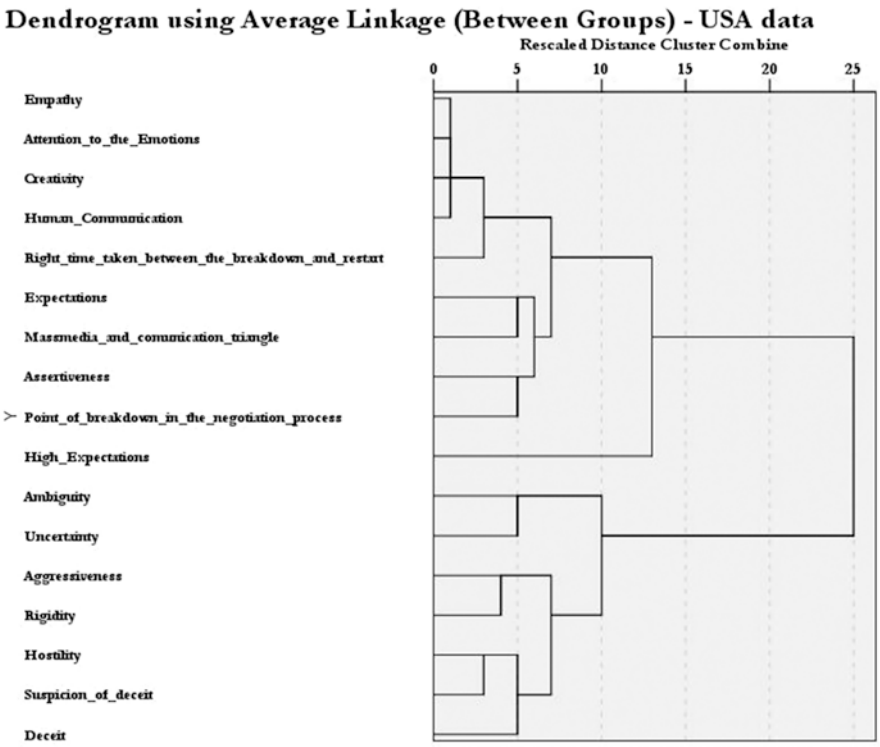


Fig. 11.3 Hierarchical clustering dendrogram—US data

of the corresponding sum of the scores: positive ("Human Communication", "Creativity", "Empathy", "Attention to the Emotions", "Right Time Taken Between the Breakdown and Restart of the Negotiation", "Expectations", "Mass Media and Communication Triangle", "Point of Breakdown in the Negotiation Process", "Assertiveness"), negative ("Ambiguity", "Uncertainty", "Aggressiveness", "Rigidity", "Suspicion of Deceit", "Hostility", "Deceit"), and null ("High Expectations"). On the other hand, dendrogram in Fig. 11.4 shows two well-separated groups: positive sum ("Human Communication", "Creativity", "Empathy", "Attention to the Emotions", "Right Time Taken Between the Breakdown and Restart of the Negotiation", "Expectations", "Mass Media and Communication Triangle", "Point of Breakdown in the Negotiation Process", "Assertiveness", "Ambiguity") and negative sum ("Uncertainty", "Aggressiveness", "Rigidity", "Suspicion of Deceit", "Hostility", "Deceit", "High Expectations"). It is worthwhile to underscore that these last two groups were more tightly clustered than those from the US data set.

The cluster membership evolution in the US data set was investigated, with the number of groups ranging from seven (greater values would result in too many fragmentary situations) to four (see Table 11.6). At the first step (from seven to six

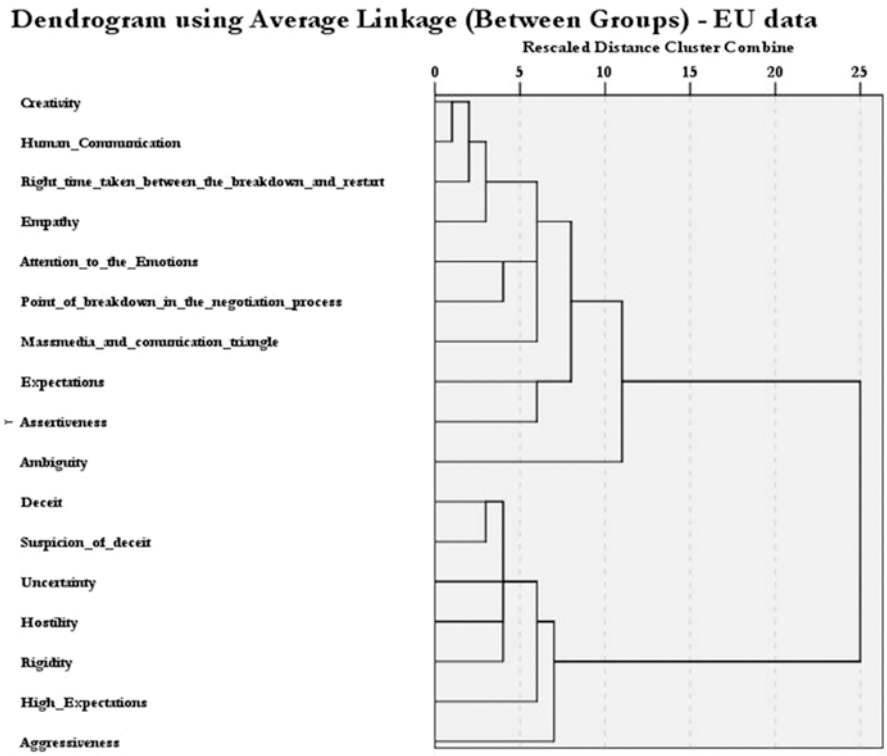


Fig. 11.4 Hierarchical clustering dendrogram—EU data

clusters), "Expectations", "Mass Media and Communication Triangle", "Assertiveness", and "Point of Breakdown in the Negotiation Process" were clustered in the same group, meaning their degree of similarity was the highest as computed by the clustering algorithm. At the second step (from six to five clusters), all interpersonal skills, the scores of which add up to a positive value, were clustered in the same group. At the last step (from five to four clusters), "Aggressiveness"-"Rigidity" and "Hostility"-"Deceit"-"Suspicion of Deceit" were clustered together, but with a lower level of similarity.

Examining the clustering in the EU data set (see Table 11.7), we note that the similarity between "Attention to the Emotions"-"Point of Breakdown in the Negotiation Process" and "Mass Media and Communication Triangle" is the greatest, being clustered in the same group at the first step. At the second step, these three mindsets were clustered together with "Empathy"-"Creativity"-"Human Communication"-"Right Time Taken Between the Breakdown and Restart of the Negotiation", while at the last step "Aggressiveness" was added to the "High Expectations"-"Uncertainty"-"Rigidity"-"Hostility"-"Deceit"-"Suspicion of Deceit" group.

Coming to conclusions, it was interesting to compare the membership pattern of the two data sets focusing on the six-cluster case, in order to highlight likely

Table 11.6 Cluster membership evolution—US data

Interpersonal Skills	7 clusters	Interpersonal skills	6 clusters
Empathy	2	Empathy	2
Attention to the Emotions	2	Attention to the Emotions	2
Creativity	2	Creativity	2
Human Communication	2	Human Communication	2
Right time taken between the breakdown and restart of the negotiation	2	Right time taken between the breakdown and restart of the negotiation	2
Expectations	3	Expectations	3
Mass-media and communication triangle	3	Mass-media and communication triangle	3
Assertiveness	6	Assertiveness	3
Point of breakdown in the negotiation process	6	Point of breakdown in the negotiation process	3
High Expectations	4	High Expectations	4
Ambiguity	7	Ambiguity	6
Uncertainty	7	Uncertainty	6
Aggressiveness	5	Aggressiveness	5
Rigidity	5	Rigidity	5
Hostility	1	Hostility	1
Deceit	1	Deceit	1
Suspicion of deceit	1	Suspicion of deceit	1

(continued)

Table 11.6 (continued)

Interpersonal skill	5 clusters	Interpersonal skill	4 clusters
Empathy	2	Empathy	2
Attention to the Emotions	2	Attention to the Emotions	2
Creativity	2	Creativity	2
Human Communication	2	Human Communication	2
Right time taken between the breakdown and restart of the negotiation	2	Right time taken between the breakdown and restart of the negotiation	2
Expectations	2	Expectations	2
Mass-media and communication triangle	2	Mass-media and communication triangle	2
Assertiveness	2	Assertiveness	2
Point of breakdown in the negotiation process	2	Point of breakdown in the negotiation process	2
High Expectations	3	High Expectations	3
Ambiguity	5	Ambiguity	4
Uncertainty	5	Uncertainty	4
Aggressiveness	4	Aggressiveness	1
Rigidity	4	Rigidity	1
Hostility	1	Hostility	1
Deceit	1	Deceit	1
Suspicion of deceit	1	Suspicion of deceit	1

Table 11.7 Cluster membership evolution—EU data

Interpersonal skills	7 clusters	Interpersonal skills	6 clusters
Empathy	2	Empathy	2
Creativity	2	Creativity	2
Human Communication	2	Human Communication	2
Right time taken between the breakdown and restart of the negotiation	2	Right time taken between the breakdown and restart of the negotiation	2
Attention to the Emotions	6	Attention to the Emotions	6
Point of breakdown in the negotiation process	6	Point of breakdown in the negotiation process	6
Mass-media and communication triangle	7	Mass-media and communication triangle	6
Expectations	3	Expectations	3
Assertiveness	3	Assertiveness	3
Ambiguity	5	Ambiguity	5
High Expectations	1	High Expectations	1
Uncertainty	1	Uncertainty	1
Rigidity	1	Rigidity	1
Hostility	1	Hostility	1
Deceit	1	Deceit	1
Suspicion of deceit	1	Suspicion of deceit	1
Aggressiveness	4	Aggressiveness	4

(continued)

Table 11.7 (continued)

Interpersonal skills	5 clusters	Interpersonal skills	4 clusters
Empathy	2	Empathy	2
Creativity	2	Creativity	2
Human Communication	2	Human Communication	2
Right time taken between the breakdown and restart of the negotiation	2	Right time taken between the breakdown and restart of the negotiation	2
Attention to the Emotions	2	Attention to the Emotions	2
Point of breakdown in the negotiation process	2	Point of breakdown in the negotiation process	2
Mass-media and communication triangle	2	Mass-media and communication triangle	2
Expectations	3	Expectations	3
Assertiveness	3	Assertiveness	3
Ambiguity	5	Ambiguity	4
High Expectations	1	High Expectations	1
Uncertainty	1	Uncertainty	1
Rigidity	1	Rigidity	1
Hostility	1	Hostility	1
Deceit	1	Deceit	1
Suspicion of deceit	1	Suspicion of deceit	1
Aggressiveness	4	Aggressiveness	1

identities and differences between American and European negotiation styles. Nine interpersonal skills/mindsets were generally classified as useful items in the negotiation process. However, they were divided into two groups (Cluster 2 and Cluster 3) in the US data set and into three groups (Cluster 2, Cluster 3, and Cluster 6) in the EU data set. On the contrary, the negative skills were tightly clustered in a single group in the EU data set (Cluster 1) and separated in three groups in the US data set (Cluster 1, Cluster 5, and Cluster 6). "High Expectations" showed a peculiar behaviour (mindset) in the US data set not being grouped with any other item, while it was classified as dangerous by European negotiators. On the other hand, "Aggressiveness" and "Ambiguity" differed from all the other skills in the EU data set (Cluster 4 and Cluster 5), but in the end they were generally considered as dangerous.

Multidimensional Scaling

Classical multidimensional scaling was applied to both data sets, in order to represent the proximity of the single interpersonal skill in a two-dimensional (Euclidean) space (Figs. 11.5 and 11.6). Starting from the US data set, it is interesting to observe that "Deceit" and "Human Communication" were located at the opposite ends of

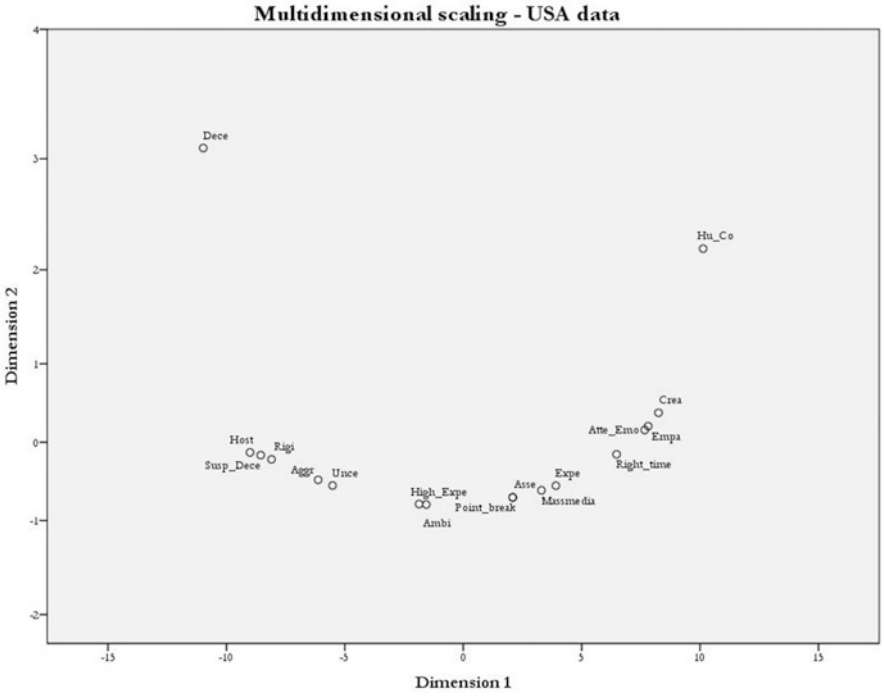


Fig. 11.5 Classical multidimensional scaling—US data

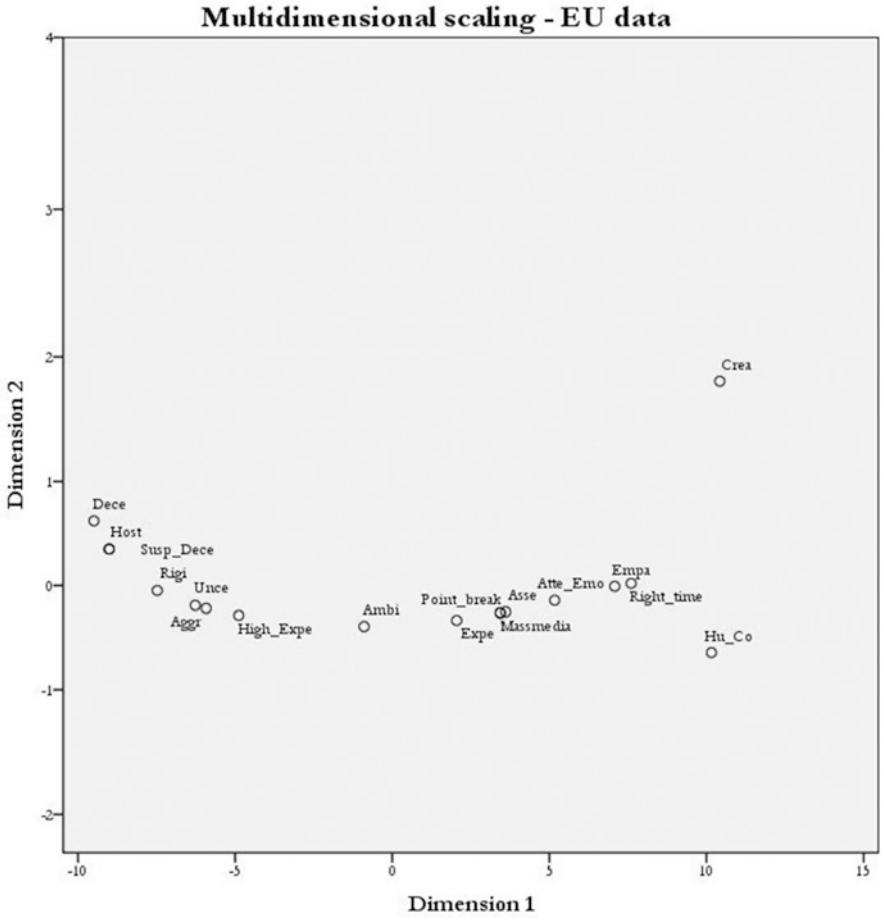


Fig. 11.6 Classical multidimensional scaling—EU data

the chart and quite distant from any other skills. All other skills/mindsets were a bit closer to one another, but three separated groups could be easily identified: (1) the "Very Useful" one (from "Creativity" to "Right Time Taken Between the Breakdown and Restart of the Negotiation"); (2) the "Useful" one (from "Expectations" to "High Expectations"); and (3) the "Dangerous" one (from "Uncertainty" to "Hostility"). The three groups were roughly equidistant, but the distance between the third one and "Deceit" was greater than the distance between the first one and "Human Communication". This can be related (a) to the lack of symmetry between the number of skills positively rated and the number of skills negatively rated and (b) to the almost unanimous opinions expressed about "Deceit".

Looking at the results for the EU data set, the situation appears to be a bit more "confused". In this case, "Creativity" was the skill exhibiting greater distance from any other skills. As in the previous case, "Human Communication" was located far

from the other skills, but its distance was now shorter. Two separated groups could be distinguished, even though they were not as clear as before, namely (1) the "Useful" one (from "Empathy" to "Expectations") and (2) the "Dangerous" one (from "High Expectations" to "Deceit"). It was interesting to stress the peculiar position of "Ambiguity", which seemed to act as a sort of dividing point between the two groups, being roughly equidistant.

Discussion

The quantitative analysis of the questionnaires submitted to the two groups of participants highlighted some differences between American and European perception of interpersonal skills and mindsets. Looking at Table 11.8, which compared the frequency of the five usefulness scores in the two samples, it was interesting to observe how European interviewees were less oriented to "drastic" opinions: the percentages of "Neutral" and "Useful" were quite similar in both American and European data sets (16.53% vs. 17.65% and 25.35% vs. 25.79%, respectively), while higher percentages of "Very Dangerous" and "Very Useful" were found in the American sample (14.85% vs. 11.16% and 23.81% vs. 20.36%, respectively). The percentage of "Dangerous" was higher in European sample (23.08% vs. 18.91%) and, not so surprisingly, European interviewees left blank a greater number of answers (1.96% vs. 0.56%). The lower attitude of the European interviewees to express "extreme" opinions could also explain the less clear situation displayed in the multidimensional scaling chart of Fig. 11.6.

Focusing on some especially important skills, further interesting differences are worth noting. 84.60% of European negotiators considered "Expectations" as a "Neutral-Useful" skill/mindset, as demonstrated by adding the frequencies of 0 and 1 in Table 11.4, while 19.00% of the American interviewees considered it as "Neutral" and 71.40% as "Useful-Very Useful" (Table 11.3). "Rigidity" was globally recognized as a "Dangerous-Very Dangerous" skill/mindset by both groups, as shown by adding the frequencies of −1 and −2 in Tables 11.3 and 11.4 (78.00% in the US data set and 73.70% in the EU data set). However, a remarkable number of European negotiators assigned it the "Neutral" score (21.10%), while 12.20% of the

Table 11.8 Frequency (%) of scores by data set

	US data set (%)	EU data set (%)
Blank	0.56	1.96
Very dangerous	14.85	11.16
Dangerous	18.91	23.08
Neutral	16.53	17.65
Useful	25.35	25.79
Very useful	23.81	20.36

American negotiators rated it as "Useful". Some slight differences could be pointed out in the opinions expressed about "Assertiveness". A larger number of European interviewees evaluated it as a "Useful-Very Useful" skill (added frequency: 71.00% vs. 59.50%). On the other hand, it was assigned a "Neutral" score by 28.60% of the American negotiators and by 18.40% of European negotiators. The frequencies of 1 and 2 observed in the American sample for the situational scenario of "Uncertainty" added up to 11.90%, while only 2.70% of European negotiators gave it a score of 2. In any case, the majority of Europeans and Americans evaluated "Uncertainty" as a "Dangerous-Very Dangerous" item (added frequency: 64.90% and 59.60%, respectively). "Attention to the Emotions" was widely considered as a positive skill/mindset, the sum of the frequencies of 1 and 2 being 95.20% in the US data set and 82.10% in the EU data set. Anyway, it was interesting to observe that, in the EU data set, the same skill was evaluated as "Very Dangerous" by 2.60% of interviewees, "Dangerous" by 2.60% of interviewees, and "Neutral" by 12.80% of interviewees. By contrast, only 4.80% of the American negotiators considered it as "Neutral". In the end, both groups agreed on the judgment about "Ambiguity" and "Human Communication", as there were no remarkable differences between the frequencies of their scores.

The quantitative analysis allows us to clearly note some interesting aspects of this research. Analysing the data in general, we came to the conclusion that at the basis of a sustainable negotiation process there are some skills defined "positive", like the ability to communicate, creativity, empathy, timing awareness, assertiveness, and attention to emotions. The use and implementation of these interpersonal skills are above all necessary in order to maintain a continuity of good working relationships between negotiators, and to make future negotiations easier, smoother, and more cooperative. Furthermore, these interpersonal skills may help to foster an increasing feeling of trust and confidence towards the counterpart. However, it seems that getting acquainted with the counterpart's needs and constraints is important in order to have a clear picture of the negotiation context and an inner awareness of which items and actions should be given priority and appropriate timing within the negotiation process. This momentum can be seized thanks to the mindful action. How can a counterpart make a concession if he or she does not know the counterpart's priority? And consequentially, what is the appropriate concession to make? As a matter of fact, in an intense ongoing negotiation process like the one between the EU and the United States, negotiators increasingly get to know each other better. Meeting, talking, and sitting at the negotiating tables for years help the construction of working relationships and sustainable dialogue in order to listen to and understand diverse positions and achieve compromises while having often different needs and interests. Negotiators and actors are forced to acknowledge the specific needs and interests of their counterparts if they in turn want their own specific needs and interests to be satisfied. Participants to a negotiation can only be open to a smooth process of conceding and obtaining if they feel safe. And they will only feel that way if participants can put trust in the ability and willingness of their colleagues/counterparts to take into account their core interests and values. On the other hand, this analysis revealed another aspect: these interpersonal skills

are necessary, but not sufficient to guarantee a good result of the negotiation process. The analysis process seemed to show the awareness between negotiators that the experience is important but not per se. It is a precious tool if the negotiator develops a structured and flexible mindset (be careful with biases and dysfunctional core beliefs) to be applied to a different and large variety of context-related specific scenarios that they may face. Negotiators are not necessarily born with inner set of skills, but they can acquire them (in theory), especially negotiating techniques. What is more difficult to learn are mental skills of empathy, listening, and understanding, being present in the moment without being influenced by the past or by the fear of the future. We see here that if we focus on the broader negotiation process, the role of the agent is recognized as fundamental to this process. A negotiator is viewed not as a passive element of the negotiation process (already studied and planned by others), but rather as an *architect* of the structure and the process.

The above recommendations reflect our understanding of this specific negotiation process of using self-report methods best suited to survey questionnaire-based research. It is apparent that some seemingly innocuous aspects loom larger than one might expect and other more substantial differences do not have the expected impact. Moreover, as we have found, some of these consequences obscure while others reveal. Nonetheless, it is our hope that with further research we will learn not only how such skills/mindsets may impact the negotiation process but also how to better assess cognitive and emotional processes ("attention to emotions") in interpersonal negotiating contexts.

Conclusions

Interpersonal skills are important and may produce differences in negotiators' styles influencing conduct and outcome of negotiations. There is a variability in negotiation outcome that can be linked to individual negotiators and it appears that a portion of this variability can be related specifically to negotiators' interpersonal skills rather than to other variables. Because negotiators' facilitative interpersonal skills explain a significant proportion of negotiators' variability in negotiation outcomes, future research in this area has the potential to improve both negotiation research and evidence-based selection and training for negotiators. In addition, it would be an advantage to know beforehand which negotiators are high in such skills: the right negotiator, at the right time, at the right place.

Chapter 12
Evidence-Informed Policymaking: An Innovative European Multi-actor Project



Maria Lodovica Gullino and Laura Vivani

Cooperation is the ability to work together toward a common vision. The ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results.

Andrew Carnegie

Introduction

Today agriculture, forestry, and ecosystems face multidimensional global challenges: climate change, environment degradation, intensive production systems, global trade, and societal changes requiring adaptive political decision-making and far-sighted governance. These challenges drive a proliferation of emerging systemic risks to plant health throughout the world, Europe included (EFSA 2018). New pathogens emerge in different areas of the world, due to the intensification of exchange and trade of plant material across countries and continents. Moreover, old pathogens often resurge, due to the adoption of new cultural practices and growing systems. There is an increased focus on plant health, thanks to a new awareness of global health promotion (Fletcher et al. 2009).

M. L. Gullino (✉)
UNITO, Turin, Italy
e-mail: marialodovica.gullino@unito.it

L. Vivani
MOVERIM sprl, Brussels, Belgium
e-mail: vivani@moverim.eu

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_12

The EMPHASIS Project

In response to these drivers, the European Union (EU) promotes changes in public policies and tends to favour an agroecological approach to the agricultural production system in parallel with a reduction of chemical inputs in both agricultural and non-agricultural areas. The EMPHASIS[1] (Effective Management of Pests and Harmful Alien Species—Integrated Solutions) project[2] ended early 2019 and played an important role in conceptualizing the new approach on effective management of agricultural risks while respecting the environment and human health. EMPHASIS—granted by the European Commission through the Horizon 2020[3] program—addressed native and alien threats (insects, pathogens, and weeds) in a range of both agricultural and natural ecosystems (field and protected crops, orchards, ornamental plants, and forests). The project involved 22 partners across 10 countries focusing on 40 crop-innovation combinations (see Table 12.1 in Appendix). The overall goal was to ensure a food security system in Europe and to promote the protection of biodiversity and ecosystem services in the frameworks of agriculture, horticulture, and forestry, by developing integrated response measures to predict and prevent native and alien threats. During the project, the effectiveness of the solutions was scientifically assessed, validated, and transferred to policymakers while all actors and endusers have been engaged in the investigation process to ensure that solutions and practices would be optimized in agreement with their needs and capacities.

The specific objectives of EMPHASIS were to:

- *Predict, prioritize, and plan*: Pest and pathogen management challenges and opportunities were evaluated according to stakeholder-focused criteria in using pathway analyses.
- *Prevent:* End users were provided with practical solutions and tools for pest and pathogen surveillance and monitoring.
- *Protect:* Improved practical solutions and innovative integrated measures were developed. Their technical and economic feasibility was demonstrated, and their market uptake enhanced.
- *Promote*: A mutual learning process involving end users was set in motion.

The practical solutions developed for pest and disease management are relevant to the European agricultural systems and have the same efficacy, ease of use, and cost-effectiveness as traditional pesticides. EMPHASIS research and "experience" clearly demonstrate that researchers have an important albeit limited role in the reduction of pesticide use in European agriculture. They must interact with involved

[1] http://www.emphasisproject.eu/deliverables.php.

[2] www.emphasisproject.eu.

[3] https://ec.europa.eu/programmes/horizon2020/.

stakeholders in order to increase and multiply results' effectiveness and their influence on evidence-informed policymaking. In this specific field, among the stakeholders having a crucial role are farmers, consumers, policymakers, and input suppliers. In addition, small and medium-sized enterprises (SMEs) need to be involved to "translate" and transform scientific results into "marketable products". For this reason, the development of sustainable agriculture could be characterized as a *multi-stakeholder process*. EMPHASIS has been a pilot *participatory research project* where stakeholders' engagement went beyond the simple dissemination of results at the end of the project. End users were involved in setting up research objectives, gathering and processing data, and interpreting results, in line with the so-called *multi-actor approach* promoted by the European Commission of the European Union through its program for research and innovation. The cooperation and engagement towards a common goal, employing the multi-actor approach, experienced in EMPHASIS were considered a pioneer action aimed at aligning scientific expertise, end users' needs, and policymakers in order to formulate a wider policy framework.

The Multi-actor Approach Within Horizon 2020

European funding for research and development has a long history, starting with the First Framework Programme in 1984. For more than 30 years the focus has been on the research collaboration and the technical side of the innovation development, with a limited involvement of the industrial sector (European Commission 2010). To encourage SMEs' participation and demand-driven innovation several measures were taken, among which is the introduction of the concept of the "multi-actor approach", under the Horizon 2020 Framework Programme. At the same time, the European Union's strategy "Europe 2020" for smart, sustainable, and inclusive growth set up five ambitious objectives among which the strengthening of research and innovation was one of the most important to prepare Europe for future challenges. In order to reach this aim, the European Innovation Partnerships (EIP) have been launched to support cooperation between policymakers and research and innovation partners for the achievement of better and faster results (EIP-AGRI 2015).

The European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI)[4] has been established in 2012 and it is run by the European Commission (DG Agriculture and Rural Development) to contribute to the Europe 2020 strategy in the agriculture sector. EIP-AGRI foundation was intended as a new way of helping the agriculture and forestry sectors to become more productive, sustainable, and capable of tackling current challenges such as fiercer competition, more volatile market price, climate change, and stricter environmental rules (EIP-AGRI 2015). It increased the impact of innovations by actively involving end users in the development process in supporting the creation of "multi-actor" partnerships.

[4] https://ec.europa.eu/eip/agriculture/en.

These partnerships bring people together from different professional backgrounds (farmers, advisors, researchers, agribusinesses, NGOs, and other stakeholders). They work together elbow to elbow, share ideas, and turn existing knowledge into innovative solutions ready to be implemented through take-up measures, facilitating the use of new better practices.

Definition and guidelines for including the multi-actor approach in research and innovation projects for sustainable food, agriculture, and forestry appeared for the first time in 2014 and have evolved over the last Horizon 2020 Societal Challenge 2 Work Programmes (see box below). The multi-actor approach encourages co-design of solutions together with end users and practitioners and supports "more demand-driven innovation requiring genuine and sufficient involvement of actors all along the project: from the participation in the planning of the work and experiments, their execution, up until the dissemination of results, and a possible demonstration phase" (Guiffart et al. 2018). Under the multi-actor approach, end users are not involved as study subject or research sample, but they are co-owners of results all along the project, and they are included in the consortium as project partners and key actors. Moreover, in Horizon 2020 multi-actor projects, the focus is on knowledge exchange rather than one-way dissemination of information, as it was in previous framework programs. The multi-actor approach means that projects will focus on real problems or opportunities that farmers, foresters, or others are facing, since these actors are involved from the project conception. As a result, multi-actor projects are able to develop innovative solutions which are more ready to be accepted and applied in practice on the ground to cover real needs. This means also that end users will be more motivated to use research results, since they have been involved in generating them (EIP-AGRI 2017).

Work Programme 2018/2020[5]: Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and bioeconomy

Innovation in the Societal Challenge dedicated to food security and sustainable agriculture is supported through the use of interactive innovation model. This approach is developed by the EIP-AGRI and fosters the development of research in practical applications and the creation of new ideas thanks to interactions between actors ("cross-fertilization") and sharing of knowledge. The interactive innovation model is implemented in this Societal Challenge through the "multi-actor approach". It aims at achieving a greater outreach to civil society by involving all the stakeholders and citizens at large through public consultation activities, end users, involvement in project co-creation, and a continued use of the multi-actor approach.

[5] https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf.

Specific requirements for multi-actor projects:

Projects financed under the topics dedicated to the multi-actor approach should meet all of the following requirements: a multi-actor project should ensure genuine and sufficient involvement of various actors, and in particular end users of project, results such as farmers/farmers' groups, forest-related groups, fishers/fishers' groups, advisors, businesses, etc. It is much more than just widely disseminating the results of a project or listening to the views of a stakeholders' board. This is to make the innovation more demand driven all along the project: from the participation in the planning of the project and experiments to the implementation, to the dissemination of results, and to a possible demonstration phase. Building blocks for innovation are expected to come from science as well as from practice and intermediaries, such as farmers, forest-related actors, advisors, businesses, NGOs, and others in a "co-creation" process. End users and practitioners must be involved, in view of using their entrepreneurial skills for developing solutions and creating "co-ownership" of results, which speed up the acceptance and dissemination of new ideas. Therefore, a multi-actor project proposal shall demonstrate:

- How the project proposal's objectives and planning are able to target needs/problems and opportunities of end users of project results.
- How the composition of the consortium and the description of the project concept reflect a balanced choice of key actors with complementary types of knowledge (scientific and practical), and a vision of the project's result implementation.
- How the project includes existing (sometimes tacit) knowledge into scientific work. This should be illustrated in the project proposal with high-quality knowledge-exchange activities and indicating the precise and active role for the different non-scientific actors in the work. The state of the art should generate innovative solutions that are more likely to be accepted and applied thanks to the cross-fertilization of competences and ideas between actors.
- How does the project complement existing research and best practices, and how it could add value representing a better practice.
- How project results are translated into practical knowledge, to make it easily understandable and accessible, and how this complements existing dissemination channels most consulted by end users in member states.
- How to produce a number of practical abstracts to populate the database managed by the EIP-AGRI that should be easy to use and upload in open access.
- How the European multi-actor projects could foster the collaboration with and for other projects by promoting the result implementation at national and local levels. This process could be held to a wide spreading of the innovation and its implementation through rural development programs.

The EIP-AGRI has developed several guidelines on how to integrate multi-actor approach in project proposals. The concept of multi-actor approach (MAA) was quite innovative in respect to the previous R&I projects financed by the EU, where methodology and research activities were proposed mainly by researchers with the participation of SMEs interested in technological innovation and where outputs were widely disseminated in the scientific community and through outreach activities. Instead a Horizon 2020 multi-actor project requires to:

• Target real-life needs, problems, or opportunities	• Bridge the gap between research and practice by facilitating discussions
• Allow cross-fertilization by choosing consortium partners with complementary types of knowledge and skills	• Involve interactive innovation groups such as EIP-AGRI Operational Groups
• Include farmers, foresters, or other end users as project partners	• Ensure co-creation and co-designing among partners
• Involve "multipliers" to disseminate results in the long term	• Illustrate how the project complements existing research and best practices
• Set up a plan with clear role for each of the different partners	• Produce practical information which feeds into the most common existing dissemination channels
• Organize knowledge exchange activities between partners	• Write easily understandable practice abstracts in the common EIP format

EIP-AGRI (2017:8[6])

The EU has allocated approximately €1 billion to fund around 180 multi-actor projects in agriculture, forestry, and rural development, during a 7-year period of Horizon 2020 (2014–2020). Over 120 projects have already started and some of them, such as EMPHASIS, have just been concluded. Projects have been funded in the field of resource management (soil; water, nutrients, and waste; genetic resources and breeding; sustainable cropping systems; animal production systems), plant and animal health, integrated ecological approaches, rural territories, and policies. Results of these projects are accessible through open-access publications and through a platform promoted by the EU which is collecting all practice abstracts resulting from the MAA projects.[7] This database is meant to facilitate the use of new knowledge in response to needs and threats and to foster the cooperation between science and society. The evaluation of the different strategies implemented by these projects and their successfulness is a long-time process; for this reason it is important to share their experiences and to take up measures to ensure an adequate learning process and the development of appropriate supporting tools. The MAA projects carried out at the EU level have the potential to transfer the knowledge at regional and national levels

[6] https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_multi-actor_projects_2017_en_web.pdf.

[7] https://ec.europa.eu/eip/agriculture/en/find-connect/projects.

where innovative solutions can be implemented by actions funded by the Common Agricultural Policy (CAP) directly in the territory where it is needed. Results and evidence-informed policy achieved in MAA can ultimately lead to changes in decision-making, allocation of public resources, policies, and regulations.

The Multi-actor Approach Adopted in the EMPHASIS Project

In EMPHASIS, partners with complementary skills and knowledge—scientific, practical, and with multiplier effect—joined forces from the start of the project to *co-create* and *co-design* innovative solutions ready to be applied on the ground in addressing real stakeholders' needs. As one of the first multi-actor projects funded by the European Commission, EMPHASIS co-designed solutions with end users through continuous two-way engagement. Potential users and their needs were considered from the beginning of the project in order to understand opportunities and potential obstacles to the use of technologies and ensure the appropriateness of innovations developed. End-user involvement was ensured in different ways. First of all, they were involved in the project as partners through a broad range of consortium members, including SMEs and end users' representatives. The project consortium integrated key stakeholders such as EU farmers and farmer organizations, agricultural extension services, researchers, industries, SMEs developing IPM and diagnostic tools, policymakers, organizations producing policy recommendations, and strategic advice consultancy firms involved in policy analysis, project management, and communication. Moreover, knowledge-exchange activities to involve external stakeholders were organized since the beginning of the project, both online and on-site (surveys, interviews, workshops, on-farm demonstrations, etc.). Co-development facilitated the understanding of agricultural and forestry stakeholders' decision-taking processes, and allowed to identify barriers to and drivers of innovation and to co-design practical solutions with end users. Furthermore, EMPHASIS devised innovative solutions to ensure timely and enough input by end users.

Multi-actor Supporting Activities

Analytical Framework

EMPHASIS was a large and complex project, which produced approximately 40 diverse and innovative crop pest management and pest surveillance measures relevant to a broad range of important pest species. In this context, it was essential to provide a dynamic framework to help innovators to consider different circumstances

in which their novel technology could be considered. The Analytical Framework[8] allowed to consider differences in stakeholder views on the potential of the individual technologies and any barriers towards end-user uptake, giving valuable insights at the EMPHASIS consortium. Moreover, since it translated relevant key indicators in an easily understandable language, it has been representing an instrument for communicating with key stakeholders.

Learning Platform and Socio-Technological Learning Labs (SLL)

The Learning Platform aimed to support co-development, helping scientists take appropriate and systematic steps to bring relevant solutions to be taken up by end users. Within the frame set by the Analytical Framework, the Learning Platform provided a forum for knowledge exchange and mutual learning, allowing the identification of end users' needs and challenges. As a matter of fact, by stimulating discussions, scientists could ensure that innovations were fit for purpose instilling a feeling of co-ownership in the end user. For this reason, two SLLs were organized alongside project meetings, in Hungary (October 2016) and Czech Republic (May 2017), to allow in-depth engagement between project scientists and envisaged end users.

Decision-Making Surveys

Two surveys were designed to obtain information on current practices, including barriers to and drivers of innovation: one to engage with experts on pest management, and the other called end users of pest management measures, such as farmers and foresters. The first survey (open from April to July 2016) addressed experts in plant health, such as researchers, agronomists, farm and forestry associations, and plant health public bodies, to learn the most important issues faced by them in Europe. It was translated into 5 EU languages (English, German, French, Spanish, and Italian) and collected 199 answers from 21 EU countries and 13 non-member countries.

The second survey (April to November 2016) collected feedbacks from plant pest control and monitoring method users, such as farmers, foresters, nurseries, and others, to understand their decision-taking processes more in depth. This survey was translated into 11 EU languages to address 87.5% of EU users in their mother tongue and allow them to actively participate. The survey was extensively disseminated not only through emails and newsletters but also via social media, where

[8] http://www.emphasisproject.eu/upload/deliverables/file/Initial_analytical_framework_report_on_Pest_Management_Challenges_and_Opportunities.pdf.

farmers were very active. A total of 1077 stakeholders, from 24 EU and 15 non-member countries, took part in a voluntary survey, giving the researchers invaluable information about how they made their pest management choices and under which conditions they would be available to change. The end users' willingness to dialogue and be involved was evidenced by the fact that 32% of the participants gave their availability to be involved in future activities and 150 people left optional comments to the survey.

Decision-Making Workshop

Besides the online surveys, the 1st June 2016 EMPHASIS held a workshop in Brussels to analyse factors considered by individual stakeholders leading to the uptake of innovative pest management measures. The event attracted 56 attendees with heterogeneous background: industry representatives, policy advisors, farmer and forestry organizations, agrarian consultancies, environmental NGOs, and researchers. This event was crucial to gain a feedback on the technologies developed by EMPHASIS and to collect data to predict the uptake of project measures by those stakeholders.

On-Farm Demonstrations

EMPHASIS carried out several co-innovative on-farm research and demonstration (large-scale field trials, workshops for inspection services for the uptake of diagnostic tools) with end users to assess and fine-tune practical solutions for surveillance and pest control of arthropods, diseases, and weeds in agriculture, horticulture, and forestry. On-farm demonstrations are a crucial element in the multi-actor process because they ensure co-ownership of the identified solutions and mutual learning. Experiments were set and monitored in a number of EU countries, Spain, Italy, the United Kingdom (not a member state anymore), and Latvia to name but a few, to learn together through the experimental process.

Call for Early Adopters

During the last months of the project, when the maturity of the technologies reached its final stage, it became crucial to foster and ease the adoption of the innovative practices developed by EMPHASIS. To do so, the project proposed the "*EMPHASIS Science with Farmers: call for early adopters*", a contest-like activity which selected seven beneficiaries as pioneers to test innovative practices responding to their specific needs. 67 organizations across Europe answered to the call, which

demonstrates the relevance of the proposed solutions to end users. Moreover, the initiative showed once again the end user's willingness to be active part of the solution development and allowed entrepreneurs in the project not only to promote their solution but also to get additional feedback from these potential end users.

HabiThreats Toolkit

A science-based, multimedia educational toolkit[9] was developed. It was based on training modules and scientific training materials as well as input from online webinars to promote integrated solutions for end users, professional organizations, and potential stakeholders. Its objective was to contribute to make up for the general lack of information on native and alien pests; to effectively communicate project's objectives and results; to provide users with an overall understanding of IPM; and to enable them to apply knowledge, making direct use of project's outcomes in a comprehensive, tailored, and interactive way.

The great number of activities carried out in the project that encompass traditional informing and educating actions shows that EMPHASIS scientists were responsive and keen to engage in a two-way interaction with end users. However, the analysis of the multi-actor experience in EMPHASIS shows that multifactorial concepts are not always intuitive at all stages of technological development and also few scientists and researchers tend to remain more focused on informing and educating (traditional dissemination), rather than co-developing. On the one hand, this is partially due to the interconnection between traditional dissemination measures and multi-actor approach. On the other hand, this is linked to the fact that there is limited information easily available to explain the rationale behind this approach and on the required changes in research approaches to successfully deliver it. Projects like EMPHASIS provide a concrete interpretation of the multi-actor approach in pushing for changing the traditional way of working. On the other side, end users engaged in EMPHASIS activities were enthusiastic and had a fruitful dialogue with researchers influencing the direction of the research process. Their willingness to cooperate in the development phase of the technology confirms the strategic importance of the multi-actor approach to ensure the acceptance and uptake of the innovations in easing their introduction into the market. Engagement with end users is essential to ensure that the generated knowledge is relevant to the real environment where it must be applied. Moreover, the sense of co-ownership among end users fosters and facilitates technology acceptance.

[9] http://www.emphasisproject.eu/habithreats/.

Use of EMPHASIS Scientific Evidence to the EU's Policymaking

EMPHASIS consortium had the ambition to translate its co-created research findings into useful and applicable tools for all the actors involved in the value chain, with a special attention to provide sound evidence-informed policies for relevant EU policymaking processes. As we have mentioned above, being a multi-actor project, EMPHASIS has generated innovative solutions in terms of pest management strategies, diagnostic tools, field devices for quick detection, and risk analysis models. Results are more likely to be applied because of the cross-fertilization of ideas between actors and the co-creation and generation of co-owned results. At present, across the EU there is a harmonized legislation in several areas of relevance to EMPHASIS, including phytosanitary measures (Plant Health Directive 2000/29/EC[10]); provisions promoting the use of integrated pest management (IPM) and alternative approaches, such as non-chemical alternatives to pesticides (Directive 2009/128/EC on the Sustainable Use of Pesticides—SUD[11]); rules concerning authorization of active substances and placing on the market of plant protection products (PPPs) (Regulation (EC) 1107/2009[12]); rules on mineral fertilizers (Regulation (EC) 2002/2003[13]); and measures for invasive alien species (IAS) of EU-wide concern (Regulation (EU) 1143/2014[14]). In this area, like in many others, policymaking processes need to be adapted to cope with societal needs in making effective use of the evolving techniques in the different agricultural sectors with the innovative pest management approach. Scientific advice plays a pivotal role in contributing to design and implement the EU policies in this field. High-quality scientific advice, provided at the right time of the policy cycle, acts as an intermediary between science and policy (SAPEA 2019) and improves the quality of the EU legislation. EMPHASIS came at a time when European agriculture was facing several major challenges: new alien pest threats, restricted use of pesticide, consumers' demand for higher food and environmental quality, and growers delivering in very competitive markets. In order to positively contribute to policy development, EMPHASIS analysed pest management challenges and opportunities using a DPSIR model (drivers, pressures, states, impact, and responses) relevant to different stakeholder groups making pest management decisions: technology and service

[10] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32000L0029.

[11] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0128.

[12] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009R1107.

[13] https://eur-lex.europa.eu/legal-content/GA/TXT/?uri=CELEX:32003R2003.

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014R1143.

providers, policymakers, and consumers. This analysis was incorporated into the Analytical Framework, a dynamic tool that provided an overall structure for evaluating the various measures produced and tested throughout the project within the context of stakeholders to ensure relevance, appropriateness, and efficiency of farm and of policymaking. Data collected under EMPHASIS have included expert elicitations, interviews, results from workshops, and survey tools. EMPHASIS aimed to respond to the requirements and challenges posed by the wider EU regulatory framework providing scientific evidence arising from its experience with the EU legislators. The analysis of pest management, challenges and opportunities, and related regulatory framework identified several issues, including a certain incoherence and gaps among different pieces of current legislation (e.g. SUD promoting IPM versus plant protection product (PPP) legislation disproportionately assessing low-risk substances; scope of fertilizer legislation excluding bio-stimulants). Crucially, the EU regulatory framework is currently transitioning towards new provisions introducing changes that could bring improvements in nearly all the areas of relevance to EMPHASIS outputs. This represents a significant potential for an increased coherence of the relevant EMPHASIS outputs to the anticipated outlook of the regulatory framework in years to come.

In this context, it became urgent for EMPHASIS to exchange views with policymakers about the needed legal adjustments to successfully embrace innovative technologies and improve the quality of the EU legislation. For this reason, during its last year EMPHASIS organized a *round table titled "H2020 projects for evidence-based agricultural related policies*" (April 25, 2018). The event took place at the European Parliament and was organized in collaboration with EUCLID,[15] another multi-actor EU project. It targeted specifically members of the DG AGRI (Directorate-General for the Agriculture and Rural Development) and DG SANTE (Health and Food Safety) of the European Commission, EIP-AGRI, and members of the ENVI (Environment, Public Health and Food Safety), AGRI (Agriculture and Rural Development), and PEST (EU authorization procedure on pesticides) committees of the European Parliament, which were involved in the revision of the above-mentioned regulation. As already pointed out, the involvement in the project of researchers, enterprises, third sector organizations, farmers, end users, and multipliers since the beginning of the action, in line with the Responsible Research and Innovation (RRI) principle and the multi-actor approach, eased the uptake and the societal acceptance of the practical solutions developed by the project. Scientific results coming from multi-actor approach projects consider the specific needs of the end users and thus have the potential to be embraced by the entire society. For this reason, the EU policymakers should particularly take into account scientific evidence-informed policies arisen from a multi-actor approach project such as EMPHASIS.

[15] www.euclidipm.org.

During the round table at the European Parliament, EMPHASIS pointed out and gave visibility to problems associated with the implementation of the current legislation and gave evidence-informed suggestions to policymakers on how to improve the regulation and future policies in this sector to facilitate the introduction of new practices and the technological innovation take-up. One of the issues highlighted was a paradox in the present EU regulations concerning pest control in agriculture: while non-chemical methods to control pests are preferred in the SUD Directive, the use of non-chemical methods, the registration of low-risk products (including biopesticides), the use of bio-stimulants, and the release of biological control agents have no special regulatory framework. EMPHASIS experience showed as well that the regulatory constraints and private retail standards can slow down the process of bringing new products to the market and discourage the adoption by farmers. Low-risk substances are considered alongside other chemical pesticides (under Regulation (EC) 1107/2009); hence disproportionate requirements apply in their assessment according to an independent review (European Commission 2018a), although more recent changes in the legislation aim to facilitate approvals (Regulation (EU) 2017/1432[16]).

Currently, the legislation is transitioning to new rules, some of which are also relevant for the solutions developed by EMPHASIS. A new phytosanitary legislation (new EU Plant Health Law: Regulation (EU) 2016/2031[17]) applies from December 2019. These new rules aim to enhance the prevention of entry or spread of plant pests within the EU territory. Regarding the implementation of the SUD Directive, the EC has called on member states to substantially improve their plans to address shortcomings, and to establish more precise and measurable targets to ensure more harmonized implementation across the EU. Another legislation that is under review is the one concerning plant protection products. Under the current legislation disproportionate requirements are imposed for the approval and placing on the market of low-risk substances (European Commission 2018b), but the new regulatory framework is expected to further encourage and speed up this approval. Moreover, a new proposal for a revised fertilizer legislation to include bio-stimulants/organic fertilizers is currently under discussion. Finally, further actions are envisaged for the implementation of the EU measures for the control of invasive alien species of the EU concern. These changes suggest a positive outlook for both the coherence and sustainability of relevant EMPHASIS solutions (e.g. promoting the use of biopesticides and bio-stimulants) from a regulatory point of view in the long term. EMPHASIS shared some key messages with EU legislators with the aim of positively contributing to the revision of the EU policies.

[16] https://eur-lex.europa.eu/eli/reg/2017/1432/oj.

[17] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R2031.

Emphasis on Key Messages for Policymakers[18]

1. **Need for specific rules. Purpose-built specific regulation would stimulate the development, adoption, and effective deployment of non-chemical methods to control insect pests and plant diseases.**
   There is a paradox in the EU regulations concerning pest control in agriculture:

   - Non-chemical methods to control pests (insects, diseases, and weeds) are preferred in important EU regulations (e.g. Directive (EC) 2009/128)
   BUT
   - The use of non-chemical methods, registration of low-risk products (including biopesticides), and release of biological control agents have no special regulatory framework. Low-risk substances are considered alongside other chemical pesticides (Regulation (EC) 1107/2009).

   At the same time as the EU is limiting the approval of new chemical active substance, the lack of incentives to register and implement low-risk products with appropriate regulations is holding back the development of innovative non-chemical methods. Another aspect to be consider is timing: actually 7–10 years is necessary to register a biopesticide in the EU and also the low-risk products (Regulation (EC) 1107/2009) take nearly 5 years to be registered and placed on the market. This is a limiting factor for the take-up of innovation. National and EU policymakers should adopt informed choices based on science concerning the revision of the regulation on placing on the market of phytosanitary products (Regulation (EC) 1107/2009). There are extensive, evidence-informed policies generated by several international institutions—such as EPPO, IOBC/WPRS, OECD, and FAO—that may be considered to regulate biopesticides in the EU.
2. **Need for streamlined and harmonized cost-effective procedures. An appropriate and clear regulatory framework could improve business opportunity for bringing to the market technological innovations for plant protection and ensure the commercialization of the technology developed using the EU funds. The existing procedures foreseen in the legislation for the approval of plant protection agents make some of the innovative integrated solutions very complicated and expensive.**
   In the case of microbial controls, biopesticides, and pheromones, specific and extensive dossiers have to be completed. In the framework of EMPHASIS and EUCLID, several SMEs are working to get their products on the market. Although their business plans indicate interest on the market, the investments needed for approval can be so expensive that the practical solutions become economically unfeasible. As a result, some integrated and effective solutions, even though they are environmentally friendly, will never reach the market. In

[18] http://www.emphasisproject.eu/upload/deliverables/file/D_5.8_Dissemination_material_5_6th_newsletter_issue_2nd_project_leaflet_3rd_press_release_2nd_opinion_paper_and_3rd_workshop_proceedings.pdf.

particular small companies with little capital have problems in relation to such investments. Specifically, for invertebrate biocontrol agents, lack of a unique EU register is hampering their commercial development. The important investment of funds made by the European Commission to support the R&D of novel invertebrate biocontrol agents is partially wasted because now the registration process must be done in all the EU member states. This situation contributes to creating barriers for the commercialization in the EU market and increasing the costs for registration procedures. Creating a single register for all the EU would be a solution. Products and technologies developed and tested within EU projects could have a priority line for registration and/or they could receive additional funding for the preparation of registration dossier.

3. **Use of non-targeted, high-throughput sequencing in plant health: an opportunity and a challenge for plant health regulation**.
   High-throughput sequencing (HTS) technologies have the ability to sequence simultaneously millions of nucleic acid fragments in one test, which gives the capacity to reveal in any plant sample the presence of known, but also unexpected or unknown, organisms that might be potential threats. Being broad spectrum and generic in nature they can potentially be used to replace a wide range of conventional methods, especially at the screening stage, but are best used as part of a workflow in support of existing technologies. Early diagnosis and rapid response are crucial in any effort to reduce the risk of entry and spread of plant pests, so such technologies present a lot of opportunities. HTS technologies are currently starting to be used in diagnostics, though mainly in virology, for example for the certification of propagation material or in post-entry quarantine where when used alongside existing technologies they can increase the speed and specificity of the results. HTS technologies are widely applied in research, accelerating the discovery of new potential pests, for example to identify and characterize new diseases. The use of HTS-based diagnosis by the regulator will be a major challenge due to the increased number of new pests being discovered, mainly viruses for which information on their biological significance may be missing. Discussions have started with plant health regulators on the opportunities but also challenges of using these technologies in plant pest diagnostic.
4. **Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions "The Future of Food and Farming": suggestions for the new legislative proposal.**
   The communication from the Commission "The Future of Food and Farming" is expected to be followed by legislative proposals as legal basis for the next programming period 2021–2028. Some highlights contained in the document relate to the adaptation of regulations for a faster adoption of IPM technology and particularly biological control:

   (a) The implementation of "greening" is identified in the public consultation as the most burdensome and complex element of the CAP which limits its effectiveness.

(b) The way food is produced and marketed in the EU should adapt to citizen's expectations and take into consideration the impact on health, environment, and climate.
(c) The future CAP should make the best use of research and innovation results.

5. **Surveillance technologies have the potential to reduce agrochemical inputs yet require commitment and carry cost and risks for growers.**
New support mechanisms could recognize (and reward) production systems which utilize surveillance technologies to reduce agrochemical inputs while ensuring quality and productivity. Key requirements of continuity and consistency—sporadic or intermittent usage of surveillance—will lead to less efficient outcomes, and consistent surveillance efforts across member states will improve interpretation of results.
6. **Need to find the right balance for guiding agribusiness behaviour between regulatory approaches and market-led mechanisms.**
On the one side, the market alone cannot deal with addressing ambitious global challenges; on the other, the sustainability of the production system cannot be imposed exclusively through rules, which are sometimes so strict that they challenge the very existence of the system. Enhanced coordination between the Ministries of Agriculture, Environment and Health, the regular involvement of the stakeholders, and a uniform regional implementation of the regulatory framework are necessary measures.
7. **Opening the way to a more comprehensive One Health concept (plant-animal-human).**
"One Health concept" is defined as the collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals, plants, and our environment. This multidisciplinary approach is of great importance in a variety of fields, from enhancement of breakthroughs in biomedical research to epidemiological studies and public health policy decision-making. The number of lethal and contagious biological agents is far greater among plants and animals than humans. Most of these pathogens are environmentally resilient, endemic in non-EU countries, and harmless to humans, making it easier for terrorists or criminals to acquire, handle, and deploy them. To date, while well developed for animals-humans, the One Health concept does not integrate in practice plant health.
8. **Key issues for integrated pest management (IPM) implementation expressed by end users.**
End users (farmers, foresters, and other professional profiles) were surveyed by EMPHASIS for developing a decision-making analysis to provide an analytical framework for business uptake of IPM innovations. A total number of 1077 answers were gathered. Main issues identified were:

(a) Interest to try new technologies without supporting initial costs. Price, costs, and development of cost-effective measures. End users regard high cost of control (37%) and monitoring (18%) methods as the main barrier for their implementation.

(b) Regulatory hurdles, regarding approval/withdrawal of plant protection products, and regulatory and trade-related bans. End users regard the cost of complying with or the constraints imposed by regulatory barriers for control (19%) and monitoring (17%) methods as an important issue.
(c) Need of training for practical solutions to specific problems. End users regard the need of training and/or expertise required for applying control (26%) and monitoring (48%) methods as one of the most important issues.
(d) Pesticides are perceived as highly necessary by about 70% of end users. A total of 74% of them were concerned to some degree about the possible future withdrawal of some or all pesticides due to the implementation of EU policy (Regulation (EC) No. 1107/2009).

A survey carried out by EUCLID points out the need for incentives. Direct incentives to growers would support IPM in the market.

9. **Need to develop a "label" to identify food produced with a controlled and reduced use of pesticides to make IPM practices and level of sustainability of products recognizable to the consumers.**
Consumers are not able to distinguish systematically on the shelf vegetable or fruits produced with the highest grade of IPM standards. While labelling exists for some specific IPM schemes and product sectors, they are not widely applied across the EU and all product sectors. An IPM common label at EU level is difficult to realize since it is not possible to define general standards for products from IPM. Other options should be considered, such as an ID for vegetables and fruits indicating the quantity of chemical pesticides used to produce them. This would help consumers to identify food grown according to IPM's guidelines, thus promoting critical consumption and supporting on the market those products produced with highest grade of IPM standards. Consequently, it would encourage growers to adopt high-grade IPM strategies.

Conclusions

The EMPHASIS project was a consortium composed by 22 organizations equally distributed in the public and private sector among which research groups, entrepreneurs, regulators, farmer associations, experts, and communicators were all active on the ground in the agricultural field. By funding the EMPHASIS project, the European Commission gave to 22 organizations the possibility to positively interact among each other, developing useful strategies to counteract major threats to plant health. Researchers, who worked together with a problem-solving perspective, were able to develop solutions designed for the specific needs of end users, taking into account regulatory obstacles and standards already in force or about to be amended. In addition, the community created ad hoc for this project has shown a willingness to participate in the process of change taking into account the needs of individuals. It is difficult to measure the impact that the project's communication and dissemination

activities may have had on policymakers at European level. Although the key messages produced were the result of scientific evidence, open consultations among the project partners, and stakeholder community's involvement, it is not easy to determine whether these key messages were considered appropriately by policymakers and their advisors. What is certain is that in the effort of bringing scientific research and its evidence closer to the political and economic world, scientists and policymakers have learned to consider different points of view and the multitude of factors influencing adaptive decision-making. Thanks to the wide involvement of stakeholders, the solutions developed have been made available to practice on the ground and they can be very helpful in the development and implementation of the EU policies on plant health. A constraint we still observe is that of the difficulty to transfer the scientific results obtained from the European projects to the national agencies. It will be very important to understand the needs and constraints from an international perspective to solve the global challenges of biosecurity, which will be more frequent in the future (Gullino et al. 2017).

Appendix

Table 12.1 List of participants to EMPHASIS project

No.	Participant organization name	Type	Country
1	Università degli Studi di Torino (UNITO)	Research	Italy
2	AgraCEAS Consulting (AgraCEAS)	Enterprise	Belgium
3	AgriNewTech (ANT)	SME	Italy
4	Agrobio S.L. (AGROBIO)	SME	Spain
5	Chatim BV (CHATIM)	SME	Netherlands
6	Confederazione Generale dell'Agricoltura Italiana (CONFAGRICOLTURA)	Other	Italy
7	European and Mediterranean Plant Protection Organization (EPPO)	Intergovernmental organization	France
8	Imperial College London (IMPERIAL)	Research	United Kingdom
9	Institut National de la Recherche Agronomique (INRA)	Research	France
10	Integrētās Audzēšanas Skola Ltd. (IAS)	SME	Latvia
11	Mendel University in Brno (MENDELU)	Research	Czech Republic
12	Metec Innovation Consulting Srl (METEC)	SME	Italy
13	Moverim Consulting (MOVERIM)	SME	Belgium
14	National Institute of Agricultural Botany (NIAB)	Research	United Kingdom
15	OPTISENSE Limited (OPTISENSE)	SME	United Kingdom

(continued)

Table 12.1 (continued)

No.	Participant organization name	Type	Country
16	DE VOOGD WILLEM BAREND—PLANT BIO CONTROL INTERNATIONAL BOB BIOLOGISCH ONKRUID BEHEER	SME	Netherlands
17	The Regional Environmental Center for Central and Eastern Europe (REC)	International organization	Hungary
18	Semios BIO Technologies Inc. (SEMIOS)	SME	Canada
19	SPIN-TO Srl (SPINTO)	SME	Italy
20	Stichting Dienst Landbouwkundig Onderzoek (DLO)	Research	Netherlands
21	Universidad de Lleida (UdL)	Research	Spain
22	Food and Environment Research Agency (FERA)	Other	United Kingdom

Chapter 13
Misunderstanding the First Nuclear Crisis with North Korea: The Inconvenient Science in Negotiations



Robert L. Gallucci

Introduction

It has been 24 years since the first crisis over North Korea's nuclear weapons program occurred and since the Agreed Framework, settling that crisis for almost a decade, was signed by the United States and the Democratic People's Republic of Korea (DPRK) representatives. References to the Agreed Framework have been in the news more recently, during the course of the current confrontation between the North and the rest of the world, usually as evidence that diplomacy has proven unsuccessful in stopping North Korea from developing nuclear weapons. What can and should be learned from the history of US-North Korean engagement a quarter of a century ago is worth analysis. But the purpose of the discussion that follows is not to pursue that analysis. It is rather to suggest that it would be a mistake to attempt that analysis without an accurate understanding of what actually drove events so many years ago. The argument here is that what has been missing is an appreciation of the scientific or technical issues upon which policy turned at the time. Further, the assertion is that aside from those who participated in the negotiations of 1993 and 1994, senior policymakers, the press, and the attentive public all misunderstood the technical realities upon which the policy was supposedly based. That is a bit surprising since, at the time, many of those involved in the crisis thought that it could easily result in a US military strike on North Korean nuclear facilities and possibly a second Korean War. So why was it that the political dimensions and context for the confrontation between the United States and the DPRK were so well reported at the time and analysed since then, but that the critical technical issues were so little appreciated then or now? One is tempted to suggest that the technical issues were too subtle and difficult to understand, and so they were simplified for those without scientific training. But this cannot be true. The exploration of those

R. L. Gallucci (✉)
Georgetown University, Washington, DC, USA
e-mail: galluccr@georgetown.edu

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_13

issues is presented here by an author whose relevant scientific education ended with high school physics—completed with less than distinguished evaluations. What is more likely is that all observers, in government and out, save for the actual negotiators inside government and some expert commentators outside government in the non-governmental organization (NGO) community found the complexity *inconvenient*, and in essence preferred a simpler and far less accurate characterization of the situation. And because of that, the quality of prescription at the time suffered, and the usefulness of lessons learned today still suffers. What follows, then, is a description of events at four key points in the negotiations as they appeared to a negotiator in all their complexity, contrasted with the apparent understanding of those events by almost everyone else.

The First Misunderstanding: Special Inspections

The history of North Korea's nuclear program and its presumed connection to the end of the Cold War, the fall of the Soviet Union, and the rise of South Korea has been described and analysed by scholars and practitioners. In the early 1990s, the DPRK confronted a hostile neighbour to the South, allied with the sole remaining superpower, and left totally dependent upon China for its political and economic survival. The North Korean reaction was not only to continue pursuing a nuclear weapons development program, but also to launch an effort to improve relations with Seoul and Washington. The North Korean charm offensive would produce the North-South Declaration on Denuclearization in 1992, which would include, among other things, a commitment by both countries not to acquire uranium enrichment facilities, that is, facilities that could be used to produce uranium enriched in the fissile isotope, U235, one route to nuclear weapons. It also led to a meeting the same year, sought by the North, at the US Mission to the United Nations in New York, between North Korean and American diplomats. In that meeting the United States laid out the requirements for an improvement in US-DPRK relations, to include the reconciliation of North Korea with the International Atomic Energy Agency. The North had years earlier become a party to the Nuclear Non-Proliferation Treaty at the insistence of the Soviet Union, but it had never provided the information to, nor had the inspections required by, the International Atomic Energy Agency (IAEA) in order to put in place the full-scope safeguard regime required by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

The North Koreans responded by inviting an IAEA inspection team to visit Yongbyon, the location of its operating nuclear facilities, including a plutonium-producing 5 MWe research reactor and a chemical separation or reprocessing plant, used to separate plutonium from spent fuel—the other route to fissile material for nuclear weapons production. The inspectors took away samples from the inspected facilities for analysis, specifically to confirm the accuracy of North Korean declarations of the facilities' operating history, including the exact amount of plutonium that had been separated over the years of the reactor's operation. As it turned out,

however, an isotopic analysis of the samples revealed inconsistencies between the North's declaration and the inspection's results. The analysis provided evidence that more than one batch of fuel had been reprocessed, meaning that the North had separated more plutonium than it had declared to the IAEA. While the Director General of the IAEA, Hans Blix, was considering how to respond to this situation, the United States shared overhead photography of the Yongbyon nuclear site with Blix, which showed an area, beneath a structure and near the reprocessing facility, that could be the location of radioactive waste storage. If the IAEA could have access to the site and take samples, it was at least possible that a more definitive conclusion could be reached about how many batches of spent fuel had been reprocessed by the North Koreans and, therefore, to produce a better estimate of how much plutonium had actually been separated. The problem was that the IAEA inspection protocol under the NPT, known as Information Circular, or INFCIRC, 153 only permitted inspections of facilities identified to it by the host government, and this site had not been declared by the North Koreans. As it turned out, INFCIRC 153 included language permitting a "Special Inspection" of an undeclared site, though the Agency had not previously sought to conduct such an inspection. So when Blix informed the North Koreans of his desire to conduct a Special Inspection, the North refused to permit it. This then was the background to the crisis that blossomed in the spring of 1993 and led to the DPRK's announced intention to become the first country ever to withdraw from the NPT.

Interestingly, it also enshrined the phrase "special inspection" in virtually all the open discussions and analysis of the North Korean nuclear issue for the next 2 years, becoming the most important, high-profile objective in any engagement with North Korea. Indeed, the site of the proposed special inspection was often referred to as North Korea's secret plutonium storage facility. But it was really nothing of the sort. At best, it might contain waste from more than one batch of reprocessed spent fuel, evident from the presence of differing ratios of isotopes of plutonium, which would in turn indicate that the waste came from spent fuel elements that had been irradiated for different amounts of time. And yes, this would mean that more plutonium could have been separated than had been declared. But were the amounts at issue understood by policymakers or public? The North Koreans told the IAEA that they had separated only 100 g of plutonium over all the years of reactor operation. At the time, the US intelligence community assessed that roughly 10 kg (10,000 g) of plutonium would be needed for a country's first nuclear weapon, taking account of inefficient design and product loss in manufacture. According to the Joint Atomic Energy Intelligence Committee, the best estimate of the worst case of how much plutonium the North could have separated by 1993 was between 8.3 and 8.5 kg. So the need for those special inspections, which drove the crisis with the North for the next 2 years, could possibly have revealed that the North had more plutonium than they admitted to, but they would not have provided evidence of how much, and the absolute outer limit of how much was somewhat below what would be required to manufacture a single nuclear weapon. Special inspections were dealt with in the Agreed Framework between the United States and the DPRK in October of 1994, but without specific reference. In response to the US negotiating team's query to

Director General Blix about how to capture its needs with respect to access for the necessary inspections, Blix said that North Korea should agree to permit whatever activity was defined by the IAEA as necessary for the application of Agency safeguards. Such language did, in fact, become part of the Agreed Framework. This was a diplomatic way to achieve an outcome sought in a negotiation without specific reference to special inspections, a high-profile, if not particularly meaningful, concession. That said, critics of the deal still noted, incorrectly, that the United States "failed to get special inspections".

The Second Misunderstanding: The Significance of the North's Abandonment of Graphite-Moderated, Gas-Cooled Reactors

Early in 1993, the first year of Clinton's administration, the North Korean nuclear crisis blossomed. Director General Blix reported North Korea's non-compliance with their safeguards' obligations to the Board of the Agency and to the United Nations. The president of the UN Security Council took the moderate step of censuring the DPRK, and the North took the dramatic step of announcing its intention to withdraw from the NPT. Soon thereafter the United States and the DPRK agreed to meet at the US Mission to the United Nations in New York City to resolve the crisis. The objectives of the US negotiating team were to get the North to agree to rescind its announced intention to withdraw from the NPT, accept special inspections, and forgo the reprocessing of spent nuclear fuel and any further separation of plutonium. How the US side was supposed to persuade the North to make these concessions was not clear, and American talking points revealed the most eager bargaining chips to deploy in the effort at persuasion: first, the United States would offer to allow the North to inspect US military bases in South Korea to insure that Americans no longer maintained nuclear weapons in the Republic of Korea (ROK), as they claimed, and second, the United States would help the DPRK become part of the "Asian Economic Miracle".

In truth, the United States had no real idea whether or not the North wished to inspect US bases in the South, but it was betting on some rough equivalency between the offered base visits and those special inspections, nor had the United States developed any specifics about what economic assistance it might offer the North in the future so it could join in the region's miracle economic performance. While all this amounted to thin gruel for the US side to work with, an even greater hurdle to be overcome was lurking in the background: one of the US negotiating objectives was technically implausible. The North Korean reactor, which the United States believed would be the source of their plutonium for nuclear weapons, was a graphite-moderated, gas-cooled reactor (GGR). Its fuel, like similar reactors in the United Kingdom, was clad in aluminium, not zirconium as is the fuel in modern, light water-moderated power reactors (LWRs), the most common type found around the

world. As a matter of policy, the United States had long opposed reprocessing and separation of plutonium, arguing for storage of the spent fuel instead. Zirconium clad fuel can be stored in water for many decades without difficulty. Over the years and different administrations, the United States took this position on reprocessing with varying degrees of enthusiasm, depending on the perceived risk of nuclear proliferation and the political costs in each case. In the North Korean case, that risk was judged high, so persuading the North not to reprocess any more spent fuel than it already had was a high priority. Unfortunately, this very sensible policy did not take account of the fact that aluminium clad fuel will eventually deteriorate in a spent fuel storage pond, making a radioactive mess. Reprocessing the fuel is what was normally done with fuel from this type of reactor in the United Kingdom, and the North's nuclear program was built around just this technology. Not only did the North Koreans operate a relatively small 5 MWe graphite reactor at Yongbyon, but they were also building two more reactors of the same kind, one rated at 50 MWe and the other at 200 MWe. If all three were to be in operation, the North would be producing roughly 200 kg of plutonium annually in its spent fuel, which could be reprocessed to allow the manufacture of roughly 40 nuclear weapons each year.

There was, therefore, a serious problem brewing in the engagement with the North for which the US side had no real solution. Most interestingly, it was a problem well known to the negotiating team, but not so for senior US policymakers or the press and the public. As US-DPRK talks at the US Mission to the United Nations (USUN) wound up in June and reconvened in Geneva in July, US negotiating objectives remained the same, without any reference to this technical hurdle initially finding its way into the discussions.

Once negotiations resumed in July, however, the situation changed. In a luncheon meeting between the heads of the two negotiating teams, with only their interpreters present, the North Korean Vice Foreign Minister, Kang Sok-ju, suggested that the North would be willing to give up its graphite-moderated reactors if the United States would help the North acquire modern, light water-moderated reactors (LWRs) of the kind the United States built and exported around the world. Kang explained that the DPRK knew well that its reactors were not state of the art, and it wanted to have LWRs which were. Moreover, he said, the scientific and technical community in his country could not simply be told to abandon its current program in nuclear energy; it would need to be compensated, and the United States could help with that. Before the lunch was over, Kang was assured that the United States would pursue the idea. That afternoon the head of the US negotiating team telephoned Washington, planning to share the good news from the lunch meeting, and to get informal encouragement to follow up with the North in the next negotiating session. He hoped to speak with either the Undersecretary of State for Policy, Peter Tarnoff, or the Undersecretary of Defence for Policy, Frank Wisner, and thought himself fortunate when he learned that the two were having dinner together that evening. Both were deeply experienced foreign service officers, and both included the North Korean negotiations in their brief. They listened to an account of the luncheon meeting and of the North Korean informal offer, and then to a brief summary of its significance: if the North gave up its gas graphite technology completely and

embraced the more proliferation-resistant LWR technology, it would have no compelling reason to reprocess its spent fuel and the US objective of preventing the separation of any more plutonium in North Korea could be realized. The Undersecretaries shared the same reaction to the report. They did not wish to prevent further discussion of the idea, but rather than seeing it as potentially a major breakthrough in the negotiations, they saw it as a major risk: Did the negotiator understand the relevance and significance of the Anti-Deficiency Act? He did not. It could mean, they explained, that he would be personally responsible for any financial obligations he incurred on behalf of the US Government which were not covered by appropriated funds. Even if only a single LWR were to be put on offer, this would amount to billions of dollars—somewhat more than what was available in the negotiator's checking account.

Over the following weeks and months, on into the next year, there would be long breaks in the negotiations, even as contacts between North Korea and the United States continued, as did US consultations with its allies, principally the ROK. Through all of it, including the crisis in June of 1994, the negotiators saw the eventual outcome, if there was to be one, as based on the idea floated at that lunch in Geneva: the United States would lead the effort to get LWRs built in North Korea and the North would return to the NPT and give up its GGRs, reprocessing, and plutonium production program. Before negotiations leading to the Agreed Framework were completed, there would be much discussion about who would supply and pay for the LWRs, and over the true proliferation resistance of that technology, whether it was worth trading LWRs for GGRs. More will be said about this later, but for now it is worth emphasizing that at the core of this international arrangement was an idea little recognized as such beyond the circle of negotiators.

The Third Misunderstanding: The Cause of the Crisis in June, 1994

In the spring of 1994, contacts between Washington and Pyongyang were sporadic, and there had been no negotiations in Geneva since the summer of 1993. In May of 1994, the United States learned from the IAEA that the North planned to de-fuel its 5 MWe reactor. The Agency had continued to inspect facilities at Yongbyon with US encouragement, even though it had no standard protocol which applied to the North Korean case. The standard protocol for NPT parties, so-called full-scope safeguards, did not apply once the North refused to permit the special inspection. Director General Blix, however, creatively agreed to maintain "the continuity of safeguards" and the presence of its inspectors in the DPRK, and the Agency was therefore made aware of the North's planned de-fuelling operation.

Although the United States was concerned about the timing of the removal of the fuel from the reactor, a technical analysis of reactor operation and fuel burn-up indicated that removal of the fuel at that time was technically justified. Of course,

the United States was concerned that the fuel would remain in the spent fuel storage pond after removal, and not be moved to the reprocessing facility where plutonium would be extracted. This concern was soon superseded by another, however, when the IAEA requested that the North remove the fuel from the reactor in a way that would permit the Agency's inspectors to examine the fuel at some time in the future, and so determine the operating history of the reactor.

This was a novel idea. Two years previous, the IAEA had sought access to a radioactive waste storage site with the objective of examining the waste and determining how many reprocessing "campaigns" the North had completed. This was an effort aimed at the "back end" of the fuel cycle. Now, the IAEA wanted the North to place the fuel it removed from each reactor fuel channel into separate, identifiable baskets so that, when permitted, the inspectors could return with sensors that would measure gamma radiation and so help them to determine the relative amounts of time fuel from each channel had been in the reactor. This might permit the IAEA to reconstruct reactor operating history and address the same concern at which a special inspection was aimed, namely plutonium production. This effort, however, was focused on the "front end" of the fuel cycle.

The North, once again, declined to accommodate the IAEA. Instead, the reactor operators made sure to mix fuel elements from different channels, making it impossible for the Agency to ever do the analysis it had proposed. Director General Blix travelled to New York and reported to the UN Security Council that North Korea had "destroyed history". Before leaving from the United States, he had told the head of the US negotiating team that he was inclined to withdraw his inspectors from North Korea since they could not do their job, and because their presence might be interpreted as legitimizing the North's behaviour with respect to de-fuelling. But the United States asked, and Blix agreed, to leave the inspectors in place while some negotiated resolution was sought.

The crisis quickly escalated. The United States announced that, under the circumstances, it would not meet with the North Koreans to continue negotiations that began the previous year and would instead seek international sanctions against the North. The North made sure that the United States understood its view that the application of international sanctions against the DPRK was a violation of the armistice which had ended the Korean War, and would be regarded by the North as an act of war. Then, just as the United States was consulting with other permanent members of the UN Security Council, focusing on the Russians and the Chinese, in the hopes of avoiding a veto, and meeting internally to develop plans for a possible air strike at the nuclear facilities at Yongbyon, former President Jimmy Carter accepted an invitation from the North Koreans to travel to Pyongyang and meet with Kim II Sung. Immediately after the Carter-Kim meeting in Pyongyang, President Carter informed President Clinton and his senior national security advisors meeting at the White House that he had persuaded Kim to allow IAEA inspectors to return to Yongbyon and continue their work, and so the United States could resume negotiations with the North at Geneva. He also went before the cameras of CNN moments later to tell the world the same thing. This was not regarded as good news at the White House. The inspectors were already at Yongbyon and they had not been asked

to leave. So President Clinton decided that negotiations could only resume if the United States "got something more" from the North to compensate for the North's rejection of the IAEA proposal on de-fuelling. This it did by telling the North that if they wished to resume negotiations, they would have to forgo re-fuelling and start-up of the 5 MWe reactor as well as any reprocessing of the spent fuel removed to the storage pond. In short, the North would have to agree to neither produce nor separate plutonium. This they did and negotiations soon resumed at Geneva.

The complexity of the inspection issue and the unprecedented request of the IAEA received no attention in the press or anywhere else. As with special inspections, there was no certainty that access would yield definitive conclusions about reactor operating history, and in neither case was there any expectation that the action would reveal any significant unreported quantities of plutonium. As for Carter's mission, it might appear as though the former president accomplished less than he might have thought. However, the reverse would seem to be more nearly correct. Before his visit to Pyongyang and meeting with Kim, there appeared little prospect of a peaceful resolution to the confrontation and substantial probability of a US air strike that might have ignited a second Korean War. Carter's visit was almost certainly critical to Kim II Sung's agreement to new US terms for continued negotiations and avoidance of war.

The Fourth Misunderstanding: The Non-proliferation Benefits of the Deal

When the negotiations between the United States and the DPRK were completed in October of 1994, the head of the US negotiating team provided a long and detailed briefing to the press on the substance of the deal, explaining what benefits would flow to each side, over time, as both took the steps described in the Agreed Framework. The briefing covered the estimated cost of these benefits and who would bear them. It also described how the deal would reduce the risk that North Korea could use its nuclear energy program to pursue a nuclear weapons program, or the non-proliferation benefits of the deal. The briefing was essentially intended as a defence of the Framework, since Clinton's administration anticipated that there would be substantial criticism of the deal, some of it certainly coming from Republicans with the midterm elections being only weeks away. The non-proliferation benefits were, of course, the purpose of the deal from the US point of view. Specifically, it was meant to end the threat that the North would use the plutonium it produced in its reactors, and separated in its reprocessing plant, to build nuclear weapons, as nearly all of the eight countries possessing nuclear weapons had done before. But the first reactions to the deal to appear in the press focused most on the benefits to the North, especially the provision of two 1000 MWe LWRs, valued then at about $2 billion each.

The political critique of the Agreed Framework began with the presumed naivety of the administration in believing that it could trust the North Koreans to abide by any agreement. Clinton's administration of course countered by asserting that the deal was not based on trust, that it could be monitored, and that the North's compliance, or lack thereof, can be verified by IAEA inspections and the US intelligence community. That debate continues to this day since the North did, in fact, secretly acquire uranium enrichment technology and equipment from Pakistan, and the US intelligence community did, in fact, discover those transfers. But while those defending and attacking the deal have much to say now, as they did in 1994, little is said about the fundamental trade-off from the negotiators' perspective, and its significance for the prevention of proliferation in Northeast Asia: that North Korea shut down its reprocessing plant and 5 MWe reactor, ceased construction of the 50 and 200 MWe reactors—all gas-graphite, natural uranium-fuelled reactors—and committed to accept instead two 1000 MWe light water-moderated, enriched uranium-fuelled reactors, LWRs of the kind operating in South Korea, the United States, and around the world.

The advocates of the deal began by observing that unless the North could be persuaded to give up their GGRs, they would always have a need and rationale for reprocessing their aluminium clad spent fuel and separating plutonium. And the plutonium so produced would be of high quality from the perspective of nuclear weapons design—especially for new nuclear weapons states, manufacturing relatively simple weapons—because the spent fuel, from which the plutonium would be derived, would be irradiated for a relatively short period of time in this type of reactor. This would mean, in turn, that the plutonium would have a relatively high percentage of the isotope Pu239 and relatively less build-up of plutonium consisting of the even isotopes, Pu240 and 242. The significance of the isotopic ratio went to the probability of the plutonium core in a weapon spontaneously emitting neutrons that could cause the weapon to detonate sooner than the designer intended. This "pre-ignition" would result in a reduced explosive yield and could increase the risk of accidental detonation. In contrast, LWR fuel is clad in zirconium and can safely be stored for decades or more, and the United States, at least, has argued that there is no technical reason why such fuel needs to be ever reprocessed or the plutonium ever extracted. Moreover, a normally operating LWR presumes a high burn-up rate, meaning that the fuel remains in the reactor for a relatively long period of time, increasing the build-up of even isotopes of plutonium, making the plutonium produced in the spent fuel far less desirable for nuclear weapons manufacture, particularly with likely early designs. So, while it is possible to design a nuclear weapon using high-burn-up LWR fuel—and the United States has done so—none of the nine countries that currently possess nuclear weapons have used LWRs as the source of their plutonium, relying instead on heavy water- or graphite-moderated reactors, with aluminium clad fuel. In addition to these arguments, advocates of the Framework also noted that moving the North from natural uranium fuel, available indigenously, to enriched uranium fuel, which the North did not have the capacity to produce and would have to purchase on the international market, makes its

nuclear program vulnerable to international sanctions were the North to violate its undertakings in the Framework.

Critics of the Agreed Framework in the NGO's community countered these arguments by observing that since the amount of plutonium produced by two 1000 MWe LWRs amounted to about 600 kg each year, compared to the presumed plutonium production of the North Korean reactors, extant and under construction, of 200 kg/year, the non-proliferation benefits of the deal were not obvious. They also argued that since a nuclear weapon could be made from any plutonium, notwithstanding isotopic composition, the difference in quality made no difference. The point here is that this argument raged between only a small number of experts in and out of government, and it was not featured in the press or in Congress. Indeed, when the chief negotiator briefed the Republican chair of a subcommittee of the House Budget Committee and attempted to explain the non-proliferation benefits of the LWR for GGR exchange, he was told that it was too hard to understand and would take too long to make the case to constituents, so he would not support US funding for that part of the deal. But this went to the core of the Agreed Framework and its value as a measure to reduce the likelihood of nuclear proliferation. The way events unfolded, with the North secretly pursuing uranium enrichment with Pakistani assistance, and the United States eventually shutting down its participation in the Framework and the LWRs never completed, it is hard to know whether advocates or critics of the deal would have eventually been proven correct. Of course, we do know that after the United States walked away from the deal, the North restarted its 5 MWe reactor and reopened its reprocessing facility to produce and separate plutonium for nuclear weapons, as well as used a gas centrifuge enrichment facility to produce uranium, enriched to high levels in the isotope U235, also for nuclear weapons production.

Conclusions

This review of one negotiation and agreement, which had political and technical or scientific elements to it which were poorly understood when the policy was being debated, suggests that the same may be true of other such agreements, be they bilateral strategic arms control agreements with the Russians or multilateral agreements of the kind negotiated with Iran. In the case of the negotiations with the North Koreans in 1993–1994, however, it was not only the virtue of the agreement which could not be fairly assessed without appreciating the science on key points, but also the rationality of considering military action as a policy option at those points. The value of special inspections and the ability to trace fuel elements back to fuel channels seem in retrospect rather thin reeds on which to base even a small bombing campaign. Who had what level of confidence that either front-end or back-end analysis would be dispositive on the question of the North's plutonium production, and since the amounts were small anyway, apart from principal, why did it matter so much? And how could those who presumably knew most about the North Korean nuclear program put such a high value on the North's willingness to abandon the

technology on which they based their program, with hardly anyone else seeing the same thing? The United States would certainly not have embraced the deal if the South Koreans were not going to pay for those LWRs. If nothing else, it would seem wise for analysts to be suspicious of easy characterizations and assertions when scientific or technical issues are presented. It just may not be all that simple, especially when it is convenient to believe it is.

Chapter 14
Scientists Meet Diplomats: A Cognitive Insight on Interpersonal Negotiation



Mauro Galluccio and Aaron Tim Beck

I count him braver who overcomes his desires than him who conquers his enemies; for the hardest victory is over self.

Aristotle

Introduction

The implementation of both science and technology is seen as the key strategic process for innovation and broader coordination at the international level. Over time there has been a growing interest in the collaboration of experts, specialists, and scientists in policymaking and policy development. Recent years have seen an increasing interest in applying scientific knowledge towards the improvement of diplomatic and political adaptive decision-making processes. To this end, researchers have sought to provide suggestions and evidence-informed strategic advice to policymakers on matters of global interest (Galluccio and Vivani 2015). Sometimes it works; other times it falls on deaf ears. We need to improve working relationships among different actors on the international scene. Today we live in a world where communication is faster than ever, where we have, on average, a strong civil society and a well-educated and informed public. The challenge is rather to persuade actors on the international scene of the benefits of openness, consensus, understanding, dialogue, and tolerance (Galluccio 2011; Melissen 2005). Soft power is therefore an

M. Galluccio (✉)
EANAM (European Association for Negotiation and Mediation), Brussels, Belgium
e-mail: mauro.galluccio@eanam.org

A. T. Beck
University of Pennsylvania, Philadelphia, PA, USA
e-mail: abeck@mail.med.upenn.edu

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1_14

essential component of the remedies being used against extremism in all its forms and transcends classical notions of power in international relations because it deals with foreign states as important (but non-singular) actors. Coercion between states is no longer the source of influence and domination, but rather the ability of any given state or society to attract, influence, and "convert" others to their dominant narratives (in this case liberal democracy, human rights, peaceful conflict resolution, open societies and markets, etc.). Public diplomacy is linked to these objectives given that it encompasses the strategic planning and execution dimension of policies that generate favourable foreign public opinion to a country's foreign policy objectives. It is, in other words, the "how" of soft power. As Edward R. Murrow, an American broadcast journalist, said in May 1963 on the nature of public diplomacy strategy during the Cold War (McPhail 2010:90):

> *Truth is the best propaganda and lies are the worst. To be persuasive we must be believable; to be believable we must be credible; to be credible we must be truthful. It is as simple as that.*

With this in mind, science diplomacy is to be seen as a subsection of public diplomacy's nature and objectives given its potential as a source for soft power due to reputation and branding. In addition, scientific values such as rationality, transparency, and universalism are widely shared by many international actors, transcending ideology, religion, and cultural, national, or ethnic divisions (Royal Society/AAAS 2010). To this end, diplomacy for science and science for diplomacy are essential for soft power goals. The former aims at establishing cooperation and exchange agreements between scientists through diplomacy, while the latter establishes cooperation agreements that can benefit the host country (through scholarships, conferences, joint research ventures, etc.) (Galluccio and Vivani 2015). While spreading the ideals and values of liberal democracy and open societies is positive in itself, the combination of openness, credibility, and prestige along with policies that attract and train high-quality scientists makes science diplomacy an essential public diplomacy tool for consolidating soft power for an economy as well as advancing inclusive narratives in an international order plagued by the dangers of different forms of rigidity (Copeland 2011; Galluccio and Beck 2015). Foreign scientists not only benefit host countries through research and technical knowledge, but also provide opportunities for international dialogue, understanding, and socialization which, combined with the ideas received from experiencing life in open societies with liberal democracy, can lead to influence in civil society on their return to their countries of origin. This not only reduces tensions but also helps to open societies that were much more closed to the national and social narratives of the host state.

The Scientist and the Diplomat: Opposing Figures?

In brief, as defined in Galluccio and Vivani (2015), *science in diplomacy* demonstrates how science is used in order to contribute to different policies and diplomatic decisions. This scientific approach aims to facilitate the resolution of issues between countries. In *diplomacy for science* the aim is to bring together different countries

to collaborate on specific scientific projects. In *science for diplomacy*, the aim is to apply a scientific approach to foster relationships between different countries. The goal here is to provide a more competent level of science in order to facilitate global development through adequate negotiation processes between different countries. This is also the meaning of the fourth dimension which is human beings' empowerment, that is, *science and diplomacy for the people*. Without this aim science diplomacy will only strengthen the links between and among states but not populations, thus failing to provide new tools for the empowerment of individuals. The aim here is to develop evidence-informed scientific knowledge without losing sight of ethical guidance and public engagement.

Science diplomacy features two main characters—the *scientist* and the *diplomat*—who "are not obvious bedfellows" (Royal Society/AAAS 2010:1) as they are inspired and driven by different backgrounds, ideals, perceptions (and misperception), beliefs, biases, and cognitive, emotional, and behavioural cues, mainly related to their personal thinking process and to specific areas covered by their fields of interest. On the one hand, science knows no boundaries: its studies transcend national borders and loyalties in order to unlock those natural secrets concerning all of humankind without distinctions. Even the language of science tends to be universally sharable and comprehensible in order to exploit, disseminate, and communicate results as successfully as possible through conferences, seminars, lectures, and social networks, and to allow the "peer-to-peer" result validation throughout a wide networking community. Moreover, "the scientist is driven by an idea of advanced knowledge in an impartial and disinterested way" (Ruffini 2017:29) because science is a public good that can be freely accessed by everyone. Scientific networks are based on internationally shared disciplines and values: merit review, critical thinking, diversity of thought, transparency, etc. (Hormats 2012). On the other hand, "*diplomacy is an art resulting from the division of the global space into sovereign nations*" (Ruffini 2015:28). Due to the plurality of national states, diplomats can perform their mission as an active agent of dialogue between different national communities. The diplomat's repository responds to concepts of influence, persuasion, balance of power, and strategic reasoning.

From these few lines, it can be easily understood that the scientist and the diplomat belong to very different worlds, embedding very different perspectives and perceptions, although *they do not ignore each other* when the momentum of action prevails. The former desires to access "the best people, research facilities or new sources of funding" (Royal Society and AAAS 2010:vi) through international cooperation, whereas the latter looks at science as a tool for strengthening networks and communication channels, which have the potential to support wider political goals. Scientists can also encourage their universities, research institutions, professional societies, and laboratories to adopt global engagement as a priority, a priority which is largely shared by diplomats and international organizations worldwide. Despite the differences between the scientist and the diplomat, it should also be taken into consideration the fact that the "way of doing science" is something strictly bound not only to national schools of thinking, but also to cultures, national regulations, and funding opportunities, which determine scientific results, their dissemination,

influence, and application. It is clear that both domestically and internationally, using science in diplomacy as well as science for policymaking is essential when tackling global issues. In 2015 the OECD published a very interesting policy paper, a milestone, on science, technology, and industry titled *Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists* (OECD 2015). The paper outlines how the scientific community has increasingly been called to advise governments in highly technical issues such as climate change and health emergencies, especially if said issues have a crisis and/or long-term component. Scientific advice can be key for adequately framing and communicating policy issues to the public and other stakeholders, including potentially interested parties. It should be stated nevertheless that using scientific advice does not necessarily imply developing an "apolitical" or technocratic stance from the part of governments, but merely means providing greater depth in the realm of decision-making for the well-being of the populations. As in every policy, scientific evidence must be weighed alongside numerous interests and considerations in order to find balanced and appropriate policies for countries. Balancing science with other interests is especially important in an international environment where communication technologies allow quick access to information, making public opinion much more sensitive and reactive than in the past. In this sense, policymakers are held increasingly accountable to political debates in civil society. Scientific debates have also come under public scrutiny, especially when they encompass issues such as climate change and epidemics. Evidence of a "scientific" nature is used in these political debates to validate and reinforce one's views (although not always in an honest way in the case of climate change, the COVID-19, but not only). Unfortunately, when situations are complex, ambiguous, and uncertain, there is a tendency to find heuristic shortcuts to simplify the problem and to exert control through limited consultations and conflict avoidance among different parties. The COVID-19 crisis showed the powerful effect of context-related "negative" emotion elicitation such as surprise, fear, anxiety, powerlessness, loss, insecurity, and hopelessness, to name but a few. These cognitive and emotional processes increased the perception of uncertainty associated with the shadow side of the pandemic (unknown trajectory and knowledge). The communication in planetary crisis is a fundamental tool to show the ability of scientists, politicians, and diplomats to work together in forging links with people. *Science and diplomacy for the people* especially in the crisis situation should provide sustainable tools for the empowerment of individuals. This makes us understand the degree to which science and scientists are at the forefront of many of today's issues in international politics and demonstrates the implicit politicization of science. Moreover, it warns all of us that there is a need to strengthen cooperation between scientists and diplomats, so as to increase the coherence and efficiency of evidence-informed policymaking.

Scientists and Diplomats' Communication

Human communication is important because it is a process that involves a shared code, or codes, or verbal and nonverbal symbols. Misunderstanding is a huge problem in human communication, because the meanings of symbols are in the people that use them, not in the symbols themselves (Aquilar and Galluccio 2008). What one says, the other may misinterpret. Where the parties speak different languages the chance for misinterpretation is compounded (Fisher et al. 1991). Donald Meichenbaum (2011, 2015a:29), one of the most influential cognitive behavioural therapists of the twentieth century, has very concisely listed 13 of the most important motivational and "thinking errors" in decision-making. They are the following:

1. Use of thinking shortcuts: Mental heuristics and habits of thought.
2. Use of confirmatory bias: Seek information that is only consistent with prior views. Ask for opinions of only those who agree with you.
3. Engage in tunnel vision: Stubbornly hold beliefs and "select" data that one wants to hear.
4. Lack of curiosity: Failure to question the credibility of the source of information.
5. Inadequate consideration of how questions are framed: Frames always trump facts.
6. Engage in stereotypic thinking: Demonize others, use escalating images, lack of perspective taking, not rethinking the conflict.
7. Use of historical analogies and metaphors: Use "like a" statements that do not fit the current situation.
8. Inadequate consequential thinking: Lack of conducting a barrier analysis and accompanying contingency planning.
9. Think defensively: Blame others (attribution bias effect), denial.
10. Make "snap" or impulsive decisions: "Hidden agendas" influence decision-making.
11. Use groupthink processes: Strive for unanimity, group cohesiveness, solidarity, homogeneity of decision-making.
12. "Game the system": Strategically bypass and misrepresent other advisors' positions. Presence of hubris and unquestioned self-confidence.
13. Hold a "fixed entity" mindset and embrace "sacred values" that undermine the negotiation process.

Scientists together with diplomats should be able to pay attention to these cognitive biases and keep alive the cooperation in solving common global problems. The acronym SCIENCE clarifies this (Mahoney 1977; Galluccio and Vivani 2015):

1. *Specify* the problem as best as you can. The genuine and cooperative exchange of mutual experience and background about the problem is essential, as well as the analysis from different angles, pros and cons, integrating different knowledge fields where science and evidence-informed policymaking are at the service of the people. The advisors' selection is a fundamental action, making sure

that appropriate experts are included to ensure the quality, legitimacy, and clarity of the advising process and to avoid conflicts of interest. Producing the advice: ensuring that selected advisors can conduct independent work, especially from a political perspective.
2. *Collect* and select information to gain fact meaning and a better perspective of the problem from different levels of interest at the intersection with the problem, such as people involved and the context. Questions should be carefully framed especially when the issues at stake are uncertain, ambiguous, and complex and they could be interpreted from different perspectives. The best available information should be used in order to produce sound, unbiased, clear, and legitimate advice, recognizing and communicating uncertainties, and avoiding non-evidence-informed "interferences".
3. *Identify* patterns: Use your experience to gain shared knowledge about a situation, trying to mutually understand the process instead of focusing on the result of your action. This is a step-by-step learning experience involving a growth of mindsets and consequently it is important to focus on the negotiating process.
4. *Examine* options: Brainstorming sessions with scientists of different branches and diplomats and politicians may help a lot. Select qualitative information in a way to understand the history of the problem. It is important to investigate cognitive biases, core beliefs, and cognitive distortions and suspend judgments and preconceived conclusions.
5. *Narrow* options and verify your hypothesis: This is an exercise familiar to scientists as such methods could be easily adapted to political decision-making. It has been proposed a cognitive-behavioural advisor to politicians in a way to improve their decision-making process (Meichenbaum 2015b).
6. *Compare*, revise, and replace your hypothesis.
7. *Extend* to other situations your problem-resolution process.

If you learn the process of how to get there, instead of just preconceived techniques to persuade and get an outcome, you will know how to collect the most relevant knowledge to advance the process. Techniques acquire a specific meaning and are solely related to the context, issues, and people at the "table". Cognitive, emotional, motivational, communication, and negotiating processes are at stake in this interpersonal negotiations and related adaptive decision-making. It is important to focus on knowledge and awareness capacity building among parties from different backgrounds and disciplines.

Cognitive and Emotional Processes in Interpersonal Negotiation

Cognitive processes are the modalities, with which every individual structures knowledge of itself and of the world and is inevitably infused with emotions and meanings. They can be categorized as sensation and perception; consciousness and

attention; memory; learning; thought; and language (Aquilar and Galluccio 2008). All the cognitive processes, as psycho-biologically determined, are subject to distortions during the personal development of everyone. If we think for instance of distortions of memory: an individual can forget all the experiences inconsistent with his or her opinion on a determined matter and continue to remember and recall episodes that confirm individual judgment (or prejudice) (Aquilar and Galluccio 2008). In this way, it is as if the events that could disconfirm a determined opinion would not exist, while few observations engrained in memory could confirm an opinion. Research, studies, and clinical assessments have identified the influence of particular cognitive distortions and dysfunctional beliefs in human information processing on subjective appraisal of present and future events and related decision-making processes (Beck 1999, 2002; Ellis 1992, 1994; Galluccio and Beck 2015). Belief systems resist changes because cognitive distortions and dysfunctional beliefs "act" as mind guards.

Emotional processes are innate factors that characterize all human beings as they are at the basis of the motivation action tendency, especially for social actions. Emotions seem to carry out a determinant psychobiological role and they typically arise from the evaluation of events in relation to a person's individual concerns and expectations providing information about the self in interaction with the environment (Bowlby 1988; Galluccio and Safran 2015; Liotti 2001). Emotional competence appears fundamental for the understanding of meaningful interactions among human beings. Besides, emotional competence requires upstream metacognitive abilities that help people *recognize* and decode one's own (and others') emotions, to *express* them, and to *modulate* their expression (to avoid being overwhelmed by them). The crux of interpersonal negotiation resides in the principal role emotions play in the dynamic of human interaction, communication, and relationship building. Many researchers and scholars have proved that emotions play a role in behavioural activation in human beings as behaviour may manifest in verbal and non-verbal communication at the negotiation table (Adler et al. 1998; Aquilar and Galluccio 2008; Bazerman et al. 2000; Bosman et al. 2001; Ekman 2003; Fisher and Shapiro 2005; Forgas 1998; Galluccio 2015b; Galluccio and Beck 2015; Galluccio and Safran 2015; Isen 1987, 1993, 2004; Labroo et al. 2000; Morris and Keltner 2000; Safran and Muran 2000; Thompson et al. 2001; Van Kleef et al. 2002, 2004). Depending upon the environment people find during an interpersonal negotiation, where vital interests (for himself or herself or for the community) could also be at stake, the level of emotion is often heightened because of perceived meaning of the whole process. A skilled negotiator should be emotionally competent. It is of utmost importance for him or her to identify, modulate, and express emotions.

Scientists and diplomats who have to negotiate evidence-informed policymaking processes, even before they take a seat and prior to becoming fully aware of the details of the negotiating issues, often have a particular predisposition from which they judge a subsequent determination of facts according to their field of expertise. The ability to *co-mediate* potential disputes or to prevent them is an essential interpersonal skill in this ever-changing and complex network of people, disciplines, and environment. The area of research on cognitive biases has made eminently clear that

the kinds of judgements policymakers and scientists (among other categories) are likely to make may well be affected—often adversely—by their own mindset in the form of various biases and perceptual predispositions (Aquilar and Galluccio 2008). A central idea in cognitive psychotherapy is that our *perception* of an event or experience powerfully affects our physiological, cognitive, emotional, and behavioural responses to it (Galluccio and Beck 2015). People need to train metacognitive functions, which is the integrated ability to reason and attribute intentions, desires, and beliefs (mental states as a whole) to themselves and to others and the ability to master problematic mental states (Di Maggio et al. 2007; Galluccio and Safran 2015). The ability to meta-represent one's own mental states plays an important role in consciousness and may even be seen as defining it (Sperber 2000). If an individual is lacking this ability, he or she will be walking through an inexplicable and worrying world with consequential behavioural defence strategies. A narcissistic personality will not be able to detect his or her internal mental states and to adjust to ongoing relationships; a paranoid personality will systematically fail to read the other's mind, going so far as to attribute to others bad intentions towards himself or herself; a borderline personality will not be able to integrate an intense, changeable, and contradictory internal experience (Aquilar and Galluccio 2008; Di Maggio et al. 2007). For instance, the deficit of the metacognitive function called *decentring* will prevent people in interpersonal interactions from seeing the perspective through which others relate to the world preventing the dismissal of threatening mental states; the deficit of the metacognitive function called *identification* (the inability to discriminate between the intrapersonal and interpersonal context compromising the emotion regulation) will prevent people from accessing their internal and others' mental states influencing negatively adaptive decision-making processes; the deficit of the metacognitive function called *integration*, the ability to reflect and order mental states, will prevent people from building up an internal and/or interactive dialogue that gives coherence and a sense of continuity to our experience (Galluccio 2011; Galluccio and Safran 2015). Summarizing, the ability to identify our mental states and the other side's mental states, together with the awareness of this interpersonal process, is an important metacognitive skill very helpful in interpersonal negotiations. How to identify, express, and modulate emotions, which have been generated and acquire meaning because of the interpersonal process (that binds scientists and diplomats together), could facilitate a high flexibility of response. *Emotional competence*, a self-efficacy in emotion-eliciting encounters (Saarni 2011, 2015), is a compass to improve the interpersonal negotiation process at large and it is a catalyst skill to build sustainable international alliances for science diplomacy.

Emotional Competence

Aristotle argued that "anyone can become angry, that is easy. But to be angry with the right person, to the right degree, at the right time, for the right purpose, and in the right way, this is not easy". According to Saarni's words (1999:2), "Emotion-

eliciting transactions are invariably social in nature. Our emotional response is anchored in social meaning, that is, the cultural messages we have absorbed about the meaning of social transactions, of relationships, and even our self-definitions". Emotional experience and social experience influence each other. The social context in which we grow up provides a meaningful foundation for the emotional experience which is developmentally embedded in social experience. The experience of emotion is never the same for two individuals. Our biological evolution has endowed us to be emotional, but it is the interpersonal dimension of consciousness which gives meaning to the emotional experience (Galluccio and Safran 2015; Liotti 2001; Safran and Muran 2000). The experience of emotion always takes place in an intersubjective context, such as a psychological field combining the experience of the interpersonal and interacting worlds of at least two people (Stolorow and Atwood 2002). Thus, our relationships influence our emotions and our emotions reciprocally influence our relationships (Aquilar and Galluccio 2008; Galluccio and Safran 2015; Liotti 2001). As stated by Saarni (1999:2–4), "The primary contributors to emotional competence include one's self or ego identity, one's moral sense or character, and one's developmental history", the latter being an especially significant factor. Moreover, "*Emotional competence* entails resilience and self-efficacy (and self-efficacy includes acting in accord with one's sense of moral character)". Resilience, the capacity to overcome adversity, facilitates interpersonal negotiation processes. Emotional experience is fundamentally moral (Saarni 1999). Our beliefs of right and wrong, good and bad, and appropriate and inappropriate determine our emotional response to the events. We perceive a conflict because it is related to our moral sense and we attempt to manage conflict in ways that optimize morality (Jones and Bodtker 2001). The relation between emotional norms and social order establishes a new conceptual bridge and an action sphere with the description of "emotional norms" which vary depending on the referring group and which could be considered the basis of some rigid thinking processes and fixed mindsets (Aquilar and Galluccio 2008; Thoits 2004).

Saarni (1999, 2011) identifies eight key emotional skills for emotional competence to be nurtured while emphasizing the cultural and gender context of emotional experience and the meaning of moral disposition and personal integrity for mature emotional competence:

Skill 1: Awareness of one's own emotions.
Skill 2: The ability to discern and understand the emotions of others.
Skill 3: The ability to use the vocabulary of emotion and expression.
Skill 4: The capacity for empathic involvement.
Skill 5: The ability to differentiate internal subjective emotional experience from external emotional expression.
Skill 6: The capacity for adaptive coping with aversive emotions and distressing circumstances.
Skill 7: Awareness of emotional communication within relationships.
Skill 8: The capacity for emotional self-efficacy.

Regarding the latter, the emphasis is on moral character. Without a sense of the right thing to do (relative to our subculture) we lose direction. Culture provides us with a way, namely values. They are an indispensable part of what gives meaning to emotional experience and they drive what become the goals of motivated behaviour. The common thread provided by culture allows us to find consensual meaning with others in emotional experience (Aquilar and Galluccio 2008). Emotional competence is the ability to master emotional processes and individual needs in order to deal with interpersonal issues and acts as a compass for people to find an orientation into the ideology and morality of the counterparts. We can understand how important it could be to provide interpersonal skills' capacity building training for scientists and diplomats to better cope with interpersonal processes. Awareness of emotional communication should be one of the core features of tailored training programs for scientists and diplomats because any particular negotiating exchange could prepare a script for the next emotional communication and far-reaching responses to it.

Conclusive Remarks

As concluding remarks, the following ten points can be listed to improve interpersonal negotiations:

1. Support from the Institution you Represent
   Be sure to have adequate backing from your government or the institution you represent. Do not go forward without it, including the staff and resources necessary to have an impact. "Symbolic" representatives are of little consequence in producing the scientific advice. Instead, ensuring that selected advisors can conduct independent work, especially from a political perspective, will bring added value to the evidence-informed policymaking. Selected advisory systems are necessary to gather scientists and policymakers and they are also essential in developing short- and long-term risk assessment and crisis management strategies.
2. Build Trust on Both Sides
   Have the ability to gain confidence of both (or more) sides, making sure that trust is built with the civil society and stakeholders. That is harder when you represent a discipline difficult to understand by the other side. But it is critically important to convey to each side that what you recommend is in fact good for the people even if they are suspicious. As correctly stated by Bert Bolin (first chair of the Intergovernmental Panel on Climate Chance, IPCC), "scientists need to inform politicians in a simple manner that can be readily understood, but the message must always be scientifically exact". In addressing specific issues in a clear and simple manner, finding common grounds, there may be more opportunity to persuade rather than addressing some of the larger differences between parties. We also need to improve and manage training by helping

scientists and diplomats to acquire better awareness and mindful attention to potential cognitive pitfalls (connections between cognitive and emotional processes, implicit beliefs, sacred values, mindsets, and chosen behaviours).

3. Go to the Nodal and Deep-Rooted Point
   Understand the underlying issues, the link between science and policymaking, the reasons behind scientific and evidence-informed advice, and the uselessness of treating your counterpart as an obstacle to your ideas or actions. Do not get misled or caught up in what may be surface ones only. Do not be taken hostage by deeply held core beliefs, misperceptions, misunderstandings, and competitive behaviours. Always remember you are all in the same boat and you must manage your ego for the well-being of people.
4. Build Partnerships
   Address and prevent potential barriers and obstacles to interpersonal negotiations in the form of worst-case scenario exercises. Engage in cooperative common goal-setting that nurtures hope and "unfreezes" core beliefs and cognitive distortions. Find a balance between joint endeavours and unilateral moves, depending on the situation and the nature of players' (or whoever's) influence. This includes determining which scientific advice should be foremost. Politicians and diplomats should figure out how to support that scientific advice while preserving independence of action.
5. Understand the Importance of Communicating Between Actors and Then Abroad
   Establish, maintain, and monitor the quality of communication processes first of all between scientists and diplomats and the way to address breakdowns in their interpersonal relationships (Galluccio 2011). Then, communicate the advice as a core strategic tool for engaging people in the process (fourth point of science and diplomacy for the people). Transparency of the communication process is an essential step, meaning that conclusions should be disseminated and communicated in a clear manner with appropriate timing and broad public outreach. In addition, policymakers must also be clear on when, how, and why they used advice offered by scientists. This is especially important in instances where the final decision contradicts scientific findings. Last, but not least, the use of the press should be carried out strategically and in cooperation. From time to time, one may feel compelled to express concern, outrage, or frustration. But overuse of these feelings loses effect. Be careful to keep balance without falling into the trap of "moral equivalency".
6. Take Risks
   Have a clear division of competences and know the limit between advisory and decision-making functions. Proper boundaries and competences will drastically improve the legal, logistical, and communicative dimensions of the main actors and among structures. That takes careful assessment, but sometimes you need to at least play with solutions more radical or more unconventional. This clear division of competences among actors allows for better management of risk strategies and repair of ruptures in interpersonal negotiations.

7. Get Ready for Everything
   Be prepared to make hard choices, between short-term and long-term objectives, and between less than ideal compromise and more perfect solutions. Here comes to the fore the importance of having a clear division of competence: make sure that the relevant expertise and actors are properly used in the risk or crisis at stake. The process should be as transparent, multidisciplinary, and organized as possible. In the case of transparency, stakeholders and civil society at large have to be more strategically involved in framing and generating advices.
8. Composure Is a Virtue of the Strong
   Understand that there are rarely silver bullets, only steps towards containing the worst and making it possible for longer term solutions to emerge. Do not have illusions about a smooth and easy-going process. When we are in the realm of human beings, perfection is an illusion. Rather try to be patient and not judge according to your own background. Avoid mutual contempt.
9. Be Discreet with the Bureaucracy
   Avoid bureaucratic conflicts, like the plague, whether in your own government, institutions, or among scientists and diplomats. Refuse to play that game.
10. Remain Neutral
    Do not let yourself be manipulated. Each side would like to make you take their side, be their friend, the one that truly "understands" the situation as they see it. There may indeed be one side more deserving or morally deserving than the other (scientists? diplomats?), but in a conflict situation each side will be using methods, tactics, and indeed intellectual and professional "seduction" to advance its cause, and you must be alert to that. You can be sympathetic and close to people on both sides, but never lose your objectivity. Scientific advice should be designed for evidence-informed policymaking and to serve the people.

Afterword

The COVID-19 crisis has been taking away the best part of us, the best part of our society. So many pieces of history are wearing thin. The culture will suffer irreversible damage. The world will be less decipherable. Many of the consequences of this planetary crisis will be psychosocial, especially when it comes to human well-being. The accumulated stress of this experience will become a problematic or traumatic memory for many people. The quarantine period represented a condition defined by Bessel Van der Kolk as "pre-traumatic", a condition that could lay the groundwork for related diseases with psychological comorbidity to emerge from the crisis. These may be represented by anxiety disorders, depression moods, and post-traumatic stress disorders (PTSD), to name but a few. The trauma may disrupt for a long time, even chronically affecting consciousness and memory. Unresolved traumatic memories could induce or confirm mistrust in the meaning and value of life and human relationships. It could create a chain of mutual misunderstandings between trauma victims and those involved with them. In the lockdowns, many people around the world have been experiencing limitations in their lives and upheaval in core aspects of their daily existence:

1. Physical security, the probability of being sick or that your loved ones could be sick.
2. Psychological consequences due to physical separation from others, general uncertainty of the situation, ambiguity, loneliness.
3. Economic conditions as many people lost their jobs or were technically unemployed, fear for the future.

We know that certain cognitive-emotional, motivational, and behavioural processes could cause or exacerbate mental stress and foster trauma, for example:

1. Inactivity: people were forced to stay at home in the lockdown.
2. Loss of connections from the world: people changed their habits as they were obliged to stay home.
3. Uncertainty: loss of predictability in the known world.

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1

4. Ambiguity: increase of confusion, misperception, and misinterpretation.
5. Numbing out: bewilderment, a painful sense of powerless.
6. Loss of sense of time: more disorganized behaviours.
7. Loss of sense of security: feeling under constant invisible threat.
8. Spacing out: to be physically and mentally "detached" from people and facts.
9. Loss of meaning and purpose in life.

The occurrence of the COVID-19 has been a completely new phenomenon for the world we believed to know. It has been a different condition for everyone and has contributed to further disorganize people's emotional experience. People experiencing intense stress could be subject to increased cognitive rigidity with the erosion of general cognitive-emotional abilities and the deterioration of the mental capital, adaptive skills to complexity and problem-solving capacity. The more the mind is closed to the outside, the more it will be impervious to information that contradicts the dysfunctional beliefs contained within its rigid frame. Mindsets have suffered from excessive rigidity. Individuals with a fixed mindset can shift towards more rigid cognitive processes in high-stress situations, thus increasing the emotional arousal that could bring more easily to consciousness stressful experiences of the past and related traumatic memories. As a result, in a crisis situation there may be limits to rationality: on the individual's ability to receive, process, and assimilate information about the situation; on the ability to generate the whole set of alternatives; on the organization of the knowledge of the consequences of any action taken (fragmented and confused); and on the organization of behaviour (maladaptive behaviour). Theoretical studies, research findings, and clinical practice have linked together the themes of attachment disorganization, dissociative processes, and vulnerability to trauma-related emotional disorders. This sheds light on complex trauma-related disorders and delayed dissociative responses to past traumatic memories. This devastating inner experience of trauma invisible to most people goes beyond the boundaries of individuals, time and generations and could affect the societies in which traumatized people live. The psychological consequences of trauma could be transmitted from generation to generation because trauma has a trans-generational dissemination capability. The healing of trauma through the implementation of post-traumatic growth will be a clinical work of great social utility. But we really need the political will to move faster from the proclamation of just and fair principles to the practical application of policies and action plans. In this era as never before we have an abundance of scientific evidence and documents. Now it is time to move towards society by effectively refining comprehensive strategies and tools to "influence" people's hearts, minds, and behaviours. Mental health should have a fundamental role when developing policies and designing interventions. It should be integrated in all policymaking processes. Scientists and policymakers around the world have a shared responsibility to work together to provide a tailor-made, evidence-informed policy for preventive action and assistance in this field. Behavioural activation and the involvement of people in social reconstruction actions for better or worse will also be a natural consequence of the implementation of mental welfare policies and effective actions on the ground. The culture of early

awareness in this field is a valuable strategic resource for a sustainable governance process. However, we need a poilitical intelligence and will to anticipate potential problems and to identify and listen to warning signals. Politicians, diplomats, scientists, and clinicians must work together to integrate the concept of governance by preventing, treating, and limiting the psychological, social, and economic consequences of traumatic events.

Mauro Galluccio
Rome, Italy
Brussels, Belgium

References

Adler, R.S., Rosen, B., Silverstein, E.M. (April 1998), "Emotions in Negotiation: How to Manage Fear and Anger" in *Negotiation Journal,* Vol. 14, No 2, pp. 161-179.

Andersson, G., Tomuzia, K., Löfström, C., Karlsson, O., & Knutsson, R. (2013). Terms, definitions and conceptual modelling. National Veterinary Institute (SVA). http://www.anibiothreat.com/final/Deliverable1.1_final.pdf

Aquilar, F., Galluccio, M. (2008), *Psychological Processes in International Negotiation. A Theoretical and Practical Framework*. Springer: New York.

Aquilar, F., & Galluccio, M. (2009), Negoziazioni interpersonali. In F. Aquilar & M. Galluccio (Eds.), *La negoziazione internazionale come processo psicologico*, pp. 15–20. Milano: Franco Angeli.

Aquilar, F., Galluccio, M. (Ed.) (2011), *Psychological and Political Strategies for Peace Negotiation: A Cognitive Approach*. Springer: New York.

Arendt, H. (1972), *Crises of the Republic.* New York: Harcourt, Brace Jovanovich.

Argyle, M. (1994), *The Psychology of Interpersonal Behaviour.* London: Penguin Books.

Argyle, M. (1995), *Bodily Communication*, Second Edition. London: Methuen & Co. Ltd.

Balazs, U. (eds.) (June 2016), "The EU Global Strategy: Going beyond Effective Multilateralism?" *European Policy Centre*. King Baudouin Foundation. Web. 25 May 2020. https://core.ac.uk/download/pdf/76830807.pdf

Bandura, A. (2002), Selective Moral Disengagement in the exercise of Moral Agency, *in Journal of Moral Education*, *31*(2).

Bandura, A. (2004), The role of selective moral disengagement in terrorism and counterterrorism. In F.M. Mogahaddam & A.J. Marsella (Eds.), *Understanding terrorism: Psychological roots, consequences and interventions* (pp. 121–150). Washington, DC: American Psychological Association.

Baubion, C. (2013), *OECD Risk Management: Strategic Crisis Management*. Paris: 2013.

Bazerman, M.H. et al. (2000), "Negotiation." in *Annual Review of Psychology,* 51, pp. 279-314.

Beck, A. T. (1999), *Prisoners of Hate.* New York: Harper Collins.

Beck, A. T., "Prisoners of Hate", *Behaviour Research Therapy*, 40 (2002), pp. 209-216.

Begley, S. (2007), *Train your mind, change your brain: How a new science reveals our extraordinary potential to transform ourselves.* Ballantine Books: NY.

Bengtsson, L., Rhinard, M. (2018), "Securitisation across borders: the case of 'health security' cooperation in the European Union," in *West European Politics*, DOI: https://doi.org/10.1080/01402382.2018.1510198, pp. 1-23. Web. 31 May 2020.

Brian M. Boom, "Biodiversity without Borders: Advancing U.S.-Cuba Cooperation through Environmental Research," in *Science & Diplomacy*, Vol. 1, No. 3 (September 2012), pp. 1-12.

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1

Bosman, R., Sonnemans, J., Zeelenberg, M. (2001), "Emotions, Rejections, and Cooling off in the Ultimatum Game." *Working Paper of the University of Amsterdam,* pp. 1-26.
Bowlby, J. (1988), *A Secure Base.* London: Routledge. (It.Tr.: Una Base Sicura (1989)). Milano: Raffaello Cortina Editore.
Boyd, I. (2013). Research: A standard for policy-relevant science. *Nature*, *501*(7466), 159–160. https://doi.org/10.1038/501159a
Burton J.W. (1990), *Conflict: Human Needs Theory.* NY: St Martin's
Center for Disease Control and Prevention, *Mental Health and Stress-Related Disorders, Impacts on Risk,* 2010, http://www.cdc.gov/climatechange/effects/mental health.htm
Chalk, P. (2003), *The Bio-Terrorist Threat to Agricultural Livestock and Produce*. Testimony presented before the Government Affairs Committee of the United States Senate on November 19, 2003, pp. 1-11. RAND Corporation.
Commandeur, J.J.F., Heiser, W.J. (1993), *Mathematical derivations in the proximity scaling (PROXSCAL) of symmetric data matrices.* Leiden, The Netherlands: University of Leiden.
Cooper, J., Fazio, R.H. (1984), "A new look at dissonance theory" in Berkowitz, L. (Ed.), *Advances in experimental social psychology* (Vol. 17). New York: Academic Press.
Copeland, D., "Science Diplomacy: What's It All About?" *CIPS*. Centre for International Policy Studies, Policy brief No 13, pp. 1-4, Nov. 2011. Web. 25 May 2020. https://www.cips-cepi.ca/wp-content/uploads/2011/11/Copeland-Policy-Brief-Nov-11-5.pdf
Copeland, D., "Bridging the Chasm", in *Science & Diplomacy*. Vol. 4, No. 3, pp. 1-6 (September 2015). Web. 25 May 2020. http://www.sciencediplomacy.org/perspective/2015/bridging-chasm
Council of the European Union (2018), *Council Conclusions on Climate Diplomacy*, 6125/18, 26 February 2018, pp. 1-9.
Cox, T.F., Cox, M.A.A. (2000), *Multidimensional Scaling.* Vol. 88, 2 ed. Boca Raton (USA): Chapman & Hall/CRC.
Davidson, R.J. (2003), "Darwin and the neural bases of emotion and affective style" in *Annals of the New York Academy of Science*, *1000,* 316-336.
Davidson, R.J., Begley, S. (2013), The emotional life of your brain. Penguin: USA.
Dehgan, A., Colglazier, E. W., "Development Science and Science Diplomacy," in *Science & Diplomacy,* Vol. 1, No. 4 (December 2012). Web. 24 May 2020. http://www.sciencediplomacy.org/perspective/2012/development-science-and-science-diplomacy
Di Maggio, G., Semerari, A., Carcione, A., Nicolò, G., Procacci, M. (2007), *Psychotherapy of personality disorders*, New York: Routledge.
Doherty, T.J., Clayton, S. (2011), *The Psychological Impacts of Global Climate Change*. American Psychologist May–June 2011, pp. 265-276
Druckman, J.N., McDermott, R. (2008), "Emotion and the Framing of Risky Choice" in *Political Behavior* 30 (3), pp. 297–321.
Dussart, Y. (2014), "CBRN Resilience in Civil Protection: The EU Contribution." *Strengthening Science-Policy-Industry Links in the CBRN-E Sector*. DG ECHO Civil Protection, 30 Jan. 2014.
Dweck, C.S. (2006), *Mindset. New York*: Ballantine Books.
Earl, L. "Science Diplomacy Improves Cuba, U.S. Relations." AAAS, 22 Mar. 2016. Web. 30 November 2019. http://www.aaas.org/news/science-diplomacy-improves-cuba-us-relations
EFSA, Donohoe T. *et al.* (2018): Scientific report on the emerging risks identification on food and feed – EFSA. EFSA Journal 2018;16(7):5359. https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2018.5359
EIP-AGRI (2017): Brochure Multi-actor projects: English version. https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_multi-actor_projects_2017_en_web.pdf
EIP-AGRI Service Point (2015): EIP-AGRI Network 2015. https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_network_2015_en_web.pdf
Ekman, P. (1985), *Telling Lies. Clues to Deceit in the Marketplace, Politics, and Marriage.* New York: Norton & Company. (It. Tr.: I volti della Menzogna (1989). Firenze: Giunti editore).
Ekman, P. (2003), *Emotions Revealed.* USA:Times Books.
Ekman, P., Davidson, R.J. (Ed.) (1994), *The Nature of Emotion.* NY: Oxford University Press.

Ekman, P., Rosenberg, E.L. (2005), *What the face reveals*, Second edition, Oxford: Oxford University Press.

Ellis, A. (1992), "Rational Emotive Approaches to Peace," in *Journal of Cognitive Psychotherapy.* New York: Springer Publishing Company, Vol. 6, No 2, pp. 79-104.

Ellis, A. (1994), *Reason and Emotion in Psychotherapy*. *Revised and updated.* New York: Carol Publishing Group.

EPA. Environmental Protection Agency (2020), *About Risk Assessment Guidelines*. Web. 30 May 2020. https://www.epa.gov/risk/risk-assessment-guidelines

EURAXESS, *EU Insight – The New Scientific Advice Mechanism (SAM)*, EURAXESS LINKS NETWORK, pp. 1-3, June 2015. Web. 25 May 2020. https://cdn3.euraxess.org/sites/default/files/domains/india/eu_insight_june_2015_-_scientific_advice_mechanism.pdf

European Commission (2001), *European Governance: A White Paper*. The European Commission of the European Communities, COM(2001) 428. Web. 27 May 2020. https://ec.europa.eu/commission/presscorner/detail/en/DOC_01_10

(The) European Commission (2008), *Scientific evidence for policy-making,* Directorate General for Research (2008), pp. 1-37. Web. 26 May 2020. https://ec.europa.eu/research/evaluations/pdf/archive/fp6-evidence-base/evaluation_studies_and_reports/evaluation_studies_and_reports_2008/knowledge-based_society_scientific_evidence_for_policy_making__report_2008.pdf

European Commission (2010): Evaluation of the Sixth Framework Programmes for research and technological development 2002-2006. Doi: https://doi.org/10.2777/84968

(The) European Commission (2014). *Responsible Research and Innovation. Europe's Ability to Respond to Societal Challenges*. Science with and for Society. Web 25 May 2020. http://ec.europa.eu/research/swafs

(The) European Commission (2015a), "On the setting up of the High Level Group of Scientific Advisors," Commission Decision, C(2015) 6946 final, pp. 1-6 (16.10.2015). Web. 26 May 2020. https://ec.europa.eu/research/sam/pdf/c_2015_6946_f1_commission_decision_en_827417.pdf

(The) European Commission (2015b), "A New Mechanism for Independent Scientific Advice in the European Commission." The European Commission, pp. 1-8. Web. 25 May 2020. https://ec.europa.eu/research/sam/pdf/scientific_advice_mechanism.pdf

(The) European Commission (2016a), "Open Innovation, Open Science, Open to the World-a Vision for Europe." European Commission, 2016. Web. 25 May 2020. https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe

(The) European Commission (2016b), *International Research, First Quarter* Issue 64 (2016), pp. 1-16. European Commission. Web. 25 May 2020. http://ec.europa.eu/research/iscp/pdf/newsletter/international-research-update_64_april-2016.pdf

(The) European Commission (2018a): Study supporting the REFIT Evaluation of the EU legislation on plant protection products and pesticides residues (Regulation (EC) No 1107/2009 and Regulation (EC) No 396/2005). Final Report, October 2018 (Ecorys). Doi: https://doi.org/10.2875/863905

(The) European Commission (1 February 2018b), *Scoping paper: Making sense of science under conditions of complexity and uncertainty.* Scientific Advice Mechanism.

(The) European Commission (2018c: pp. 9–13): Horizon 2020 Work Programme 2018-2020. Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy. https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-food_en.pdf

(The) European Commission (4 June 2018d), Scientific Opinion "Making sense of science under conditions of complexity and uncertainty" *Outcomes of the Scoping Workshop,* Scientific Advice Mechanism Group, Brussels.

(The) European Commission (27 March 2019a), *Practitioner Consultation Meeting "*Making sense of science under conditions of complexity and uncertainty*"* Group of Chief Scientific Advisors, summary of outcomes.

(The) European Commission (September 2019b), *Scientific Advice to European Policy in a Complex World*. Group of Chief Scientific Advisors. Directorate-General for Research and Innovation, September 2019.

(The) European Commission (2020), *Horizon 2020. Work Program 2018-2020*. (European Commission Decision C(2020)1862 of 25 March 2020). Web. 25 May 2020. https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-intro_en.pdf

European Environment Agency (2014), *Report of the EEA Scientific Committee Seminar on Environment, Human Health and Well-Being*, 12 February 2014 in Copenhagen, pp. 1-37.

(The) European Parliament (2015), "EU Scientific Cooperation with Third Countries." *Briefing*, pp. 1-7. (July 2015). Web. 25 May 2020. https://era.gv.at/object/document/1957/attach/EPRS_BRI_July2015_564393_EN_pd.pdf

(The) European Union (2016), "Consolidated version of the Treaty on European Union", OJ, C 202 (7.6.2016).

Eysenck, M.W. (1990), *The Blackwell Dictionary of Cognitive Psychology.* Oxford: Blackwell Publisher.

Fedoroff, N. (2009, January 9). Science Diplomacy in the 21st Century. *Cell Magazine.*

Fisher, R.; Shapiro, D. (2005), *Beyond reason. Using emotions as you negotiate.* New York: Penguin Book.

Fisher, R., Ury, W., Patton, B. (1991), *Getting to Yes. Negotiating an Agreement without Giving in.* London: Random House.

Fletcher J. Franz D., Le Clerc J.E. (2009): Healthy plants: necessary for a balanced "One health" concept. Veterinaria Italiana, 45, 79-95.

Forgas, J.P. (1998), "On Feeling good and getting your way: Moods effects on negotiation cognition and bargaining strategies" in *Journal of Personality and Social Psychology,* 74, pp. 565-577.

Friedman, T. (2004), "War of Ideas". NYTimes. 8 January. Accessed online: https://www.nytimes.com/2004/01/08/opinion/war-of-ideas-part-1.html

Funtowicz S., Ravetz J. (1993), "Science for the post-normal age," in *Science direct,* Vol. 25, Issue 7, September 1993, pp. 739-755.

Gallucci, R. (2012), How Scholars Can Improve International Relations. Chronicle of Higher Education *on November 26, 2012*

Galluccio, M. (2005), *Emotional Competence as a Compass to Facilitate the Negotiation Process.* Paper presented at the Second International Biennale on Negotiation. Paris, France, November 17-18, 2005.

Galluccio, M. (2011), *Transformative Leadership for peace Negotiation*, in Aquilar, F., Galluccio, M. (Ed.), *Psychological and Political Strategies for Peace Negotiation: A Cognitive Approach*. Springer: New York.

Galluccio, M. (Eds.) (2015), "*Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives*." Switzerland: Springer.

Galluccio, M. (2019), "Hydrometeorological extremes events effects on populations: A Cognitive insight on Post-Traumatic Growth, resilience processes and mental well-being" in La Jeunesse, I.; Larrue, C. (2019), *Facing Hydrometeorological Extreme Events: A Governance Issue*. John Wiley & Sons Ltd.

Galluccio, M., Beck, A.T. (2015), "A Cognitive insight on Cooperation and Conflict", in M. Galluccio (Eds.) The Handbook of International Negotiation: Interpersonal, intercultural, diplomatic perspectives. Springer: New York.

Galluccio, M., Safran, J.D., "Mindfulness-based training for Negotiators: Fostering Resilience in the Face of Stress", in Galluccio, M. (Eds.) (2015), *Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives.* New York: Springer.

Galluccio, M., Vivani, L. (2015), "Diplomacy meets Science: Negotiating responsible and Inclusive Growth", in Galluccio, M. (Eds.), *Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives.* Switzerland: Springer.

Gellman, B. (2008), *Angler: The Cheney vice presidency*. New York: Penguin.

George A. (1993), *Bridging the Gap: Theory and Practice in Foreign Policy*. United States Institute of Peace : Washington, DC.
Government of the United Kingdom (1999). *White Paper: Modernising government.* London: UK Government.
Guiffart, A., Cossu, F., Van Oost, I. (2018): Workshop on the Multi-Actor Approach. SC2 Coordinator's Day.
Gullino M.L., Stack J.P., Fletcher J., Mumford J.D. (eds.) (2017): Practical tools for plant and food biosecurity. Springer Nature, 384 pages.
Hassler, K., Oman, J. (2003), "Agricultural Bioterrorism: Why It Is a Concern and What We Must Do." USAWC STRATEGY RESEARCH PROJECT. U.S. Army War College, 7 Apr. 2003, pp. 1-53. Web. 20 May 2020. http://docplayer.net/38139283-Agricultural-bioterrorism-why-it-is-a-concern-and-what-we-must-do.html
Hecker, S. "Adventures in Scientific Nuclear Diplomacy." Center for International Security and Cooperation, in *Physics Today* 64, 7, 31 (2011). Web. 24 May 2020. https://doi.org/10.1063/PT.3.1165
Hormats, R.D. (2012), *Science Diplomacy and Twenty-First Century Statecraft*. Science & Diplomacy, Vol. 1, No. 1 (March 2012). AAAS Center for Science Diplomacy. http://www.sciencediplomacy.org/files/science_diplomacy_and_twenty-first_century_statecraft_science__diplomacy.pdf
Isen, A.M. (1987), "Positive affect, cognitive processes, and social behavior" in Berkowitz, L. (Eds.) *Advances in experimental social psychology,* Vol. 20, pp. 203-253. New York: Academic Press.
Isen, A.M. (1993), "Positive affect and decision making" in Lewis, M. & Havilland J.M., *Handbook of Emotions.* New York: Guilford Press.
Isen, A. M. (2004), "Some Perspectives on Positive feelings and Emotions" in Manstead A.S.R., Frijda, N., Fischer, A. *Feelings and Emotions.* Cambridge: Cambridge University Press, pp. 263-281.
Janis, I.L. (1982), *Groupthink*. Boston: Houghton Mifflin Company.
Jillson, I. A. (March 2013), "The United States and Iran: Gaining and Sharing Scientific Knowledge through Collaboration," in *Science & Diplomacy,* Vol. 2, No. 1, pp. 1-10.
Johnson, S. (2012), *U.S.-Cuba Academic and Science-based Exchanges: Prospects for a Two-Way Street*. Washington D.C.: Center for Strategic & International Studies, 2012.
Jones, T.S., Bodtker, A. (2001), "Mediating with Heart in Mind: Addressing Emotion in Mediation Practice" in *Negotiation Journal.* Vol. 17, No 3, July 2001, pp. 217-244.
JRC. (2018). *JRC Strategy 2030*. Brussels.
Juncker, J.C., "State of the Union 2015: Time for Honesty, Unity and Solidarity." (The) European Commission, 9 Sept. 2015. Web. 13 July 2016. https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_15_5614
Just, D.R., Wansink, B., Turvey, C.G. (2009), "Biosecurity, Terrorism, and Food Consumption Behavior: Using Experimental Psychology to Analyze Choices Involving Fear", in *Journal of Agricultural and Resource Economics* Vol. 34, No. 1 (April 2009), pp. 91-108.
Jyotsana, S. (2013), "Extreme Weather Events and Mental Health: Tackling the Psychosocial Challenge." *ISRN Public Health*. Hindawi Publishing Corporation. Volume 2013, Article ID 127365, pp. 1-7. https://doi.org/10.1155/2013/127365
Kahneman, D. (2011), *Thinking, Fast and Slow*. New York: Farrar, Straus, and Giroux
Kahneman, D., Slovic, P., Tversky, A. (1982), Judgement under uncertainty: *Heuristics and biases.* UK: Cambridge University Press.
Khalil A.T., Shinwari Z.K. (2014) "Threats of Agricultural Bioterrorism to an Agro Dependent Economy; What Should be Done?" in *Journal of Bioterrorism and Biodefence,* Volume 5, Issue 1, pp. 1-8.
Klein, G. (2009), *Streetlight and Shadows. Searching for the Keys to Adaptive Decision Making*. Cambridge (Massachusetts): MIT Press.
Klein, G. (2013), *Seeing What Others Don't*. New York: Public Affairs.

Klein, G.; Militello, L. (2001), "Some guidelines for conducting a cognitive task analysis", Advances in Human Performance and Cognitive Engineering Research, Vol. 1. Emerald Group Publishing Limited, Bingley, pp.163–199. https://doi.org/10.1016/S1479-3601(01)01006-2.

Klein, D.E., Woods, D.D., Klein, G., Perry, S.J. (2016), "Can We Trust Best Practices? Six Cognitive Challenges of Evidence-Based Approaches", in *Journal of Cognitive Engineering and Decision Making*. Volume 10, Number 3, September 2016, pp. 244–254.

KNAW (2013), "Improving Biosecurity: Assessment of Dual-Use Research." *Royal Netherlands Academy of Arts and Sciences (KNAW) Biosecurity Committee* (December 2013): ISBN 978-90-6984-678-1, pp. 1-69.

Labroo, A.A., Isen, A.M., Stanteau, J. (2000), "The Influence of Positive Affect on Strategic Decision-Making in Prisoner's Dilemma Situations." Paper presented at the annual meeting of the Society for Judgement/Decision-Making, New Orleans.

Liotti, G. (2001), *Le Opere della Coscienza.* Milano: Raffaello Cortina Editore.

Liotti, G. (2007), *La dimensione interpersonale della coscienza*. Roma: Carocci.

Lowenstein, D.H., Parent, J.M. (1999), "Brain, Heal Thyself" in *Science* 283, pp. 1126-27.

Lowenthal, M. D. (2011), "Science Diplomacy for Nuclear Security." Washington D.C.: United States Institute of Peace.

Mahoney, M.J. (1977), "Personal Science : A Cognitive-Learning Therapy", in Ellis, A., Grieger, R. (eds.), *Handbook of Rational Psychotherapy*, Springer: New York.

Mair, D., Smillie, L., La Placa, G., Schwendinger, F., Raykovska, M., Pasztor, Z. and Van Bavel, R., and core project experts (names: pp. 68-70). *Understanding our Political Nature: How to put knowledge and reason at the heart of political decision-making* (June 2019). Science for Policy report by the Joint Research Centre (JRC), the European Commission, Luxembourg: Publications Office of the European Union, 2019.

Maliniak, D., Peterson, S., Powers, R., Tierney, M.J. (Eds.) (2020), Bridging the Theory-Practice Divide in International Relations. Georgetown University Press: Washington, DC.

McClory, J. *The New Persuaders: An International Ranking of Soft Power*. Institute for Government, Dec. 2010, pp. 1-15. Web. 25 May 2020. https://www.instituteforgovernment.org.uk/sites/default/files/publications/The%20new%20persuaders_0.pdf

McPhail, T.L. (2010), *Global Communication. Theories, Stakeholders, and Trends.* UK: Wiley-Blackwell.

Meichenbaum, D. (2011). Ways to Improve Political Decision-Making: Negotiation Errors to be Avoided, in Aquilar, F., Galluccio, M. (eds.) *Psychological and Political Strategies for Peace Negotiation. A Cognitive Approach*. New York: Springer, pp. 87-97.

Meichenbaum, D. (2015a). A Psychotherapist's View of Decision-Making: Implications for Peaceful Negotiations, in Galluccio, M. (eds.) *International Negotiation Handbook*. New York: Springer, 27-31.

Meichenbaum, D., "A Psychotherapist's View of Decision Making: Implications for Peaceful Negotiations", in Galluccio, M. (Eds.) (2015b), *Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives.* New York: Springer.

Melissen, J. (Eds.) (2005), *The New Public Diplomacy.* New York: Palgrave Macmillan.

Michalski, A., "The EU as a Soft Power: The Force of Persuasion." In Melissen, J. (Eds.), *The New Public Diplomacy: Soft Power in International Relations* (2005), pp. 124-144. England: Palgrave Macmillan.

Moedas, C., "Science Diplomacy in the European Union," in *Science & Diplomacy,* Vol. 5, No. 1, pp. 1-9 (March 2016). Web. 25 May 2020. http://www.sciencediplomacy.org/files/science_diplomacy_in_the_european_union_science__diplomacy.pdf

Mogherini, F., "Speech by the High Representative/Vice-President, Federica Mogherini at the Chinese Academy of Social Sciences in Beijing, China." European Union External Action Service, 13 July 2016. Web. 25 May 2020. https://eeas.europa.eu/topics/eu-global-strategy_en

Morris, M. W.; Keltner, D. (2000), "How Emotions Work: An analysis of the social functions of emotional expressions in negotiations" in *Research in Organizational Behavior*, 22, pp. 1-50.

Muggah, R., White, N. (Feb. 2013), "Is There a Preventive Action Renaissance? The Policy and Practice of Preventive Diplomacy and Conflict Prevention." Report by *NOREF*: Norwegian Peacebuilding Resource Centre.

Nye, J.S. (2008), *The powers to lead.* New York: Oxford University Press.

Nye, J. S. Jr. (2002) "The Paradox of America Power. Why the World's Only Superpower Go It Alone" Oxford: Oxford University press.

Nye, J. S. Jr. (2004), *Soft Power: The means to success in world politics.* New York: Public Affairs.

Nye, J. S. Jr. (2011), *The future of the power.* New York: Public Affairs.

Obama, B., Speech given at Cairo University, Cairo, Egypt, 4 June 2009.

OECD (2015), "Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists", *OECD Science, Technology and Industry, Policy Papers,* No. 21, OECD Publishing.

Oliver, K., Innvar, S., Lorenc, T., Woodman, J., & Thomas, J. (2014). A systematic review of barriers to and facilitators of the use of evidence by policymakers. *BMC Health Services Research*, *14*. https://doi.org/10.1186/1472-6963-14-2

Oppenheimer, A.M., Diop, C., Hess, J., Lempert, R., Li, J., Muir-Wood, R., Myeong, S. (2012), "Climate change: new dimensions in disaster risk, exposure, vulnerability, and resilience," in: Field, C.B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi, K.L., Mastrandrea, M.D., Mach, K.J., Plattner, G.K., Allen, S.K., Tignor, M., Midgley, P.M. (eds.), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation.* A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 25-64.

Owen, D. (2007). *The hubris syndrome: Bush, blair and the intoxication of power*. London: Politico's.

Owen, R., Macnaghten, P.; Stilgoe, J. (2012), "Responsible Research and Innovation: from Science in Society to Science for Society, with Society", *Science and Public Policy*, Vol. 39(6), pp. 751–760, December 2012.

Panksepp, J. (1998), *Affective Neuroscience: The Foundations of Human and Animal Emotions.* Oxford: Oxford University Press.

Panksepp, J. (2003), "An Interface of the Affective, Behavioral, and Cognitive Neurosciences: Decoding the Emotional Feelings of the Brain" in *Brain and Cognition*, 52, pp. 4-14.

Perret, Q. (2006), "The European Union and Crisis Management," in *European Issue*, N. 22. Foundation Robert Schuman. Web. 13 Mar. 2020. https://www.robert-schuman.eu/en/european-issues/0022-the-european-union-and-crisis-management

Prodi, R. "Poverty Alleviation: A Role for Technology and Infrastructure?" Concept note. *Foundation for World Wide Cooperation*, May 2015, pp. 1-21. May 2015. Web. 25 May 2020. http://www.fondazionepopoli.org/wpcontent/uploads/2015/05/POVERTY-ALLEVIATION_concept_note_May15.pdf

Pruitt, D.G. (2002), "Strategy in Negotiation," in *International Negotiation*, Kremenyuk, V.A. (Ed.). San Francisco: Jossey-Bass Inc. Publisher, pp. 85-96.

Ramsbotham, O., Miall, H., Woodhouse, T. (2011a), *Contemporary Conflict Resolution.* Cambridge, UK: Polity.

Ramsbotham, O., Woodhouse, T., Miall, H. (2011b), *Contemporary Conflict Resolution.* PP: MA. Jackson, P., Ward, N. and Russell, P., "Moral economies of food and geographies of responsibility," *Transaction, Institute of British Geographer* 34 (2009): 12-24.

Reillon, V., "Scientific Advice for Policy-makers in the European Union," *Briefing*: The *European Parliament*. European Parliamentary Research Service, June 2015. Web. 25 May 2020. https://www.europarl.europa.eu/EPRS/EPRS-Briefing-559512-Scientific-advice-for-policy-makers-in-the-EU-FINAL.pdf

Riordan, S., Torres Jarrín, M. (2020), *The Global Policy Perspective Report Science Diplomacy,* published by the European Institute of International Studies. January 20, 2020, pp. 1-10. Web. 2 June 2020. https://www.ieeiweb.eu/wp-content/uploads/2020/01/Science-Diplomacy.pdf

(The) Royal Society. (2010). *New Frontiers in Science Diplomacy*. *Navigating the Changing Balance of Power*. London: The Royal Society.

(The) Royal Society (2015), "The Sendai Framework for Disaster Risk Reduction: The Challenge for Science." Conclusions and recommendations of a meeting at the Royal Society on 24–25 June 2015. Web. 30 April 2020. https://royalsociety.org/-/media/policy/Publications/2015/300715-meeting-note%2D%2Dsendai-framework.pdf

Ruffini, P.B. (2017). *Science and Diplomacy. A New Dimension of International Relations*. Paris: Springer.

Ruggeri, K., van der Linden, S., Wang, Y. C., Papa, F., Riesch, J., Green, J. (2020). Standards for evidence in policy decision-making. *Nature Research Social and Behavioural Sciences, 39905; pp. 1-13.* go.nature.com/2zdTQIs

Runde, D. F., Zargarian, A. (2014), *Building Networks of Diplomatic Cooperation*. Center for Strategic and International Studies. August 2014, pp. 1-20.

Russell, J.A., Fernàndez-Dols, J.M. (Edited by) (2002), *The Psychology of Facial Expression.* UK: Cambridge University Press.

Saarni, C. (1999), *The Development of Emotional Competence.* New York: The Guilford Press.

Saarni, C. (2011), "Emotional Competence and Effective Negotiation: The Integration of Emotion Understanding, Regulation, and Communication", in Aquilar, F., Galluccio, M. (Eds.) (2011).

Saarni, C. (2015), "Improving Negotiation Effectiveness with Skills of Emotional Competence", in Galluccio, M. (Eds.) (2015), *Handbook of International Negotiation: Interpersonal, Intercultural, and Diplomatic Perspectives.* New York: Springer.

Safran, J.D. (1984), *Assessing the Cognitive-Interpersonal Cycle* in "Cognitive Therapy and Research", 8, pp. 333-348.

Safran, J.D. (1998), *Widening the Scope of the Cognitive Therapy.* New Jersey:Jason Aronson.

Safran J.D., Muran J.C. (2000), *Negotiating the therapeutic Alliance.* New York: The Guilford Press.

Sanderson, I. (2002). *Evaluation, Policy Learning and Evidence-Based Policy Making*. Oxford: Blackwell.

Saner, R. "Global Prosperity and Sustainable Development Goals." *Centre for Socio-Economic Development (CSEND)* (2015), pp. 1-4. Web. 24 May 2020. https://sustainabledevelopment.un.org/content/documents/6654135-SanerScience%20diplomacy%20suggested%20revisions%203%20final.pdf

SAPEA (Science Advice for Policy by European Academies) (July 2019), *Making Sense of Science under conditions of complexity and uncertainty*. Berlin, Germany. https://doi.org/10.26356/MASOS

Sapolsky, R.M. (2004), *Why Zebras Don't Get Ulcers.* New York: St. Martin's Griffin.

Sato Y., Hirokazu K., Tateo A. "Building the Foundations for Scientific Advice in the International Context," in *Science & Diplomacy*. AAAS, Vol. 3, No. 3 (September 2014), pp. 1-14. http://www.sciencediplomacy.org/article/2014/building-the-foundations-for-scientific-advicein-the-international-context

Schweitzer, G. E., Neureiter, N. P., "Engaging Iran," *Science* 219, No. 5861 (2008): 258, pp. 1-10.

Semerari, A. (2000), *Storia, teorie e tecniche della psicoterapia cognitiva.* Bari: Editori Laterza.

Sheffer, L., Loewen, P.J., Soroka, S., Walgrave, S., Sheafer, T. (2018), "Nonrepresentative Representatives: An Experimental Study of the Decision Making of Elected Politicians" in *American Political Science Review*, 112, 2, pp. 302–321.

Sherwood, J.L., Fletcher, J., Swyers, J. (2003), *Crop Biosecurity: Are We Prepared?* White Paper: Developed by the Public Policy Board of the American Phytopathological Society (APS), May 2003, pp. 1-10. Web. 29 May 2020. http://extension.missouri.edu/eden/Lesson_2/PDF_Readings/L2_biosecurity_are_we.pdf

Simon, H.A. (1977), *The New Science of Management Decision.* New York: Prentice Hall PTR

Skolnikoff E. (1993), *The elusive transformation: science, technology, and the evolution of international politics*. Princeton, NJ: Princeton University Press.

Smith, J.R. (2009). Negotiating Environment and Science. An Insider's View of International Agreements, from Driftnets to the Space Station. Washington: Resources for the Future.

Smith, J.R. (2015), "Environment and Science: Finding Common Ground through International Agreements. An Insider's View of Negotiation Processes," in Galluccio, M. (Eds.) *Handbook of International Negotiation. Interpersonal, Intercultural, and Diplomatic perspectives.* Springer: Switzerland.

Solomon, R.H. (2010), *American Negotiating Behaviour. Wheeler-Dealers, Legal Eagles, Bullies, and Preachers.* Washington, DC: United States Institute of Peace.

Sperber, D. (Eds.) (2000), *Metarepresentation.* Oxford: Oxford University Press.

Stolorow, R.D., Atwood, G.E. (2002), *Contexts of Being: The Intersubjective Foundations of Psychological Life.* UK: Routledge.

Stone, R. (4 August 2015), "Iran's atomic czar describes the art of the deal" in *Science,* Vol. 349, Issue 6249, pp. 674-675.

Suffert, F., Barbier, M., Sache, I., Latxague, E. (2008), "Biosécurité Des Cultures et Agroterrorisme. Une Menace, Des Questions Scientifiques et Une Opportunité: Réactiver Un Dispositif D'épidémiovigilance", in *Courrier De L'environnement De L'INRA*, N°56, Décembre 2008, 67, pp. 67-86.

Sunstein, C.R. (2007), *Worst-case scenarios*. Ann Arbor, MI: Caravan Books.

Tetlock, P.E. (2005), *Expert Political Judgment. How good is it? How can We Know?* New Jersey: Princeton University Press.

Thoits, P. A. (2004), "Emotion Norms, Emotion Work, and Social Order" in Manstead, A.S.R.

Thompson, L. L., Medvec, V. H., Seiden, V., Kopelman, S. (2001), "Poker Face, Smiley face, and Rant'n' Rave: Myths and Realities about Emotion in Negotiation" in Hogg, M. A., Tindale (Eds.), *Blackwell handbook of Social Psychology: Group Processes.* London: Blackwell Publishers.

Thorson, S. J. "Universities and Networks: Scientific Engagement with North Korea," Science & Diplomacy, Vol. 1, No. 2 (June 2012), pp. 1-10. Web. 24 May 2020. http://www.sciencediplomacy.org/files/universities_and_networks_science__diplomacy.pdf

Tucker, J.B. (2003), "Biosecurity: Limiting Terrorist Access to Deadly Pathogens" Peaceworks No. 52, pp. 1-52. United States Institute for Peace, Nov. 2003. Web. 29 May 2020. https://www.usip.org/sites/default/files/pwks52.pdf

Turekian, V. C., Macindoe, S., Copeland, D., Pozza, M. (2015), "Emergence of Science Diplomacy in Lloyd S. D., Patman, R. G., *Science Diplomacy: New Day or False Dawn*. New Zealand: University of Otago, pp. 3-21.

UKDC Resilience (2015), "Disaster Risk: A Future Agenda for Integrative Science." *Integrated Research on Disaster Risk*, 3 Mar. 2015. Web. 06 May 2020. http://www.irdrinternational.org/2015/03/03/ukdc-resilience/

UNDRR (United Nations Office for Disaster Risk Reduction) (2019), *Global Assessment Report on Disaster Risk Reduction* (GAR 2019). Web. 20 April 2020. https://gar.undrr.org/

UNEP (United Nations Environment Program) (2008), "Environment and Disaster Risk: Emerging Perspectives." Prepared on behalf of the UNISDR Working Group on Environment and Disaster Reduction. ISBN: 978-92-807-2887-3, Job No.: DEP/1016/GE, July 2008, pp. 1-34.

UNISDR (United Nations International Strategy for Disaster Reduction) (2008), *Climate Change and Disaster Risk Reduction.* Briefing Note 1, Geneva, Sept. 2008. Web. 3 May 2020. https://eird.org/publicaciones/Climate-Change-DRR.pdf

United Nations (17 June 1992) "An Agenda for Peace: Preventive diplomacy, peacemaking and peace-keeping" (A/47/277–S/24111).

United Nations (26 August 2011), "Preventive Diplomacy: Delivering Results." (S/2011/552).

United Nations (2015), *Sendai Framework for Disaster Risk Reduction*. *UNISDR*/GE/2015-ICLUX EN5000, 1st edition. Web. 30 April 2020. https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

United Nations (2016a), "Transforming our World: The 2030 Agenda for Sustainable Development Goals," (A/RES/70/1).

United Nations (2016b), *The Future of Scientific Advice to the United Nations. A Summary Report to the Secretary-General of the United Nations from the Scientific Advisory Board.*

New York: UNESCO publishing. Web. 25 May 2020. https://unesdoc.unesco.org/ark:/48223/pf0000245801

United Nations (2019), "The Future is Now. Science for Achieving Sustainable Development," Global Sustainable Development Report. Web. 24 May 2020. https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

Urban Institute (September 2016), Principles of Evidence-Based Policymaking, pp. 1-11.

Van Kleef, G. A., De Dreu, C. K. W., Manstead, A. S. R. (2002), *The Interpersonal Effects of Anger and Happiness on Negotiation Behavior and Outcomes*. Paper presented at the 15th annual conference of the International Association for Conflict Management, June 2002, Park City, Utah.

Van Kleef, G. A., De Dreu, C. K. W., Manstead, A. S. R. (2004), *The Interpersonal Effects of Emotions in Negotiations: A Motivated Information Processing Approach.* Journal of Personality and Social Psychology, 87 (4), pp. 510-528.

Vandewalle, L., "The Increasing Role of the EU's Culture, Education and Science Diplomacy in Asia.": 1-24. (The) European Parliament, Policy Department, Directorate-General for External Policies, DG EXPO, PE549.050, June 2015. Web. 25 May 2020. https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/549050/EXPO_IDA(2015)549050_EN.pdf

Weiss, C., "Science, Technology and International Relations" in *Technology in Society*, Volume 27, Issue 3, August 2005, Pages 295-313.

Wheelis, M., Casagrande, R., Madden, L.V. (2002), "Biological Attack on Agriculture: Low-Tech, High-Impact Bioterrorism," in *BioScience*, Vol. 52, Issue 7, July 2002, pp. 569-576.

Wolfe, A. "When Scientists Do What Diplomats Can't" in *The Atlantic*. Atlantic Media Company, 26 Sept. 2015. Web. 24 May 2020. https://www.theatlantic.com/science/archive/2015/09/science-diplomacy/407455/

Young, F.W. (1985), "Multidimensional Scaling" in Kotz-Johnson (Ed.) *Encyclopedia of Statistical Sciences.*Vol. 5. John Wiley & Sons, Inc.

Index

A
Acidification, 79
Adaptive decision-making, 5, 19–21
Affective neuroscience, 18
Aggressiveness, 127–130, 133, 134, 139
Agreed Framework, 168
Agricultural bioterrorism
  definition, 97
  global economic impact, 98, 99
  logistical level, 97
Agriculture, 98
Agroterrorism, 98, 99, 115
A Large Ion Collider Experiment (ALICE), 49
Ambiguity, 12, 20, 127–130, 133, 141, 142
American Association for the Advancement of Science (AAAS), 30–35, 38
Antipersonnel agents, 97
Arbitrary inference, 14
Assertive behaviour, 80
Assertiveness, 127, 128, 132–134, 142

B
Balancing science, 180
Behaviours, 3, 5, 7
Biological agents, 118
Biological hazards, 117
Biological threat reduction (BTR), 118
Biosafety
  biological integrity, 91
  biosecurity preparedness, EU, 115, 116
  crisis management, 92, 93, 102, 114
  environmental disasters, 91, 99–101
  resilience, 102
  risk assessment, 114
  risk management, 96
  stakeholders, 102, 111
Biosecurity, 91, 92, 96, 98, 102
  EU projects, 111
  human resilience, 118
  policy area, 119
  policymaking mechanisms, 120
  preparedness, EU, 116
  stakeholders, 111
Bioterrorism, 104, 107, 118
  agricultural, 97
  animal virus preparations, 97
  antipersonnel agents, 97
  attacks, agriculture, 97
  biological agents, 97
  border control and export regulation issues, 118
  CFSP, 118
  crisis management, 118
  definition, 96
  genetic engineering, 97
  infection areas, 97
  infectious material, 97
Blix, Hans, 167
Bovine spongiform encephalopathy (BSE), 98
Brainstorming sessions, 182
British Royal Society, 114, 115

C
Call for early adopters, 153
Chemical, biological, radiological and nuclear (CBRN), 95, 109, 112, 115
  EU and international organizations, 109
Chief Scientific Advisor (CSA), 55

© Springer Nature Switzerland AG 2021

M. Galluccio, *Science and Diplomacy*,
https://doi.org/10.1007/978-3-030-60414-1

China-EU Workshop on Water and Air—Challenges and Opportunities, 62
Chinese Co-funding Mechanism (CFM), 62
Chinese Research Academy for the Environmental Sciences (CRAES), 62
Civil Protection Mechanism, 103, 105
Classical swine fever (CSF), 98, 99
Climate change, 26, 38–41, 43–45, 101
  challenges, 78
  communities and individuals, 81
  compound, 78
  hydrometeorological hazards, 81
  policymakers, 81
  practice, 75
  scientists and policymakers, 78
Cognitive behavioural interventions, 5
Cognitive biases, 5, 7, 13, 19, 20
Cognitive dissonance, 13
Cognitive distortions, 14
Cognitive engineering research, 77
Cognitive interpersonal cycles, 14
Cognitive processes, 17, 120, 182
Cognitive psychology, 9
Cologne University of Applied Sciences (CUAS), 112
Commission's High-Level Policy Dialogue (HLPD), 61
Committee for Scientific and Technological Policy (CTSP), 46
Common Agricultural Policy (CAP), 151
Common Foreign and Security Policy (CFSP), 103, 118
Common Research Area (CRA), 53
Communicating risk, 114
Communication, 68, 73, 159
Communication channel, 4
Communication impairment, 12
Community of Latin American and Caribbean States (CELAC), 53
Compact Muon Solenoid (CMS), 49
Competitive behaviours, 187
Complexity, 12, 13, 19
Comprehensive approach, 107, 108
Confirmatory bias, 181
Consortium S4D4C, 83
Cooperation, 3, 5, 51, 66, 68
Cooperative advisory mechanisms
  crisis management, 45
  decision-making framework, 44
  full-scale global effort, 44
  global challenges, 44
  governments, 45
  guidelines, 45, 46
  ICSU, 46
  INGSA, 46
  international dialogue, 44
  OECD, 46
  opportunity, 44
  risk assessment, 45
  science diplomacy, 46
  science-policy interface, 44
  SGDs, 44
  STI, 44
  structures, 45
Cooperative brainstorming, 20
Cooperative solution, 86
Cooperative Threat Reduction (CTR) program, 30
Co-ownership, 149
Core beliefs, 3, 5, 7
Council's Strategic Forum for International Science and Technology Cooperation (SFIC), 50
COVID-19, 63, 94, 117
COVID-19 crisis, 4–6, 72, 81, 85, 180
  conflict and crisis, 12
  consequences of pandemic, 12
  perception and misperception, 10–11
  uncertainty, 12, 20
Creativity, 128–130, 133, 134, 140, 142
Crisis and Emergency Risk Communication (CERC), 119
Crisis leadership, 93
Crisis management, 103
  communication process, 93
  EU, 115
  European and International Projects, 111, 112
  feedback, 94
  forms, 92
  fundamental pillars, 92
  institutional structures, 92
  leadership, 93
  officials, 93
  phases, 92
  pre-drafted messages, 93
  psychological needs, 92
  SOPs, 93
  sources, 93
  stakeholders' training strategy, 112, 113
  state's reactions, 92
  trust, 93
  uncertainty and discontinuity, 92
Cutting-edge year, 60–63

D
Data and information management
courses, 114
Decentring, 18
Decision-making, 5, 25
Decision-making workshop, 153
Decisions, 4
Degraded environments, 100
Democracy, 47
Democratic People's Republic of Korea
(DPRK), 165
inspectors, 170
international sanctions, 171
North Korean reaction, 166
United States, 165, 167, 168, 172
Democratic People's Republic of Korea
(DPRK), 31, 32
DG for Research and Innovation (DG RTD),
50, 51, 56, 60, 61
Dichotomous thinking, 14
Differentiation, 18
Diplomacy, 10, 25, 26
Director General Blix, 168
Directorate-General for Home Affairs (DG
HOME), 104
Disaster risk reduction, 99, 101, 112, 114, 117
Disasters, 101
Dissonant evidence, 86, 87

E
Early warning systems, 92
Ebola vaccines, 62
Effective Management of Pests and Harmful
Alien Species
Integrated Solutions (EMPHASIS), 111
Emergency Response Coordination Centre
(ERCC), 105
Emerging systemic risks, 145
Emotional communication, 15, 186
Emotional competence, 183, 185, 186
Emotional experience, 185
and social experience, 185
Emotional processes, 3, 116, 119, 120, 183
Emotional regulation, 20
Emotional stress, 19
Emotional style (ES), 18
Emotions, 15, 127–130, 133, 134, 142, 143
Empathy, 19, 21, 127–130, 133, 134, 141–143
EMPHASIS project, 161
activities, 154
consortium, 155
EU legislation, 155
experienced, 147
legislation, 157
MAA projects, 150
objectives, 146
participants, 162–163
pest and disease management, 146
phytosanitary legislation, 157
policymakers, 146, 156
SLLs, 152
technology acceptance, 154
End-user involvement, 151
Enlargement fatigue, 48
Environmental degradation, 100
Environmental disaster, 96, 99–102, 115, 116
Environmental issues, 99
EU Emergency and Crisis Coordination
Arrangements (EU-CCA), 104
EU foreign policy, 28
EU institutions, 54–56
EU regulations, 158
EU security-related decision-making, 118
EU's Foreign and Security Policy, 118
EU's Green Paper, 108
EU-Egypt Innovation Day, 61
Euro-Mediterranean partnership
(EUROMED), 61
European Academies' Science Advisory
Council (EASAC), 54
European agenda on security, 105
digitalization, 105
information exchange, 105
European agricultural systems, 146
European Commission (EC), 48–50, 53–63,
83, 84, 118, 119
European Cooperation in Science and
Technology (COST), 49
European crisis response systems, 116
European Environment Agency, 78
European External Action Service (EEAS), 50,
51, 60, 124, 125
European Free Trade Association
(EFTA), 51, 52
European Innovation Partnership for
Agricultural productivity and
Sustainability (EIP-AGRI), 147
European Medicines Agency (EMEA), 118
European Neighbourhood Policy (ENP), 51
European Open Science Cloud (EOSC), 59
European Organization for Nuclear Research
(CERN), 49
European Parliament (EP), 52, 54, 84, 157
European Parliamentary Research Service
(EPRS), 54

European policy process, 83
European Political Strategy Centre (EPSC), 55
European professional code, 109
European Research Area (ERA), 50, 57, 63
European Research Area and Innovation Committee (ERAC), 50
European Research Council (ERC), 50, 53, 60–62
European Science Advisors Forum (ESAF), 55
European Science Diplomacy, 51
European Space Agency (ESA), 49, 53
European Union (EU), 5, 6, 16, 34, 38, 94, 113, 115, 116, 124
  CELAC, 53
  CERN, 49
  COST, 49
  CRA, 53
  cutting-edge year, 60–63
  DG RTD, 50, 51
  EC, 49, 50, 53
  EEAS, 50, 51
  EFTA, 51, 52
  enlargement fatigue, 48
  ENP, 51
  EP, 52
  ERA, 50
  ERAC, 50
  ERC, 50, 53
  ESA, 53
  European Science Diplomacy, 51
  experiments and instruments, 49
  foreign and security policies, 47
  foreign policy, 51
  FP7, 52
  hard power, 47
  Horizon 2020, 51, 52
  Horizon Europe, 52
  institutions, 54–56
  international governance, 48
  international relations, 47
  international stakeholders, 48
  IPCC, 53
  JRC, 49
  MSCA, 52
  normative power, 48
  RRI, 56–59
  science cooperation, 49
  SDGs, 54
  SESAME, 49
  SFIC, 50
  SMEs, 49
  soft power, 47
  strategy, 59–60
  technological advancements, 50
  TFEU, 48, 50
Evidence-based approach, 75
Evidence-based medicine (EBM), 76
  daily practice, 76
Evidence-based policymaking
  history, 67
Evidence-informed policymaking, 3, 4, 13, 15, 21, 73–75, 84, 86
  concept, 65
  contextual, 69
  cooperative attitude, 66
  cultural, 69
  decision-making process, 70
  DG Research, 69
  economic theory, 86
  EU's action, 68
  European Commission, 84
  evaluation processes, 71
  games theory, 86
  global scale, 66
  goals, 66
  governmental effectiveness, 66
  initiatives, 71
  international level, 69
  public policy development, 65
  quantitative methods, 65
  structural, 69
  sustainable, 86
Expectation, 127, 129, 130, 133, 134, 140, 141
Experience, 20, 21

F
Federal Bureau of Investigation (FBI), 98
Feedback, 92, 94, 96, 102
Flexible mindset, 10
Food and Drug Administration (FDA), 98
Food defence, 98
Food industry, 98
Food Safety and Inspection Service, 98
Food security system, 146
Foreign policy, 35, 37, 47
Framework Programme, 68

G
Game the system, 181
Gas-cooled reactor (GGR), 168
Genetic engineering, 97
Global agreements, 79
  acidification, 79
Global challenges, 124
Global Climate Action Agenda, 79
Global communication, 10
Global economic impact, 98, 99
Global health promotion, 145

Global Research Collaboration for Infectious Disease Preparedness (GloPID-R), 63
Global Risk Identification Program, 113, 114
Global University Partnership on Environment and Sustainability (GUPES), 112
Greenhouse gases, 100
Green paper on bio-preparedness, 108, 109
GRIPWeb, 113
Groupthink processes, 181

H
Hard power, 35
Health safety, 98
Health Security Committee (HSC), 107
Heuristic shortcuts, 11
High-throughput sequencing (HTS) technologies, 159
Historical analogies, 181
Horizon 2020, 51, 52, 56, 58–61, 85
Horizon 2020 framework programme, 147
  EIP-AGRI foundation, 147
  multi-actor approach, 148
Horizon Europe, 52, 59
Human cognitive interpersonal cycles, 14
Human communication, 128–131, 133, 134, 139, 140, 142, 181
Human health, 100
Human rights, 47
Hydrometeorological hazards, 40, 82
Hyogo and Sendai Frameworks, 82
Hyogo framework, 101

I
Identification, 18
Information Circular, 167
Institute for Science and International Security (ISIS), 34
Integrated pest management (IPM), 160
Integration, 18
InterAcademy Council (IAC), 46
InterAcademy Panel (IAP), 46
Intergovernmental Panel on Climate Change (IPCC), 53, 100
International agreements, 51
International Atomic Energy Agency (IAEA), 166
International cooperation, 11
International Council for Science (ICSU), 46
International Experimental Reactor (ITER), 27
International negotiation, 124, 125
International Network for Government Science Advice (INGSA), 46, 119
International science diplomacy, 44
Interpersonal communication, 15
Interpersonal negotiating skills, 18
Interpersonal negotiation, 74
  cluster membership evolution
    EU data, 134, 137, 139
    US data, 133, 135, 139
  data set
    research procedure, 125
    sample, 125
    self-assessment questionnaire, 125
    statistical analysis, 126
  decision-making process, 124, 125
  descriptive statistics
    EU data, 126–128
    standard deviation measures, 127
    US data, 126, 127
  experience-based mindset, 124
  frequency distribution
    EU data, 129, 131
    US data, 129, 131
  frequency scores
    EU data set, 141
    US data set, 141
  global challenges, 124
  hierarchical cluster analysis
    EU data, 133, 134, 141
    US data, 132, 133, 141
  MDS
    EU data, 140
    US data, 139
  mode ranked in descending order
    EU data, 128, 130
    US data, 128, 129
  multidisciplinary research project, 124
  quantitative analysis, 142
  self-report methods, 143
  sum of the scores
    EU data, 130, 132
    US data, 130, 132
  trust and confidence, 142
  US Department of State, 124
  White House, 124
Interpersonal negotiations, 10, 15
Interpersonal policymaking negotiations, 19
Interpersonal skills
  experience-based mindset, 124, 127
  international negotiation, 124 (*see also* Interpersonal negotiation)
  negotiation process, 143
  negotiators' styles, 124
IPM standards, 161
IPM technology, 159

J
Japanese Science and Technology Agency (JST), 61
Joint Atomic Energy Intelligence Committee, 167
Joint Research Centre (JRC), 49, 54, 56, 70, 82
Joint Science and Technology (S&T) Coordination Committee (JSTCC), 61

K
Knowledge-exchange activities, 151

L
Large Hadron Collider (LHC), 27
Large-scale crises, 94
Learning Platform, 152
Liberal democracy, 37, 178
Light water-moderated reactors (LWRs), 169

M
Mad cow disease, 98
Madrid declaration, 83
Madrid Declaration on Science Diplomacy, 83
Man-made hazards, 100, 101
Marie Skłodowska-Curie actions (MSCA), 52
Mastery, 18
Material protection, control, and accounting (MPC&A) program, 31
Maximisation, 14
Mediation, 123
Medical community, 76, 77
Mediterranean Science, Policy, Research and Innovation (MEDSPRING) program, 61
Members of the European Parliament (MEPs), 54
Mental states, 17, 21
Metacognition (cognition of cognition), 17
Metacognitive abilities, 3
Metacognitive function improvement, 20
Metacognitive functions, 14, 17, 120
Micro-and macroeconomic policy, 41
Millennium Declaration, 101
Millennium Development Goals (MDGs), 41
Mindsets, 5
Minimisation, 11, 14
Misinformation, 66
Misperception, 11, 19
Modernity, 4
Multi-actor approach (MAA), 147, 148, 150
  decision-taking processes, 151
  evidence-informed policy, 151
  SMEs, 151
Multi-actor supporting activities
  analytical framework, 152
  decision making surveys, 152
  EMPHASIS, 151
  on-farm demonstrations, 153
  SLLs, 152
  stakeholders, 153
Multidimensional scaling (MDS), 126, 139–141
Multilateral science diplomacy
  climate change, 40
  Cold War, 39
  communicating policy issues, 43
  conventional warfare, 39
  Department of State, 42
  globalization, 39
  hydrometeorological hazards, 40
  industrialization, 41
  initiatives, 42
  international governance, 38
  issue assessment, 38
  MDGs, 41
  micro-and macroeconomic policy, 41
  National Academy of Sciences, 43
  National Security Strategy, 42
  OAS, 40
  opportunity, 38
  PEER programs, 42, 43
  policymakers, 43
  Presidential Global Development Policy, 42
  preventive diplomacy, 38–41
  risks and vulnerabilities, 38
  said policy, 42
  scientific nature, 43
  SDGs, 41
  Transformation to Sustainability Program, 41
  USAID, 42
  violence, 40
  vulnerabilities, 41
Multimedia educational toolkit, 154
Multi-stakeholder process, 147

N
National Institutes of Health (NIH), 61
National Science Foundation (NSF), 61
National Security Strategy, 42
National Veterinary Institute (SVA), 111

Natural disasters, 82
Negotiation process, 10, 15
  assessment questionnaire, 125
  experience-based mindset, 124
  interpersonal skills, 124
  interpersonal skills/mindsets, 139
  mindsets, 143
  negotiator, 143
  point of breakdown, 127, 130, 132–134
  self-report methods, 143
  skills, 142, 143
Negotiators, 142, 143
Neuroscience, 33
Non-governmental organizations (NGOs), 57
Non-verbal communication, 15, 16
North Korean negotiations, 169
North Korean nuclear crisis, 168
Nuclear crisis
  Agreed Framework, 165
  Carter's mission, 172
  DPRK, 165, 168
  IAEA, 167, 171, 172
  LWR, 169, 173
  nuclear program, 166
  special inspection, 167

O
One health concept, 41, 119, 160
On-farm demonstrations, 153
Open innovation, 58, 59
Open science, 57–59
Open to the World, 58, 59, 62
Organisation for Economic Co-operation and Development (OECD), 45, 46, 56, 86
Organization of American States (OAS), 40
Outlook, 18
Overgeneralisation, 14

P
Pandemic, 11, 12
Panksepp, J., 18
Paris Agreement, 79
Partnerships for Enhanced Engagement in Research (PEER), 42
Perception
  emotions, 17
  equal interpersonal, 21
  non-verbal communication, 16
  and sensation, 17
  uncertainty, 11
Perceptual predispositions, 184
Plutonium production, 171
Policymakers, 10, 12, 26, 48, 57, 114, 119
  and advisers, 13
  awareness and empathy skills, 21
  cognitive biases and emotional regulation, 20
  emotional stress, 19
  interpersonal skills, 15
  need management tools, 13
  and scientists, 12
Policymaking, 4, 7, 12, 13, 180
Political decisions, 4
Political realism, 35
Political world, 13
Politics, 4
Post-normal science, 91
Post-traumatic COVID-19 growth (PTCG), 20
Post-traumatic stress disorder (PTSD), 81, 117, 119
President Carter, 171
President Clinton, 172
Presidential Global Development Policy, 42
Preventive diplomacy, 38–41
Problem-resolution process, 182
Psychology, 124
Psychosocial mechanisms, 19
Public diplomacy, 26, 27, 35, 37, 178
Public Diplomacy Association of America (PDAA), 27
Public policy, 10
Public-private programs, 98

R
Rapid Reaction Mechanism (MRR), 103
Regional vulnerability, 82
Regulatory Scrutiny Board, 84
Relationships, 10
Research and development (R&D), 25, 33, 42, 44
Resilience, 12, 18, 81, 82, 102, 112, 116–118
Responsible research and innovation (RRI), 56–59, 156
Risk assessment, 92, 95, 96
  EU, 115
  European and International Projects, 111, 112
Risk assessment system, EU
  crisis management, 106
  DG SANCO, 107
  EU security, 107
  stakeholders, 107
Risk communication, 114, 115

Risk management, 91
biosafety, 96
biosecurity, 96
definition, 95
international level, 96
organization, 96
reference points, 95
sectorial risk assessment, 95
solid institutional frameworks, 95
stressing broader approaches, 96

S
Said policy, 42
Science, 25, 26
Science and technology, 177
Science and Technology Council (STAC), 55
Science counsellors, 51
Science diplomacy, 48, 87, 178, 179
AAAS, 30
American international relation, 30
biodiversity loss, 32
Cold War, 30
cooperative advisory mechanisms, 44–46
crisis management, 32
CTR programs, 30
Cuba's leaders, 32
Cuban Academy of Sciences, 33
definition, 26–28
diplomatic negotiations, 35
DPRK, 31, 32
ecological and socio-economic progress, 34
emotional communication, 15
EU (*see* European Union (EU))
history, 28, 29
interpersonal negotiation, 3
Iran *vs*. United States, 33, 34
Iranian Revolution, 34
medical cooperation, 32
MPC&A programs, 31
nuclear stockpile reduction, 34
origin, 3
paradigm changes, 34
personal bonds, 33
politics, 4
preventive diplomacy, 3
public diplomacy, 3
scientific collaborations, 26
scientific language, 30
soft power, 3
Soviet Union, 29
stakeholders, 33
START I, 29
Track II Diplomacy tools, 28
United States, 29–32
US-Iranian cooperation, 34
Science with and for Society (SwafS), 56, 58
Science, technology, and innovation (STI), 44
Science-policy interface, 44
Scientific Advice Mechanism (SAM), 55, 56
Scientific Advisory Board, 44
Scientific evidence, 84, 180
Scientific research, 25
Scientific uncertainty, 84, 85
Sectorial risk assessment, 95
SECUREAU projects, 112
Selective abstraction, 14
Selective moral disengagement, 14
Self-efficacy, 184
Seventh Framework Programme for Research (FP7), 52, 56
Small and medium-size enterprises (SMEs), 49, 57, 61, 62, 109, 147
Social intuition, 18
Social policy, 47
Soft power goals, 178
Soft power tool
American foreign policy, 36
Digital Age, 36
diplomacy, 36
foreign policy, 35, 37
hard power, 35
international dialogue, 37
international economy, 36
international relations, law, 36
liberal democracy, 37
political realism, 35
public diplomacy, 37
science diplomacy, 35
scientific values, 37
United States, 36
war of ideas, 36
Solid cooperation mechanisms, 96
Special Inspection, 167
Stability, 47
Stakeholders, 33, 92–96, 98, 101, 102, 111, 113
Stakeholders' training strategy, 112, 113
Standard operating procedure (SOP), 93
Standardization *vs*. experience-based approach, 71, 72
Strategic Arms Reduction Treaty (START I), 29
Strategic Partnership Program Agroterrorism (SPPA), 98
Surveillance technologies, 160
Sustainability, 16

Sustainable agriculture, 148
Sustainable Development Goals (SDGs), 41, 44, 54, 78
Sustainable ecosystem, 101
Sustainable science diplomacy, 5
Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME), 49

T
Tacit knowledge, 20–22, 72
Teamwork cooperation, 10
Temperatures, 100
Terrorist attack, 111
Theoretical, Empirical, Applicable, and Replicable Impact rating system (THEARI), 71
Thinking shortcuts, 181
Thinking traps, 5
Toroidal LHC ApparatuS (ATLAS), 49
Transformation to Sustainability Program, 41
Treaty on the Functioning of the European Union (TFEU), 48, 50, 104
Tunnel vision, 14, 181

U
Uncertainty, 11–13, 20, 114, 115, 117, 120
Union deployments, 106
UNISDR, 102
United Nations Development Programme (UNDP), 113, 115
United Nations Environment Programme (UNEP), 99, 112
United Nations Framework Convention on Climate Change (UNFCCC), 100
Unpredictability, 12
US Agency for International Development (USAID), 42
US Department of State, 125
US-DPRK relations, 166
US policymakers, 169
US-North Korean engagement, 165

V
Violence, 40
Virus, 97

W
War of ideas, 36, 37
White House, 124, 125
Working relationship, 16, 177
World Health Organization (WHO), 95

Z
Zirconium clad fuel, 169