Etege Menen Girls' Boarding Secondary School

Biology Department

Grade 12

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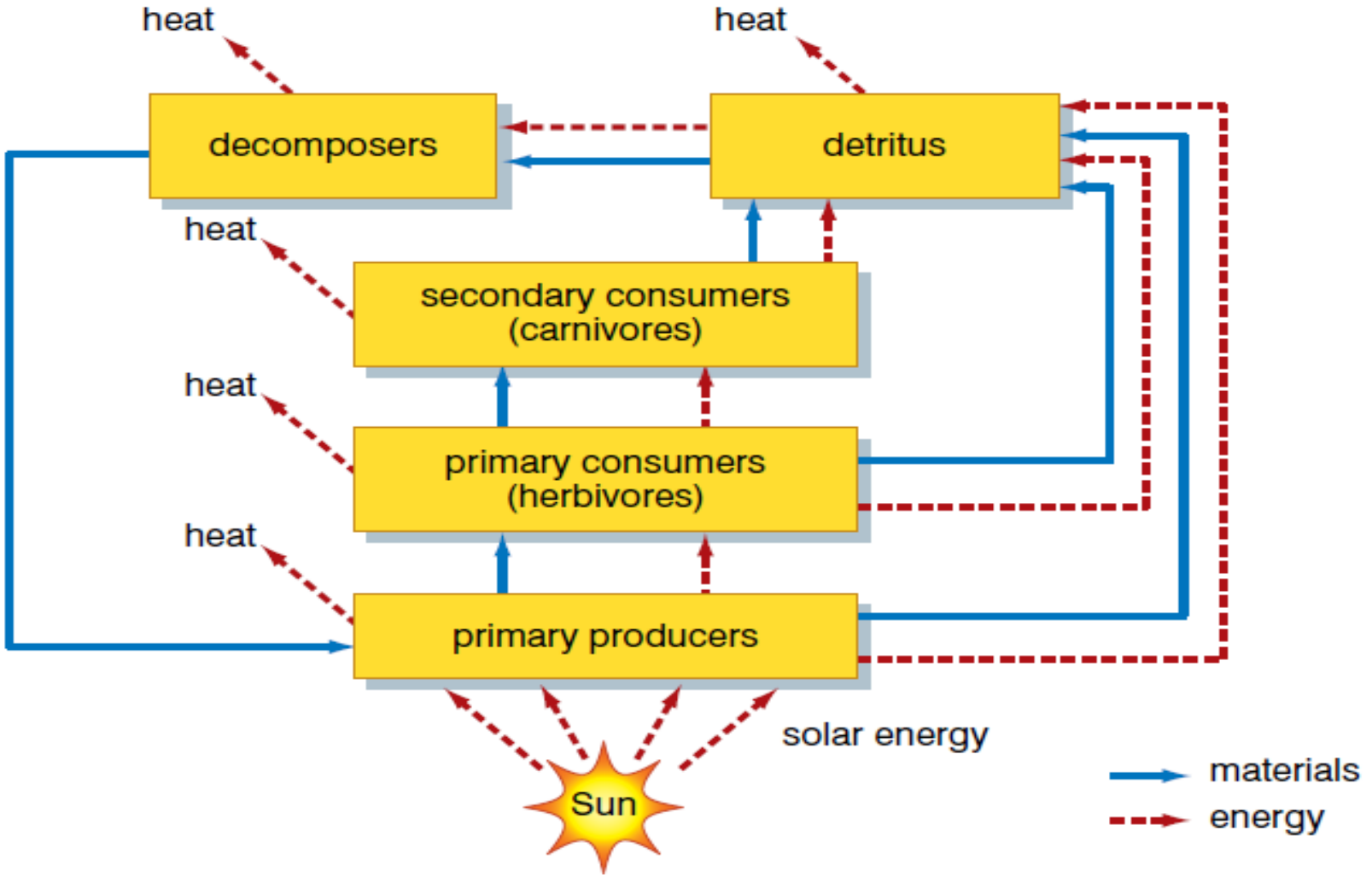
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2.1 Cycling matter through ecosystems

- **Ecology** it the interactions of organisms with another and their physical environment
- To maintain the biosphere, there must be a constant supply of nutrient and energy.
  - Non cyclic flow /transfer/ of energy
  - Cyclic of matter within an ecosystem
- Energy never recycles with in an ecosystem
- **Importance of material recycling**
  - To be **re-used nutrient** constantly over and over again due to its finite amount.

Energy and material cycle in an ecosystem



Cycling matter…

- **Materials are moved around an ecosystem** when organisms:
  - Feeding
  - Excretion
  - Respiration and breathing
  - Death and decomposition.
- **Energy** transfer from one trophic level to other and **lost as heat** to environment
- **Decomposers** (**bacteria and fungi**) returning nutrients to the ecosystem.
- Decomposers have a **saprobiotic nutrition**, break down dead remain of organism and release mineral ion to the ecosystem.
- Decomposers secretes **hydrolytic enzymes** that break down complex organic molecules and digest outside the body (**extracellular digestion**)

1. Carbon cycle

- The main processes involved in cycling carbon through ecosystems are:

1) Photosynthesis

- The process that fixes carbon atoms from an inorganic source (carbon dioxide) into organic compounds

2) Feeding and assimilation

- Feeding and assimilated into the body of that organism

3) Respiration

- this releases inorganic carbon dioxide from organic compounds

4) Fossilization

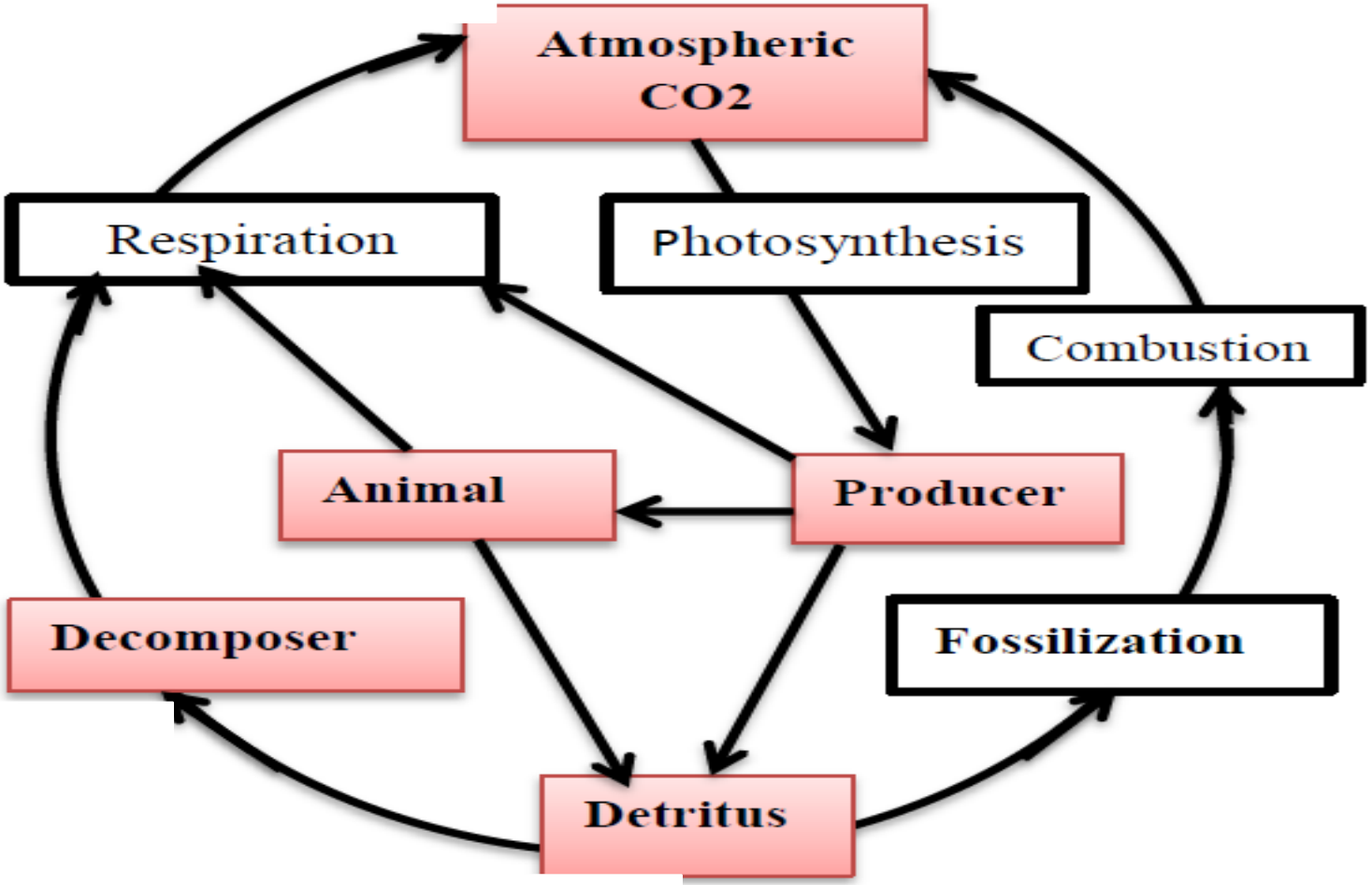
- Sometimes living things do not decay fully when they die due to the conditions in the soil, and fossil fuels are formed

5) Combustion

- Fossil fuels are burned, releasing carbon dioxide into the atmosphere

- The main source of carbon for organism is carbon dioxide present in the atmosphere in gaseous form and in water dissolved for

Carbon cycle…

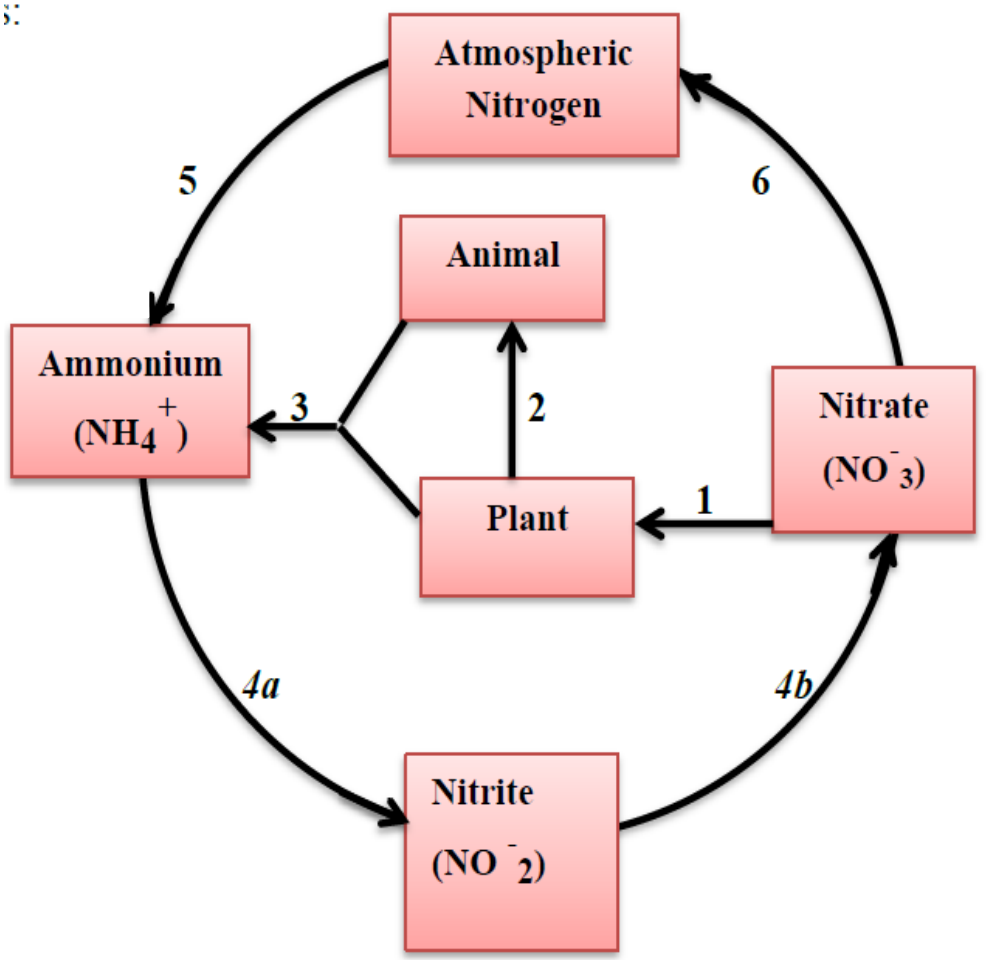


2. Nitrogen cycle

- Nitrogen is found in all living organism in the form of protein, DNA, RNA & ATP
- Animal and plant use nitrogen for the of synthesis of:
  - Genetic material (DNA)
  - Proteins
  - Energy transfer molecule (ATP)
- Plants absorb **nitrate (NO3)** from the soil
- Animals eat plants to make their own protein

Nitrogen cycle….

1) Absorption and assimilation
2) Feeding and assimilation
3) Ammonification
4) Nitrification
5) Nitrogen fixation
6) Denitrification



The main process involve in nitrogen cycle

1. **Ammonification**
   - **Decomposers break down** protein dead bodies (detritus) and their excretory products (urine, faces and urea) into **ammonium ions (**NH_4^+**)** and release into the soil
2. **Nitrification**
   - Ammonium ion **(**NH_4^+**)** oxidised into nitrates **(**NO^-_3**)** in two step process by nitrifying bacteria (Nitrosomonas & Nitrobacter**)**
     - **Nitrosomonas:** oxidised ammonium ion to nitrite **(**NO^-_2 **)**
     - **Nitrobacter:** oxidised nitrite **(**NO^-_2**)** (NO_2) to nitrate **(**NO^-_3**)**

Nitrogen cycle…

3. Denitrification

- Reduction of **nitrates** in soil into **elemental nitrogen** by denitrifying bacteria E.g. **Pseudomonas**
- **Decrease** the amount of nitrogen in the soil

4. Nitrogen fixation

- Conversion of elemental **nitrogen** into **ammonium ion** by nitrogen fixing bacteria
- Two type of bacteria involve;
  - Free living nitrogen fixing bacteria in the soil **E.g.** ***Azotobacter*** and ***Klebsiella***
  - Nitrogen-fixing bacteria in the roots nodules legumes form ammonium ions E.g. ***Rhizobium***

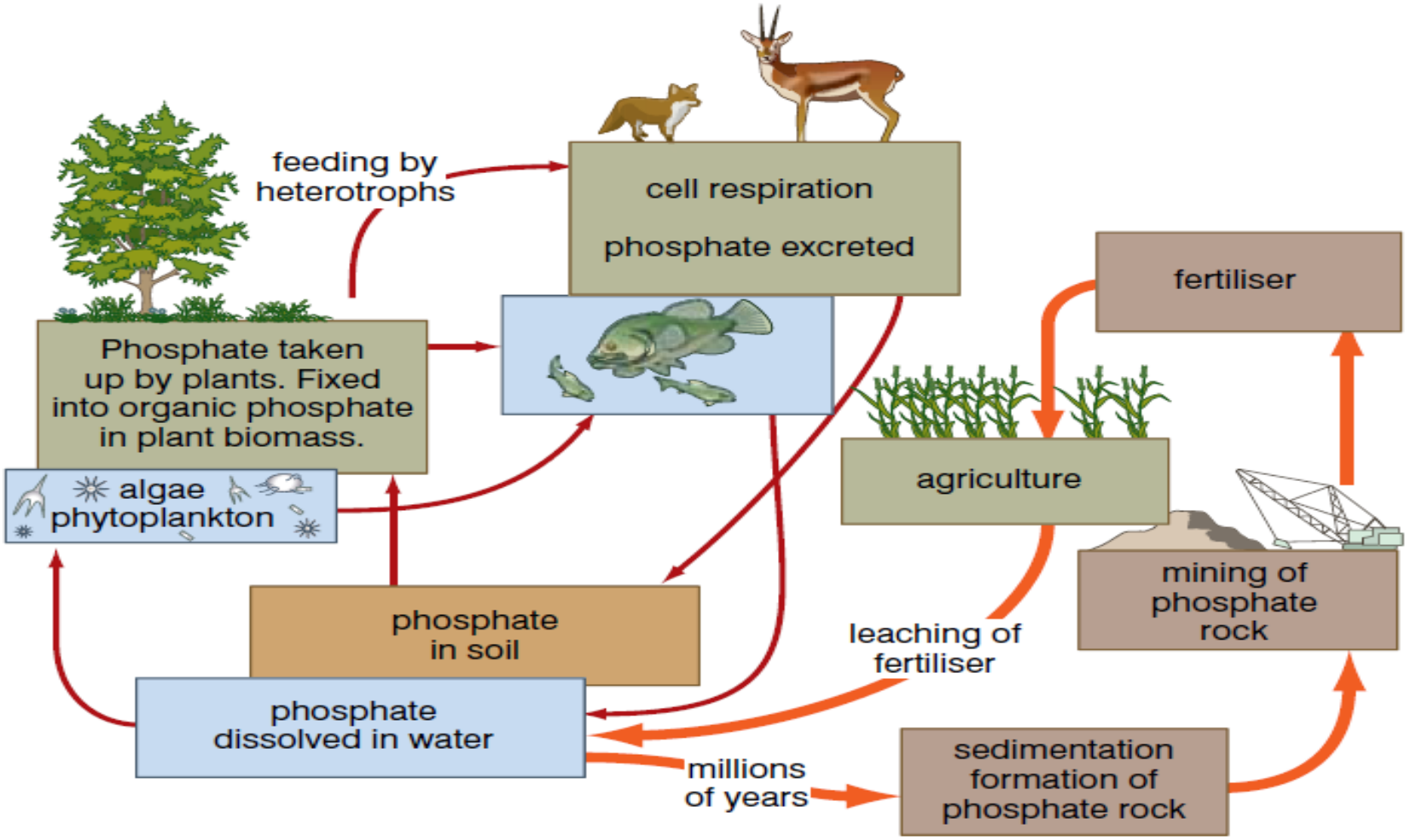
3. Phosphorus cycle

- Phosphorus is a **component of ATP, DNA** and **RNA**, **phospholipid, bone** and **teeth**
- **Crystalline rocks** are a major source of phosphorus
- Phosphors moves in a **cycle** through **rocks, soil, sediments** and **organism**
- Unlike Carbon, nitrogen, water phosphorus has no gaseous form and **does not cycle through atmosphere.**
- Hence **phosphorous cycle** involves only **soil and aquatic** environment.
- **Plant takes phosphors** from the soil in the form of **inorganic phosphates.**

Phosphorus cycle….

- Animals obtain phosphors from plant along food chains
- **Phosphate ion is added to the soil using;**
  - **Mineralization**, decomposer returns phosphate ion during decay.
  - **Weathering,** breaking down of rocks and release phosphates ion into the soil or water
  - Human add phosphate ion in the form **fertilizers** and leaching into water bodies
  - **Sedimentation**: over millions of years, phosphate ions can leach into the seas and become part of newly forming sedimentary rock.

Phosphorus cycle….



4. Sulphur cycle

- Sulphur is a component proteins, amino acids, such as methionine and cysteine
- Sulphur is stored underground in rocks and in ocean floor deposits
- Plants taken up **sulphate ions** in the soil and incorporated in plant tissue
- Sulphur passed to animals by feeding and digestion
- Sulphur cycle involves the following major process

1) Weathering and Oxidation

- Weathering release stored sulphur and converting it to sulphate

2) Decomposition

- ***Desulphovibrio*** at anaerobic conditions break down protein dead bodies (detritus) into hydrogen sulphide (rotten egg smell).

Sulphur cycle…

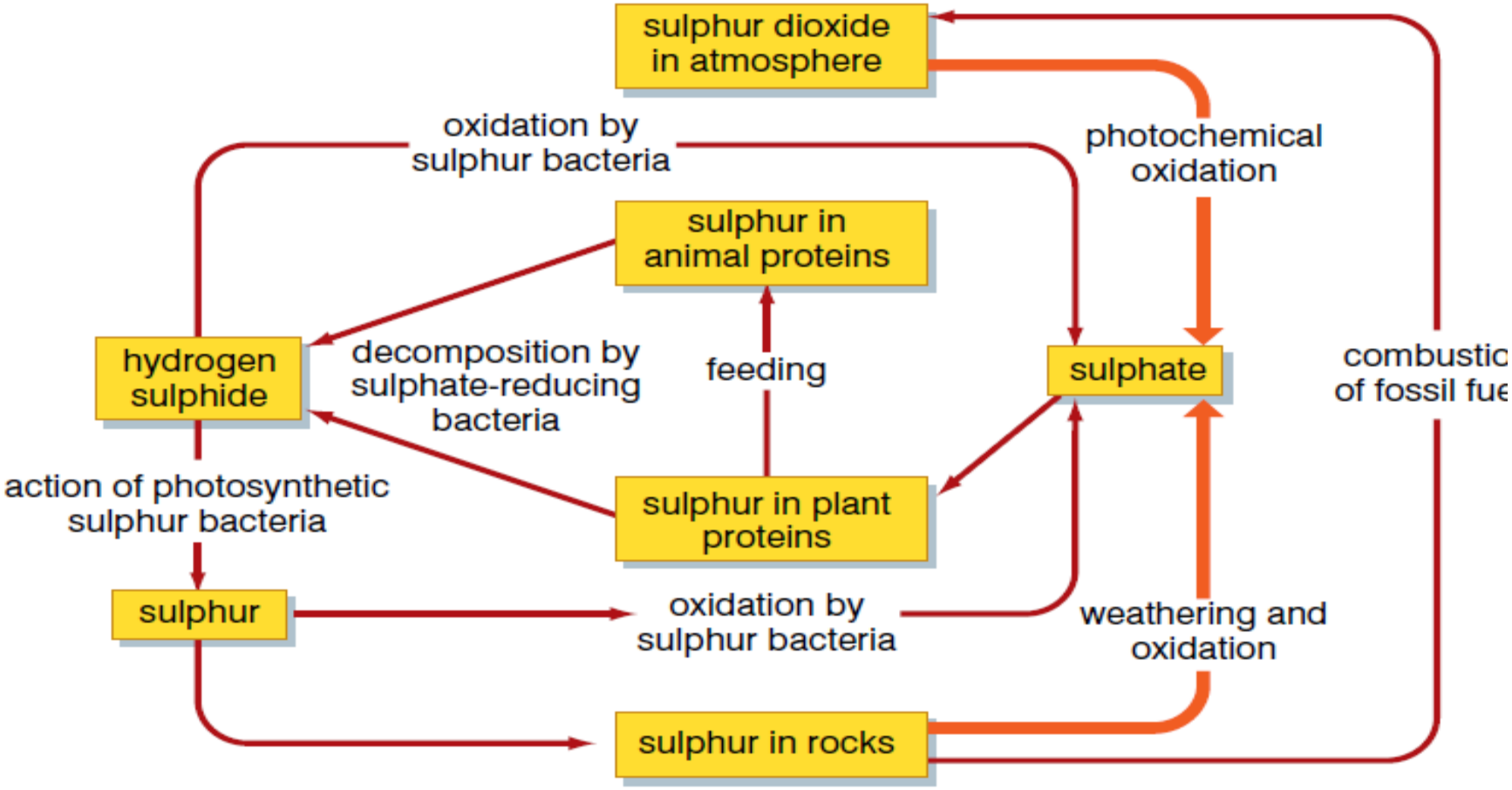
3) Oxidation

- **photosynthetic sulphur bacteria** oxidised hydrogen sulphide to sulphur in anaerobic condition
- **Non Photosynthetic sulphur** bacteria (***Thiobacillus*)** Oxidise hydrogen sulphide (or sulphur) to sulphate ($SO4^{2-}$) in aerobic condition, with sulphite (SO_3^{2-}) as an intermediate step;

4) Combustion

- Burning of fossil fuels oxidises sulphur to sulphur dioxide
- SO_2 a major contributor to the formation of acid rain
- SO_2 dissolve in rainwater to form a mixture of sulphurous and sulphuric acid
- $SO_2(g) + H_2O(l) \rightleftharpoons H_2SO_3\,(aq) \rightleftharpoons H_2SO_4\,(aq)$

Sulphur cycle…



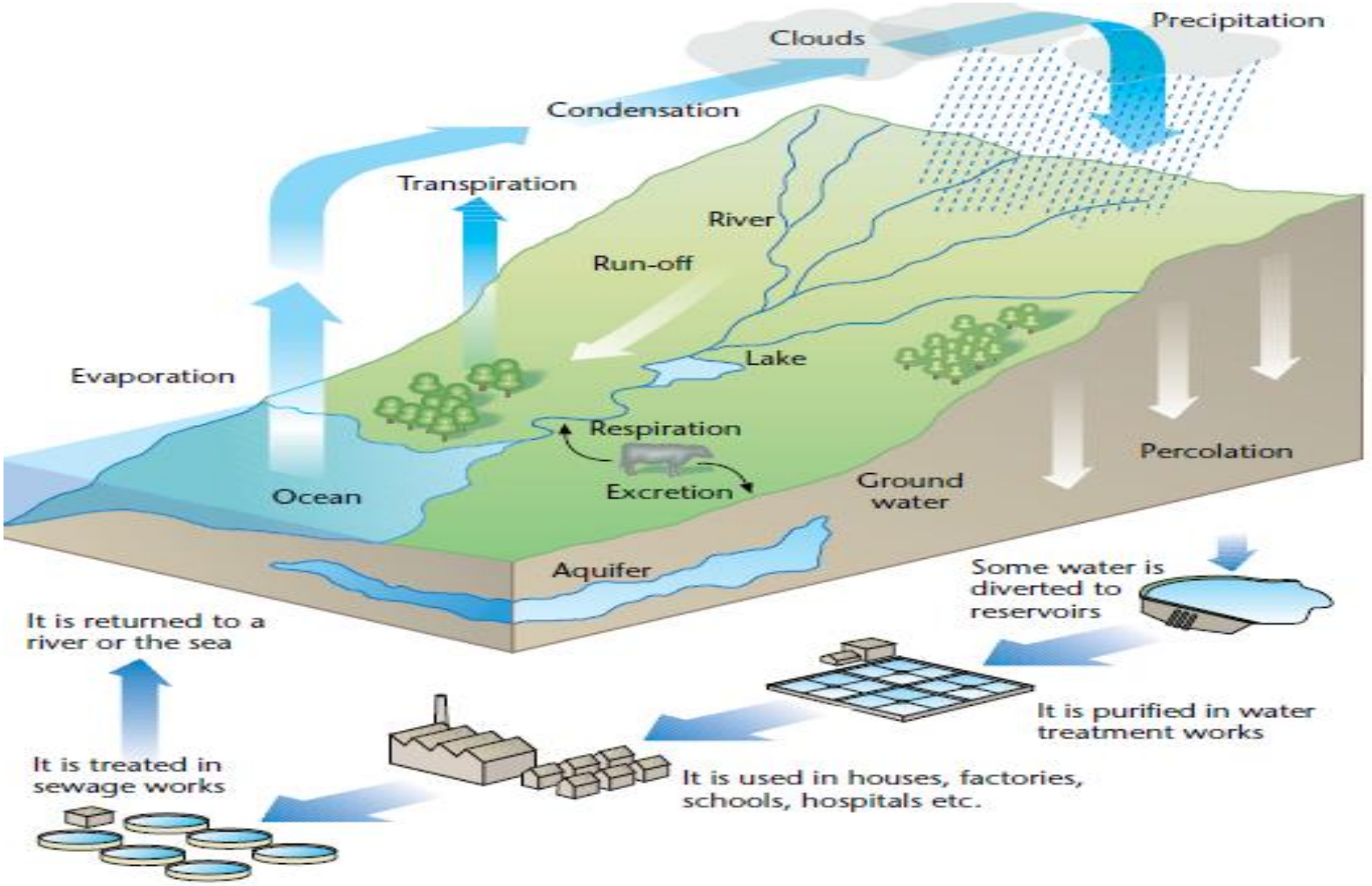
5. Water cycle

- Water is essential to all living organisms in all kinds of ways:
  - It makes up 70% of all cells
  - It is an essential requirement of photosynthesis
  - it is the basis of all transport systems in organisms
  - it provides a means of removing excretory products
- Water recycle with in an ecosystem is known as **hydrological cycle /water cycle/**

Water cycle divide into five parts

1. **Evaporation;** release of water into the atmosphere in the form of steam
2. **Transpiration:** water loss from plant
3. **Condensation**: conversion of gaseous water into liquid from as it cools down
4. **Precipitation:** is the coming back of water to earth in different form
5. **Percolation:** precipitation seeps downward into the ground
   - **Infiltration:** precipitation seeps into the surface layer
     - It depend on the permeability of the ground
     - If more permeable, the more precipitation seep into the ground

Water cycle…


Clouds
Precipitation
Condensation
Transpiration
River
Run-off
Lake
Evaporation
Respiration
Excretion
Percolation
Ocean
Ground water
Aquifer
Some water is diverted to reservoirs
It is returned to a river or the sea
It is purified in water treatment works
It is treated in sewage works
It is used in houses, factories, schools, hospitals etc.

2.2 Ecological succession

- **Ecological succession**; the process of change in the species structure of an ecological community over time
- The various stages in a succession are called **seral stage.**
- The whole succession consisting of various seral stage is referred to as **sere**
- The final, most complex, state of a succession is the **climax community**.
- **The following trends occur in any succession**
  - Total biomass of the community increases.
  - The species diversity increases.
  - The number of ecological niches increases.
  - Food webs become more complex.
  - The community becomes more stable

Ecological succession…

- **Characteristics of climax community**
  - The vegetation tolerant of environmental condition
  - Has a wide diversity of species
  - It is a final stable community
- **Factor affecting the type of climax community formed include:**
  - Temperature
  - Precipitation (rainfall)
  - Soil type and depth
- **This is the essence of succession:**
  - Organisms colonies the area.
  - They change the abiotic conditions in the area.
  - New species to colonies the area.
  - The new species become dominant.
  - More species enter the area

TYPE OF SUCCESSION

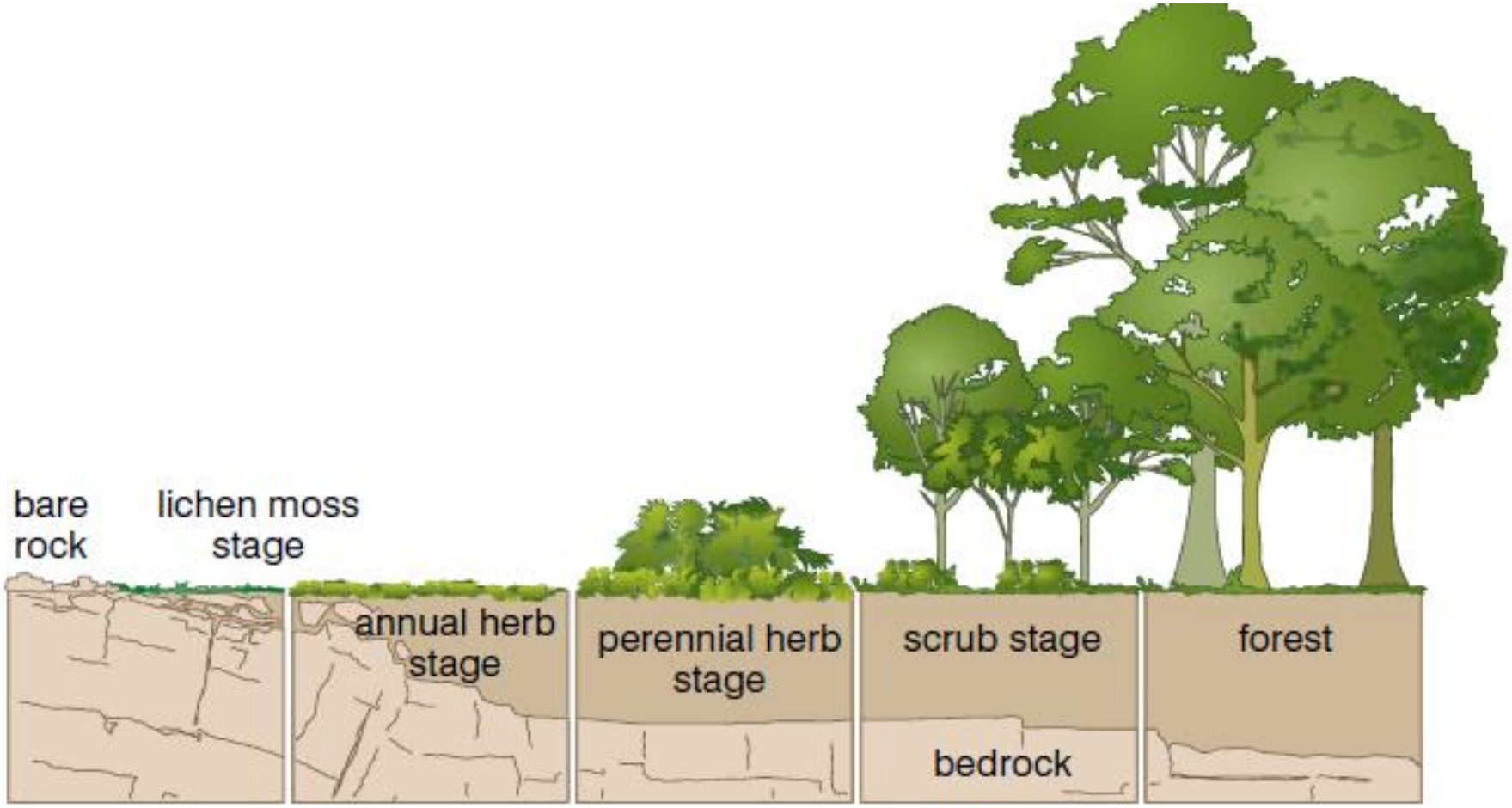
1. Primary succession

- Succession starts from **bare**, previously **uncolonised ground** or from a **newly formed** pond with no life.
- **Lichens** are the first community colonies an area is known as **pioneer community**.

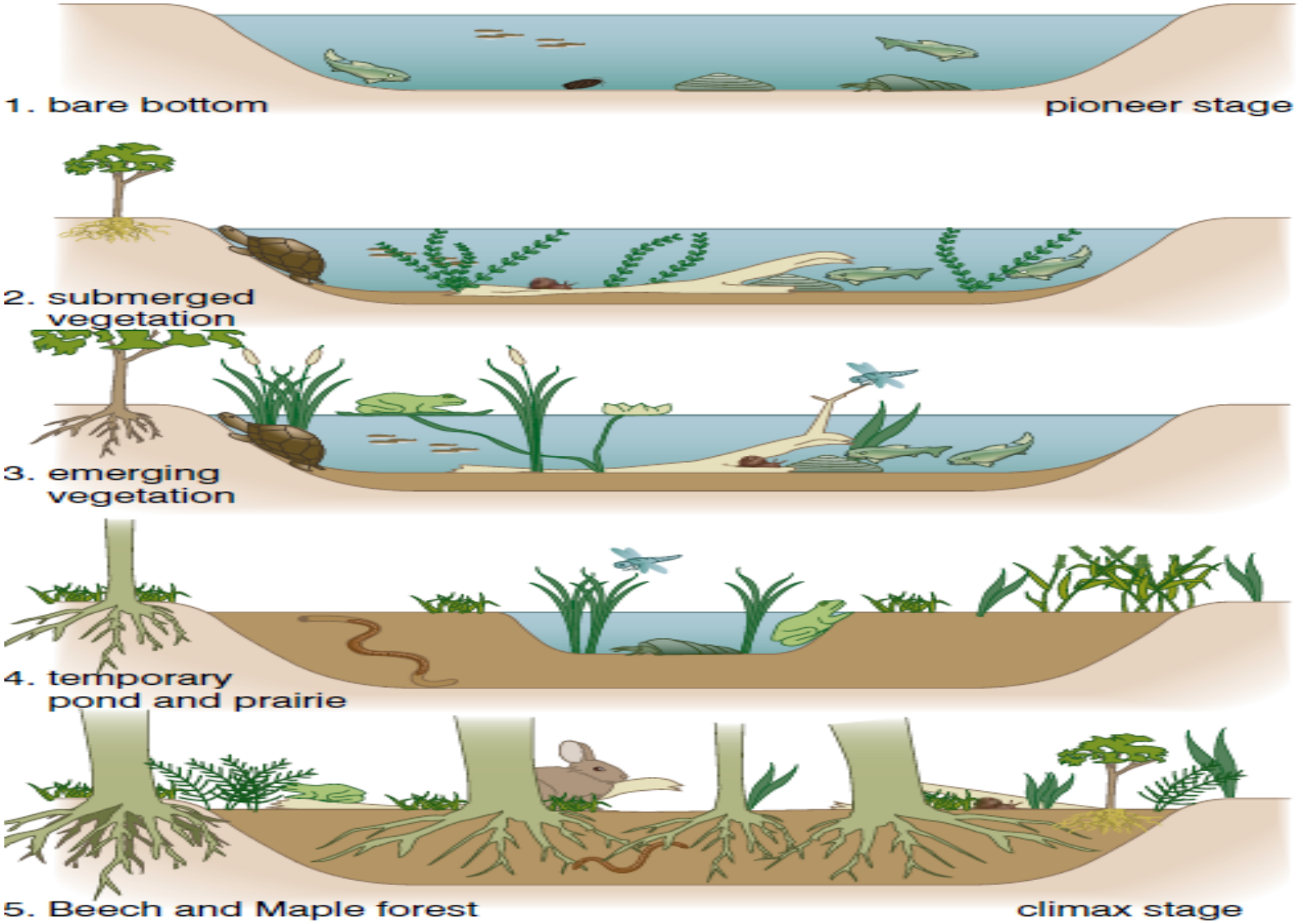
Divide into

- **Xerosere.**
  - Succession began from bare rock
  - Associated with the buildup of soil and soil moisture
  - The pioneer plant are called **xerophyte**
  - Bare rock ⟶ Lichen moss stage(Pioneer stages) ⟶ Perennial herb stage ⟶ Annual herb stage ⟶ Scrub stage forest
- **Hydrosere**
  - Succession began from open in water
  - The pioneer plant are called **hydrophyte**

Succession begin from bare land to woodland climax



Succession begin from open water to woodland climax



2. Secondary succession

- Succession begins from previously colonized ground but the communities are destroyed by fire, by a farmer ploughing a field, by some other human intervention
- It is less time to reach climax community than primary successions because:
  - The succession is not starting from bare rock/open water
  - A seed bank of remaining undamaged plants
  - The soil is already present

2.3 Biomes

- **Biosphere** the parts of Earth where living organisms can be found
- Biosphere divided into a number of **biomes.**
- **Biome** a climatically and geographically limited ecological area that consists of organisms that are adapted in similar ways
- A biome is a geographical or regional area with:
  - a specific climate
  - a specific soil type,
  - Specific organisms adapted in similar ways to the abiotic conditions of an area.
- **Temperature** and **precipitation (rainfall)** are the most significant climatic factors in determining biome type
- **Two main type of biomes**
  - **Terrestrial**
  - **Aquatic**

Terrestrial biomes

1. Desert

- **Cold desert**
  - Are desert in temperate region
  - Temperate is a cold almost no rain and the soil is poor
  - Inhibited by microorganisms and some lichens Sparse – polar bears, seals
- **Hot desert**
  - Found in tropic and sub tropic
  - Has almost no rain, Temperature is hot, the soil is poor
  - Fauna and flora include– insects, arachnids, reptiles , birds, succulent (cactus)

Terrestrial biomes…

2. Thorn forest (scrub)

- Dry **hot summer** and **rainy cool winter**
- The soil is very thin and poor in nutrient
- Drought and fire resistant animals and plants inhibited it
- During summer the plant are dormant and green during winter
- E.g. Oak, Shrub, lizard, wood rat

3. Tundra

- **Long harsh winter** and **extremely short summer**
- Rain fall is low and temperature is cold
- The **soil is permanently frozen (Permafrost)**
- Dominant plant lichens and mosses
- Migrating animals found

Terrestrial biomes…

4. Boreal forest (Taiga)-Northern **coniferous forest**

- Dominant vegetation evergreen conifer
- Days are longer in **summer and short in winter**
- Adequate rain fall and cool year round
- **Poor, rocky soil**
- Inhibited by many mammals, birds, insects, arachnids, etc.

5. Temperate deciduous forest

- Hot summer and cold winter
- Rain fall distributed throughout the year
- **Fertile soil-** rich in organic matter and nutrients
- Dominated by broad-leaved **deciduous tree**
- Inhibited by many mammals, birds, reptiles, Insects, etc.

Terrestrial biomes…

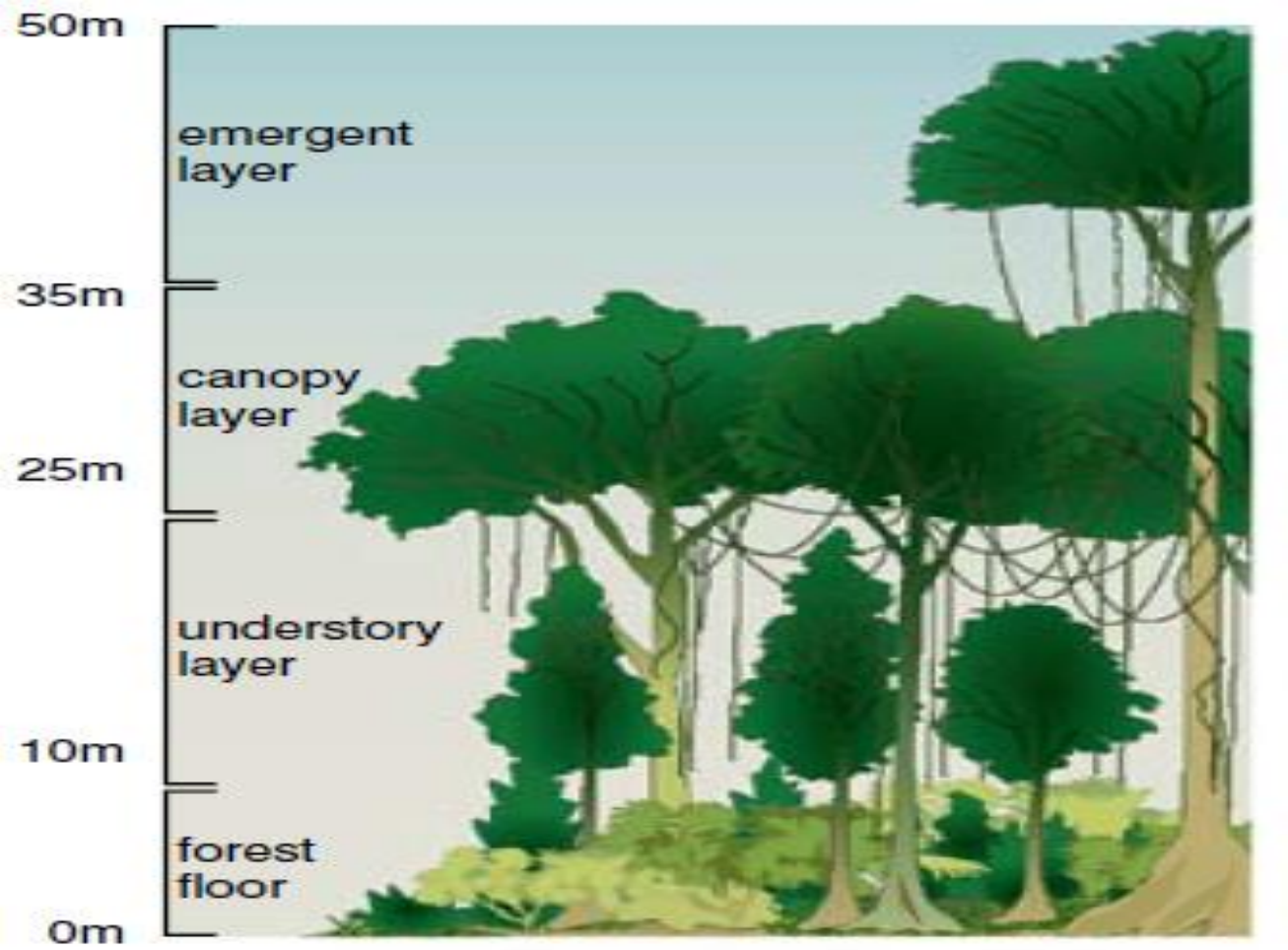
6. Tropical Montana forest

- Rain fall 8–9 wet months, air always humid
- Temperature always warm
- **Fertile soil**
- Dominated by ferns, tree ferns, large deciduous trees, epiphyte

7. Tropical rain forest

- Very wet , always warm and Poor, thin soil type
- The **richest biome** in species diversity
- They are worm and abundant amount rain fall
- Infertile soil because most of the nutrients are found within the plant
- Have high net productivity
- Many tree in the canopy have **epiphytes**
- Inhibited many plants, **epiphytes common**, many animals

The structure of rainforest



Aquatic biomes

Marine biome a biome consisting of a part of the sea and ocean

Biome	Salt content	Moving or standing	Other feature	Animals and plants
Oceanic, pelagic	High	Moving	The region of the ocean where light penetrates	Many fish, mammals and plankton
Oceanic, abyssal	High	Less movement	The region of the ocean where no light penetrates	Angler fish, sulphur bacteria at vents
Coral reef	High	Moving	Most diverse of all marine habitats. Has many strata like a rainforest	Corals, many fish, many seaweeds
Estuarine	Intermediate	Extreme movement	Unique habitat due to mixing of saltwater and freshwater	Shore birds, fish, crabs, mangroves, kelps, sea grass

Freshwater:

Biome	Salt content	Moving or standing	Other feature	Animals and plants
Ponds and Lakes	Freshwater	Standing	Are stratified as top layer absorbs more heat and light	Large numbers of plankton, plants and animals in top layer
Streams and rivers	Freshwater	Moving	Water is highly oxygenated	Algae, plankton, plants and fish
Wetlands	Freshwater	Standing	Water is very nutrient rich	Many plants and animals highest of all aquatic biomes

2.4 Biodiversity

- Biodiversity is the **variability of living things**; it **includes** their species diversity, genetic diversity and ecological diversity.
- The most usual way to think of **biodiversity** is in terms of **species richness.**
- An **index of diversity** can be calculated and this can be used to give a picture of the ecosystem as a whole
  - A **low index** of diversity suggests **an area dominated by one or just a few species**
    - suggesting only a few successful species as a result of a hostile environment
    - If those few species that can survive are seriously affected, then the whole ecosystem may be disrupted.
  - **Higher Index of diversity** indicates that there are **more successful species** with no species completely dominating the area.

Index of diversity

- **Index of diversity** is Simpson's index of diversity and is calculated from the formula:

$$d = \frac{N(N-1)}{\Sigma n(n-1)}$$

- In this formula
  - ***d*** is the index of diversity,
  - ***N*** is the total number of organisms in the area
  - ***n*** is the total number of organisms of each species.

Species	Number of organisms of each species		
	Area 1	Area 2	Area 3
A	86	16	23
B	5	17	25
C	2	16	27
D	3	17	5
E	1	17	12
F	3	17	8

Index of diversity…

For area 1:

$d = (100 \times 99) / [(86 \times 85) + (5 \times 4) + (2 \times 1) + (3 \times 2) + (1 \times 0) + (3 \times 2)] = 1.348$

For area 2:

$d = (100 \times 99) / [(16 \times 15) + (17 \times 16) + (16 \times 15) + (17 \times 16) + (17 \times 16) + (17 \times 16)] = 6.314$

For area 3:

$d = (100 \times 99) / [(23 \times 22) + (25 \times 24) + (27 \times 26) + (5 \times 4) + (12 \times 11) + (8 \times 7)] = 4.911$

- **In area 1**, only species A is really successful and dominates the area.
- **In area 2,** all the species are more or less equally successful.
- **In area 3**, three of the six species dominate the area.

Biodiversity…

- Biodiversity is a measure of the **overall variability of life**]and it includes:
  - **Species diversity;** refers to the variety of species within local area. It can be measured by species richness and species abundance
  - **Ecological diversity:** refers to the variety of ecological niches.
  - **Genetic diversity;** refers to the variation of genes with in species.
- **Humans influenced biodiversity (Anthropogenic factors)** Human reduced biodiversity in many ways, but two important activities are:
  - **Deforestation**
  - **Impact of agriculture.**
- **Deforestation is usually carried out** for one of two main reasons:
  - To clear land for human activities, such as mining, agriculture or house building,
  - To obtain timber to make products such as paper, charcoal, furniture, or to use as a building material.

The significance biological diversity

❖ **Ecosystem services** are the benefits that humans gain from biodiversity these are:

Supporting	Provisioning	Regulating	Cultural
❖ Nutrient cycling ❖ Soil formation ❖ Primary production ❖ Security from disasters	❖ Food ❖ Fresh water ❖ Wood and fiber ❖ Fuel	❖ Climate regulation ❖ Flood regulation ❖ Disease regulation ❖ Water purification	❖ Aesthetic ❖ Spiritual ❖ Educational ❖ Recreational

Biodiversity in Africa and Ethiopia

- *Coffee arabica* – Coffee
- *Eragrostis tef* – Tef
- *Ensete ventriculum* – Ensete
- *Coccinia abyssinica* – Anchote
- *Guizotia abyssinica* – Niger seed (Nug)
- *Brassica carinata* – Ethiopian rape (Gomenzer)
- *Carthamus tinctures* – Safflower (Suf)
- *Sorghum* Spp. – Sorghum
- *Hordeum* Spp. – Barley
- *Linum usitatissimum* – Linseed (Telba)
- *Ricinus communis* – Castor bean (Gulo)

❖Practices with direct effects on biodiversity:

- Deforestation
- Fuel wood collection and illegal logging
- Overgrazing by stock animals
- Introduction of improved crop varieties – reduce the genetic diversity of the Particular crop plant as only the ‘improved’ variety is used
- Overhunting (poaching)
- Introduction of alien invasive species

- **Practices with indirect effects on biodiversity:**
  - high population growth
  - undervaluation of the biodiversity resources
  - legal and institutional systems that promote unsustainable exploitation
  - disregard of traditional communal (range) land management systems
- **A loss of biodiversity can lead to:**
  - Worsening health
  - Increasing insecurity of food supply
  - Increasing vulnerability
  - less freedom for choice and action
- **Two key activities in maintaining biodiversity are**:
  - Maintaining habitats
  - Using resources in a sustainable way

2.5 Populations

- **What is a population?**
  - A population is all the individuals of a particular species in a particular habitat at a particular time.
  - **Population is dynamic**, not static. Like ecosystems they are constantly changing.
  - Population studies as a discipline is known as **demography**
  - **Demography** is concerned with the **size, composition**, and **distribution** of population
  - **A habitat** is an area where a population lives and finds the nutrients, water, living space and other essential resources it needs to survive.

Populations….

- In a pond, there are populations of many different organisms live in the same area with exploitation of different habitat.
- For example:
  - **plankton** exploit the **open water regions** of the pond
  - **decomposers** inhabit the detritus found at the **bottom of the pond**
  - **snails** browse the surface of the **sediment at the bottom** of the pond
- **Different organism can share the same habitat** due to different ecological niche
- **Ecological niche;** the role of population in a habitat.
  - For example, both **floating plants** and **tadpoles** are found in the open water habitat.
    - Plants use sunlight, carbon dioxide, water and minerals from the water
    - The tadpoles feed on the larvae of insects.

Ecological niche…

- In another example, **both blue tits** and **great tits** spend much of their time **foraging** in trees for **insects** and **insect larvae**.
  - When **one of species is present**, they forage at about **the same height.**
  - However, **if both species are present** in the same trees, **they forage at different heights** and so **avoid competing for the same niche**.
- If two species are present compete for the same available resources in the niche. One will be more successful and the other will be made locally extinct. This is called the **competitive exclusion principle.**
  - However, research shows that two species cannot normally occupy the same niche.

Factors influence the sizes of population

- **There are three factors that directly affect sizes of population:**
  - **Natality** – birth rate
  - **Mortality** – death rate
  - **Migration** – movement into **(immigration)** and out of **(emigration)** the area
- **Natality and mortality are clearly linked in their influences:**
  - if natality exceeds mortality, the population numbers will increase
  - if mortality exceeds natality the population numbers will decrease
  - if mortality and natality are equal, the population numbers will remain the same
- **In a similar way, emigration and immigration are linked in their influences:**
  - if immigration exceeds emigration, the population numbers will increase
  - if emigration exceeds immigration the population numbers will decrease
  - if emigration and immigration are equal, the population numbers will remain the same

Other factors influence mortality and natality

- **Abiotic factors;** the effects of factors in the physical environment
  - Light,
  - Temperature,
  - Carbon dioxide concentration
  - Oxygen concentration,
  - Water salinity
  - Humidity
  - Topography

Biotic factors

- Some of the main biotic factors are:

1) **Predation** – the presence of a carnivore (predator) or herbivore (for plants) increase mortality
2) **Parasites and Disease** – infection by micro-organisms can reduce productivity and may be fatal
3) **Competition**
   - **Intra-specific competition** – competition between members of the same species
     - Seed germinating in large number at a point
     - Caterpillars hatched in large number on tree leaves
     - Many human families occupying a small plot of land
   - **Inter-specific competition** – competition between members of different species.
     - Ethiopian wolf and domestic dog hunting for rat
     - Weeds and crop grow on the same field
     - Lion and cheetah competing for zebra

Biotic factor	How it affects population size
➢ **Predation**	➢ The presence of a predator (or herbivore in the case of plants) will effectively increase mortality and reduce the numbers in a population.
➢ **Disease-causing organisms**	➢ If disease is widespread, then mortality will be increased and population growth will be slowed.
➢ **Intra-specific competition**	➢ Competition between members of the same species can operate in two main ways: ✓ reducing the resources to all of the population can reduce their fertility and so reduce population growth, and ✓ reducing the resources to just some of the population (as others compete more effectively) means that they die whilst the others reproduce, but population growth is still reduced.
➢ **Inter-specific competition**	➢ Although the competitive exclusion principle states that two species cannot occupy the same niche, this is not absolute. The following can happen in appropriate circumstances: ✓ one of the two species outcompetes the other, which may die out ✓ both species suffer a reduction as they are nearly equal in their ability to 'harvest' the resource and the effects of intra-specific competition for a reduced resource also come into play, or ✓ the species are able to coexist.

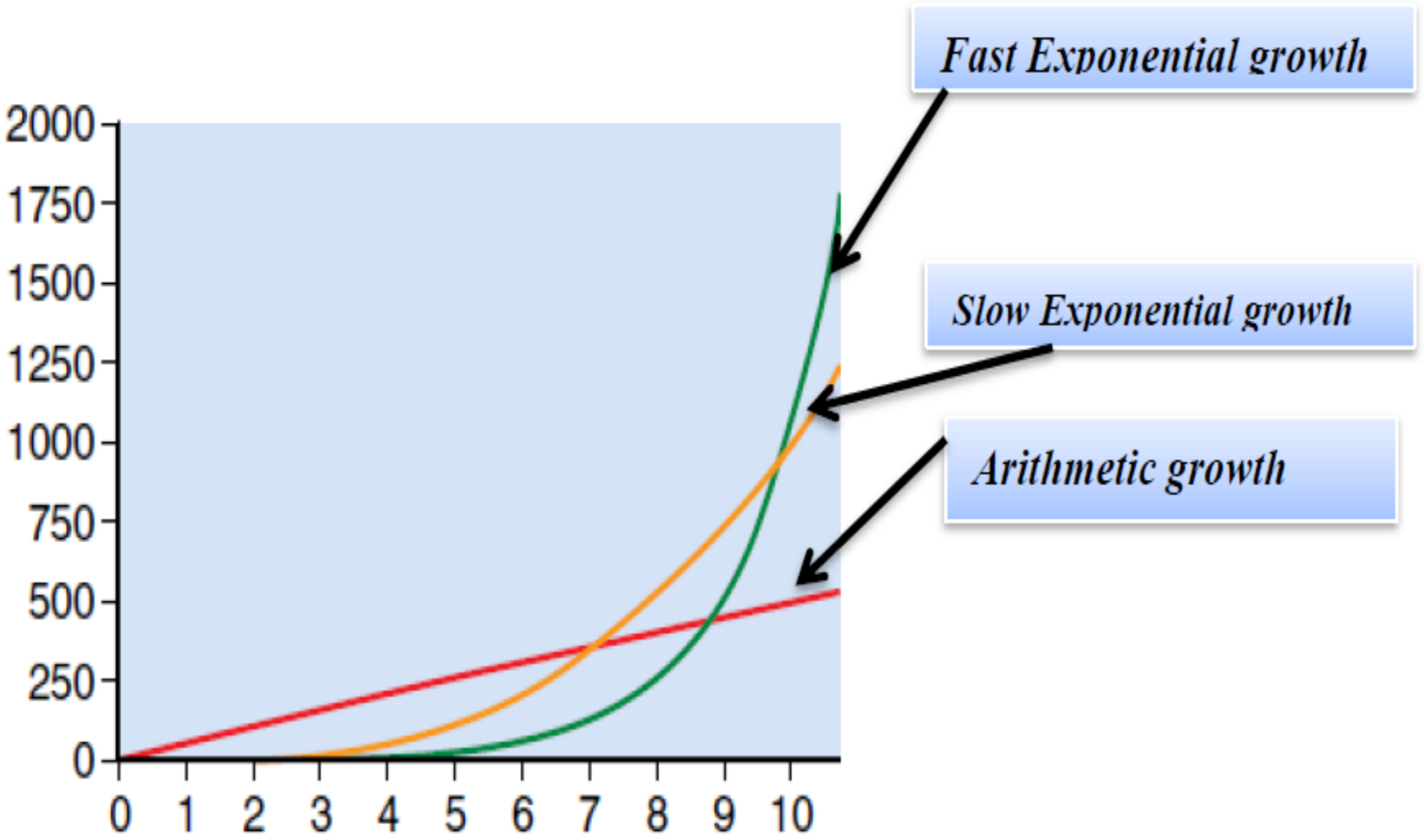
Populations grow

- Is the change in population over time
- **Biotic potential** the maximum population growth under ideal circumstance or unlimited environmental resource

1. **Exponential growth;**
   - Population growth under unlimited environmental resource exhibit exponential growth result in a **J-shaped curve**
     - The rate of ideal expansion of a population under ideal, unregulated conditions
     - Population doubles in each period time
     - Producing an ever-increasing growth rate that is clearly not sustainable in nature.
     - E.g. 5 → 10 → 20 → 40 → 80 → 160

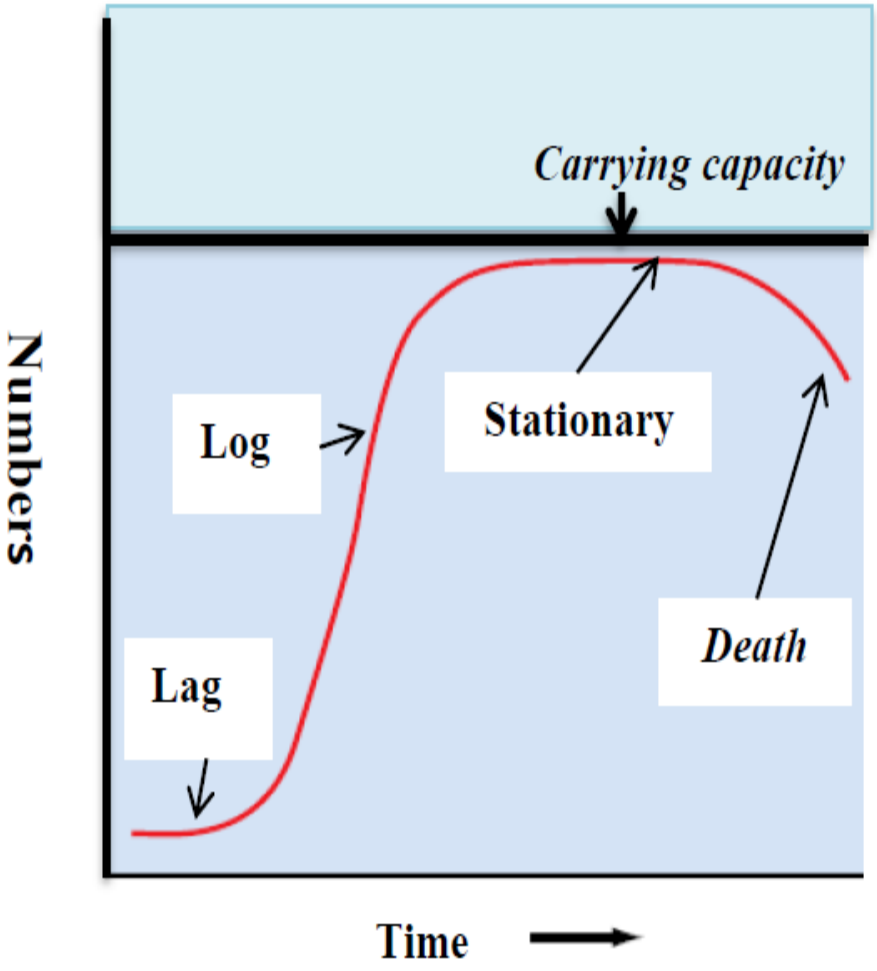
Arithmetic growth-Linear shaped

- A population growing arithmetically would increase at a constant number of people in each period.
- The numbers increase by the same fixed amount in each time period.
- Produces a uniform rate of growth over the time period
- E.g. 5 → 10 → 15 →20 → 25 → 30 →35


Fast Exponential growth
Slow Exponential growth
Arithmetic growth
2000
1750
1500
1250
1000
750
500
250
0
0 1 2 3 4 5 6 7 8 9 10

Logistic population growth-S-shaped curve

- Population growth under limited environmental resource are called **logistic population growth**
- It is the **actual population growth**
- **Carrying capacity**: the maximum number of individual that the environment supports.
- Population stabilize at its carrying capacity
- The balance of a population at its carrying capacity is called **dynamic equilibrium**



Population growth pattern has 4 phases

Phase	What is happening	Effect on population size
➢ **Lag**	Population establishing itself; some organisms are not adapted to the environment and die, others reproduce	Numbers remain low and stable or increase slowly.
➢ **Log**	All are adapted and reproduce rapidly due to plentiful resources.	Numbers increase rapidly.
➢ **Stationary**	The carrying capacity is reached; the same numbers are dying as are produced in reproduction.	Numbers remain fairly constant; they fluctuate about a 'mean' level.
➢ **Decline**	Nutrients exhausted, a new disease strikes or toxic excretory products accumulate.	Numbers decline rapidly.

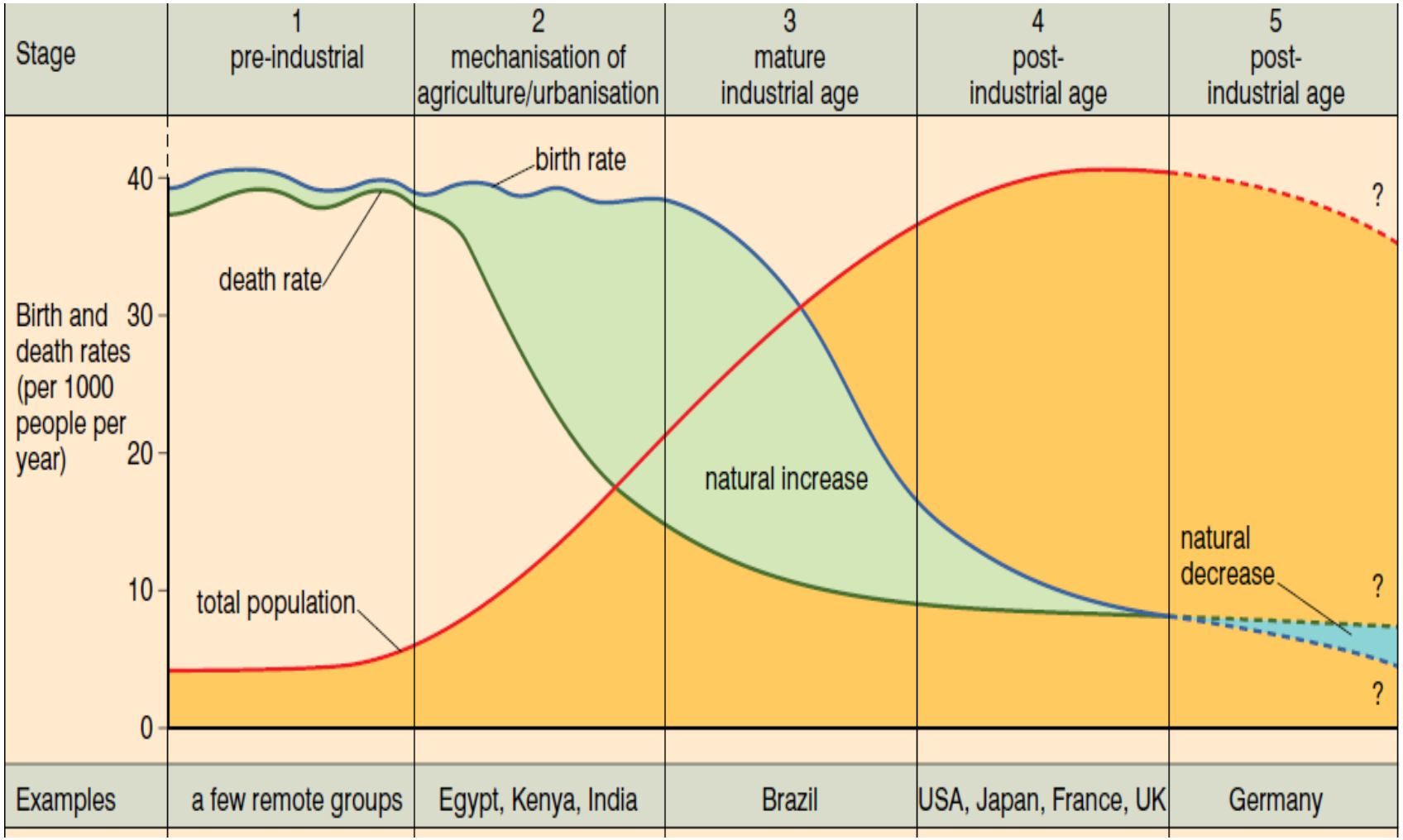
What about human populations?

- The population has been increasing particularly quickly over the past two hundred years:
  - Because increased the quality and quantity of food available
  - Decreased the impact of disease-causing organisms with improved sanitation and medical care.
- However, there can be no doubt that the human population has increased far too much and far too quickly.
  - In countries with the highest population growth rates is one factor in preventing or slowing development.
- **Demographic transition** a model that seeks to explain the transformation of countries from having **high birth and death rates to low birth and death rates**

Stages demographic transition

- **Stage 1**
  - High birth rate and death rate
  - Population growth very slow or stable
  - E.g. a few remote groups that are far from civilization
- **Stage 2**
  - High birth rate and declining death
  - High population growth
  - E.g. Egypt, Kenya, India
- **Stage 3**
  - High birthrate and low death rate
  - High Population growth
- **Stage 4**
  - Decaling birth and low death
  - Slow increase and decrease population size
- **Stage 5**
  - Low birth, low death and low growth

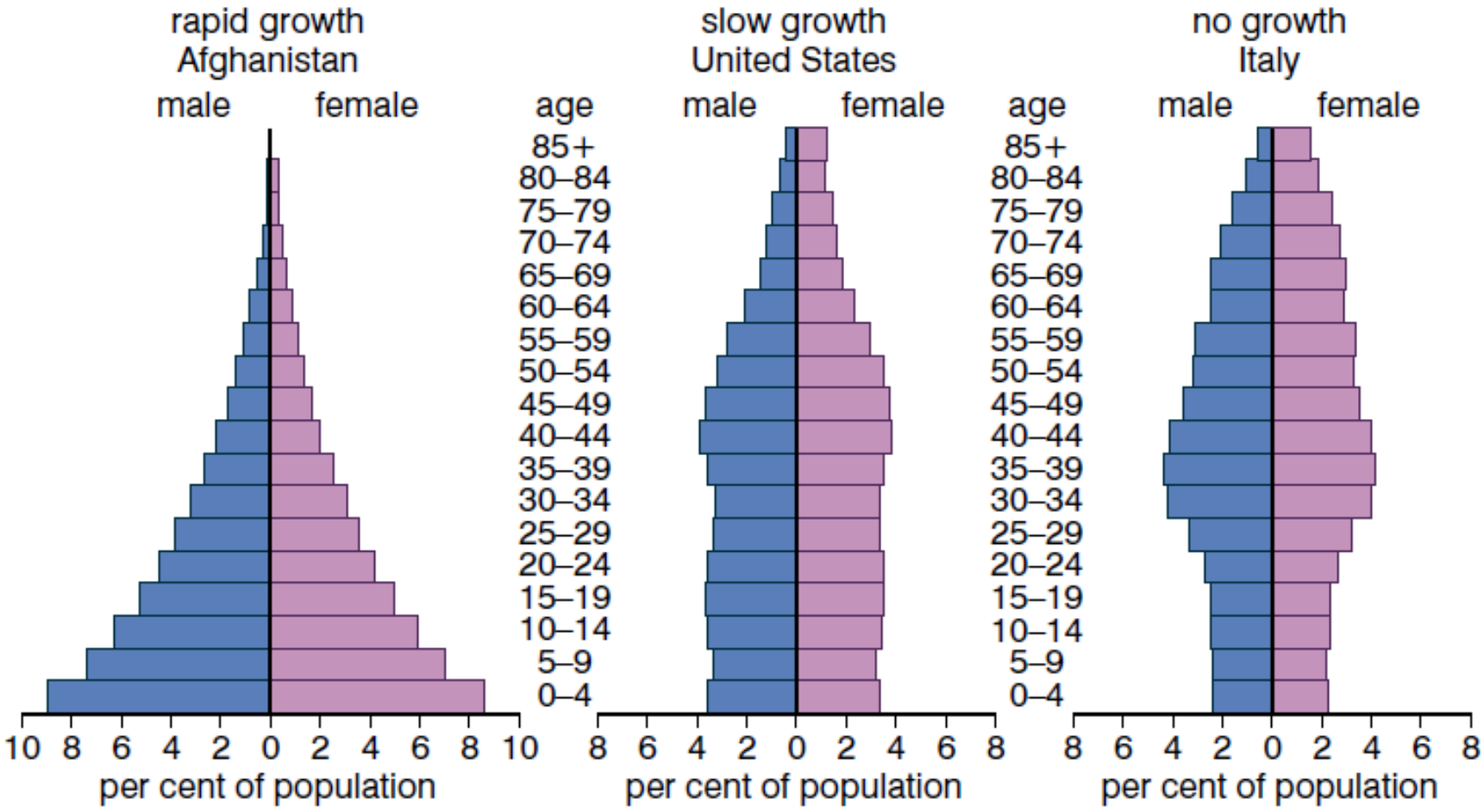
Stages demographic transition



Age pyramid

- During demographic transition, the relative number of young and old people change these are illustrated by **age pyramid**
- **Age pyramids** shows the percentage males and females in each age group in a population
- **Age pyramid of developing country**
  - Broad at the base and narrower at the tip of pyramids
  - Short life expectancy as there are few old people in the societies
- **Age pyramid of developed country**
  - Relatively rectangular
  - Less gap between different age group
  - Life expectancy is longer
  - Population size is stable

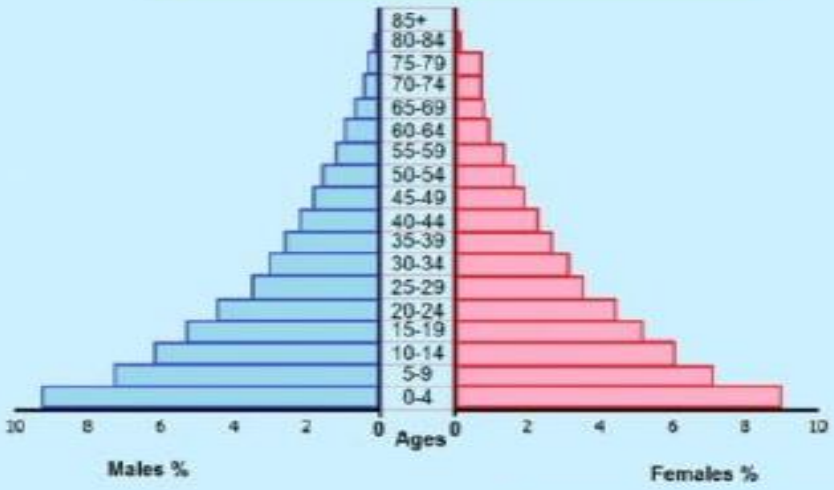
Age pyramid for Afghanistan, USA & Italy



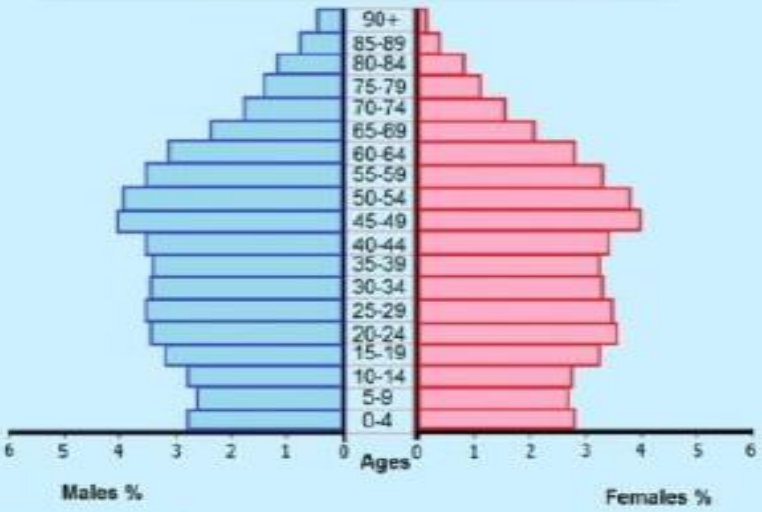
3 types of population pyramid

Expanding	Contrasting	Stationary
➢ Wide at the base narrower at the top ➢ Indicates high birthrate and death rate ➢ Large number of youth ➢ Rapid population growth	➢ Lower number of young people ➢ Low birth rate and low death rate	➢ Pyramid display some what equal number ➢ Low birthrate and death rate ➢ Growth is neutral or stable

Expanding



Contrating



Stationary

