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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 1
GLOBAL ISSUE AND SUSTAINABILITY

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GLOBAL ISSUE AND SUSTAINABILITY

- These lecture material are for the **Marine Coastal and Delta Sustainability for Southeast Asia (MARE)** (Project No 610327-EPP-1-2019-1-DE-EPPKA2-CBHE-JP)
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LECTURE OUTLINE

- What is Environmental Science?
- What is an environmental sustainable society?
- How can environmentally society grow economically?
- How are our ecological footprints affecting the earth?
- What is pollution, and what can we do about it?
- Why do we have environmental problems?
- How we can work together to solve environmental problems?

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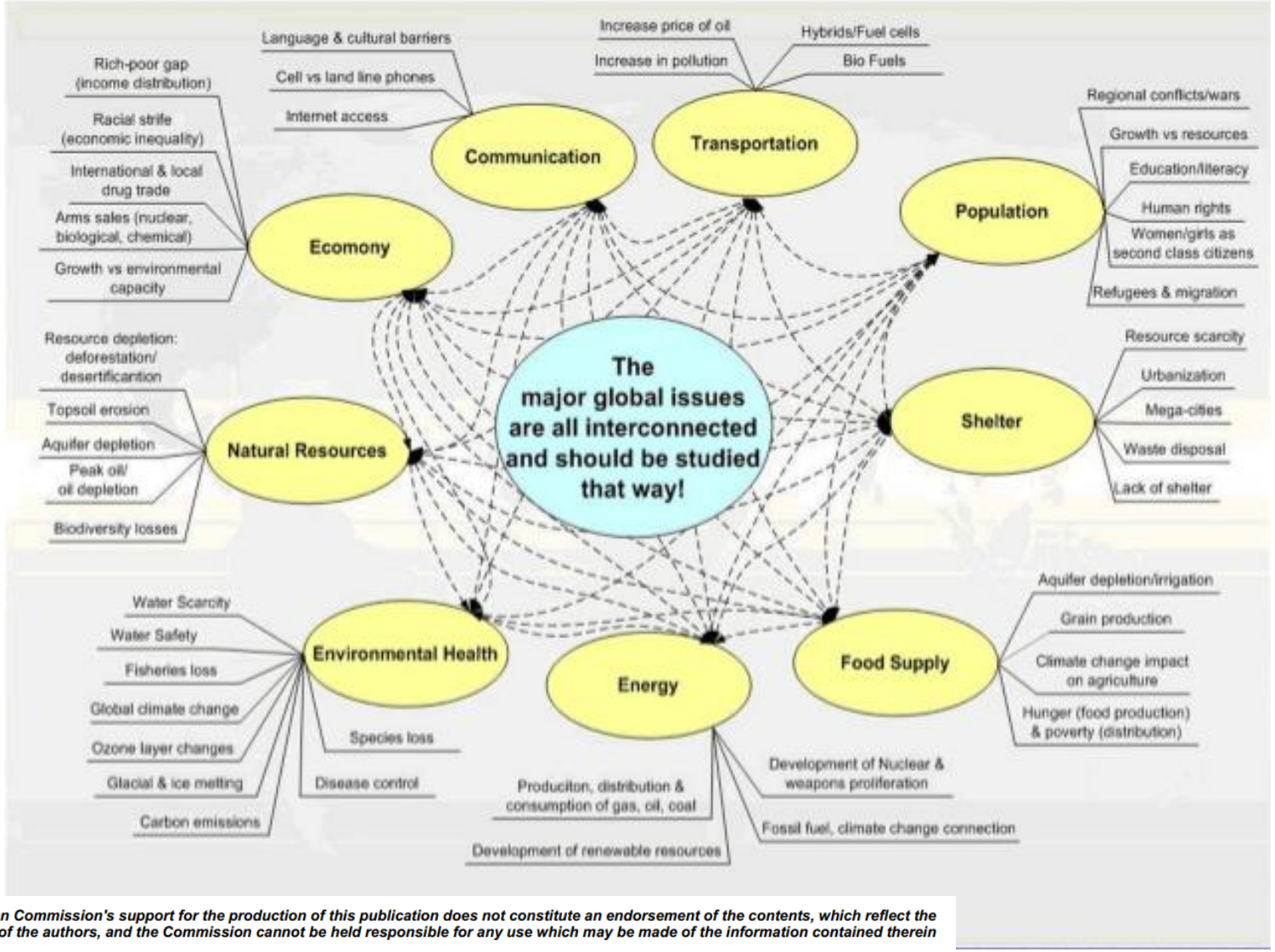
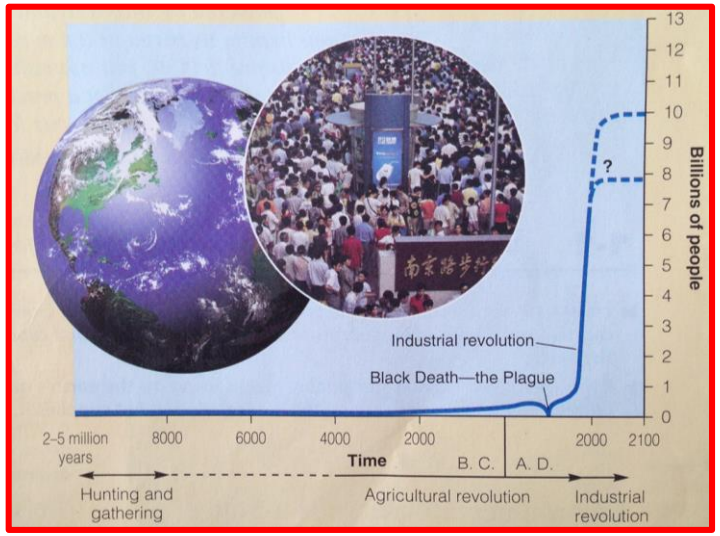
GLOBAL ISSUE





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ENVIRONMENTAL SCIENCE

- Environmental Science is a **study of connections in nature**.
- The environment is everything around us. It includes all of the **living and the non living things** with which we interact.
- We depend on the environment for air, water, food, shelter, energy and everything else we need, to stay alive and healthy.
- An **interdisciplinary study of how humans interact with the environment of living and non-living things**.

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ENVIRONMENTAL SCIENCE

- **Ecology** – The biological science that studies how organisms, or living things, interact with their environment and with each other.
- **Species** – A group of organisms with distinctive traits and, for sexually reproducing organisms, can mate and produce fertile offspring
- **Ecosystem** – A set of organisms interacting with another and with their environment of non-living matter and energy within a defined area or volume.
- **Environmentalism** – A social movement dedicated to protecting the earth's life-support systems for us and all other forms of life.

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ENVIRONMENTAL SUSTAINABLE SOCIETY

- Our lives and economies depend on **energy**.
- Living sustainably means living off the earth's natural income without **depleting or degrading the natural capital** that supplies it.

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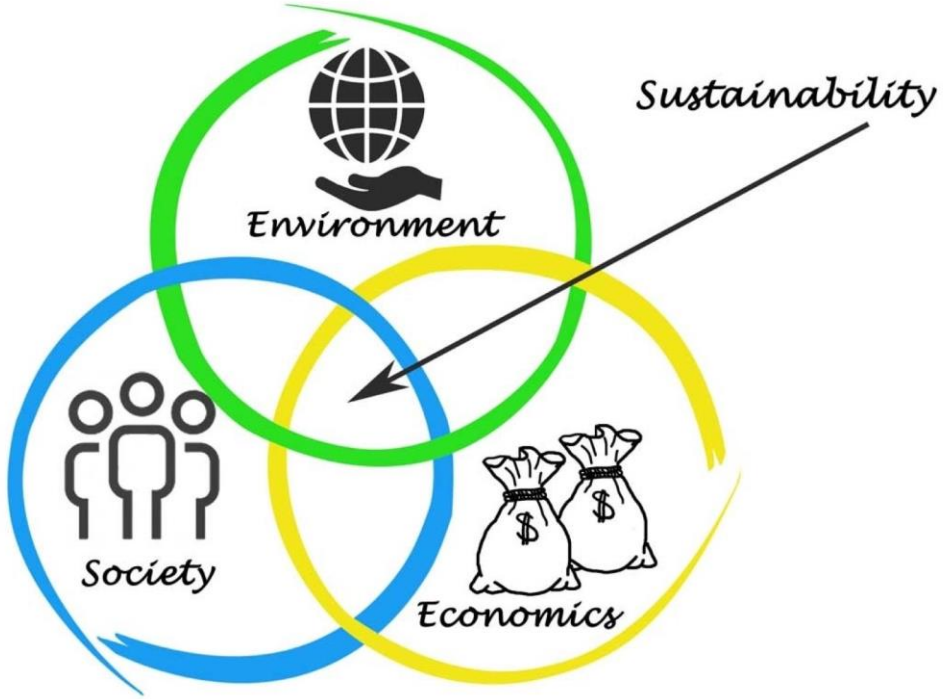
SUSTAINABILITY

- The **ability** of the earth's various natural systems and human cultural systems and economies to **survive and adapt to changing environmental conditions** indefinitely.



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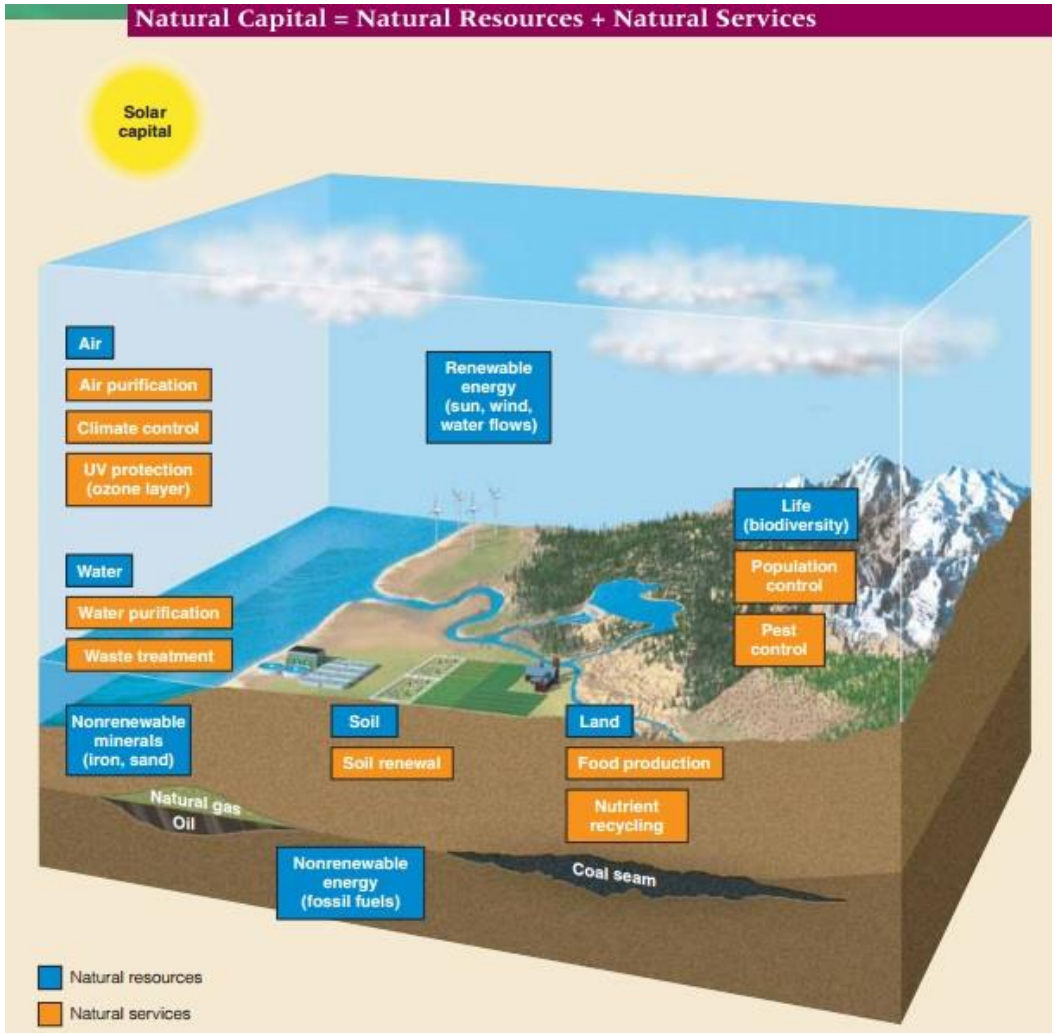
SUSTAINABILITY

- **Natural Capital** – The natural resources and natural services that keep us and other forms of live alive and support our economies.
- **Natural Services** – Functions of nature, such as purification of air and water, which support life and human economies.



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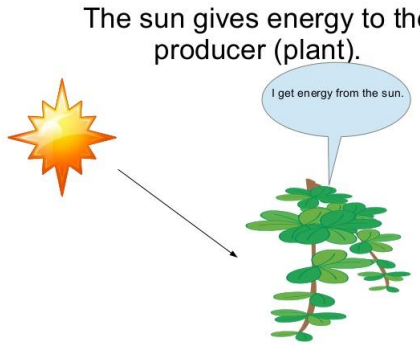
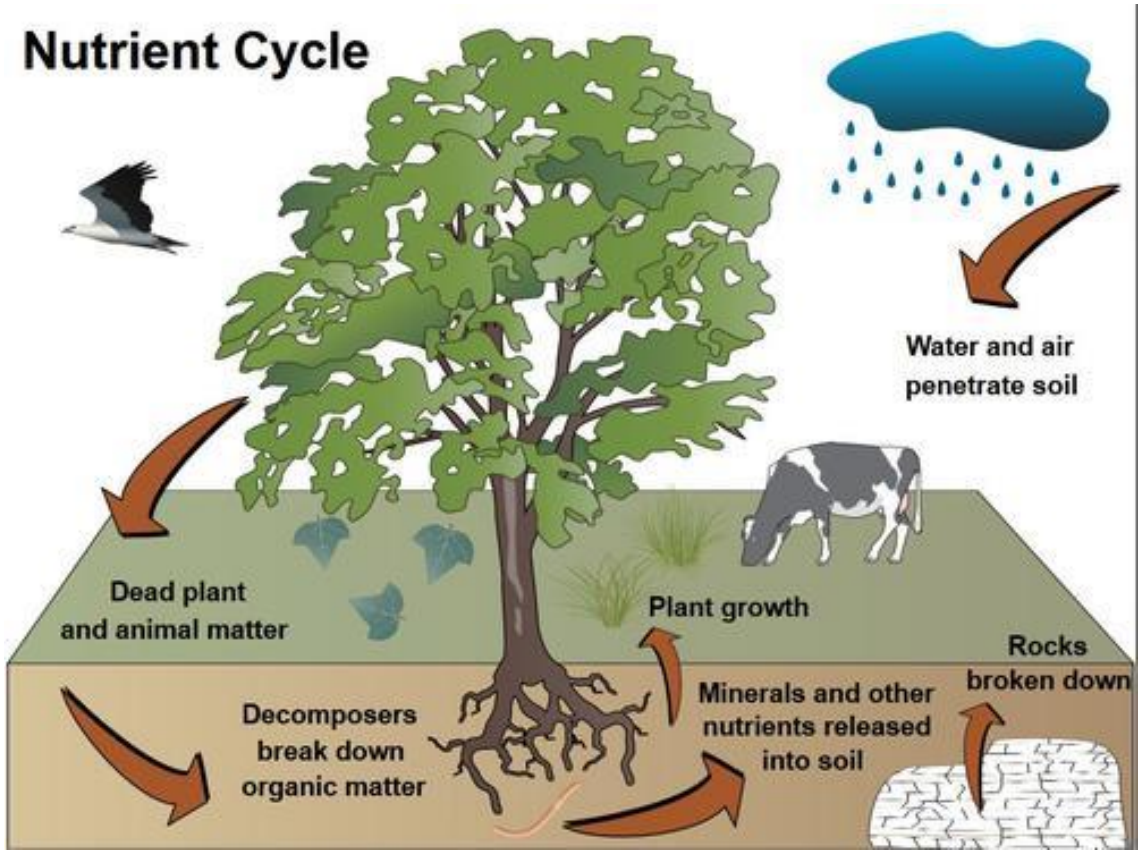
SUSTAINABILITY

- **Nutrient Cycling** – The circulation of chemicals necessary for life, from the environment (mostly from soil and water) through organisms and back to the environment.
- **Solar Capital** – Energy from the sun. Solar energy warms the planet and support photosynthesis.





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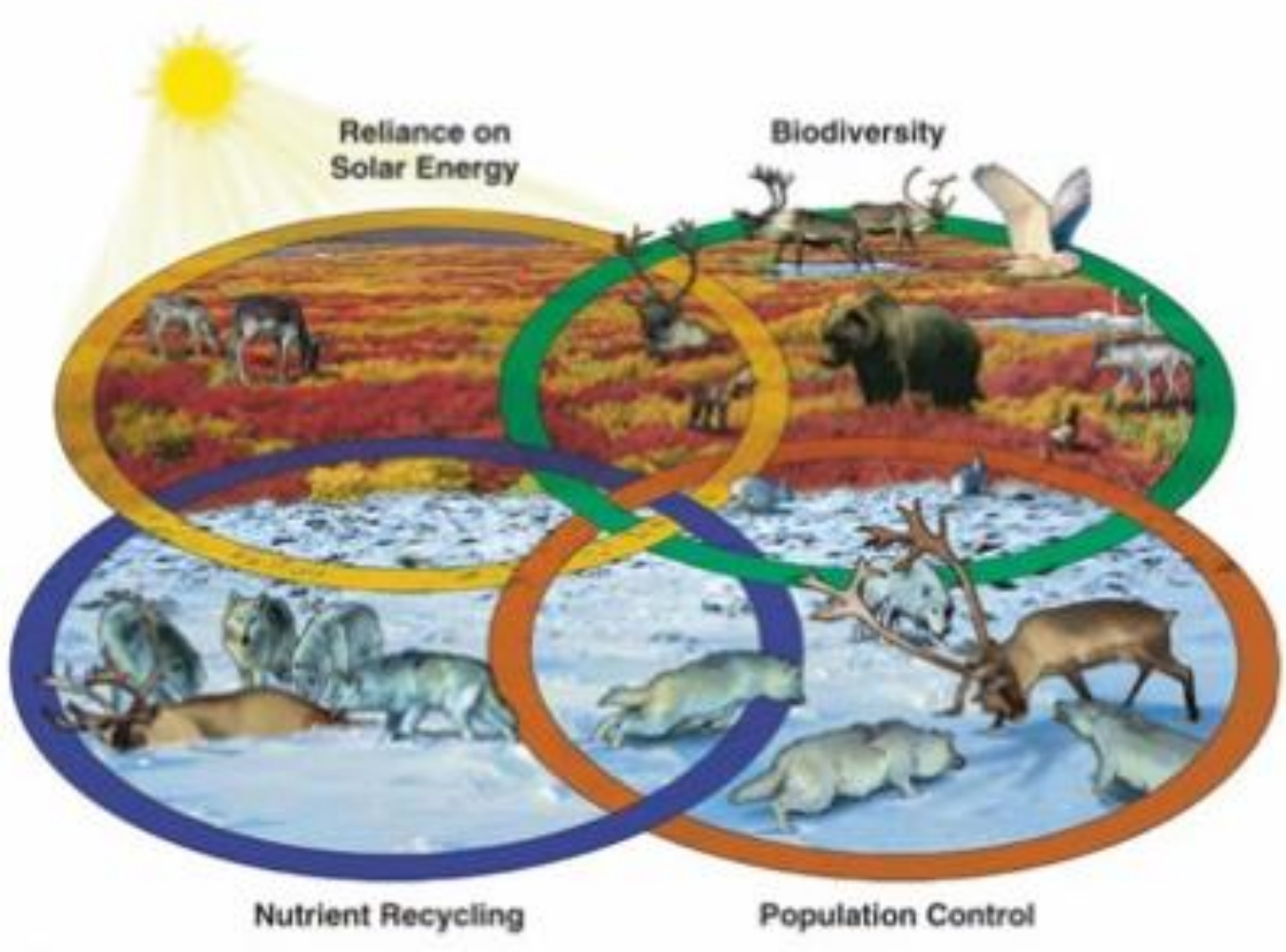
FOUR SCIENTIFIC SUSTAINABILITY PRINCIPLES



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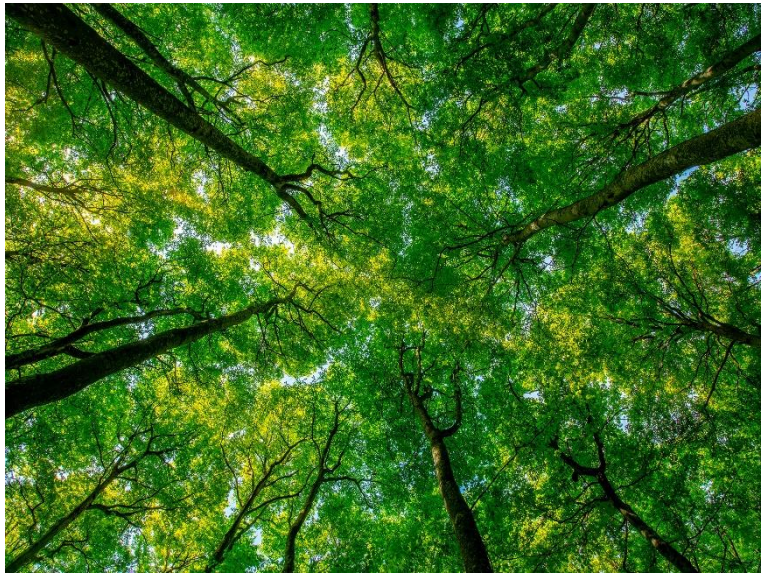
FOREST – ECONOMIC AND ECOLOGICAL SERVICES

Ecological Services

- Support energy flow
- Reduce soil erosion
- Absorb and release water
- Purify water and soil
- Influence local and regional climate
- Store atmospheric carbon
- Provide habitat



Economic Services

- Fuelwood
- Lumber
- Pulp to make paper
- Livestock grazing
- Recreation
- Jobs

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EFFECT OF DEFORESTATION

- Decreased **soil fertility** from erosion
- **Runoff of eroded soil** into aquatic systems
- Premature **extinction of species** with specialized niches
- **Loss of habitat** for native species and migratory species such as birds and butterflies
- Regional **climate change** from extensive clearing
- **Release of CO_2** into atmosphere
- Acceleration of **flooding**

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HOW TO MANAGE AND SUSTAIN FOREST?

- Identify and protect forest areas high in biodiversity
- Rely more on selective cutting and strip cutting
- No clear cutting on steep slopes
- No logging of old-growth forests
- Plant tree plantations primarily on deforested and degraded land
- Include ecological services of forests in estimating their economic value.

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MAJOR THREATS TO AQUATIC BIODIVERSITY

- Habitat loss
- Invasive species
- Pollution
- Climate change
- Overfishing

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HOW TO PROTECT AND SUSTAIN MARINE BIODIVERSITY?

- Using laws and economic incentives to protect species
- Marine reserves to protect ecosystems
- Integrated coastal management
- Identify severely threatened areas and protect those with high plant diversity (biodiversity hotspots)
- Rehabilitate and restore damaged ecosystems

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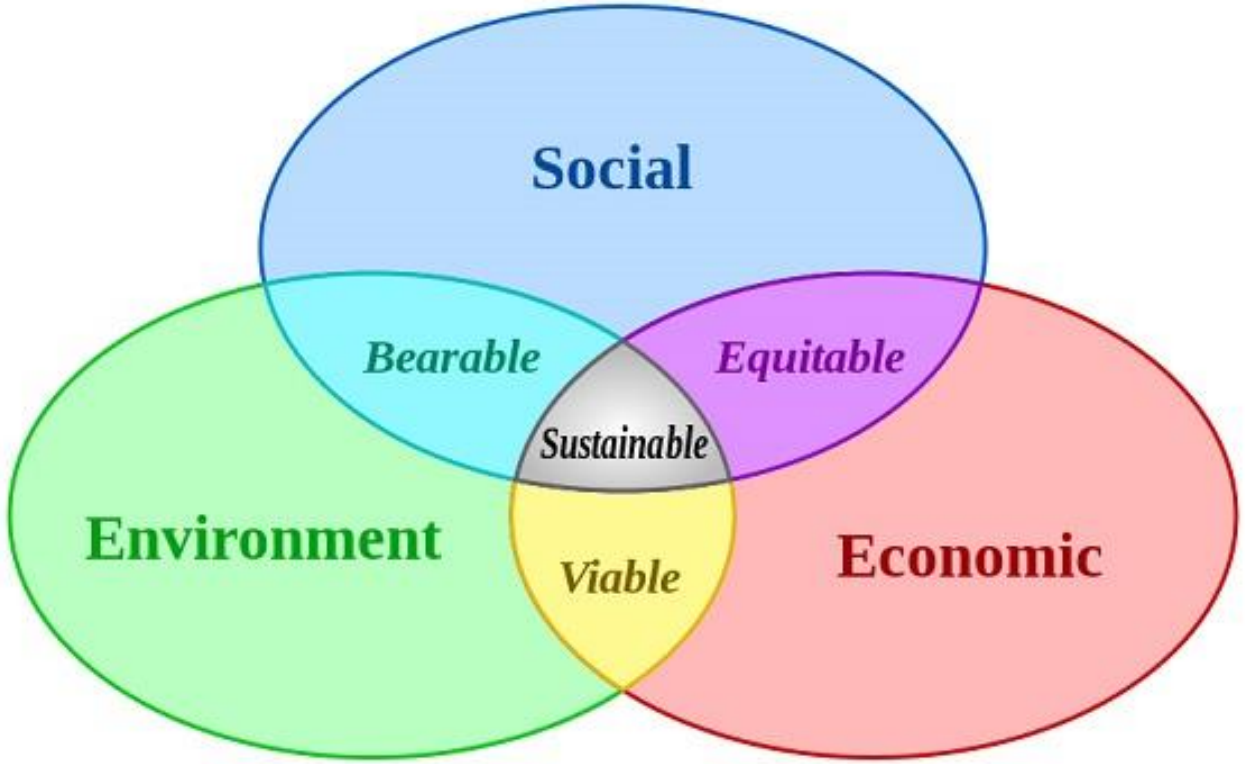
SUSTAINABLE SOCIETIES

- How can environmentally sustainable societies grow economically?



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SUSTAINABLE SOCIETIES

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SUSTAINABLE SOCIETIES

- Societies can become more environmentally sustainable through economic development dedicated to improving the quality of life for everyone **without degrading the earth's life support systems**.
- Using political and economic systems to discourage environmentally harmful and unsustainable forms of economic growth that degrade natural capital, and to encourage **environmentally beneficial and sustainable forms of economic development** that help sustain natural capital.

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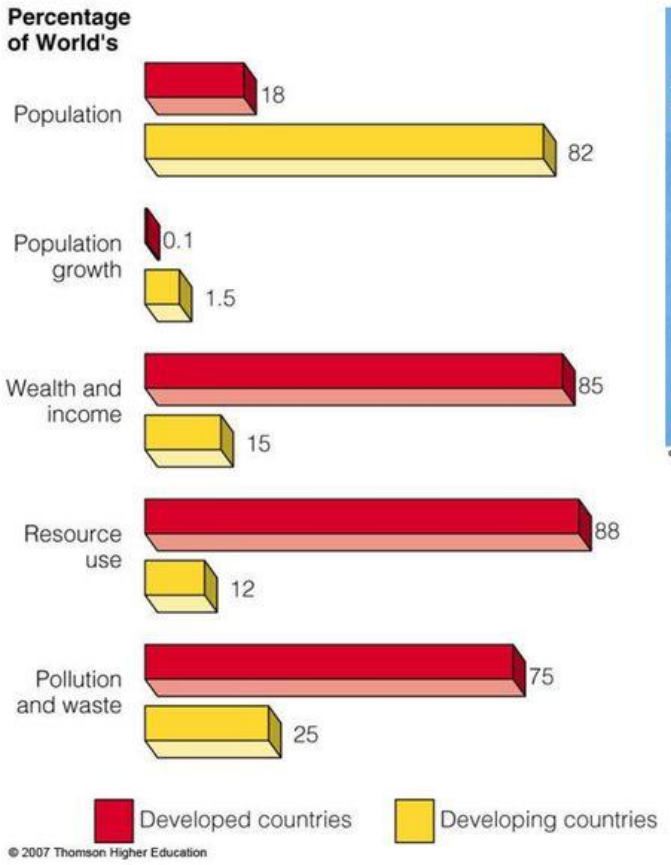
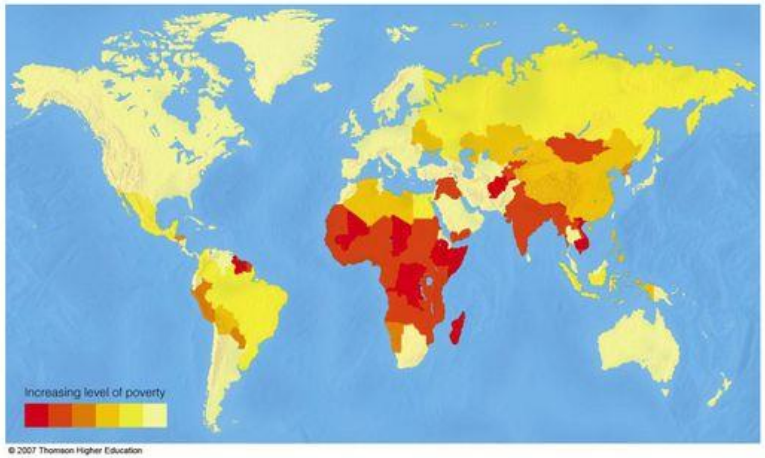
SUSTAINABLE SOCIETIES





- Comparison of developed and developing countries.

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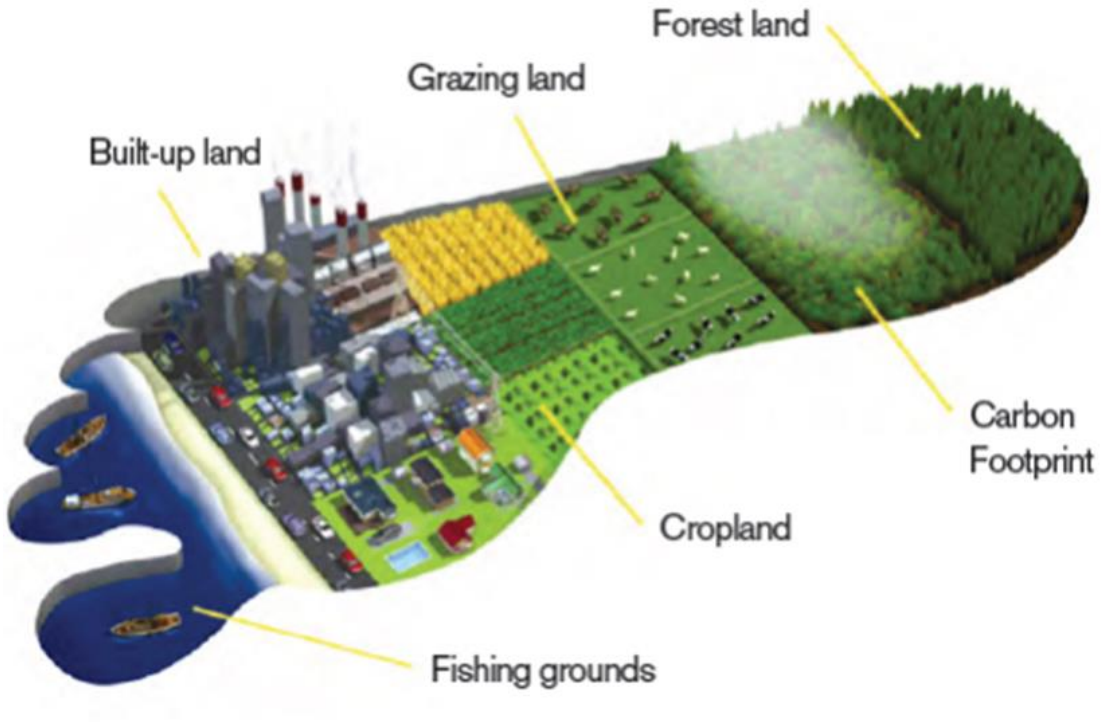
ECOLOGICAL FOOTPRINTS

- **Measures human demand in nature**.
- **Quantity of nature it take to support** people or an economy.



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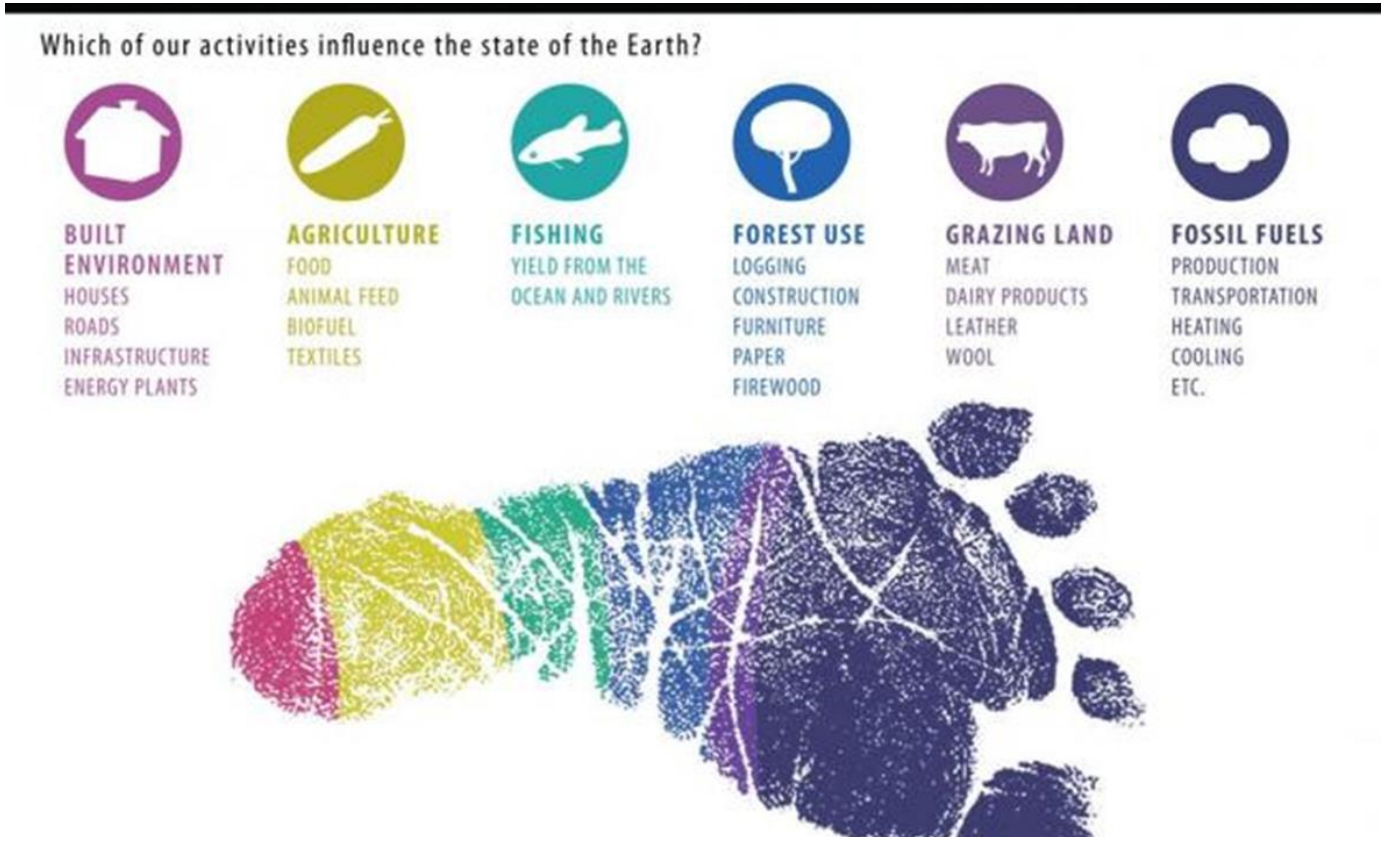
ECOLOGICAL FOOTPRINTS

- How are our ecological footprints affecting the earth?



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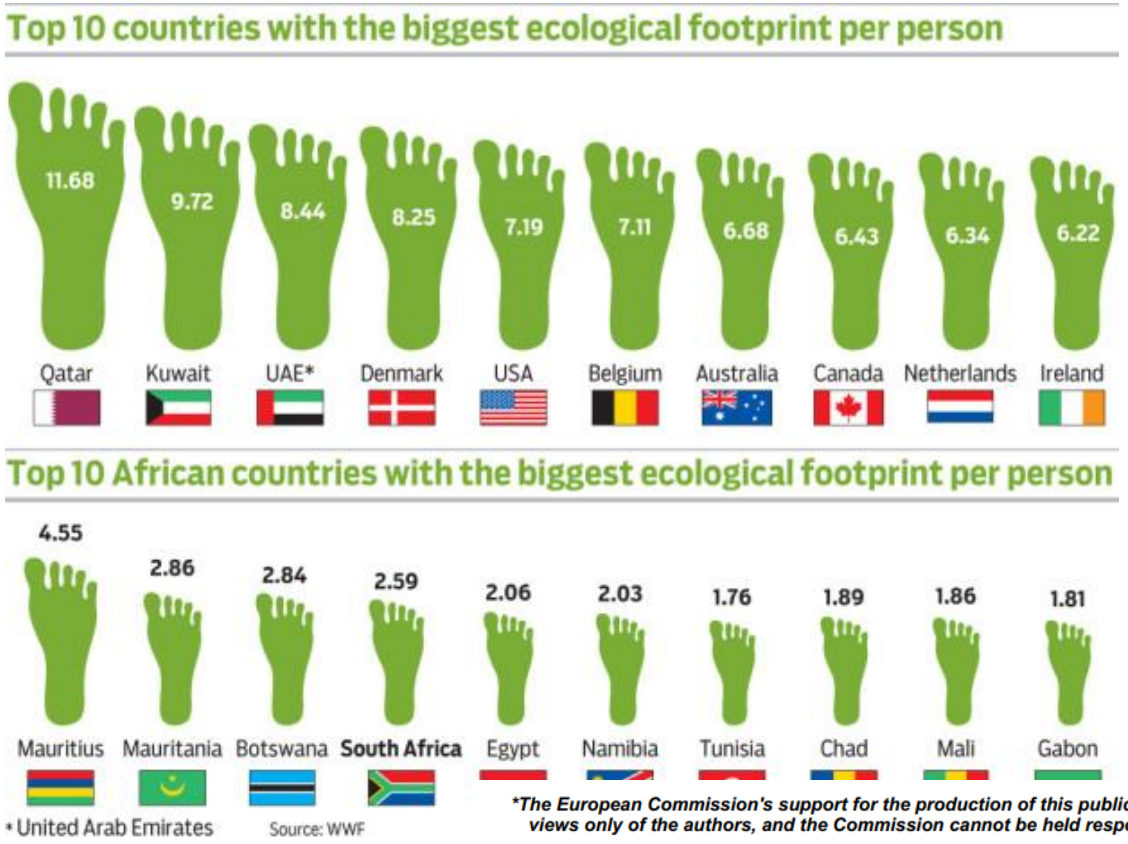
ECOLOGICAL FOOTPRINTS

- Ecological footprint analysis is widely used around the Earth as an **indicator of environmental sustainability**.



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POLLUTION

- **Introduction by human**, directly or indirectly, of substances or energy into natural environment which **resulting in such deleterious effects** as harmful to living resources and hazards to human health.
- **Preventing pollution** is more effective and less costly than cleaning up pollution.
- Pollutants **can enter the environment naturally**, such as from of volcanic eruptions, or through human activities, such as burning coal and gasoline and discharging chemicals into rivers and the ocean.
- Pollutants and three types of unwanted effects:
  - They can disrupt or degrade life-support systems for humans and other species.
  - They can damage wildlife, human health and property.
  - They can create nuisance such as noise and unpleasant smells, tastes and sights.

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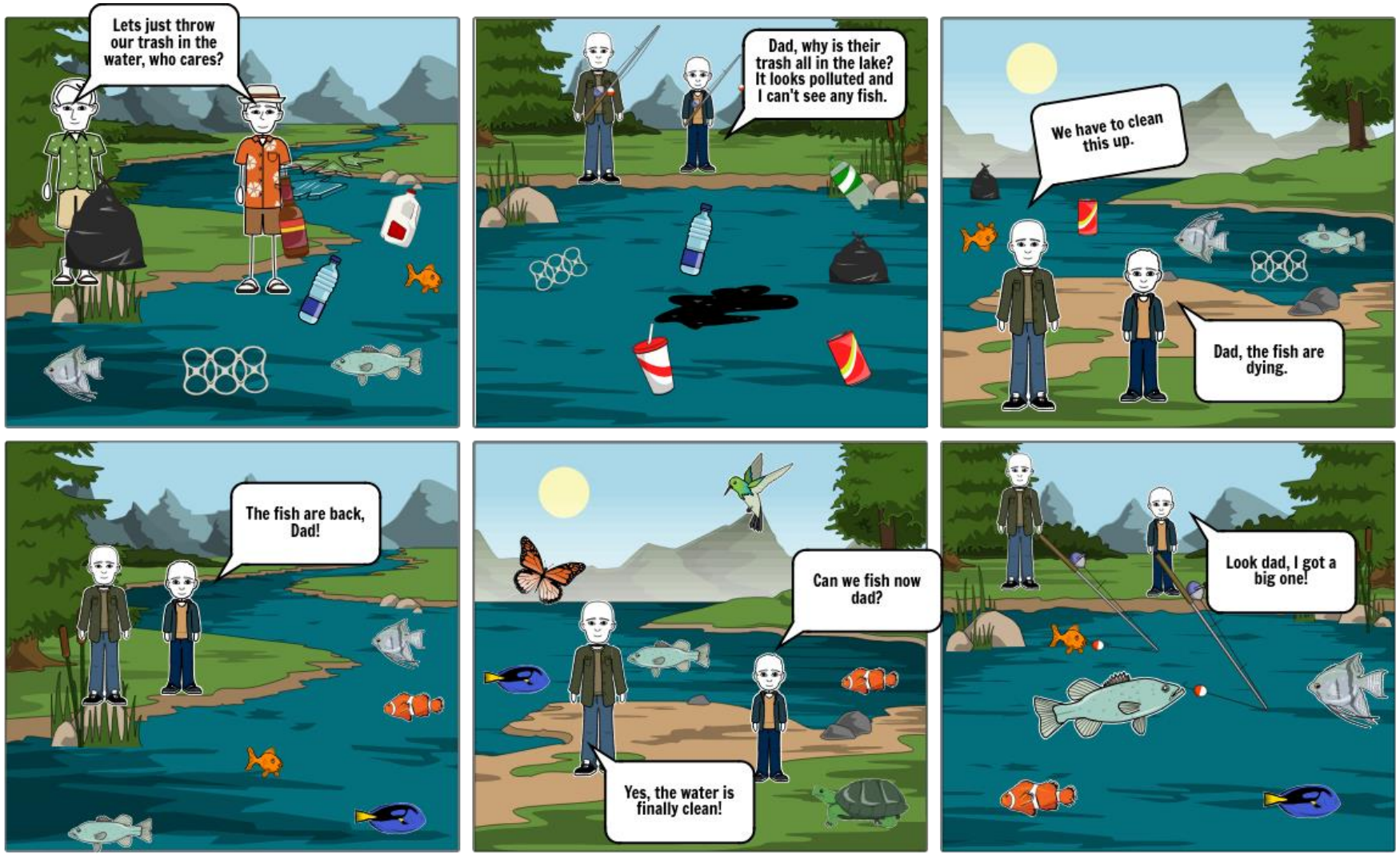
POLLUTION



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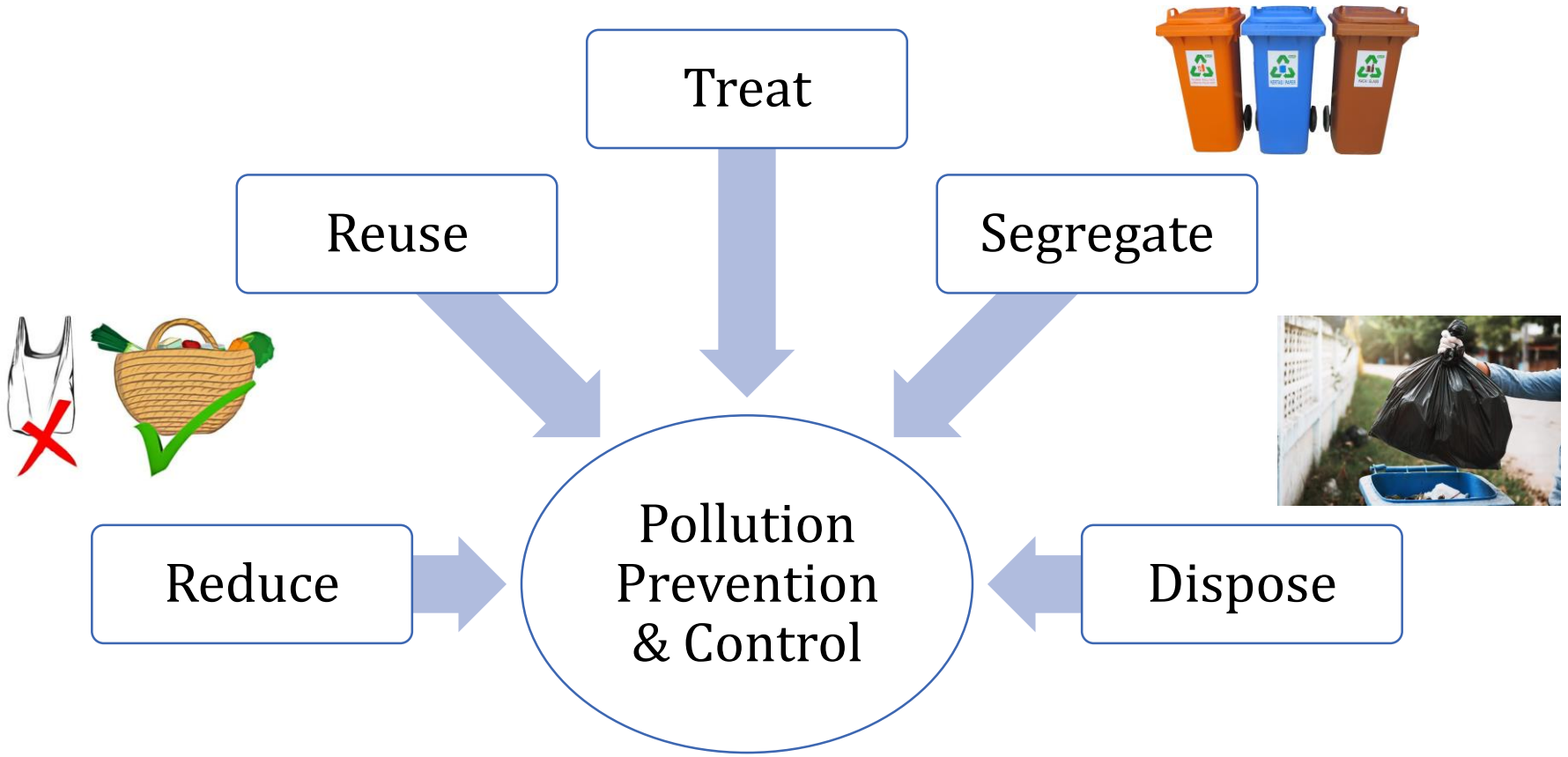
POLLUTION

Pollution prevention



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ENVIRONMENTAL PROBLEMS

- Why do we have environmental problems?
- Four basic causes of environmental problems.

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WHAT CAN WE DO FOR OUR EARTH?

- Any proposed solution has short and long-term advantages and disadvantages that must be evaluated.
- What is our role?
- Why should we care about the environment?

We do not inherit the Earth from our Ancestors,

We borrow if from our Children

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HOW TO LIVE MORE SUSTAINABLY

Current Emphasis	Sustainability Emphasis
Pollution cleanup	Pollution prevention
Waste disposal	Waste prevention
Protecting species	Protecting habitat
Environment degradation	Environmental restoration
Increasing resource use	Less resource waste
Population growth	Population stabilization
Depleting & degrading natural capital	Protecting natural capital


Q&A

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THANK YOU

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 2
ENVIRONMENTAL POLLUTION ISSUES

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ENVIRONMENTAL POLLUTION ISSUES

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LECTURE OUTLINE

- Major pollutants in our environment
- Sources of these pollution
- Impact to environment
- How we can work together to solve the problems

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POLLUTION

- **Any change in the environment** due to anthropological activities.
- **Direct or indirect introduction** as a result of human activity, of substances, vibration, heat or noise into the air, water or land which may be **harmful to human health** or the **quality of the environment**, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment.
- BUT not all pollution is caused by substance? Example?

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SEVERITY OF POLLUTION

- **Three factors** determine severity of pollution:
  - **Concentration** → The amount of substance in unit volume of air, water or other medium. ppm 1 part of pollutant in million parts of the gas, liquid or solid substance.
  - **Persistence** → Measure of how long the pollutant stays in air, water, soil of body.
  - **Chemical nature**

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POLLUTANT

- Pollutants are **four categories** up on their persistence:

Degradable Pollutants:

- Breakdown completely or reduced to acceptable levels by natural physical, chemical and biological processes – microorganism
- Example : Paper products, vegetable, seed, leaves

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POLLUTANT

- Pollutants are **four categories** up on their persistence:

Biodegradable Pollutants:

- Complex chemical pollutants that breakdown by living organisms (Bacteria).
- Example: Human sewage

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POLLUTANT

- Pollutants are **four categories** up on their persistence:

Slowly degradable Pollutants:

- Degradable in decades
- Example : Plastics, cans

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POLLUTANT

- Pollutants are **four categories** up on their persistence:

Non-degradable Pollutants:

- Chemicals that natural process cannot breakdown.
- Example : DDT, mercury, lead, arsenic, silicon-based materials

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TYPES OF POLLUTION

- Major types of pollution
  - Water Pollution
  - Air Pollution
  - Thermal Pollution
  - Noise Pollution
  - Soil Pollution

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WATER POLLUTION

- Water pollution is any **chemical, biological or physical change in water quality** that **harms living organisms** or makes water unsuitable for desired uses.
- The substances that cause water pollution are called **pollutants**.
- Water pollution causes illness and death in humans and other species and disrupt ecosystems.
- The main sources of water pollution are agricultural activities, industrial facilities, and mining, but growth in population and source use makes it increasingly worse.

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WATER POLLUTION

- Water pollution can come from **single (point) source**, or from **larger and dispersed (nonpoint) sources**.
- **Point Source Pollution** → Specific source of pollution that can be identified. Example: A pipe gushing colored water into a river
- **Nonpoint Source Pollution** → A widely spread source of pollution that can't be tied to a specific point of origin is called nonpoint source pollution. Example: Runoff from a farm field, a street, or a construction site

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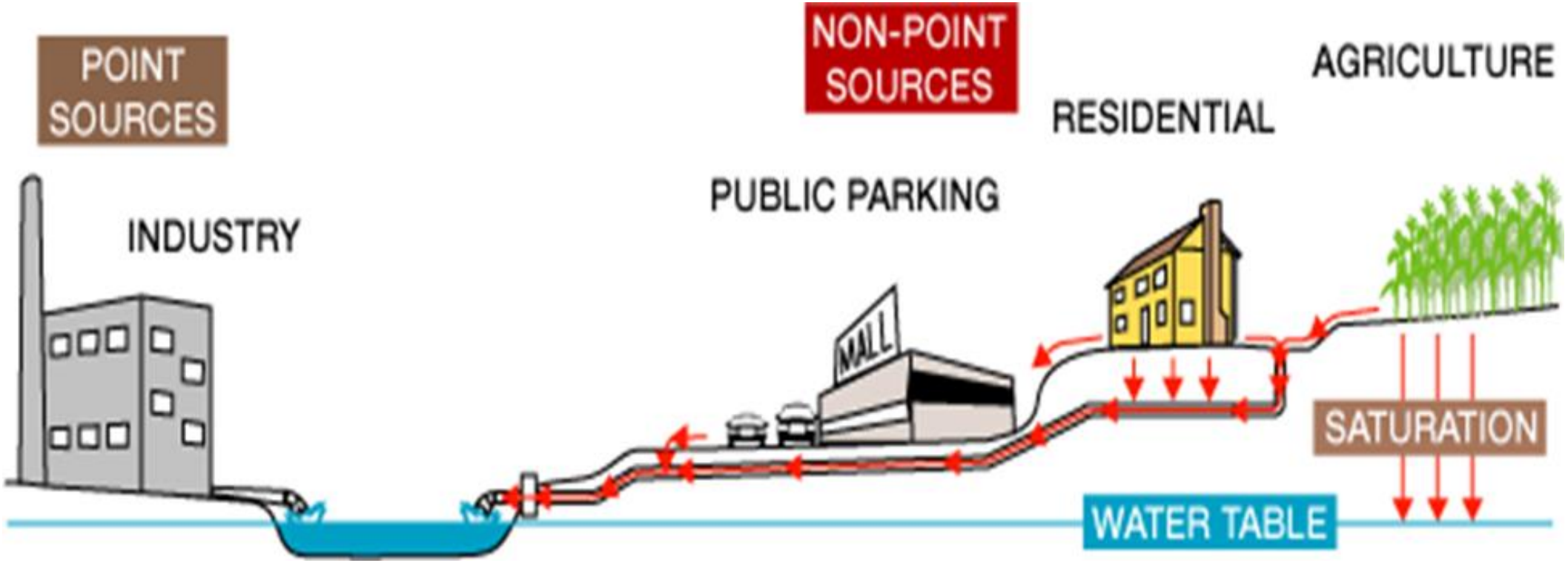
WATER POLLUTION



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WATER POLLUTION

- The three major sources of water pollution are **human wastes**, **industrial wastes**, and **chemical runoff**.

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WATER POLLUTION

Sewage in cities

- During heavy rains or floods, sanitary sewers sometimes overflow and can pollute the surface water.

Sewage in Rural Areas

- In rural areas, people must be careful where they locate septic tanks. If a tank is too near a stream or on a hill, wastewater can leak into the stream or flow downhill to the area of a well.
- Wastes from cattle, pigs, and chickens can also be a problem in rural areas. Animal wastes can run off from pastures and barn yards and pass disease-causing bacteria and other kinds of pollution into bodies of water.

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WATER POLLUTION

Industrial wastes

- Chemicals, smoke , and heated water are three types of pollutants produced by factories, mines, and other industries.
- Heated water: the change in temperature decreases oxygen supply and affects ecosystem composition

Chemicals

- Many factory processes involve toxic chemicals and strong acids.
- Other toxic wastes are produced as a result of manufacturing and mining processes.
- Although laws control many point sources of chemical pollution, some factories still release toxic chemicals directly into nearby rivers and lakes.

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WATER POLLUTION

Major pollution problems

- Chemicals used in agriculture, industry, transportation, and homes can spill and leak into groundwater and make it undrinkable.
- There are simple ways and complex ways to purify drinking water, but protecting it through pollution prevention is the least expensive and most effective strategy.

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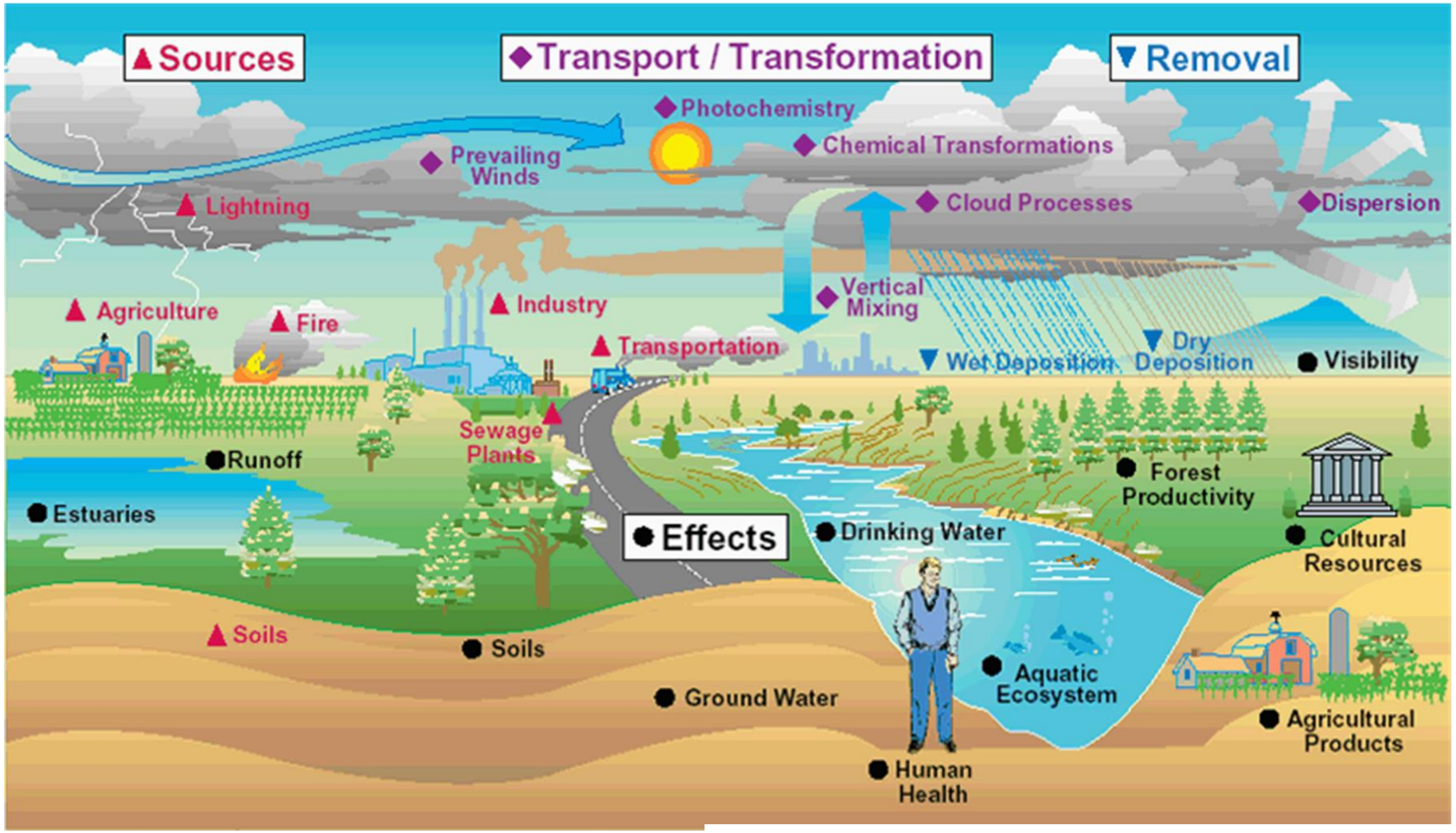
WATER POLLUTION



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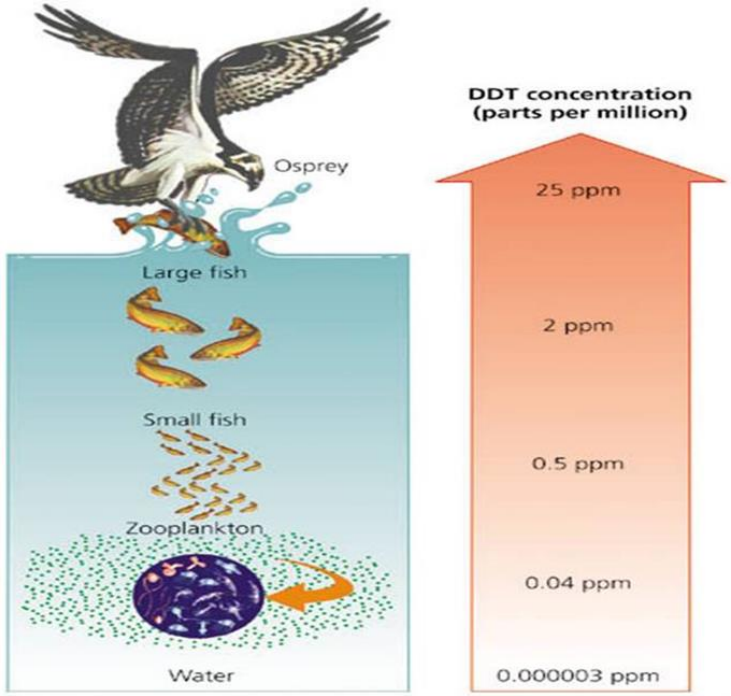
WATER POLLUTION

Major water pollution problems affecting oceans

- The great majority of ocean pollution originates on land and includes oil and other toxic chemicals and solid wastes, which threaten aquatic species and other wildlife and disrupt marine ecosystems.
- The key to protecting the oceans is to reduce the flow of pollutants from land and air and from streams emptying into these waters.
- A very small amount of DDT in water can build up to harmful levels in living organisms.



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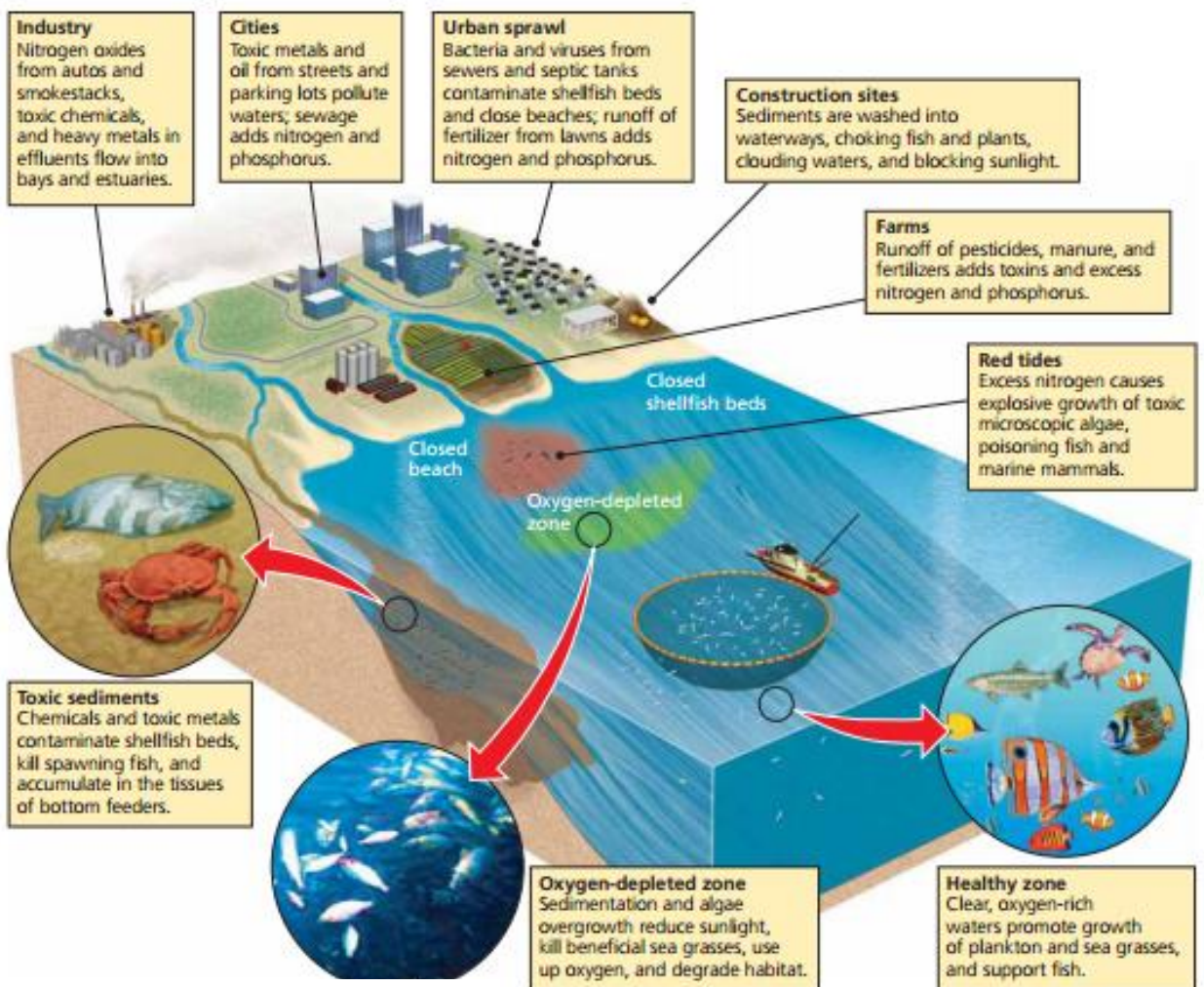
WATER POLLUTION



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WATER POLLUTION

Microbeads

- Microbeads are small pieces of plastic (ranging in size from 10 micrometers to 1 mm) commonly found in facial cleansers, body scrubs and soap.
- They are washed into waterways where they settle into sediment.
- The small plastic pieces can be consumed by marine life, and scientists believe they are also likely to attract other pollutants such as oils and pesticides.
- Humans can ingest microbeads when eating contaminated fish.

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WATER POLLUTION

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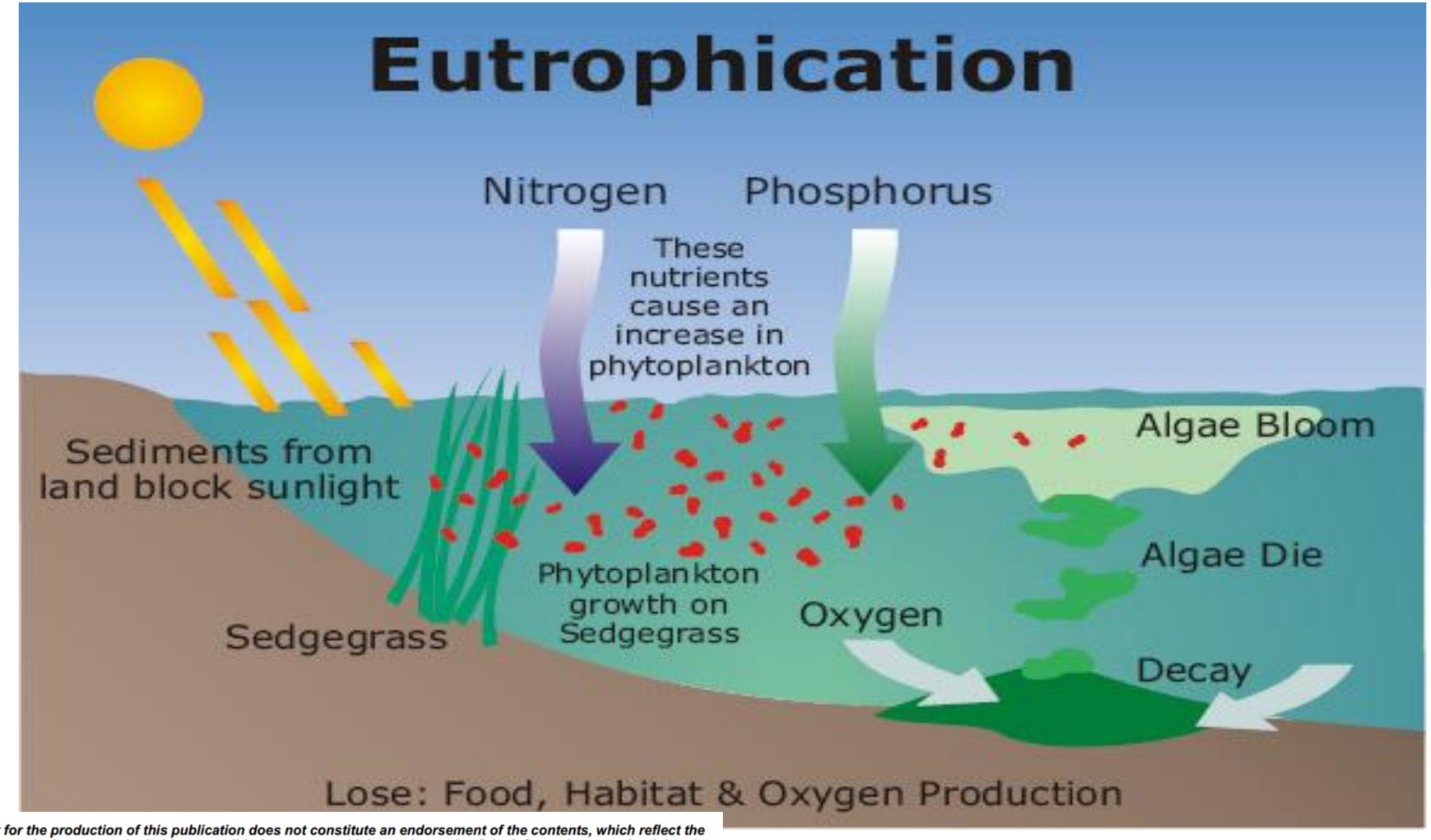
WATER POLLUTION



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WATER POLLUTION

Bioremediation

- Living organisms helping cleanup pollution.
- Plant roots filter larger particles from the water.
- Certain bacteria consume oil and have been used to cleanup oil spills.
- Natural and artificial wetlands can be used to clean up water pollution.
- Wetlands have been built near coal mines to treat acidic mining runoff before it returns to the environment.

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WATER POLLUTION

How Can We Best Deal with Water Pollution?

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AIR POLLUTION

- Air pollution is the **presence of chemicals in the atmosphere** in concentrations high enough to **harm organisms, ecosystems, or human-made materials**.
- The effects of air pollution range from annoying to lethal.

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AIR POLLUTION

- Air pollution comes from **natural and human sources**
- Natural sources include dust blown by wind, pollutants from wildfires, volcanic eruptions.
- Most natural air pollutants are spread out over the globe or removed by chemical cycles, precipitation and gravity.
- Human inputs of outdoor air pollutants occur mostly in industrialized and urban areas where people, cars, are factories are concentrated.
- Pollutants of major public health concern include particulate matter, carbon monoxide, nitrogen dioxide and sulphur dioxide.

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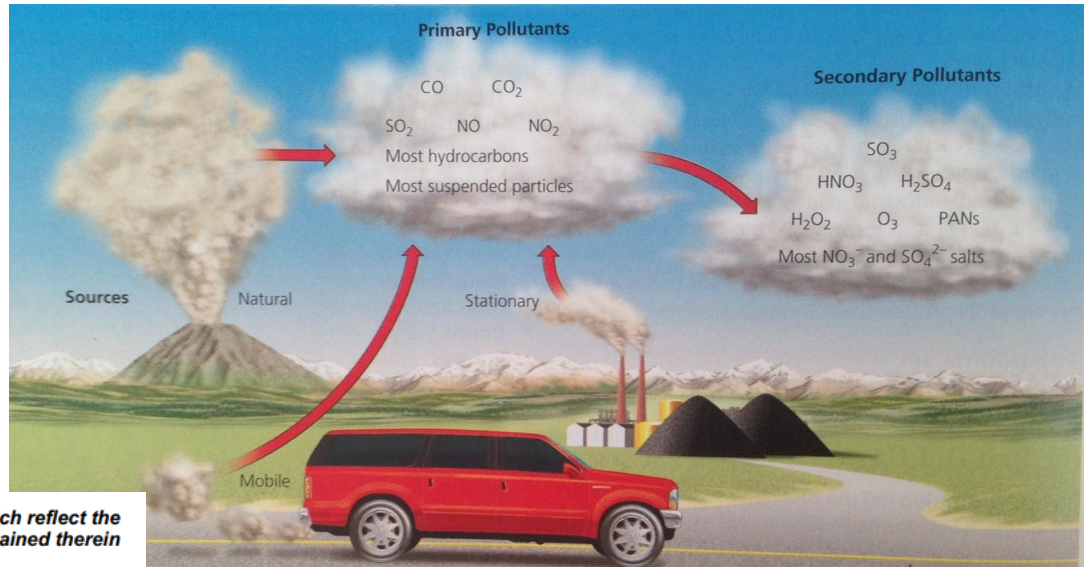
AIR POLLUTION

- Scientist classify outdoor air pollutants into two categories.
  - **Primary pollutants** → Harmful chemicals emitted directly into the air from natural processes and human activities.
  - **Secondary pollutants** → While in the atmosphere, some primary pollutants react with one another and with the basic components of air to form new harmful chemicals



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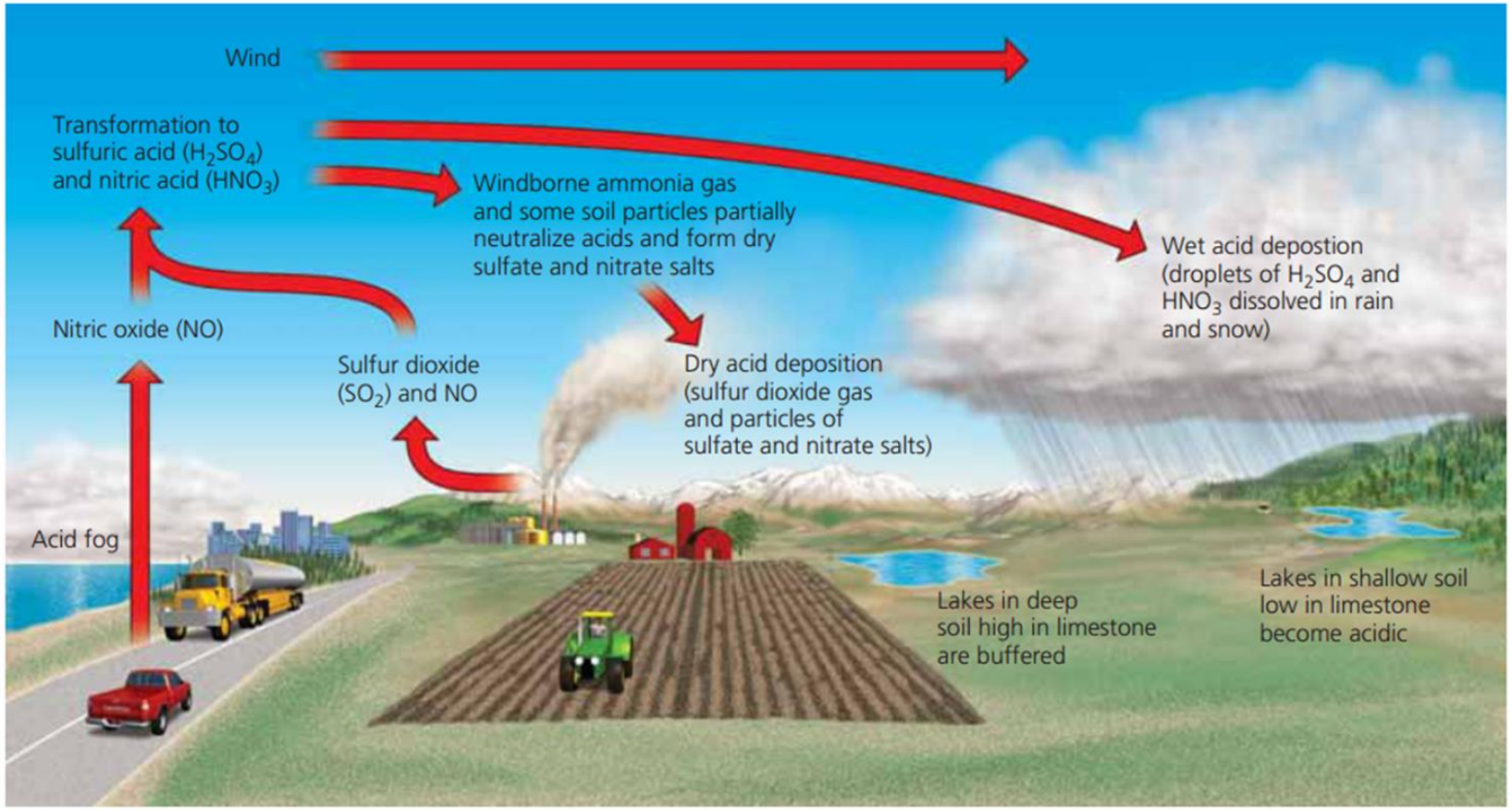
AIR POLLUTION



CENGAGENOW™ **Active Figure 18-12 Natural capital degradation:** *acid deposition,* which consists of rain, snow, dust, or gas with a pH lower than 5.6, is commonly called acid rain. Soils and lakes vary in their ability to neutralize excess acidity. *See an animation based on this figure at* CengageNOW. **Question:** What are three ways in which your daily activities contribute to acid deposition?

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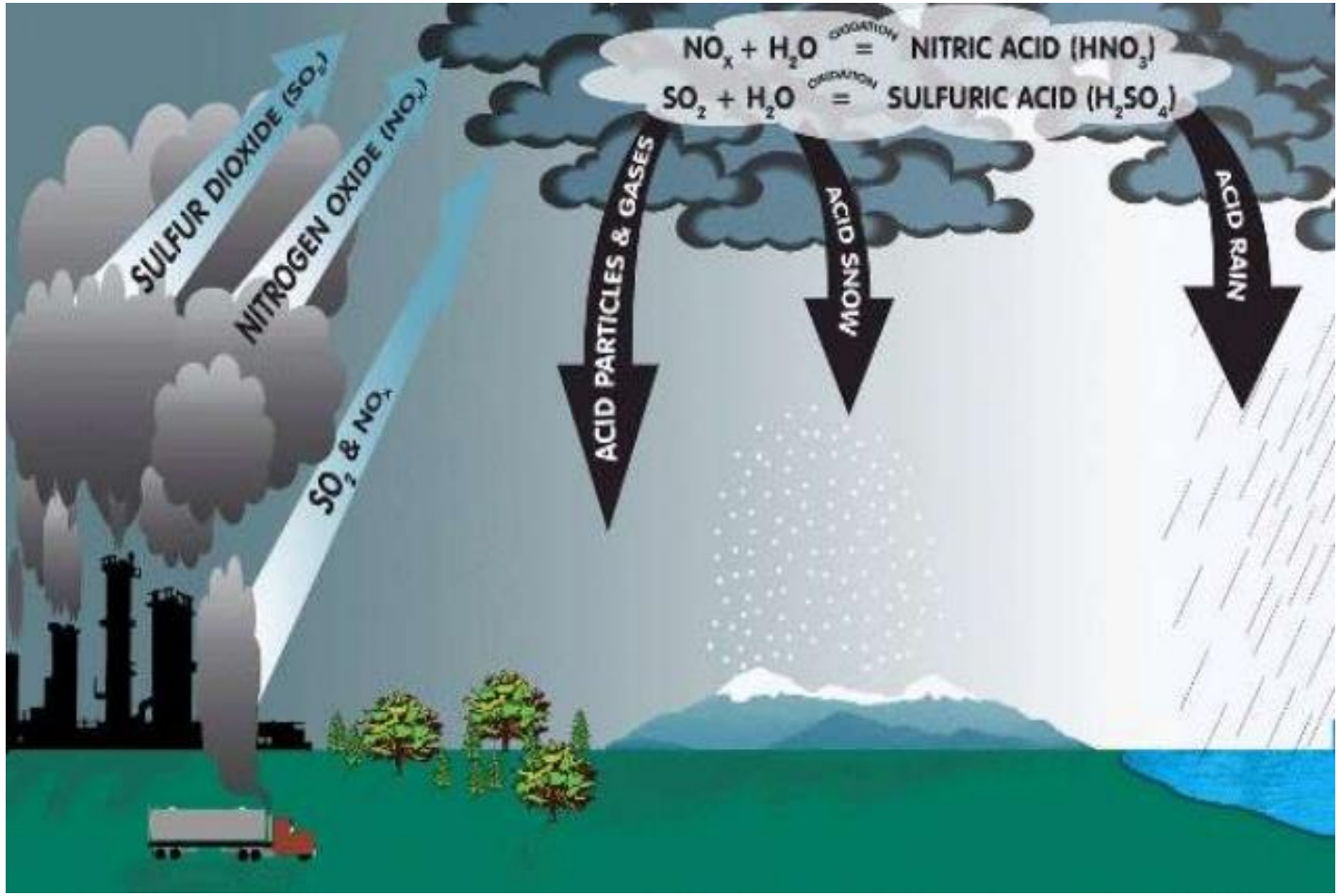
AIR POLLUTION



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AIR POLLUTION

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THERMAL POLLUTION

- Much of the water in factories is used to **cool machinery or metal objects**.
- The hot water alone can act as a pollutant.
- Many water organisms can live in only a **narrow range of temperatures**.
- Warm water released by factory into a nearby river or pond raises the temperature of the water, sometimes enough to harm the living things there.
- When water used as a coolant is returned to the aquatic environment at a higher temperature, the change in temperature **decrease oxygen supply** and affect the ecosystem composition.
- Urban run-off and storm water discharge to surface waters from road and parking lots can also be a source of elevated water temperatures.

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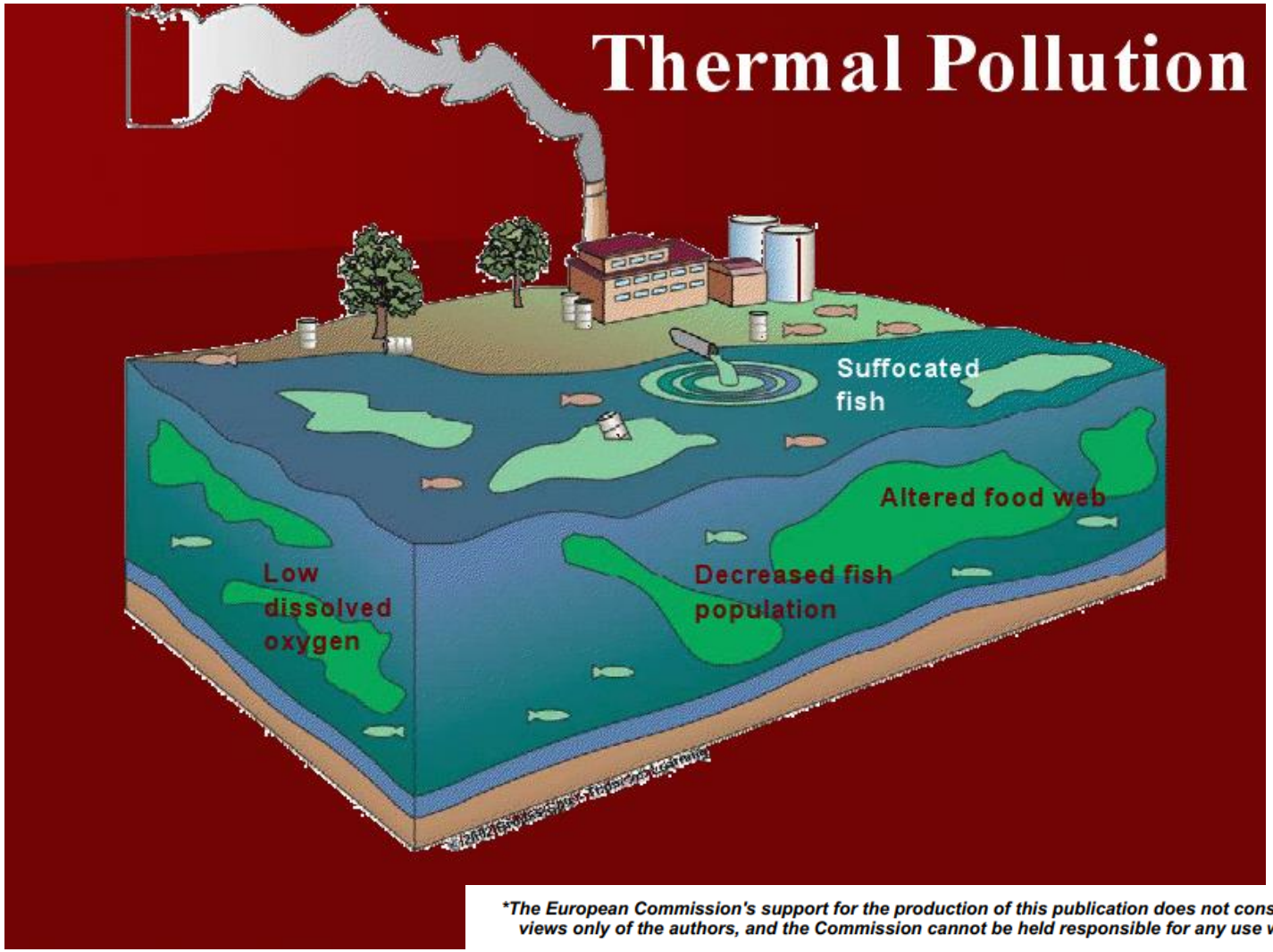
THERMAL POLLUTION



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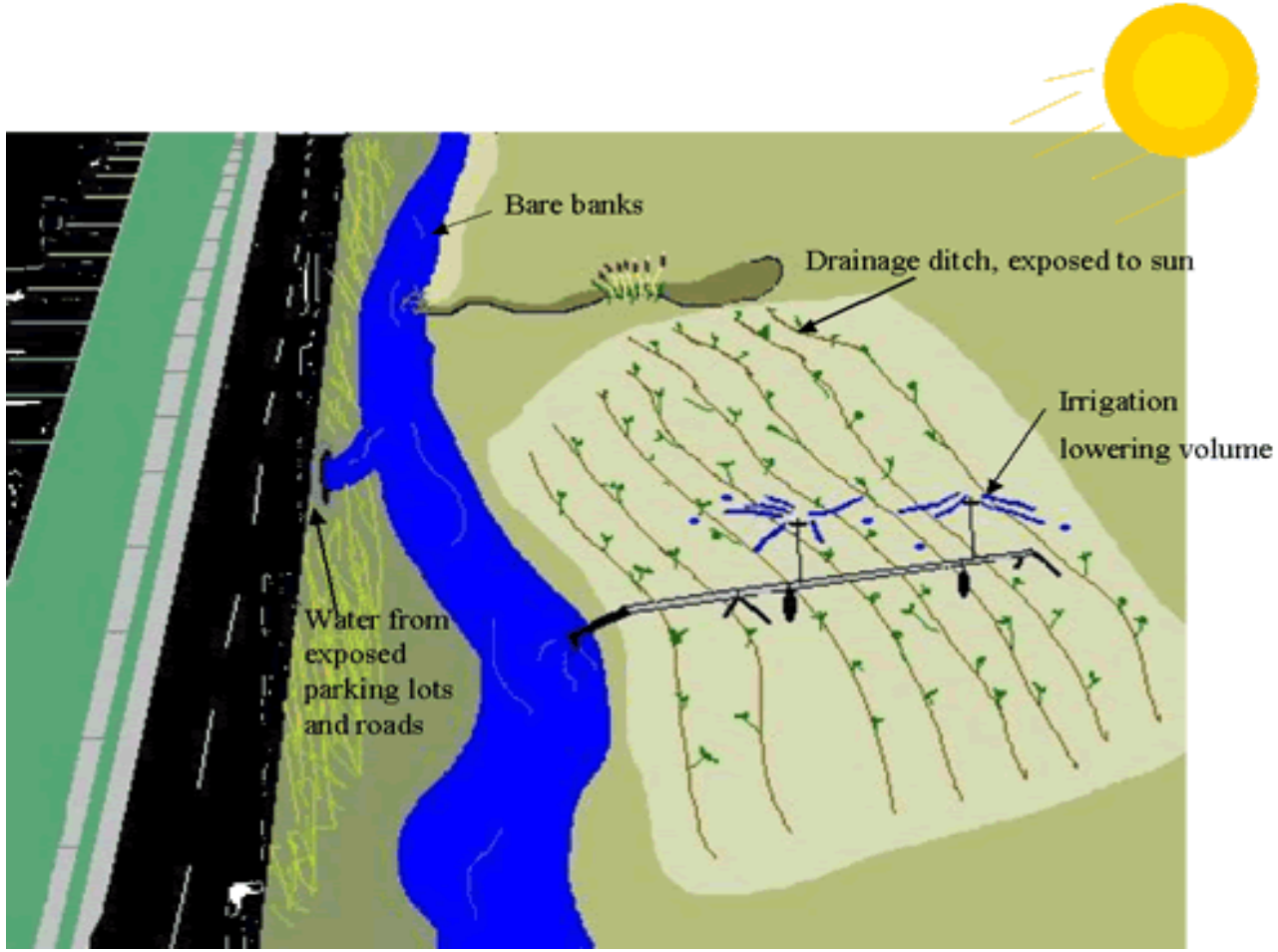
THERMAL POLLUTION



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THERMAL POLLUTION

- When a power plant first opens or shuts down for repair or other causes, fish and other organism adapted to particular temperature range can be killed by the abrupt change in water temperature → **THERMAL SHOCK**

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THERMAL POLLUTION

Any suggestion to solve/minimize the problem

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NOISE POLLUTION

- Most urban dwellers are subjected to noise pollution: any **unwanted, disturbing, or harmful sound** that impairs or interferes with hearing, causes stress, hampers concentration and work efficiency, or causes accidents.
- Noise levels are measured in decibel (dB) sound pressure units that vary with different human activities.
- Sound pressure becomes damaging at about 85 dB and painful at around 120 dB. At 180 dB it can kill.
- Prolonged exposure to sound levels above 85 dB can cause permanent hearing damage.

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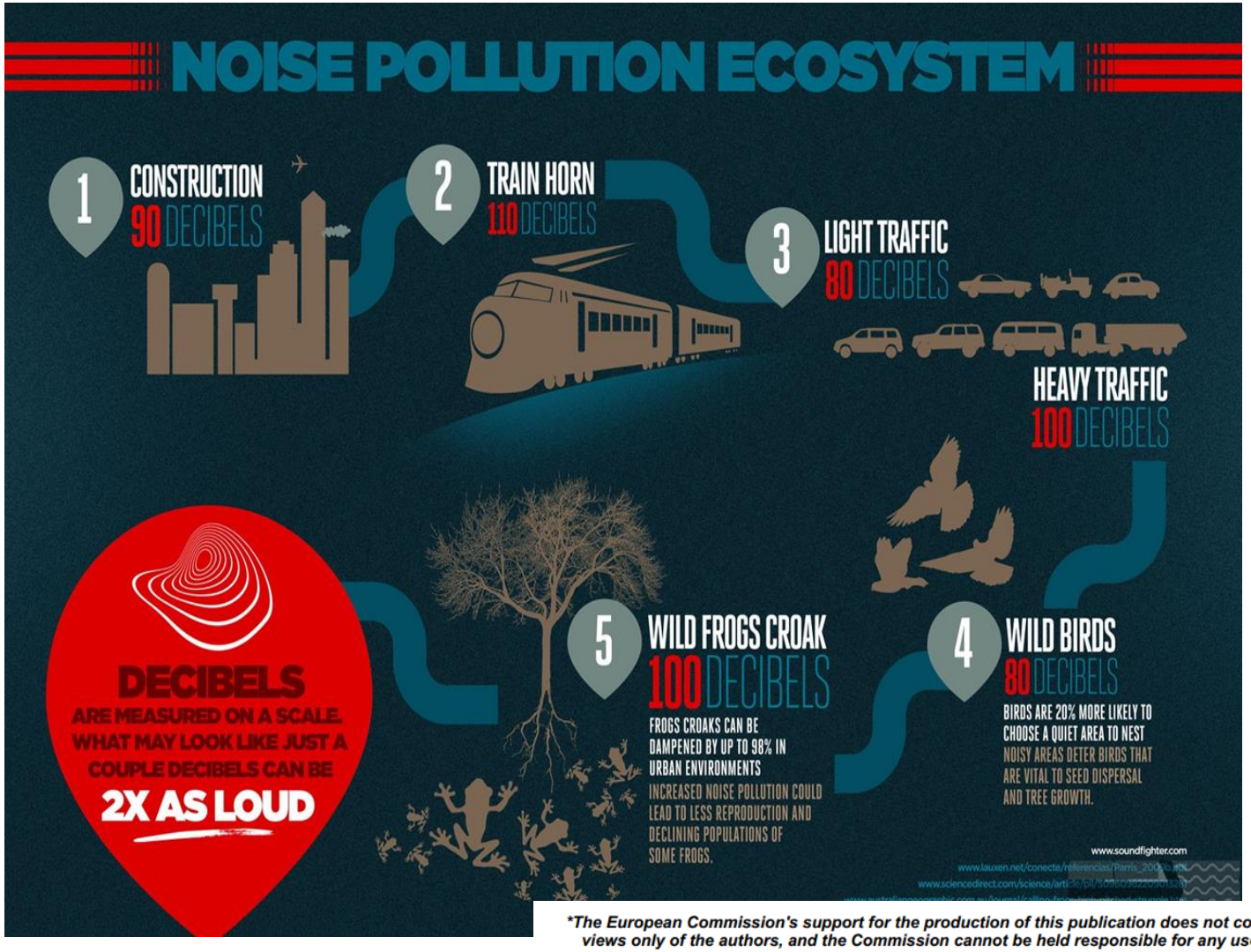
NOISE POLLUTION



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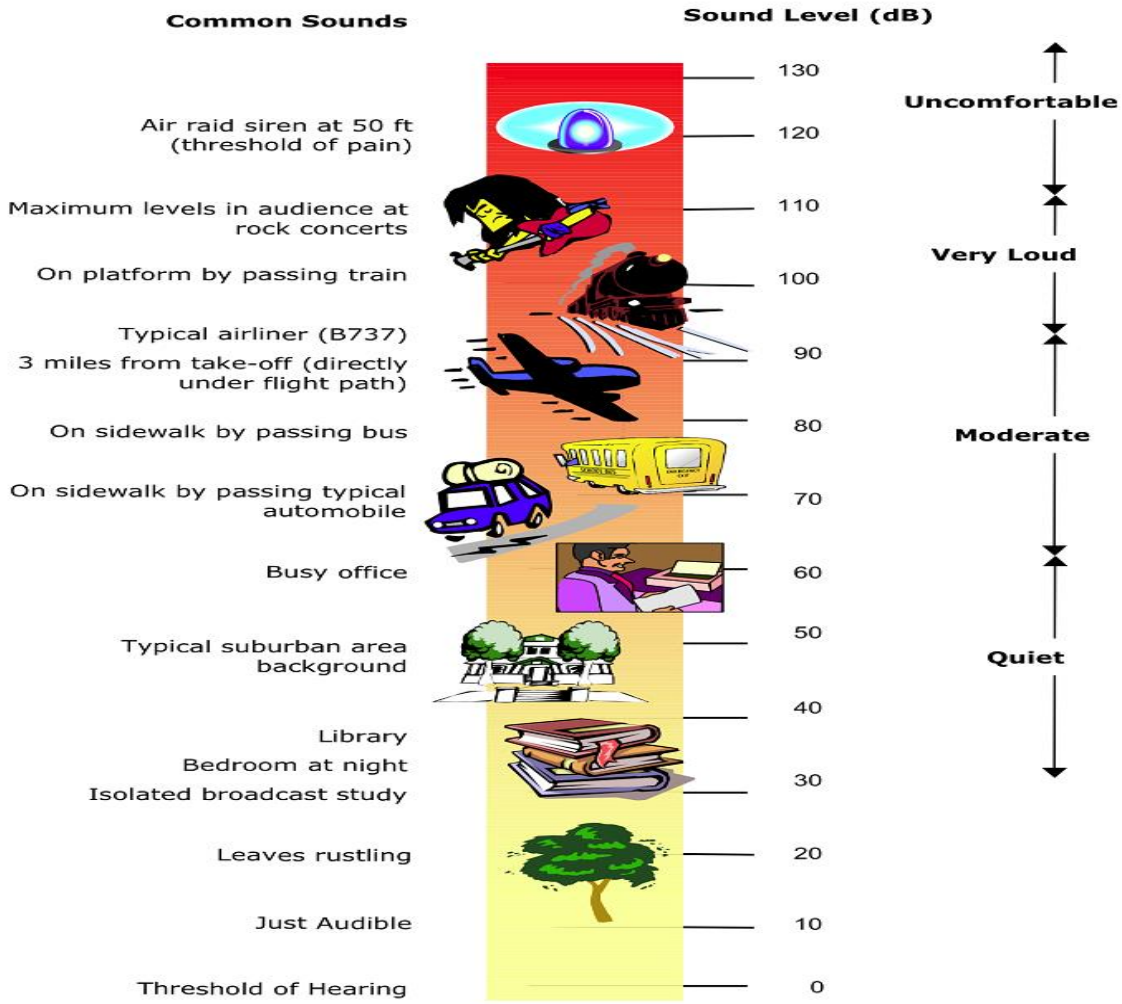
NOISE POLLUTION



Source: Handbook of Environmental Acoustics, James P. Cowan, 1994

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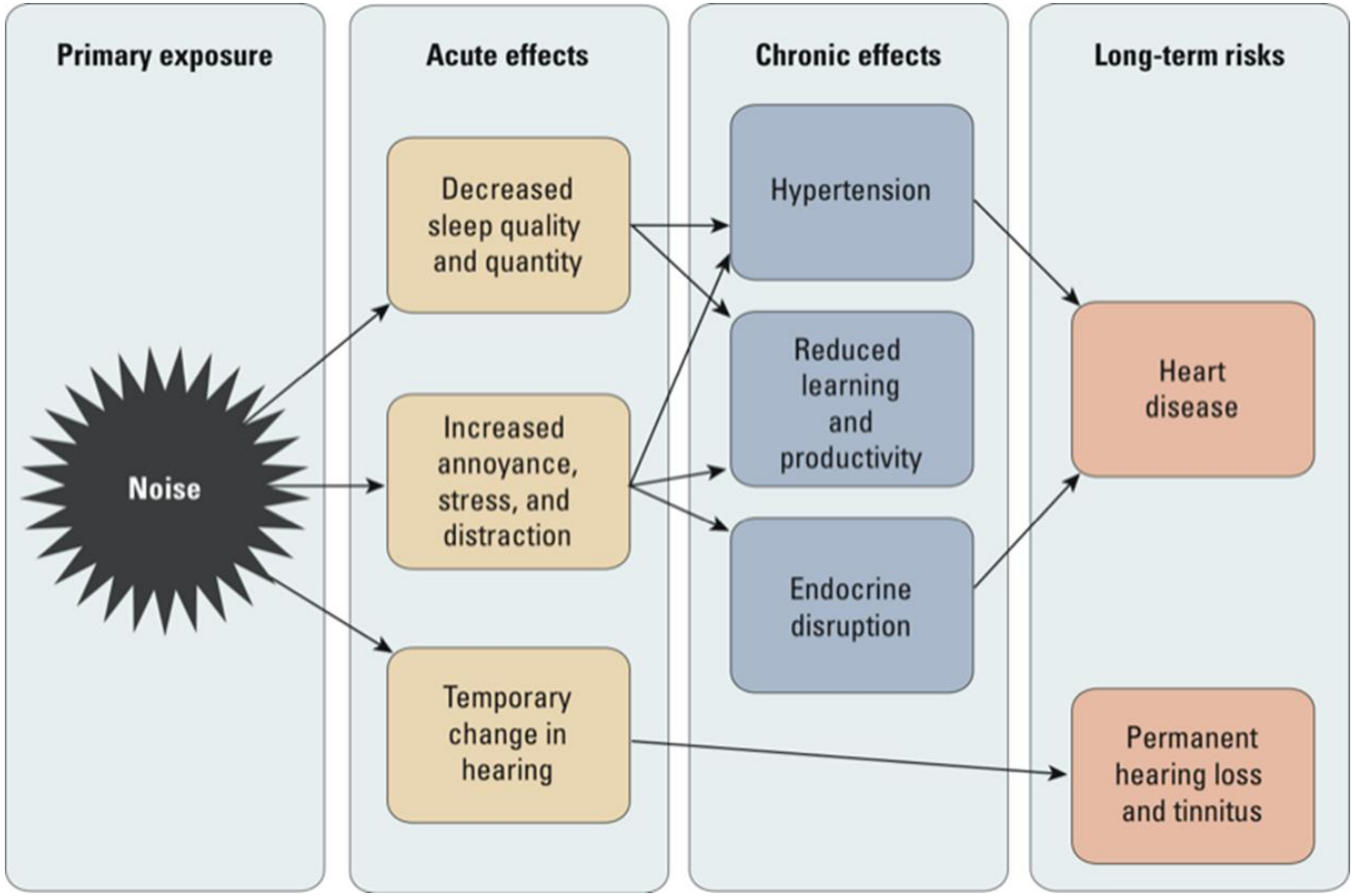
NOISE POLLUTION

Effects of noise pollution



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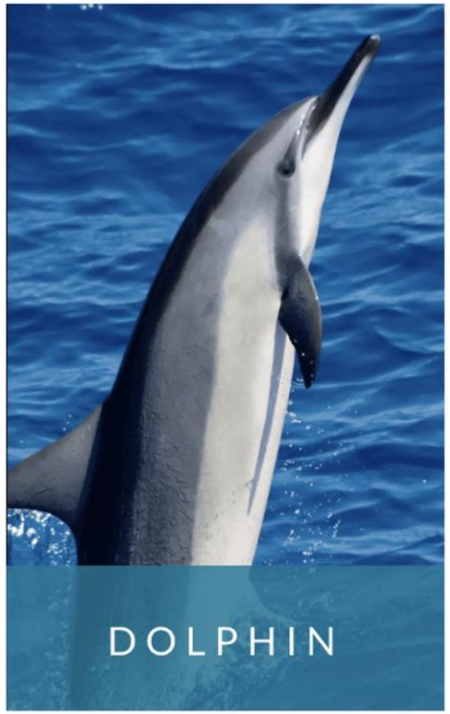
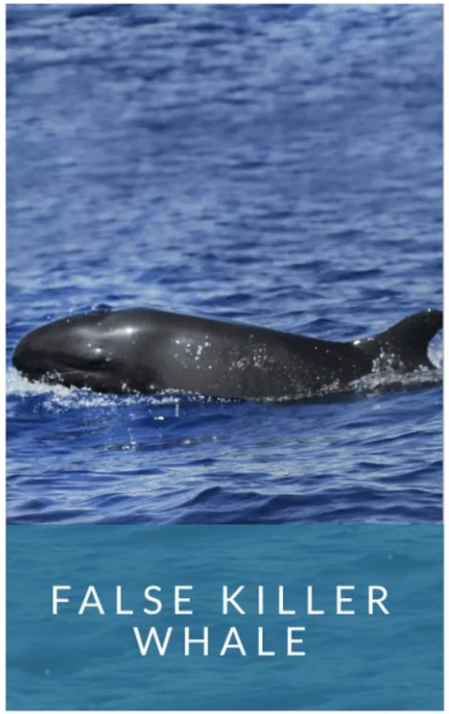
NOISE POLLUTION

Impact to marine organisms?





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NOISE POLLUTION

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SOIL POLLUTION

- Dumping garbage, waste, and other toxins making the **land contaminated** or **polluted**.
- Degradation of earth's land surfaces often caused by human activities and its misuse.
- Deposition of solid or liquid waste materials on land or underground in a manner that can contaminate the soil and groundwater, threaten public health, and cause unsightly conditions and nuisances.
- Waste materials that cause land pollution are broadly classified as municipal solid waste, construction and demolition waste or debris, and hazardous waste.

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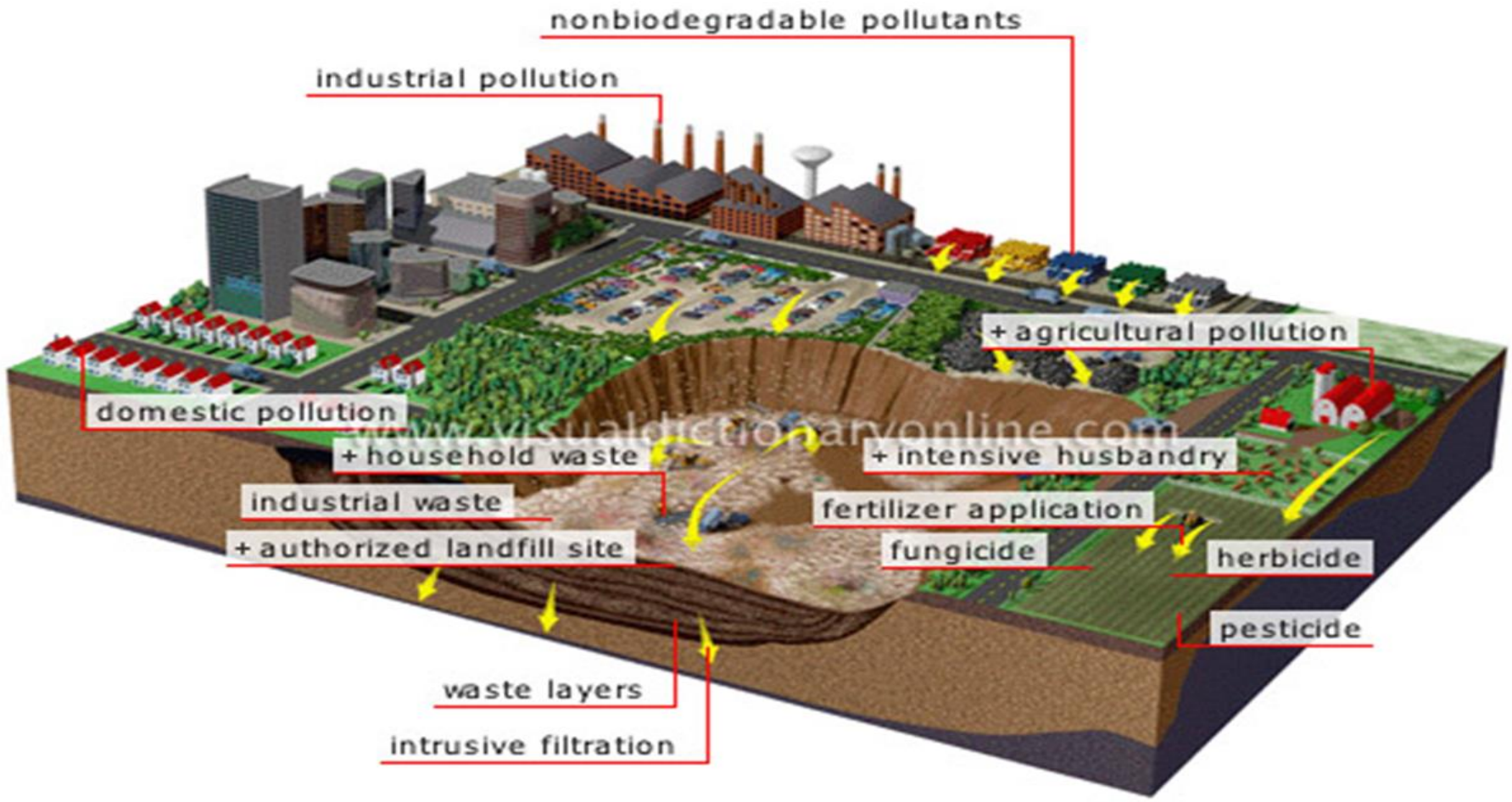
SOIL POLLUTION



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SOIL POLLUTION

- Type of pollution
  - Agriculture
  - Industrial
  - Landfill
  - Deforestation
  - Mining

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SOIL POLLUTION

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SOIL POLLUTION

Our problems? What we can do?


Q&A

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— MMS3003 —

ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

THANK YOU

Assoc. Prof. ChM. Dr. Ong Meng Chuan
Marine Science Program
Faculty of Science and Marine Environment
Universiti Malaysia Terengganu

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 3
ACT LOCALLY THINK GLOBALLY

Assoc. Prof. ChM. Dr. Ong Meng Chuan
Marine Science Program
Faculty of Science and Marine Environment
Universiti Malaysia Terengganu

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ACT LOCALLY THINK GLOBALLY

- These lecture material are for the **Marine Coastal and Delta Sustainability for Southeast Asia (MARE)**(Project No 610327-EPP-1-2019-1-DE-EPPKA2-CBHE-JP)
- This project has been funded with support from the **European Commission**. This publication **reflects the views only of the authors**, and the Commission cannot be made responsible for any use which may be made from the information contained herein.
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LECTURE OUTLINE

- Definition of Act Locally Think Globally
- Our role to care and protect environment
- Suggest actions can be taken

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ACT LOCALLY THINK GLOBALLY

- The phrase has been echoed around the world millions of times in recent years.
- Focus on your local environment and your **small acts will add up, slowly leading to change in an office, then a neighborhood, then a community, a city, a state, and so on**.
- This idea has traditionally been associated with the environment and sustainability, but it can be applied to food consumption, politics, the arts, and much more.
- In today's changing markets, it's time for us to consider what 'think globally, act locally' can mean for corporate social responsibility.

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ACT LOCALLY THINK GLOBALLY

- Example : Issue of reducing or even eliminating the use of plastics (especially single-use).
- The move could potentially serve many environmental goals that include, most prominently, the reduction of marine litter.
- Elimination of plastics could also seem consistent with climate action since plastic production requires fossil fuels as a feedstock.
- These products also release methane and carbon during decomposition, which contrasts with plastics that actually sequester carbon and decompose very slowly.

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ACT LOCALLY THINK GLOBALLY

- To think globally means that we must be really conscious that all human beings live on the same planet, in a moving environment managed by biodiversity within the frame of nature's laws.
- And that each of our acts has an impact for all.

Earth is one. Life is one.

- If we cut ourselves from this idea, we are lost.
- So, that means that we must have a holistic view of the world — with its differences insides cultures and societies, in each territory, in each community.

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ACT LOCALLY THINK GLOBALLY

- To act local is obvious.
- In the economical frame, it means that particularly food products should be proposed on the base of local resources and sold locally for the most fresh of them.
- Of course, transformed products (canned in a glass jar for example) can have a longer life and eventually can travel anywhere, but provided that the means of transport has no impact on the environment.

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ACT LOCALLY THINK GLOBALLY

- To act locally by thinking globally: **to provide answers to a territory by adapting them to the environment and by anticipating their consequences on the planet**.
- Here, the concept of sustainable development fits into this approach.

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ACT LOCALLY THINK GLOBALLY

- Another way of describing the meaning of the phrase is that people should think about the global significance on the environment while they take action to improve their local environment.
- For instance, you can think about the problem with trash disposal across the world, but to avoid being stymied by the scope of the problem, you can reduce your own waste and recycle more which is a step in solving the world-wide problem.
- To the extent that more and more people take local actions, the positive effects spread wider and wider.

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ACT LOCALLY THINK GLOBALLY

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ACT LOCALLY THINK GLOBALLY

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ACT LOCALLY THINK GLOBALLY

Our role to care and protect environment? Our responsibility?

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ACT LOCALLY THINK GLOBALLY

Our role to care and protect environment? Our responsibility?

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ACT LOCALLY THINK GLOBALLY

Can you name ONE example?


Q&A

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 4
CLIMATE CHANGE AND GLOBAL WARMING

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CLIMATE CHANGE AND GLOBAL WARMING

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LECTURE OUTLINE

- Climate Change vs Global Warming
- How weather affected climate change and global warming
- Impact to environment
- How to solve the problems

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GLOBAL WARMING

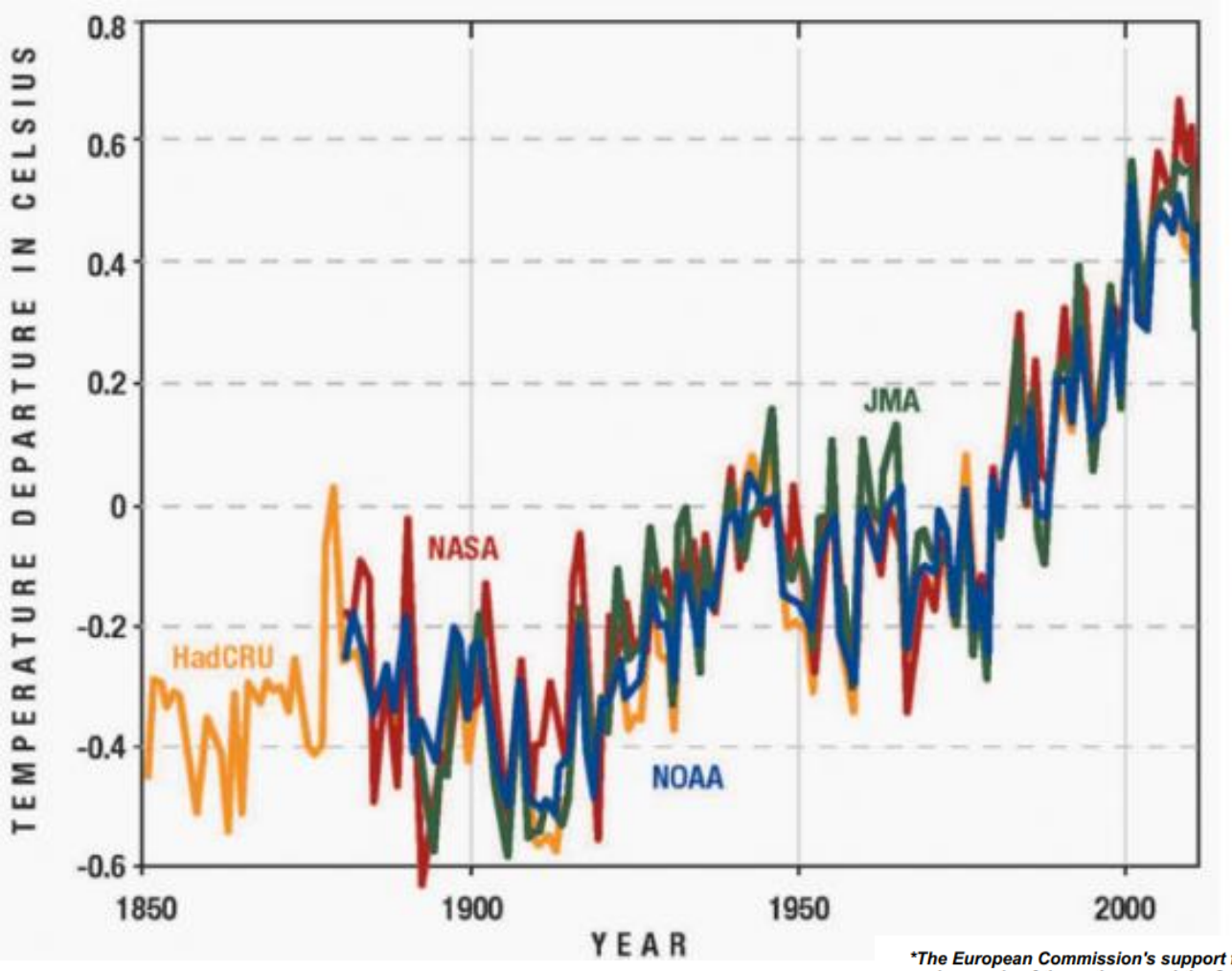

FIGURE 20.2 The temperature difference between the average at the end of the 19th century and the years between 1860 and today. This graph shows the difference between calculated world surface temperatures for each year and the average at the end of the 19th century. Temperature departure refers to changes in mean global temperature from some standard such as 1951–1980. Climatologists studying climate change prefer, in general, to look at the difference between temperatures at one time compared to another, rather than the actual temperature, for a variety of technical reasons. (*Source:* Hadley Meteorological Center, Great Britain.) http://www.metoffice.gov.uk/corporate/pressoffice/myths/2.html)

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GLOBAL WARMING

- The modern concern about global warming arise from two kinds of observations:
  1. **average surface temperature of the Earth from 1850 to the present**
  2. **measurement of carbon dioxide concentrations in the atmosphere**

- Several questions need to be answered
  - ❑ **To what extent, have people caused it?**
  - ❑ **What are likely to be the effects on people?**
  - ❑ **What are likely to be the effects on all life on Earth?**
  - ❑ **How can we make forecasts about it and other kinds of climate change?**
  - ❑ **What can we do to minimize potential negative effects?**

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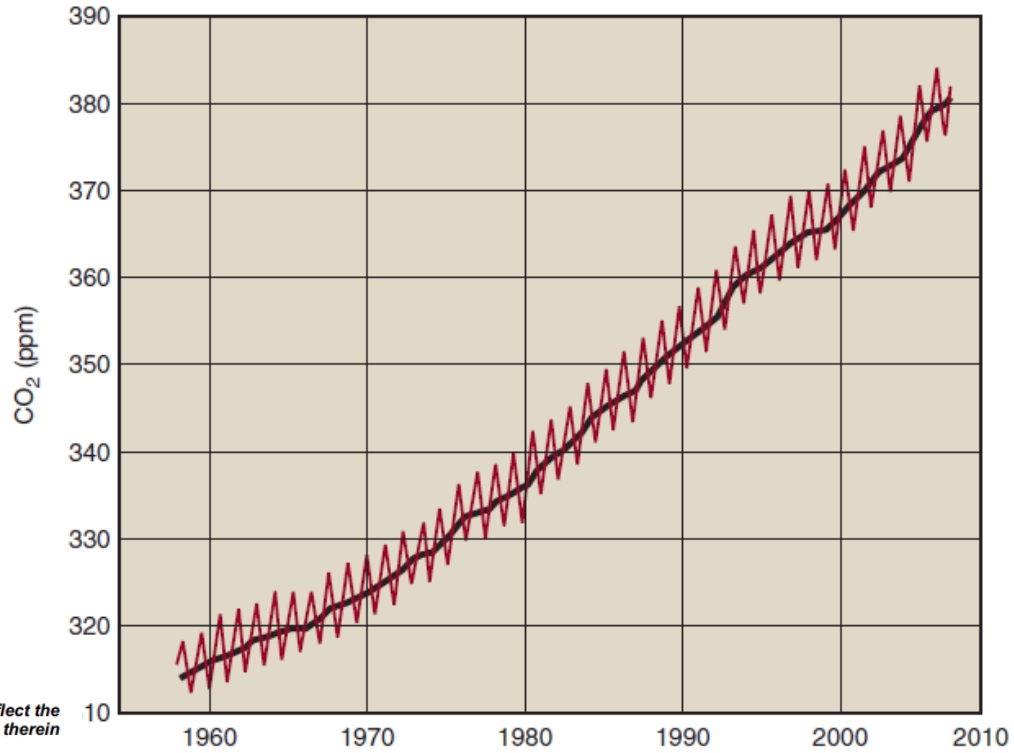
GLOBAL WARMING

- Loa Mountain, Hawaii, by Charles Keeling and are now known as the Keeling Curve. Taken at 3,500 m (11,500 ft) on an island far from most human activities, these measurements provide an excellent estimate of the background condition of the atmosphere.



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WEATHER AND CLIMATE

- Weather is **what's happening now** or over some short time period—this hour, today, this week—in the atmosphere near the ground: its temperature, pressure, cloudiness, precipitation, winds.
- Climate is the **average weather** and usually refers to average weather conditions over long periods, at least seasons, but more often years or decades.
- When we say it's hot and humid in New York today or raining in Seattle, we are speaking of weather. When we say Los Angeles has cool, wet winters and warm, dry summers, we are referring to the Los Angeles climate.
- Since climates are characteristic of certain latitudes, they are classified mainly by latitude—tropical, subtropical, midlatitudinal (continental), sub-Arctic (continental), and Arctic—but also by wetness/dryness, such as humid continental, Mediterranean, monsoon, desert, and tropical wet–dry.

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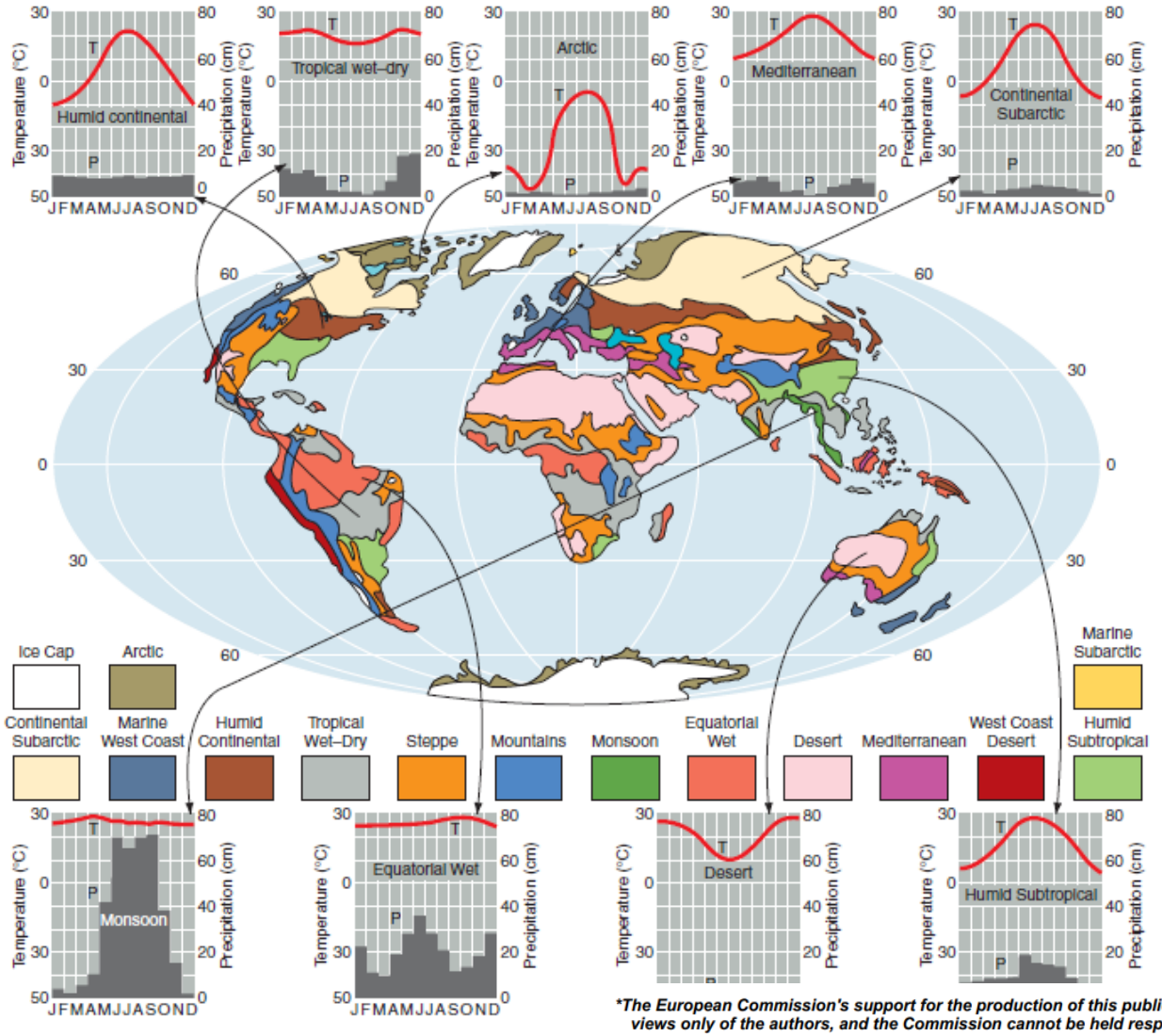
WEATHER AND CLIMATE



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WEATHER AND CLIMATE

https://www.ksat.com/news/local/2020/10/06/explained-the-difference-between-weather-and-climate/

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THE ATMOSPHERE

- This atmosphere is the **thin layer of gases** that envelop Earth. These gases are almost always in motion, sometimes rising, sometimes falling, most of the time moving across Earth's surface.
- The atmosphere's gas molecules are held near to the Earth's surface by gravity and pushed upward by thermal energy—heating—of the molecules. Approximately 90% of the weight of the atmosphere is in the first 12 km above Earth's surface.
- Major gases in the atmosphere include nitrogen (78%), oxygen (21%), argon (0.9%), carbon dioxide (0.03%), and water vapor in varying concentrations in the lower few kilometers.

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THE ATMOSPHERE

- The atmosphere also contains trace amounts of methane ozone, hydrogen sulfide, carbon monoxide, oxides of nitrogen and sulfur, and a number of small hydrocarbons, as well as synthetic chemicals, such as chlorofluorocarbons (CFCs). Methane at about 0.00017% of the atmosphere is emerging as an important gas that tracks closely with climate change (more so than CO_2).

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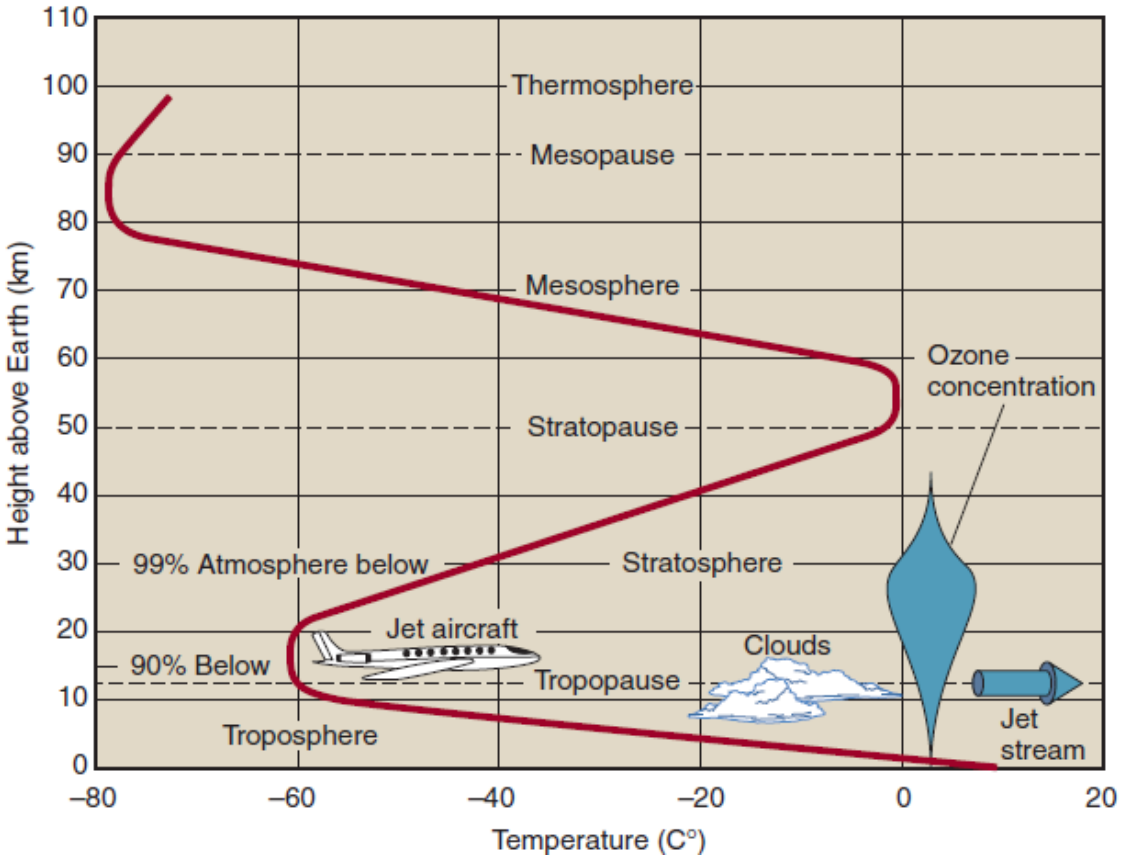
STRUCTURE OF THE ATMOSPHERE

- Stratospheric ozone (O3) protects life in the lower atmosphere from receiving harmful doses of ultraviolet radiation.
- stratosphere, which we visit occasionally when we travel by jet airplane
- Troposphere, we spend most of our lives in it
- Tropopause has a constant temperature (–60°C) and acts as a lid, or cold trap because it is where almost all remaining water vapor condenses.



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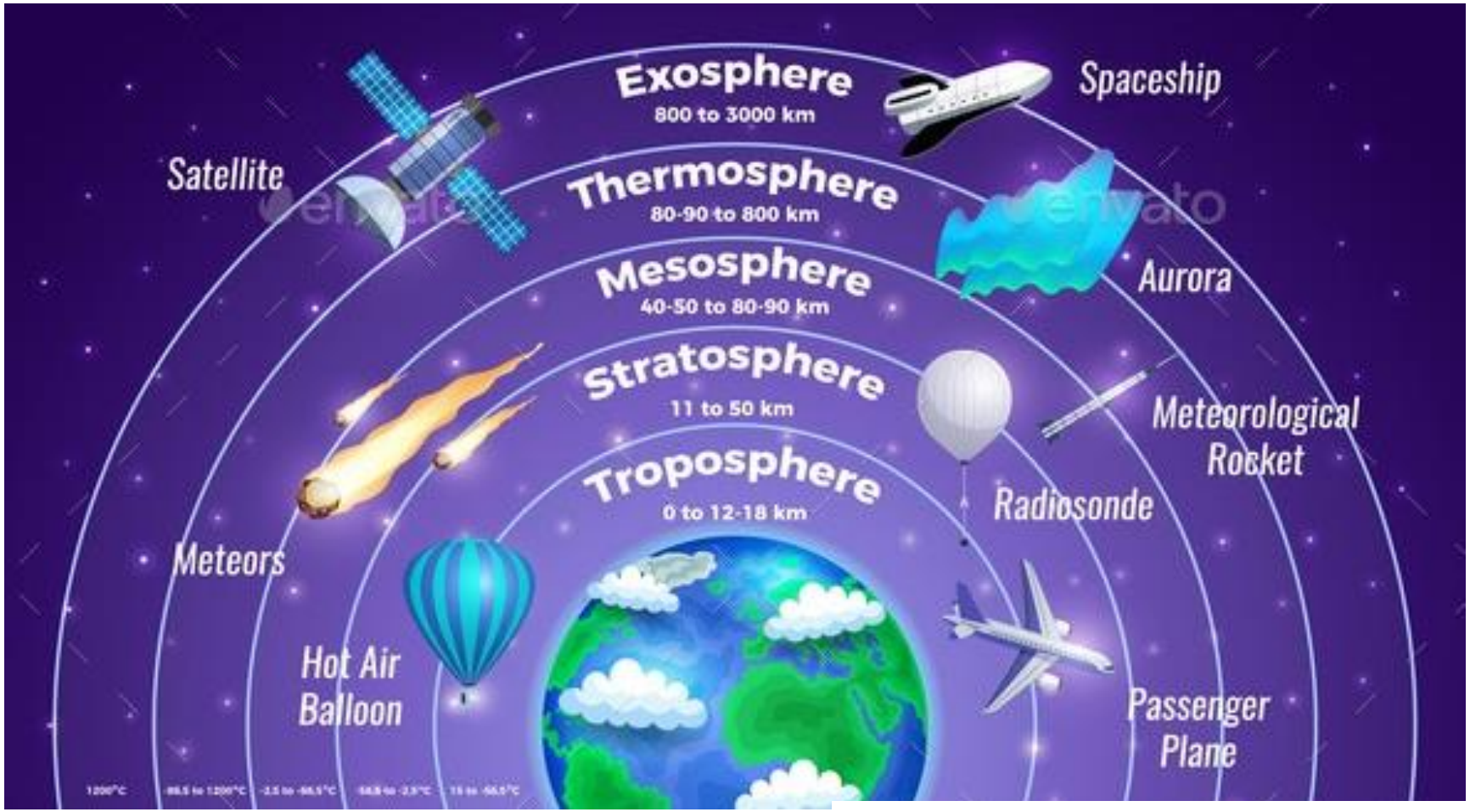
STRUCTURE OF THE ATMOSPHERE



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ATMOSPHERIC PROCESSES

Temperature, Pressure, and Global Zones of High and Low Pressure

- Two important qualities of the atmosphere are pressure and temperature. Pressure is force per unit area. Atmospheric pressure is caused by the weight of overlying atmospheric gases on those below and therefore decreases with altitude. At sea level, atmospheric pressure is 105 N/m^2 (newtons per square meter).
- Temperature, familiar to us as the relative warmth or coldness of materials, is a measure of thermal energy, which is the kinetic energy—the motion of atoms and molecules in a substance.
- Water vapor content varies from less than 1% to about 4% by volume, depending on air temperature, air pressure, and availability of water vapor from the surface.

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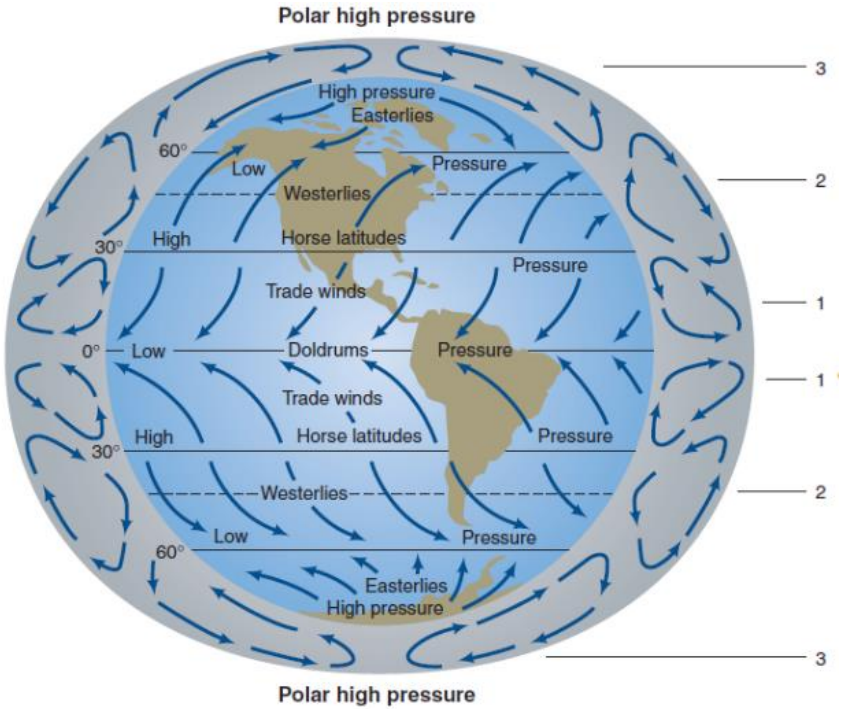
ATMOSPHERIC PROCESSES

- The atmosphere moves because of the Earth's rotation and differential heating of Earth's surface and atmosphere. These produce global patterns that include prevailing winds and latitudinal belts of low and high air pressure from the equator to the poles.



Air moves toward the poles at higher elevation. Sinking cool air at the poles produces the polar high-pressure zones at both poles (Cell 3)

Low air pressure develop at the equator. The heated air rises, creating an area of low pressure and a cloudy and rainy climate (Cell 1)

Air moves to higher latitudes, creating a region of high pressure, with sunny skies and low rainfall, where many of the world's deserts are found (Cell 2)

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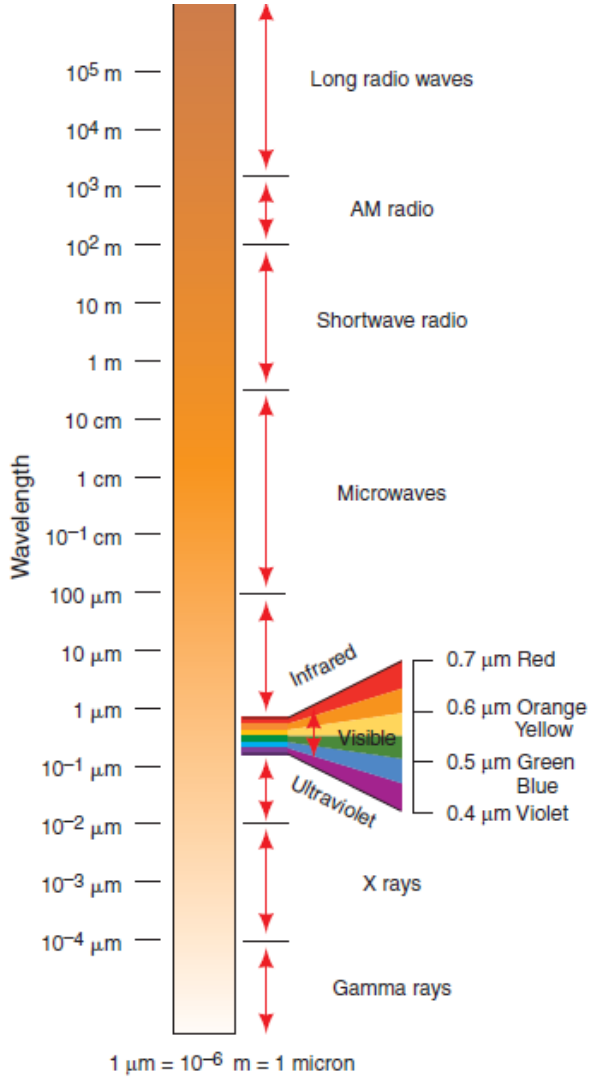
ATMOSPHERIC PROCESSES

What Makes the Earth Warm

- Almost all the energy the Earth receives is from the sun. Sunlight comes in a wide range of electromagnetic radiation, from very long radio waves to much shorter infrared waves, then shorter wavelengths of visible light, even shorter wavelengths of ultraviolet, and then on to shorter and shorter wavelengths



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ATMOSPHERIC PROCESSES

- Under typical conditions, the Earth's atmosphere reflects about 30% of the electromagnetic (radiant) energy that comes in from the sun and absorbs about 25%. The remaining 45% gets to the surface. The warmed atmosphere radiates some of its energy upward into outer space and some downward to the Earth's surface.

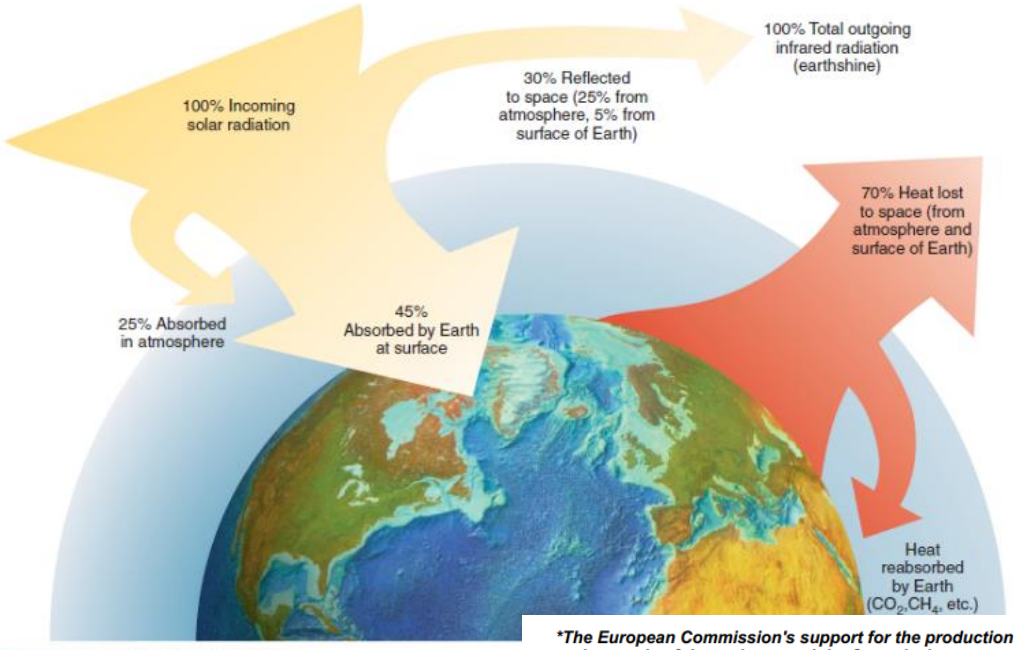

FIGURE 20.10 Earth's energy budget.

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HOW WE STUDY CLIMATE

- Data to document and understand climate change come from three main time periods grouped as the

  1. Instrumental Record
  2. Historical Record
  3. Paleo-Proxy Record

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HOW WE STUDY CLIMATE

The Instrumental Record

- The use of instruments to make climate measurements began around 1860. Recently, the extrapolation methods used to make these reconstructions have come under criticism, and today there is controversy over the reliability and usefulness of such attempts.
- Temperature measurement has improved greatly in recent years thanks to such devices as ocean platforms with automatic weather-monitoring equipment, coordinated by the World Meteorological Organization. Thus, we have more accurate records since about 1960.

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HOW WE STUDY CLIMATE

The Historical Record

- Historical record would be people's written recollections in books, newspapers, journal articles, personal journals, ships' logs, travelers' diaries, and farmers' logs, along with dates of wine harvests and small-grain harvests.
- For example, a painting of a mountain glacier in Switzerland can be used to determine the elevation to which the glacier had descended by the year it was painted.

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HOW WE STUDY CLIMATE

The Paleo-Proxy Record

- Information gathered as proxy data includes natural records of climate variability as indicated by tree rings, sediments, ice cores, fossil pollen, corals, and carbon-14 (14C).

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HOW WE STUDY CLIMATE

The Paleo-Proxy Record - Ice Cores

- Polar ice cores often contain small bubbles of air deposited at the time of the snow, and we can measure the atmospheric gases in these. Two important gases being measured in ice cores are carbon-dioxide (CO2) and methane (CH4), the most relevant proxy for climate change. The ice cores also contain a variety of chemicals and materials, such as volcanic ash and dust, which may provide additional insights into possible causes of climate change.

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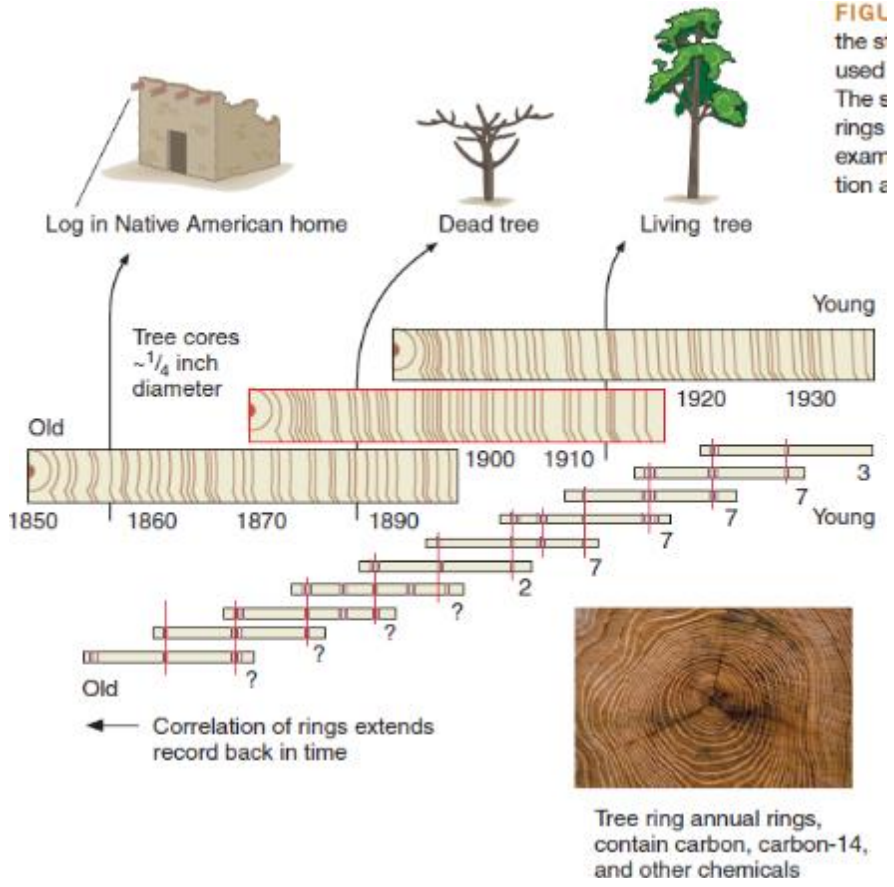
HOW WE STUDY CLIMATE

The Paleo-Proxy Record - Tree Rings

- The growth of trees is influenced by climate, both temperature and precipitation. Many trees put on one growth ring per year, and patterns in the tree rings—their width, density, and isotopic composition—tell us something about the variability of the climate. When conditions are good for growth, a ring is wide; when conditions are poor, the ring is narrow. Tree-ring chronology, known as dendrochronology, has produced a proxy record of climate that extends back over 10,000 years.



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HOW WE STUDY CLIMATE

The Paleo-Proxy Record - Sediment

- Biological material, may be taken of very small fossils and of chemicals in the sediments, and these may be interpreted to study past climates and extend our knowledge back hundreds of thousand years. Sediments recovered by drilling in the bottom of the ocean basin provide some of the very strongest evidence of past climate change.

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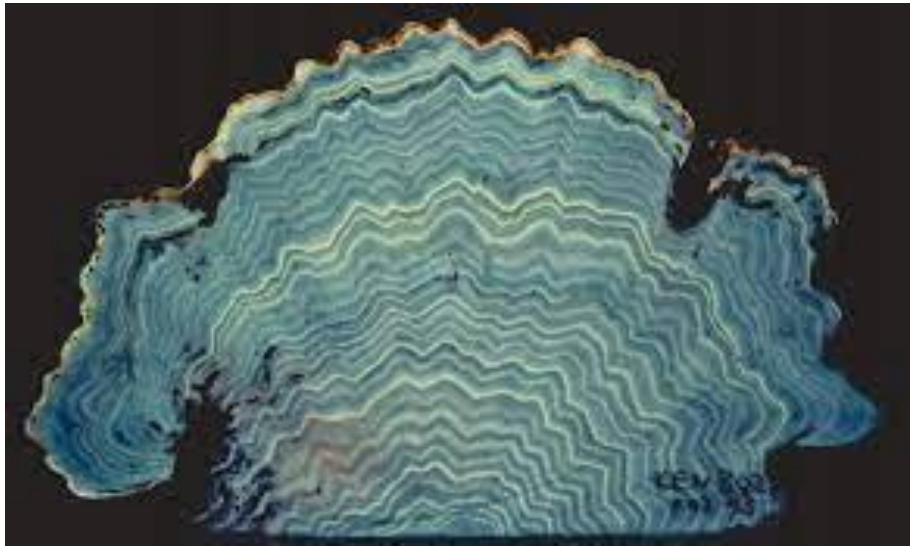
HOW WE STUDY CLIMATE

The Paleo-Proxy Record - Corals

- Corals have hard skeletons composed of calcium carbonate ($CaCO_3$), a mineral extracted by the corals from seawater. The carbonate contains isotopes of oxygen, as well as a variety of trace metals, which have been used to determine the temperature of the water in which the coral grew. The growth of corals has been dated directly with a variety of dating techniques over short time periods of coral growth thereby revealing the chronology of climate change over variable time periods.



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HOW WE STUDY CLIMATE

The Paleo-Proxy Record - Carbon-14 (Dating Element)

- Radioactive carbon-14 (14C) is produced in the upper atmosphere by the collision of cosmic rays and nitrogen-14 (14N). Cosmic rays come from outer space; those the Earth receives are predominantly from the sun. The abundance of cosmic rays varies with the number of sunspots, so called because they appear as dark areas on the sun. The radioactive 14C is taken up by photosynthetic organisms—green plants, algae, and some bacteria—and stored in them. If these materials become part of sediments, the year at which they were deposited can be estimated from the decay rate of the 14C.

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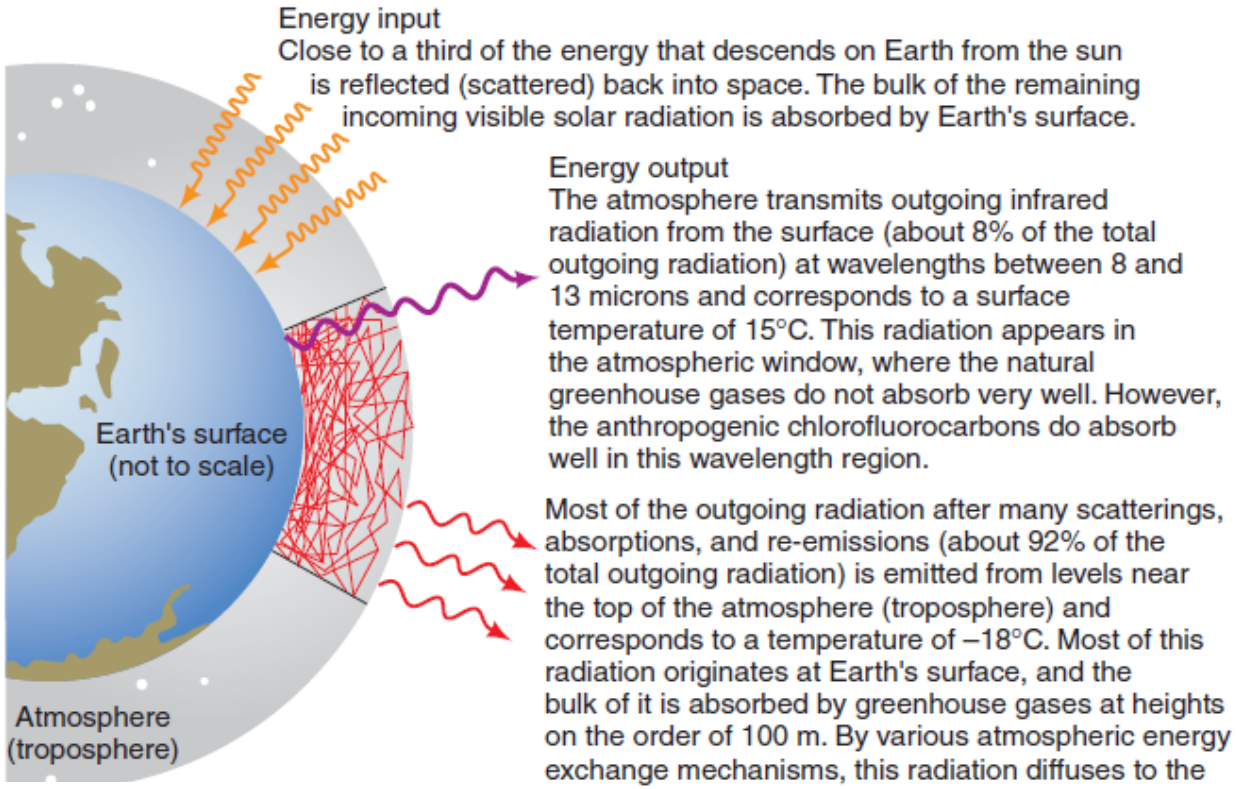
THE GREENHOUSE EFFECT

- The major greenhouse gases are water vapor, carbon dioxide, methane, some oxides of nitrogen, and chlorofluorocarbons (CFCs).



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THE MAJOR GREENHOUSE GASES

Carbon Dioxide

- Current estimates suggest that approximately 200 billion metric tons of carbon in the form of carbon dioxide (CO2) enter and leave Earth's atmosphere each year as a result of a number of biological and physical processes: 50 to 60% of the anthropogenic greenhouse effect is attributed to this gas.
- About 140 years ago, just before the major use of fossil fuels began as part of the Industrial Revolution, the atmospheric concentration of carbon dioxide was approximately 280 ppm. Since then, and especially in the past few decades, the concentration of CO2 in the atmosphere has grown rapidly. Today, the CO2 concentration is about 392 ppm, and at its current rate of increase of about 0.5% per year, the level may rise to approximately 450 ppm by the year 2050—more than 1.5 times the preindustrial level.

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THE MAJOR GREENHOUSE GASES

Methane

- The concentration of methane (CH4) in the atmosphere more than doubled in the past 200 years and is thought to contribute approximately 12 to 20% of the anthropogenic greenhouse effect.
- Certain bacteria that can live only in oxygenless atmospheres produce methane and release it. These bacteria live in the guts of termites and the intestines of ruminant mammals, such as cows, which produce methane as they digest woody plants. These bacteria also live in oxygenless parts of freshwater wetlands, where they decompose vegetation, releasing methane as a decay product. Methane is also released with seepage from oil fields and seepage from methane hydrates.
- Our activities also release methane. These activities include landfills (the major methane source in the United States), the burning of biofuels, production of coal aising cattle and cultivating rice.

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THE MAJOR GREENHOUSE GASES

Chlorofluorocarbons (CFC)

- Chlorofluorocarbons (CFCs) are inert, stable compounds that have been used in spray cans as aerosol propellants and in refrigerators.
- The rate of increase of CFCs in the atmosphere in the recent past was about 5% per year, and it has been estimated that approximately 15 to 25% of the anthropogenic greenhouse effect may be related to CFCs.
- Each CFC molecule may absorb hundreds or even thousands of times more infrared radiation emitted from Earth than is absorbed by a molecule of carbon dioxide. Furthermore, because CFCs are highly stable, their residence time in the atmosphere is long.

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THE MAJOR GREENHOUSE GASES

Nitrous Oxide

- Nitrous oxide (N2O) is increasing in the atmosphere and probably contributes as much as 5% of the anthropogenic greenhouse effect. Anthropogenic sources of nitrous oxide include agricultural application of fertilizers and the burning of fossil fuels. This gas, too, has a long residence time; even if emissions were stabilized or reduced, elevated concentrations of nitrous oxide would persist for at least several decades.

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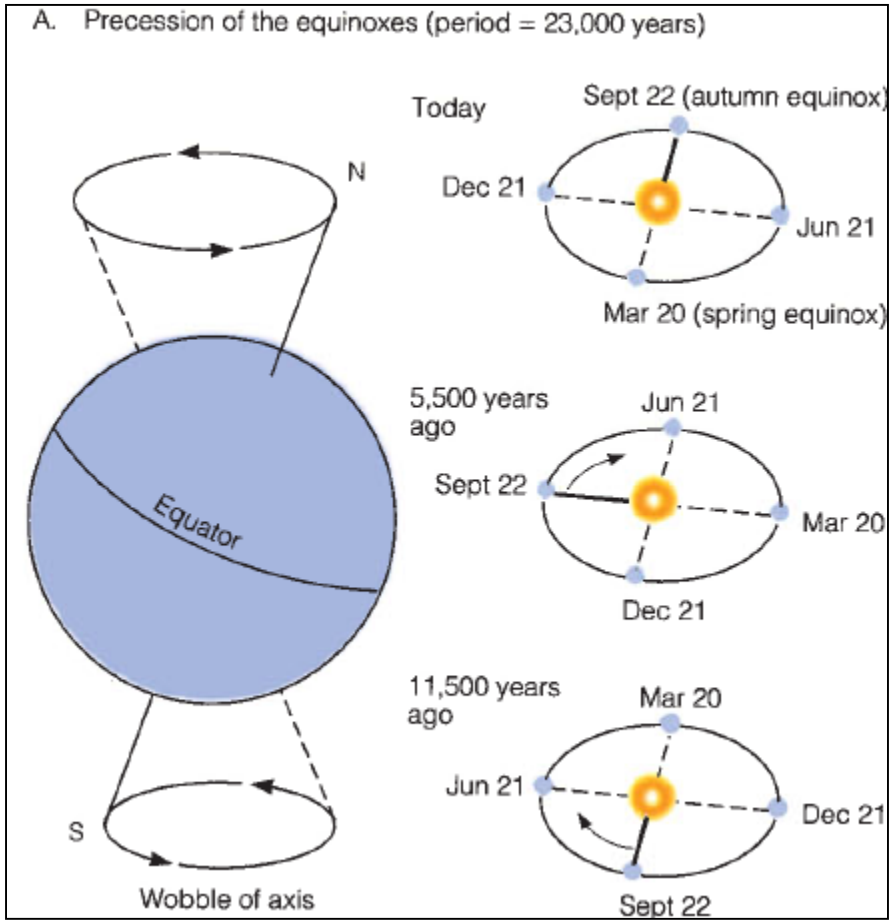
CAUSES OF CLIMATE CHANGE

Milankovitch Cycles

- The wobble means that the Earth is unable to keep its poles at a constant angle in relation to the sun. Right now, the North Pole points to Polaris, the North Star, but this changes as the planet wobbles.
- The wobble makes a complete cycle in 26,000 years.



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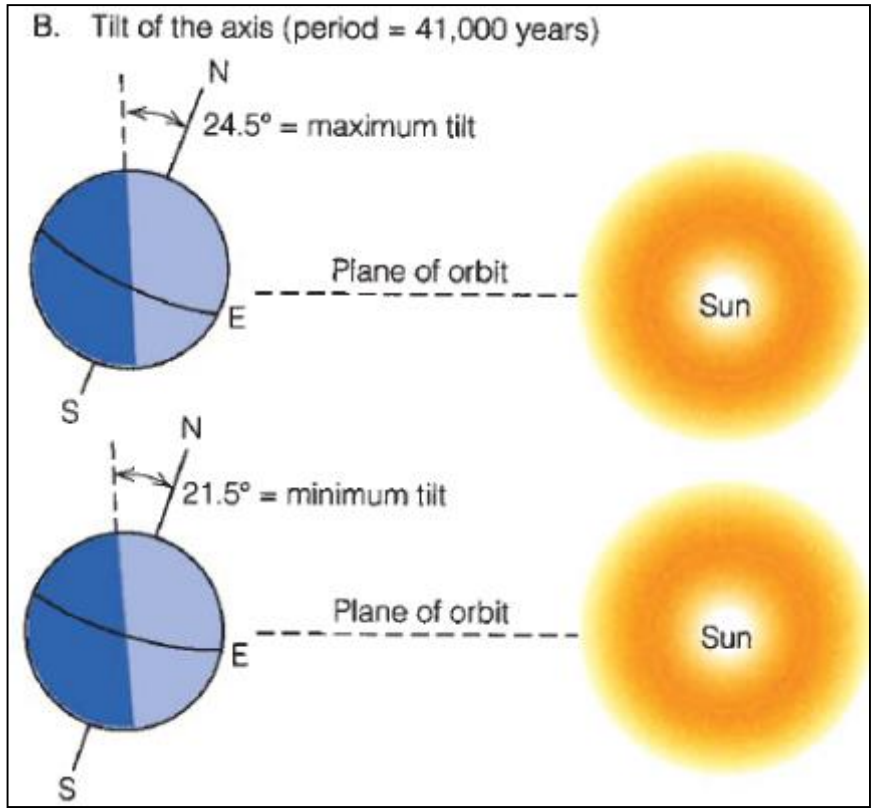
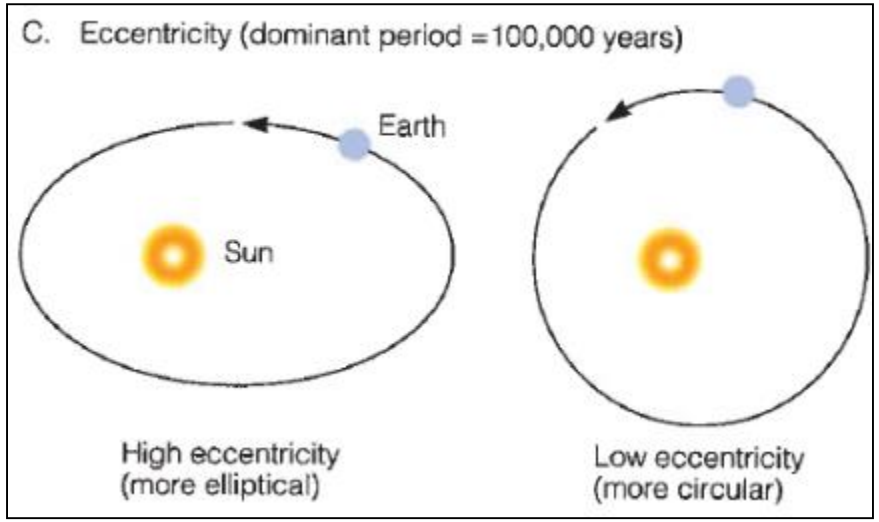
CAUSES OF CLIMATE CHANGE

The tilt of Earth's axis varies over a period of 41,000 years.



The elliptical orbit around the sun also changes. Sometimes it is a more extreme ellipse; at other times it is closer to a circle, and this occurs over 100,000 years.



The combination of these changes leads to periodic changes in the amount and distribution of sunlight reaching the Earth.

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CAUSES OF CLIMATE CHANGE

Solar Cycles

- Variations in the sun's intensity in the past can be determined because hotter and cooler sun periods emit different amounts of radionuclides—atoms with unstable nuclei that undergo radioactive decay (such as beryllium-10 and carbon-14), which are trapped in glacial ice and can then be measured. Thus, it appears that the variability of solar energy input explains a small part of the Earth's climatic variability.

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CAUSES OF CLIMATE CHANGE

The Surface of Earth and Albedo (reflectivity) Affects

- Albedo is the reflectivity of an object that is measured as the percentage of incoming radiation that is reflected.
- A dark rock surface exposed near the North Pole absorbs more of the sunlight it receives than it reflects in the summer, warming the surface and the air passing over it. When a glacier spreads out and covers that rock, it reflects more of the incoming sunlight than the darker rock cooling both the surface and the air that comes in contact with it.
- Vegetation also affects the climate and weather in the same way. If vegetation is a darker color than the soil, it warms the surface. If it is a lighter color than the soil, it cools the surface. Now you know why if you walk barefoot on dark asphalt on a hot day you feel the heat radiating from the surface (you may burn the bottom of your feet).

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CAUSES OF CLIMATE CHANGE

Roughness of the Earth's Surface Affects the Atmosphere

- Above a completely smooth surface, air flows smoothly—a flow called "laminar." A rough surface causes air to become turbulent—to spin, rotate, reverse, and so forth. Turbulent air gives up some of the energy in its motion (its kinetic energy), and that energy is turned into heat. This affects the weather above. Forests are a much rougher surface than smooth rock or glaciers, so in this way, too, vegetation affects weather and climate.

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CAUSES OF CLIMATE CHANGE

The Chemistry of Life Affects the Atmosphere

- The emission and uptake of chemicals by living things affect the weather and climate. Thus, a planet with water vapor, liquid water, frozen water, and living things has a much more complex energy-exchange system than a lifeless, waterless planet. This is one reason (of many) why it is difficult to forecast climate change.

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CAUSES OF CLIMATE CHANGE

Climate Forcing

- Climate forcing—defined as an imposed perturbation of Earth's energy balance.
- Factors that affect and are in turn affected by regional global temperature changes include higher ice-sheet temperatures; changes in vegetation; changes in atmospheric gases, such as carbon dioxide, methane, and nitrous oxide; and changes in sunlight intensity.
- Positive forcings cause warm and negative forcings cause cooling. In recent decades human caused forcings have dominated over natural forcings.

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THE OCEANS AND CLIMATE CHANGE

- The oceans play an important role in climate because two thirds of the Earth is covered by water. Moreover, water has the highest heat-storage capacity of any compound, so a very large amount of heat energy can be stored in the world's oceans.
- If carbon dioxide **increases in the atmosphere**, it will also **increase in the oceans**, and, over time the oceans can absorb a very large quantity of CO_2.
- This can cause seawater to become more acidic (**$H_2O+CO_2 \rightarrow H_2CO_3$**) as carbonic acid increases.

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THE OCEANS AND CLIMATE CHANGE

- Part of what may drive the climate system and its changes is the “ocean conveyor belt”—a global circulation of ocean waters characterized by strong northward movement of upper warm waters of the Gulf Stream in the Atlantic Ocean.
- Natural oscillations of the ocean linked to the atmosphere can produce warmer or cooler periods of a few years to a decade or so. The effect of the oscillations can be ten times as strong (in a given year) as long-term warming that we have observed over the past century—larger.

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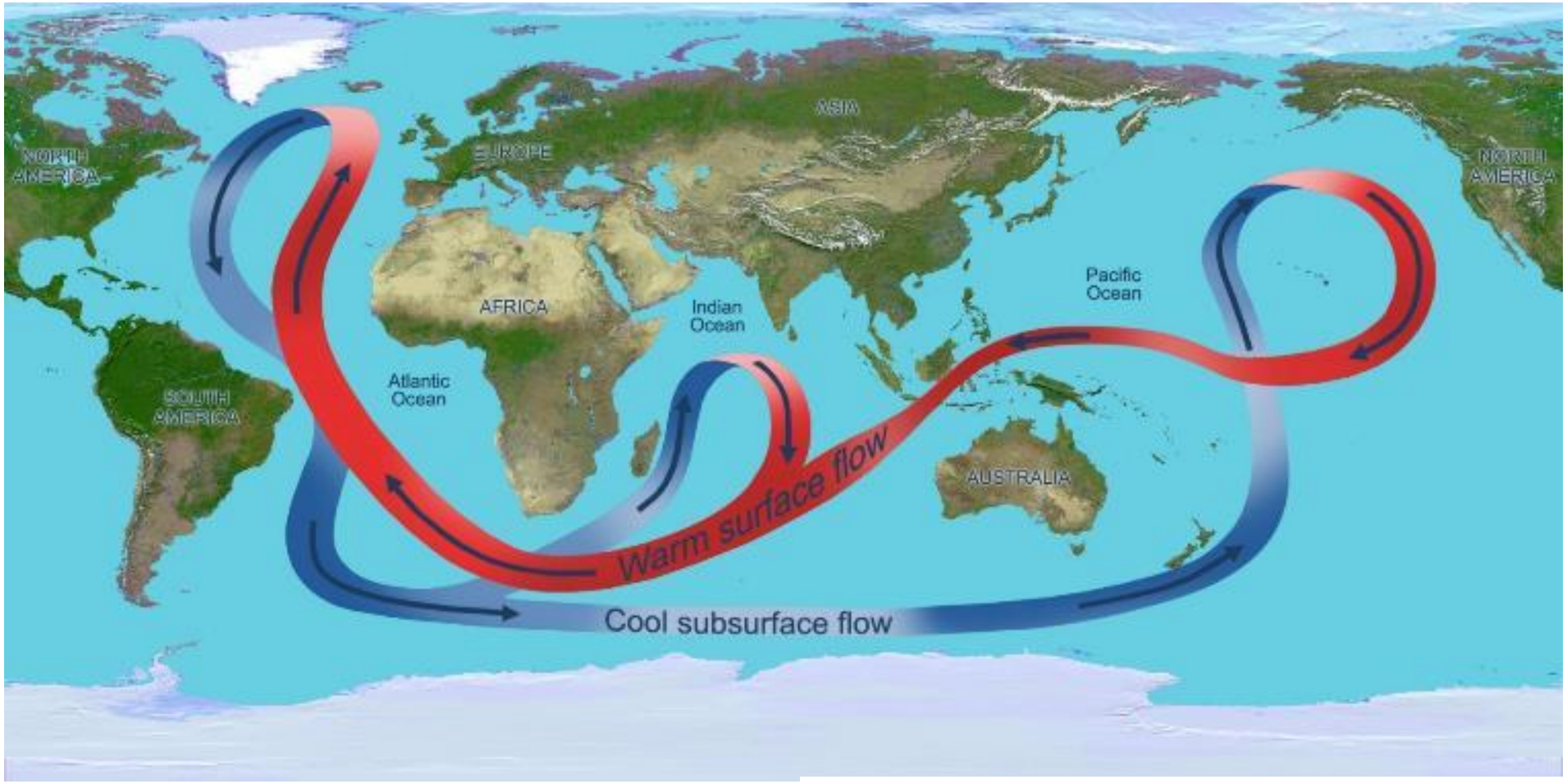
THE OCEANS AND CLIMATE CHANGE



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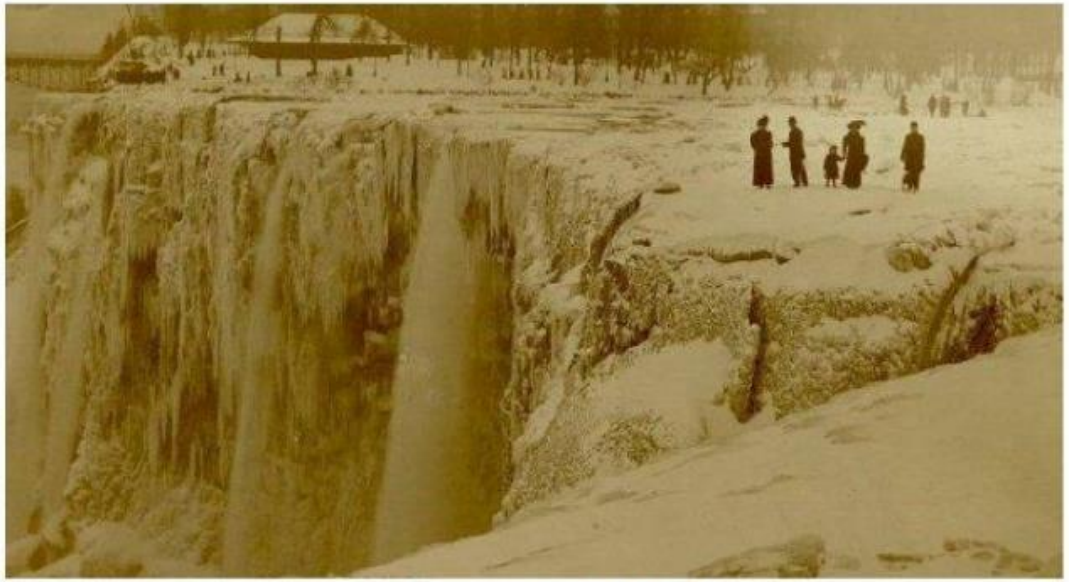
THE OCEANS AND CLIMATE CHANGE

- By comparison, the annual increase in warming due mostly to human activity is about two-hundredths of a degree Celsius per year. Some scientists attribute the cool winter of 2009–2010 to natural ocean–atmosphere oscillations, and also suggest that these caused a cool year in 1911 that froze Niagara Falls. The more famous El Niño oscillations that occur in the Pacific Ocean are connected to large-scale but short-term changes in weather.



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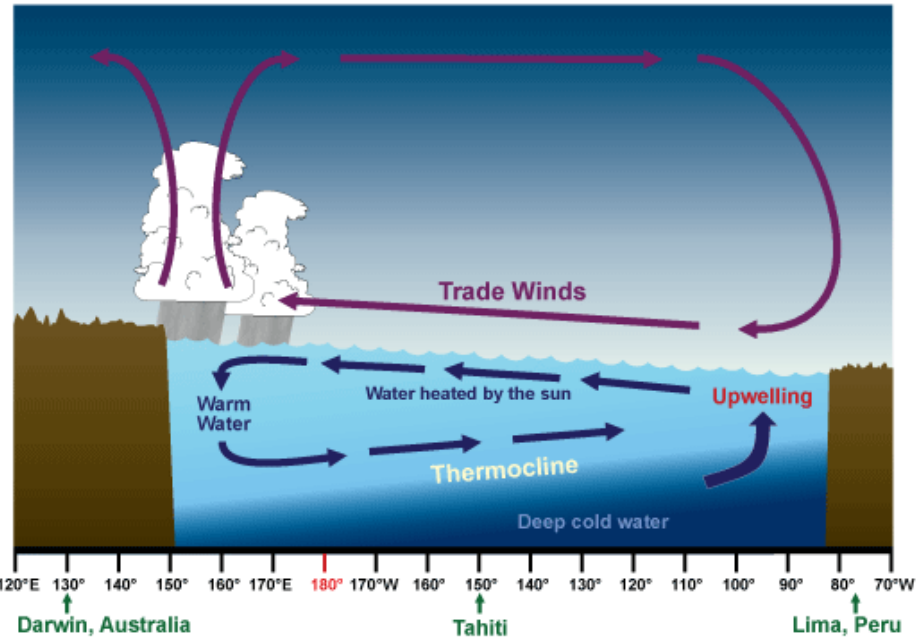
EL NIÑO AND CLIMATE

- A curious and historically important climate change linked to variations in ocean currents is the Southern Oscillation, known informally as El Niño.
- Under normal conditions, there are strong vertical, rising currents, called upwelling, off the shore of Peru. These are caused by prevailing winds coming westward off the South American Continent, which move the surface water away from the shore and allow cold water to rise from the depths, along with important nutrients that promote the growth of algae (the base of the food chain) and thus produce lots of fish.



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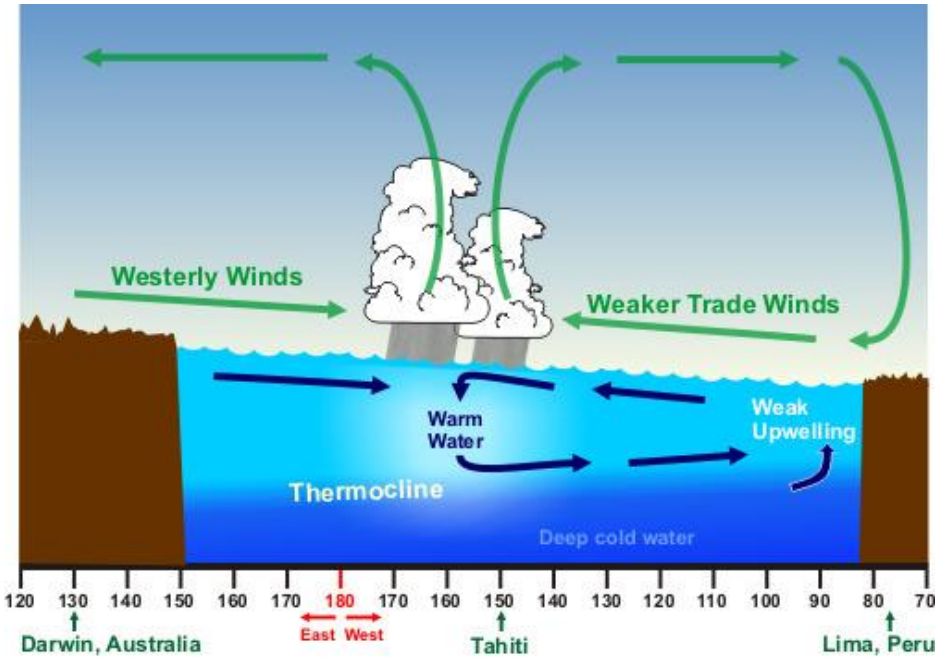
EL NIÑO AND CLIMATE

- El Niño occurs when those cold upwellings weaken or stop rising altogether. As a result, nutrients decline, algae grow poorly, and so do the fish, which either die, fail to reproduce, or move away. Because rainfall follows warm water eastward during El Niño years, there are high rates of precipitation and flooding in Peru, while droughts and fires are common in Australia and Indonesia. Because warm ocean water provides an atmospheric heat source, El Niño changes global atmospheric circulation, which causes changes in weather in regions that are far removed from the tropical Pacific.



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FORECASTING CLIMATE CHANGE

Past Observations

- The use of empirical records is based on the idea of uniformitarianism—the idea that processes occurring in the past occur today and that processes occurring today occurred in the past.
- The argument that human actions are leading to global warming is heavily based on this kind of empirical evidence, in particular measurements from the past 150 years and proxy evidence over the past few hundred years that suggest relationships between Earth's average surface temperature with both the concentrations of carbon dioxide and methane in the atmosphere.

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FORECASTING CLIMATE CHANGE

Experiments and Laboratory Research

- Laboratory research has taught scientists some fundamental things about the cause and effect of climate change. For example, the understanding that carbon dioxide absorbs in specific infrared wavelengths that are different from those of the other gases in the atmosphere comes from a long history of laboratory studies of the air around us, beginning with the work of one of the first modern chemical scientists, the Englishman Joseph Priestley (1733–1804).

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FORECASTING CLIMATE CHANGE

Computer Simulations

- Computers are much faster today, and the major theoretical method used today to forecast climate change is a group of computer models called general circulation models (GCMs). Mathematically, these are deterministic differential equation models.

- They are all steady-state models, meaning that for any given set of input information about the climate at the beginning, the result will always be the same—there is no chance or randomness involved. These models assume that the climate is in a steady state except for specific perturbations, especially those believed to be caused by human activities. Thus an assumption of these models, and a necessary outcome, is that the climate, if left to itself, will be in balance, in a steady state. This is unlike the real world's global environmental systems, which are inherently non-steady-state.

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EFFECTS OF GLOBAL WARMING

Changes in River Flow

- With a continuation of global warming, melting of glacial ice and reductions in snow cover are anticipated to accelerate throughout the twenty-first century.
- California, which depends on snowmelt from the Sierra Nevada for water to irrigate one of the richest agriculture regions in the world, will have problems storing water in reservoirs if these forecasts became true. Rainfall will likely increase, but there will be less snowpack with warming. Runoff, will be more rapid than if snow slowly melts. As a result, reservoirs will fill sooner and more water will escape to the Pacific Ocean.

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EFFECTS OF GLOBAL WARMING

Rise in Sea Level

- Sea level rises from two causes:
  1. **Liquid water expands as it warms; and**
  2. **ice sheets on land that melt increase the amount of water in the oceans.**
- About half the people on Earth live in a coastal zone, and about 50 million people each year experience flooding due to storm surges. As the sea level rises and the population increases, more and more people become vulnerable to coastal flooding.
- This could lead to further investments to protect cities in the coastal zone by constructing seawalls, dikes, and other structures to control erosion. In short, coastal erosion is a difficult problem that is very expensive to deal with.
- Groundwater supplies for coastal communities could also be threatened by saltwater intrusion.

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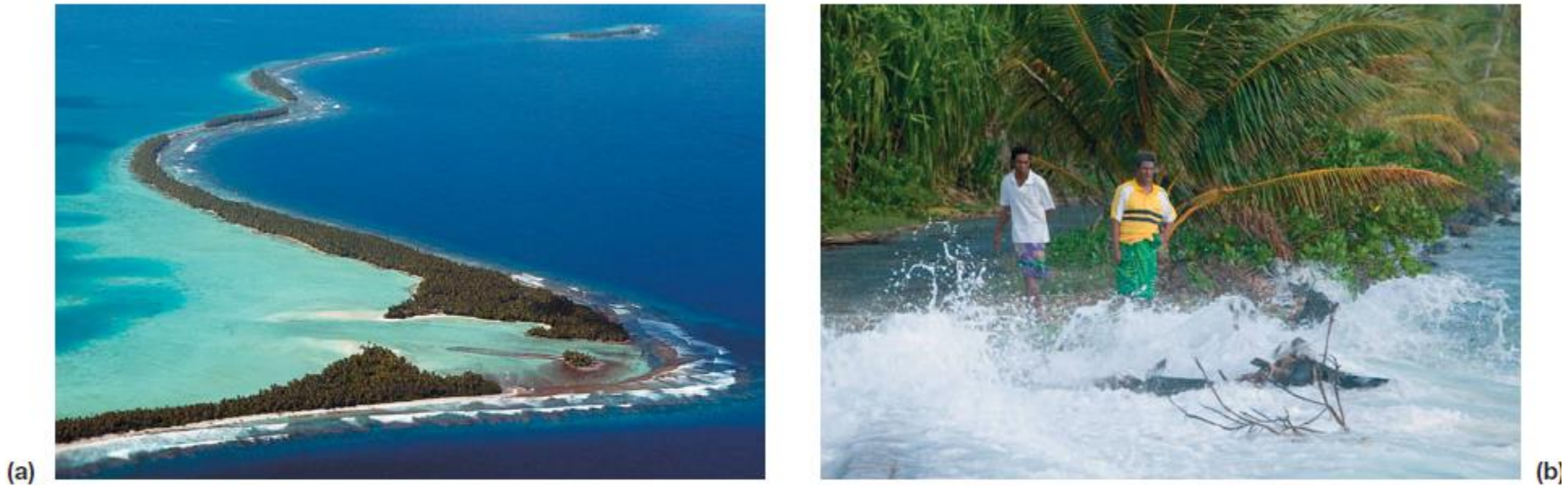
EFFECTS OF GLOBAL WARMING

Rise in Sea Level



(a) (b)

FIGURE 20.23 The world's smallest nation, Tuvalu, may succumb to sea-level rise. Tuvalu consists of nine coral islands in the South Pacific, with a total area smaller than Manhattan, and its highest elevation above sea level is 4.5 meters. Sea levels have been rising since the end of the last ice age, a natural response. But global warming could accelerate this rise, making the 12,000 citizens of Tuvalu the world's first sea-level-rise refugees.

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EFFECTS OF GLOBAL WARMING

Glaciers and Sea Ice

- A major concern is whether global warming will lead to a great decline in the volume of water stored as ice, especially because melting of glacial ice raises the mean sea level and because mountain glaciers are often significant sources of water for lower-elevation ecosystems.
- Since they were first observed in 1912, the glaciers of Kilimanjaro have decreased in area by about 80%. The ice is disappearing not from warmer temperatures at the top of the mountain, which are almost always below freezing, but because less snowfall is occurring and ice is being depleted by solar radiation and sublimation (ice is transformed from solid state to water vapor without melting). More arid conditions in the past century led to air that contained less moisture and thus favored sublimation.

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EFFECTS OF GLOBAL WARMING

Glaciers and Sea Ice

- In addition to many glaciers melting back, the Northern Hemisphere sea ice coverage in September, the time of the ice minimum, has declined an average of 10.7% per decade since satellite remote sensing became possible in the 1970s (Figure 20.25). If present trends were to continue, the Arctic Ocean might be seasonally ice-free by 2030.

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EFFECTS OF GLOBAL WARMING

Muir Glacier, Alaska

1941

2004

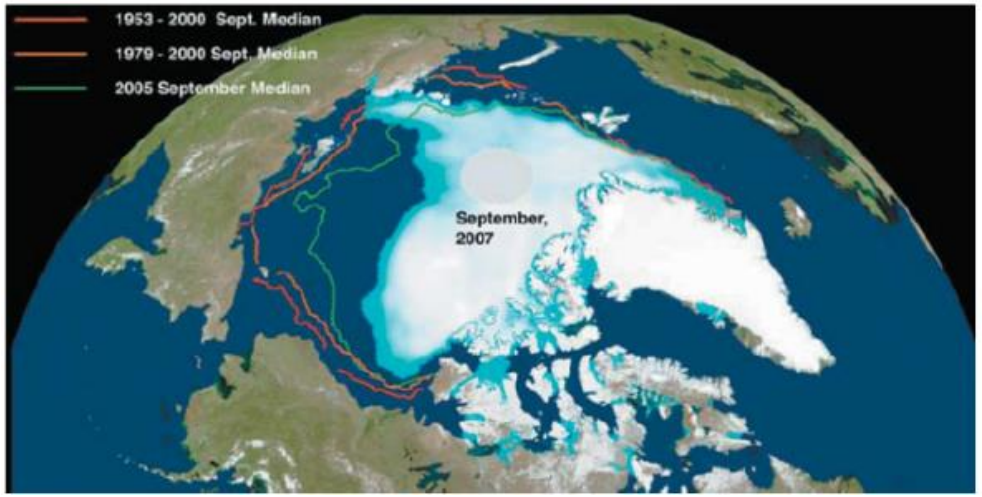

FIGURE 20.25 Satellite observations, which began in 1977, show that Arctic sea ice reached a minimum in September 2007 and has increased since then. The sea ice coverage varies greatly between summer and winter, with July marking the summer minimum. The rapid decline in 2007 was partly due to atmospheric circulation that favored melting. (*Source*: Modified after Stroever et al., 2008. EOS 89 [2] 13–14.)

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EFFECTS OF GLOBAL WARMING

Changes in Biological Diversity

- Warming is one change, but others—such as availability of nutrients, relations with other organisms (predator and prey), and competition for habitat and niches in ecosystems—also affect biodiversity.
- The abundance of black guillemots, birds that nest on Cooper Island, Alaska has declined since temperature increases in the 1990s caused the sea ice to recede farther from Cooper Island each spring.

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EFFECTS OF GLOBAL WARMING

Changes in Biological Diversity

- The parent birds feed on Arctic cod found under the sea ice and must then return to the nest to feed their chicks, who are not yet mature enough to survive on their own. For the parents to do this, the distance from feeding grounds to nest must be less than about 30 km, but in recent years the ice in the spring has been receding as much as 250 km from the island.
- As a result, the black guillemots on the island have lost an important source of food. The future of black guillemots on Cooper Island depends on future springtime weather.

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EFFECTS OF GLOBAL WARMING

Agricultural Productivity

- Globally, agricultural production will likely increase in some regions and decline in others. A climate shift could have serious negative effects on midlatitude food production. Meanwhile, lands in the southern part of the Northern Hemisphere may become more arid. Prolonged drought as a result of future warming as evidently occurred during the Medieval warming period with loss of agricultural productivity could be one of the serious impacts of global warming.

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EFFECTS OF GLOBAL WARMING

What are the impacts of global warming to human population?

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ADJUSTING TO POTENTIAL GLOBAL WARMING

- People can adjust to the threat of global warming in two ways:
  - **Adapt** → Learn to live with future global climate change over the next 20 years because there is warming in the pipeline from greenhouse gases already emitted.
  - **Mitigate** → Work to reduce the emissions of greenhouse gases and take actions to reduce the undesirable effects of a global warming.

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HOW TO COPE WITH GLOBAL WARMING?

What is your role?


Q&A

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

THANK YOU

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 5
CARE OUR HOME

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CARE OUR HOME

- These lecture material are for the **Marine Coastal and Delta Sustainability for Southeast Asia (MARE)**(Project No 610327-EPP-1-2019-1-DE-EPPKA2-CBHE-JP)
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LECTURE OUTLINE

- Watch the documentary and summarized the output.

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THE WATER CRISIS

https://www.youtube.com/watch?v=3VyfN30XzDM

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 6
OCEAN RESOURCES AND VALUES

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OCEAN RESOURCES AND VALUES

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LECTURE OUTLINE

- Resources from the ocean
- Ocean mining activities
- Fisheries resources
- Biodiversity resources
- How to use sustainably the ocean resources

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OCEAN RESOURCES

- The ocean is one of Earth's **most valuable natural resources**. It provides food in the form of fish and shellfish—about 200 billion pounds are caught each year.
- It's used for transportation—both travel and shipping. It provides a treasured source of recreation for humans. It is mined for minerals (salt, sand, gravel, and some manganese, copper, nickel, iron, and cobalt can be found in the deep sea) and drilled for crude oil.
- The ocean plays a critical role in removing carbon from the atmosphere and providing oxygen. It regulates Earth's climate. The ocean is an increasingly important source of biomedical organisms with enormous potential for fighting disease.

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FISHERIES RESOURCES

- The oceans have been fished for thousands of years and are an integral part of human society.
- Fish have been important to the world economy for all of these years, starting with the Viking trade of cod and then continuing with fisheries like those found in Europe, Italy, Portugal, Spain and India.
- Fisheries of today provide about 16% of the total world's protein with higher percentages occurring in developing nations.
- Fisheries are still enormously important to the economy and well-being of communities

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FISHERIES RESOURCES

- The word fisheries refers to all of the fishing activities in the ocean, whether they are to obtain fish for the commercial fishing industry, for recreation or to obtain ornamental fish or fish oil.
- Fishing activities resulting in fish not used for consumption are called industrial fisheries.
- Fisheries are usually designated to certain ecoregions like the salmon fishery in Alaska, the Eastern Pacific tuna fishery or the Lofoten island cod fishery.
- Due to the relative abundance of fish on the continental shelf, fisheries are usually marine and not freshwater.

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FISHERIES RESOURCES

- Although a world total of 86 million tons of fish were captured in 2000, China's fisheries were the most productive, capturing a whopping one third of the total.
- Other countries producing the most fish were Peru, Japan, the United States, Chile, Indonesia, Russia, India, Thailand, Norway and Iceland- with Peru being the most and Iceland being the least.
- The number of fish caught varies with the years, but appears to have leveled off at around 88 million tons per year possibly due to overfishing, economics and management practices.

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FISHERIES RESOURCES

- Fish are caught in a variety of ways, including one-man casting nets, huge trawlers, seining, driftnetting, handlining, longlining, gillnetting and diving.
- The most common species making up the global fisheries are herring, cod, anchovy, flounder, tuna, shrimp, mullet, squid, crab, salmon, lobster, scallops and oyster.
- Mollusks and crustaceans are also widely sought. The fish that are caught are not always used for food.
- In fact, about 40% of fish are used for other purposes such as fishmeal to feed fish grown in captivity. For example cod, is used for consumption, but is also frozen for later use. Atlantic herring is used for canning, fishmeal and fish oil. The Atlantic menhaden is used for fishmeal and fish oil and Alaska pollock is consumed, but also used for fish paste to simulate crab. The Pacific cod has recently been used as a substitute for Atlantic cod which has been overfished.

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FISHERIES RESOURCES

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FISHERIES RESOURCES

- The amount of fish available in the oceans is an ever-changing number due to the effects of both natural causes and human developments.
- It will be necessary to manage ocean fisheries in the coming years to make sure the number of fish caught never makes it to zero.
- A lack of fish greatly impacts the economy of communities dependent on the resource, as can be seen in Japan, eastern Canada, New England, Indonesia and Alaska.
- Any example?

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FISHERIES RESOURCES

- Due to the importance of fishing to the worldwide economy and the need for humans to understand human impacts on the environment, the academic division of fisheries science was developed.
- Fisheries science includes all aspects of marine biology, in addition to economics and management skills and information.
- Marine conservation issues like overfishing, sustainable fisheries and management of fisheries are also examined through fisheries science.

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FISHERIES RESOURCES

- In order for there to be plenty of fish in the years ahead, fisheries will have to develop sustainable fisheries and some will have to close.
- Due to the constant increase in the human population, the oceans have been overfished with a resulting decline of fish crucial to the economy and communities of the world.
- The control of the world's fisheries is a controversial subject, as they cannot produce enough to satisfy the demand, especially when there aren't enough fish left to breed in healthy ecosystems.
- Scientists are often in the role of fisheries managers and must regulate the amount of fishing in the oceans, a position not popular with those who have to make a living fishing ever decreasing populations.

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FISHERIES RESOURCES

- What is the carrying capacity of the ocean? How many fish are there and how many of which type of fish should be caught to make fisheries sustainable?
- How should fisheries resources be divided among people?

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SHIPPING

- The word “shipping” refers to the activity of moving cargo with ships in between seaports. Wind-powered ships exist, but more often ships are powered by steam turbine plants or diesel engines.
- Naval ships are usually responsible for transporting most of trade from one country to another and are called merchant navies.
- The various types of ships include container ships, tankers, crude oil ships, product ships, chemical ships, bulk carriers, cable layers, general cargo ships, offshore supply vessels, dynamically-positioned ships, ferries, gas and car carriers, tugboats, barges and dredgers.

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SHIPPING

- In theory, shipping can have a low impact on the environment. It is safe and profitable for economies around the world.
- However, serious problems occur with the shipping of oil, dumping of waste water into the ocean, chemical accidents at sea, and the inevitable air and water pollution occurring when modern day engines are used.
- Ships release air pollutants in the form of sulphur dioxide, nitrogen oxides, carbon dioxide, hydrocarbons and carbon monoxide.
- Chemicals dumped in the ocean from ships include chemicals from the ship itself, cleaning chemicals for machine parts, and cleaning supplies for living quarters.

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SHIPPING

- Large amounts of chemicals are often spilled into the ocean and sewage is not always treated properly or treated at all.
- Alien species riding in the ballast water of ships arrive in great numbers to crash native ecosystems and garbage is dumped over the side of many vessels.
- Dangerous industrial waste and harmful substances like halogenated hydrocarbons, water treatment chemicals, and anti-fouling paints are also dumped frequently.
- Ships and other watercraft with engines disturb the natural environment with loud noises, large waves, frequently striking and killing animals like manatees and dolphins.

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SHIPPING

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TOURISM

- Tourism is the fastest growing division of the world economy and is responsible for more than 200 million jobs all over the world. In the US alone, tourism resulted in an economic gain of 478 billion dollars.
- With 700 million people traveling to another country in the year 2000, tourism is in the top five economic contributors to 83% of all countries and the most important economy for 38% of countries.
- The tourism industry is based on natural resources present in each country and usually negatively affect ecosystems because it is often left unmanaged. However, sustainable tourism can actually promote conservation of the environment.

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TOURISM

- The negative effects of tourism originate from the development of coastal habitats and the annihilation of entire ecosystems like mangroves, coral reefs, wetlands and estuaries.
- Garbage and sewage generated by visitors can add to the already existing solid waste and garbage disposal issues present in many communities.
- Often visitors produce more waste than locals, and much of it ends up as untreated sewage dumped in the ocean.
- The ecosystem must cope with eutrophication, or the loss of oxygen in the water due to excessive algal bloom, as well as disease epidemics.
- Sewage can be used as reclaimed water to treat lawns so that fertilizers and pesticides do not seep into the ocean.

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TOURISM

- Other problems with tourism include the overexploitation of local seafood, the destruction of local habitats through careless scuba diving or snorkeling and the dropping of anchors on underwater features.
- Ecotourism and cultural tourism are a new trend that favors low impact tourism and fosters a respect for local cultures and ecosystems.



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MINING

- Humans began to mine the ocean floor for diamonds, gold, silver, metal ores like manganese nodules and gravel mines in the 1950's when the company Tidal Diamonds was established by Sam Collins.
- Diamonds are found in greater number and quality in the ocean than on land, but are much harder to mine.
- When diamonds are mined, the ocean floor is dredged to bring it up to the boat and sift through the sediment for valuable gems.
- The process is difficult as sediment is not easy to bring up to the surface, but will probably become a huge industry once technology evolves to solve the logistical problem.

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MINING

- Metal compounds, gravels, sands and gas hydrates are also mined in the ocean.
- Mining of manganese nodules containing nickel, copper and cobalt began in the 1960's and soon after it was discovered that Papua New Guinea was one of the few places where nodules were located in shallow waters rather than deep waters.
- Although manganese nodules could be found in shallow waters in significant quantities, the expense of bringing the ore up to the surface proved to be expensive.
- Sands and gravels are often mined for in the United States and are used to protect beaches and reduce the effects of erosion.

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MINING

- Mining the ocean can be devastating to the natural ecosystems.
- Dredging of any kind pulls up the ocean floor resulting in widespread destruction of marine animal habitats, as well as wiping out vast numbers of fishes and invertebrates.
- When the ocean floor is mined, a cloud of sediment rises up in the water, interfering with photosynthetic processes of phytoplankton and other marine life, in addition to introducing previously benign heavy metals into the food chain.
- As minerals found on land are exploited and used up, mining of the ocean floor will increase.

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MINING

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CLIMATE BUFFER

- The ocean is an integral component of the world's climate due to its capacity to collect, drive and mix water, heat, and carbon dioxide.
- The ocean can hold and circulate more water, heat and carbon dioxide than the atmosphere although the components of the Earth's climate are constantly exchanged.
- Because the ocean can store so much heat, seasons occur later than they would and air above the ocean is warmed.

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CLIMATE BUFFER

- Heat energy stored in the ocean in one season will affect the climate almost an entire season later.
- The ocean and the atmosphere work together to form complex weather phenomena like the North Atlantic Oscillation and El Niño.
- The many chemical cycles occurring between the ocean and the atmosphere also influence the climate by controlling the amount of radiation released into ecosystems and our environment.

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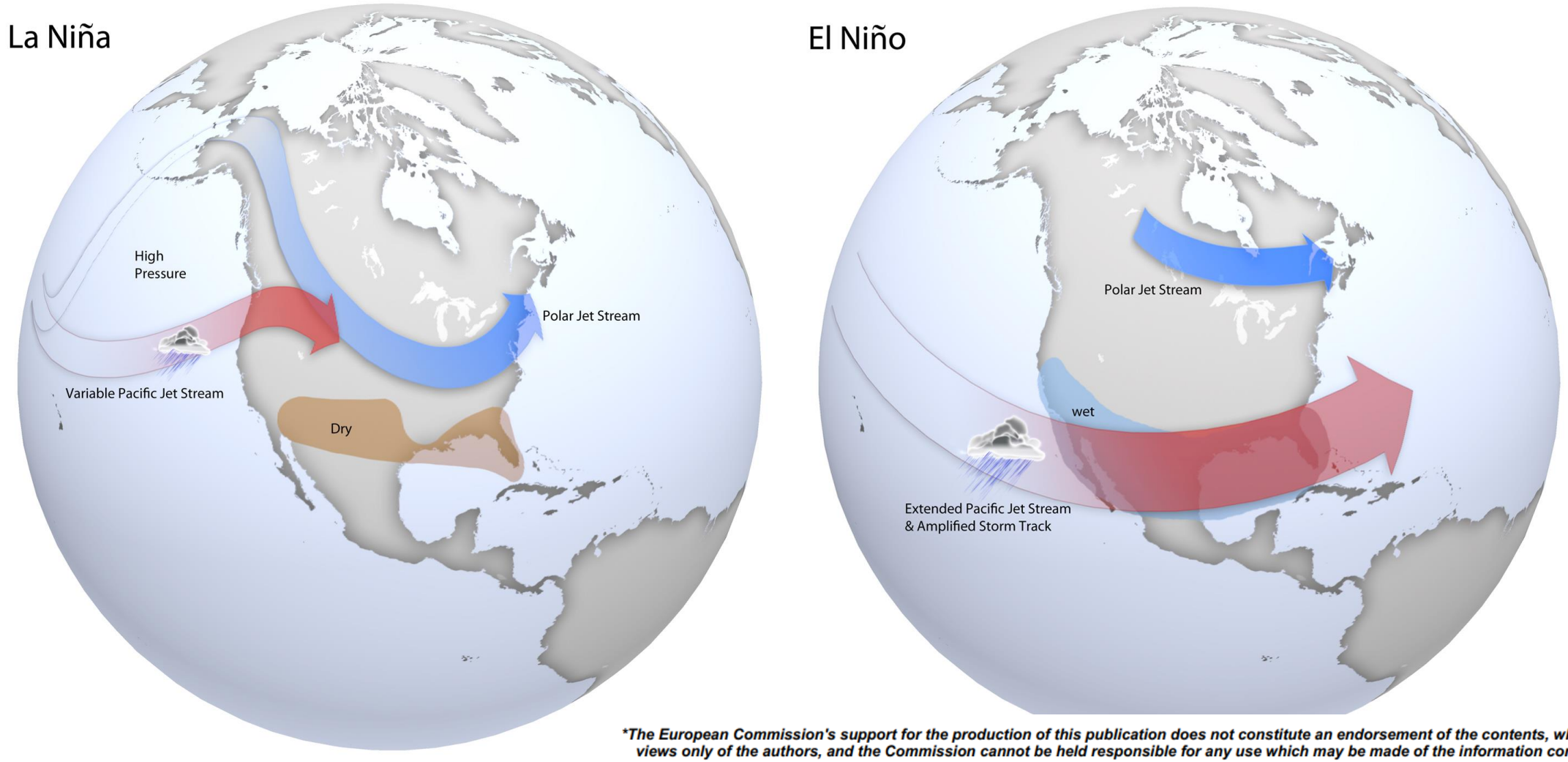
CLIMATE BUFFER



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OXYGEN PRODUCTION

- The rate of flow for oxygen as well as other gases is controlled by biological processes, especially metabolism of organisms like prokaryotes and bacteria.
- Prokaryotes have been around since the beginning of the Earth, have evolved to be able to use chemical energy to create organic matter and are capable of both reducing and oxidizing inorganic compounds.
- Bacteria that can reduce inorganic compounds are anaerobic and those that oxidize inorganic compounds are aerobic. Aerobic bacteria release oxygen as a by-product of photosynthesis.

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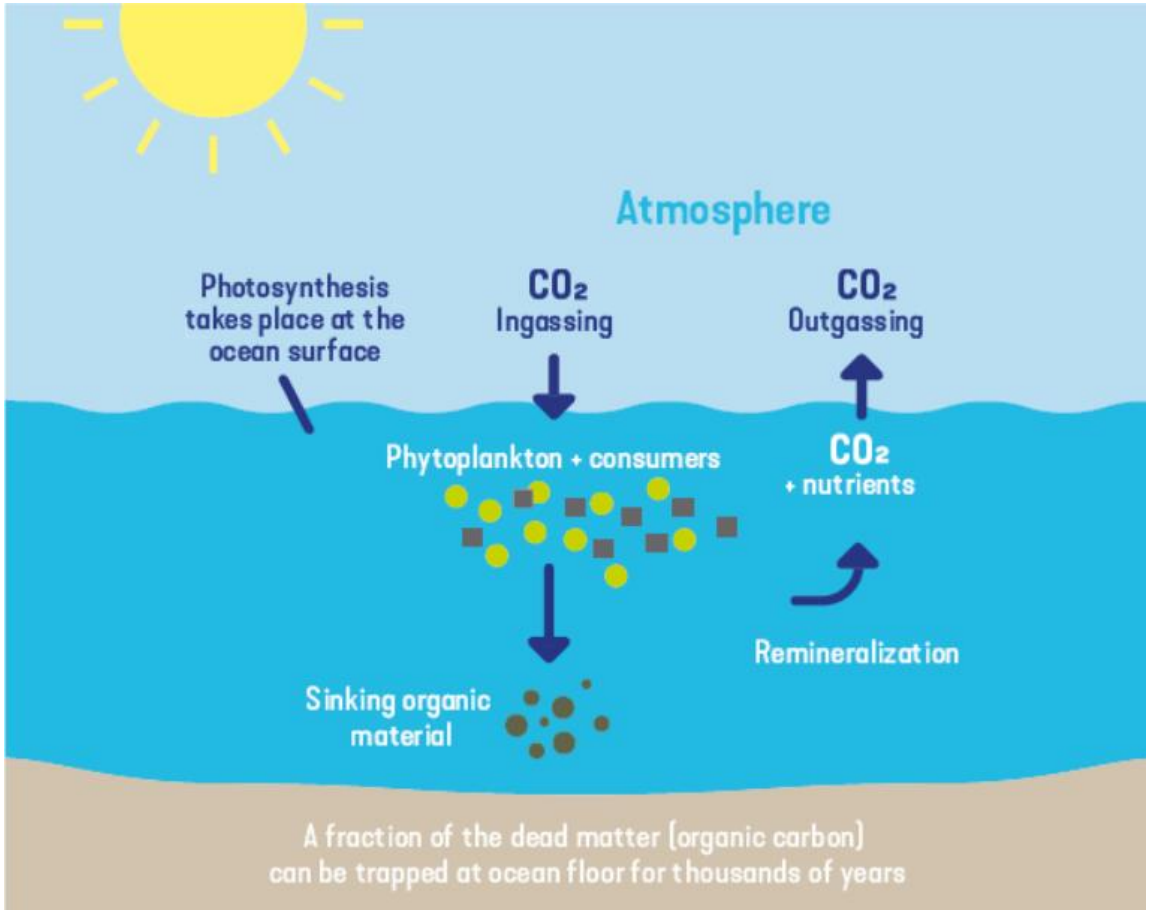
OXYGEN PRODUCTION

- Phytoplankton account for possibly 90% of the world's oxygen production because water covers about 70% of the Earth and phytoplankton are abundant in the photic zone of the surface layers.
- Some of the oxygen produced by phytoplankton is absorbed by the ocean, but most flows into the atmosphere where it becomes available for oxygen dependent life forms.



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OCEAN ENERGY RESOURCES

- The oceans' waters, the air above the oceans, and the land beneath them contain enormous energy resources.
- Oceans cover almost three-fourths of the earth’s surface.
- The oceans' waters, the air above the oceans, and the land beneath them contain enormous energy resources.
- These energy resources include non-renewable energy sources such as oil and gas, and renewable energy sources, such as offshore wind energy, wave energy, ocean current energy, offshore solar energy.
- Offshore renewable resources are the focus of the OCS Alternative Energy Programmatic EIS.

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OCEAN ENERGY RESOURCES

- In many areas, large deposits of petroleum and natural gas are buried under the seabed.
- Today, more than a fourth of the oil and gas produced in the United States comes from offshore areas, and many other countries have extensive offshore oil and gas facilities as well.
- In contrast, relatively few countries have extensive offshore renewable energy facilities, and in the U.S., offshore renewable energy technologies are currently little utilized for commercial energy generation.
- The technologies are relatively new, and historically they have not generally been economically competitive with traditional non-renewable energy sources such as oil, gas, and coal.

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OCEAN ENERGY RESOURCES

- More recently, as the prices of traditional energy sources such as gas and coal continue to climb, and the design and efficiency of offshore renewable energy technologies improves, these energy sources are becoming more economically competitive with traditional energy sources.
- The alternative energy sources under consideration for use on the OCS—wind, solar, wave, and current power—hold significant potential to alleviate the growing energy demands of society.

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OCEAN THERMAL ENERGY

- Oceans cover more than 70% of Earth's surface, making them the world's largest solar collectors.
- The sun's heat warms the surface water a lot more than the deep ocean water, and this temperature difference creates thermal energy.
- Ocean thermal energy can be used for many applications, including electricity generation.
- While the OCS Alternative Energy Programmatic EIS will examine ocean current energy, which is based primarily on thermal energy that drives ocean currents, it does not consider other ocean thermal energy technologies, such as ocean thermal energy conversion systems.

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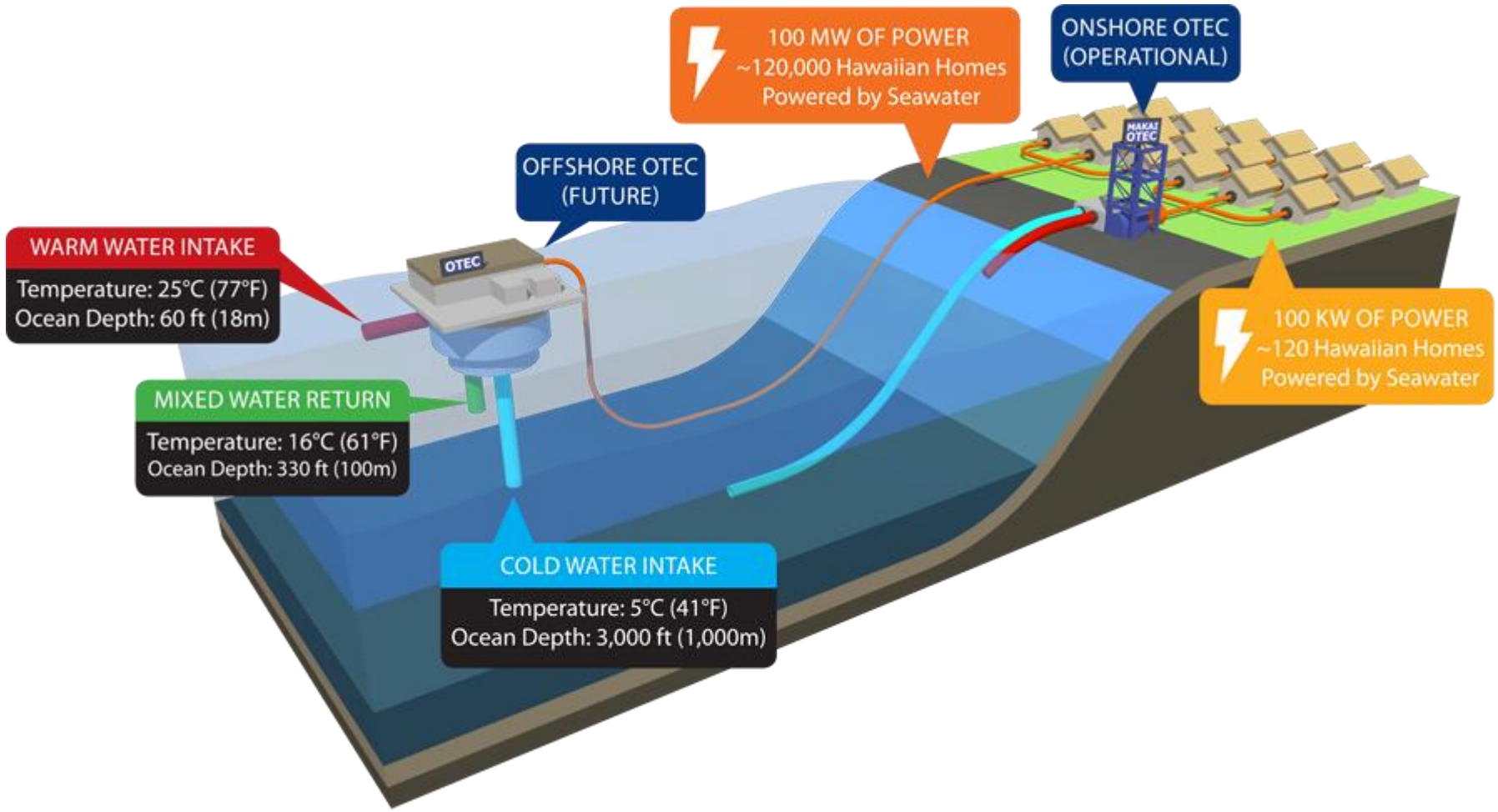
OCEAN THERMAL ENERGY



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OCEAN MECHANICAL ENERGY

- Ocean mechanical energy is quite different from ocean thermal energy.
- Even though the sun affects all ocean activity, tides are driven primarily by the gravitational pull of the moon, and waves are driven primarily by the winds.
- As a result, tides and waves are intermittent sources of energy, while ocean thermal energy is fairly constant.
- Also, unlike thermal energy, the electricity conversion of both tidal and wave energy usually involves mechanical devices.
- Because the OCS region begins beyond waters affected by tides, tidal energy generation is not considered in the OCS Alternative Energy Programmatic EIS.
- Ocean current energy is another form of ocean mechanical energy generated by the continuous movement of surface or near-surface waters, driven primarily by wind and by solar heating of the ocean water.

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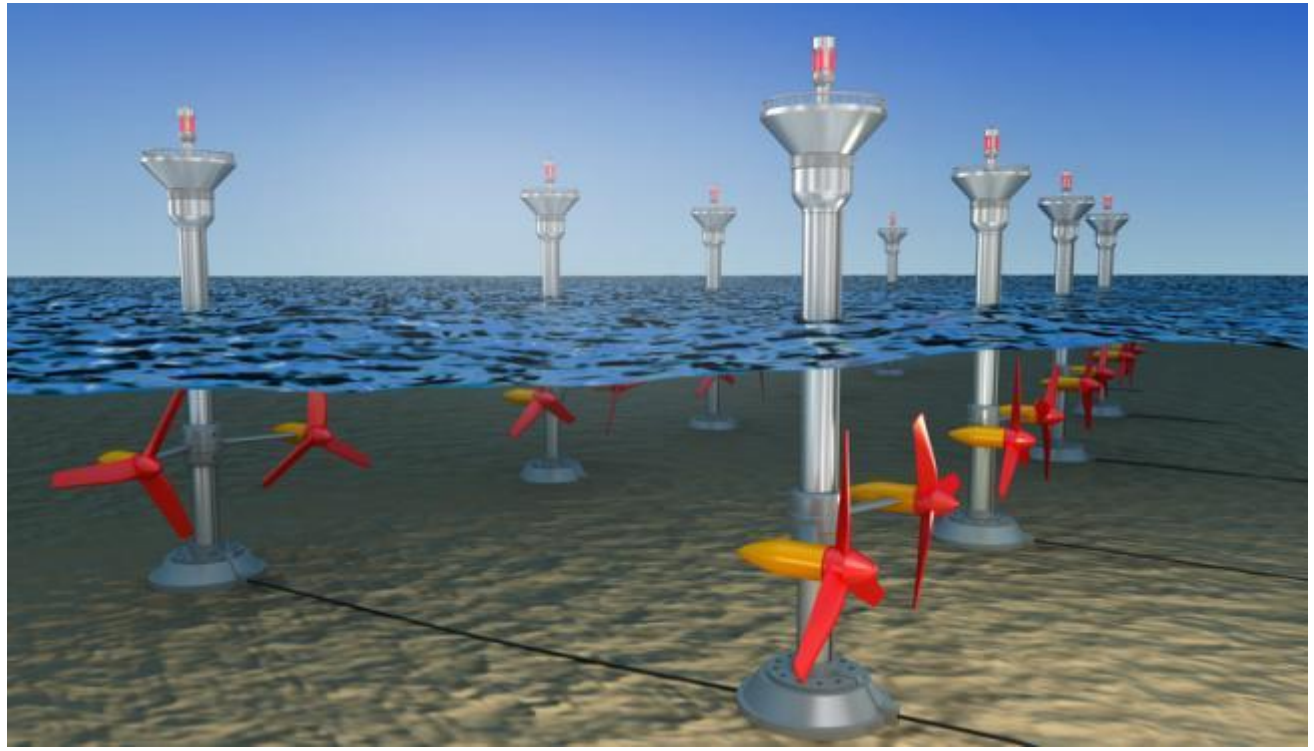
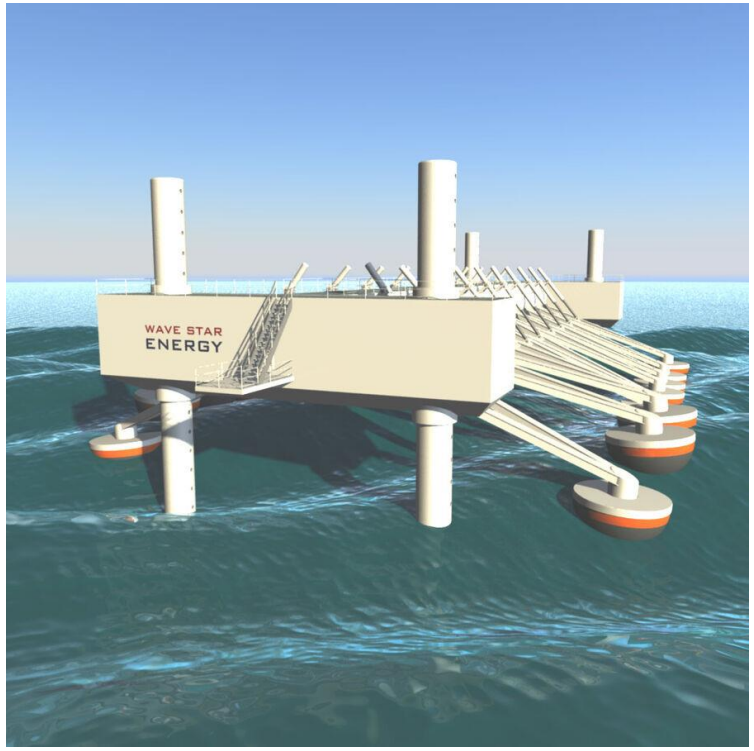
OCEAN MECHANICAL ENERGY





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OTHER OFFSHORE ENERGY SOURCES

- Offshore wind and offshore solar energy do not rely directly on ocean waters as an energy source, although ocean water temperature differences affect ocean winds and cloud formation that would in turn affect these energy sources.
- Both energy sources can be and are currently used for power generation on land throughout the world.


Q&A

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

THANK YOU

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 7
RENEWABLE AND NON-RENEWABLE ENERGY

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RENEWABLE AND NON-RENEWABLE ENERGY

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LECTURE OUTLINE

- Renewable energy
- Non renewable energy
- How to use sustainably

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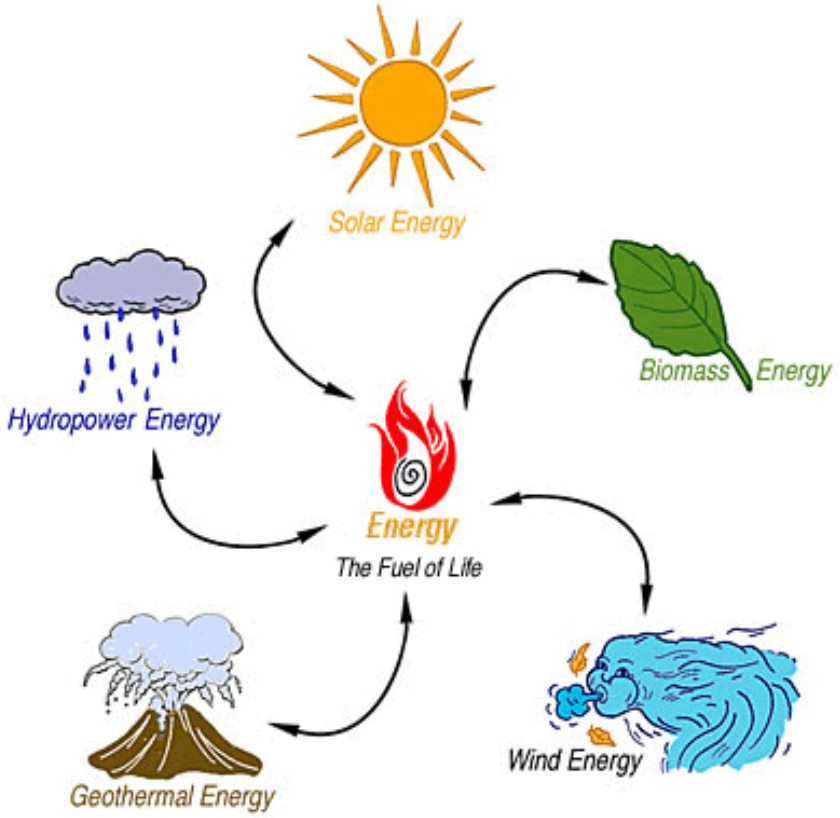
RENEWABLE ENERGY

- **Renewable Energy or Green energy** - a term describing what is thought to be environmentally friendly sources of power and energy (refers to renewable and non-polluting energy sources)



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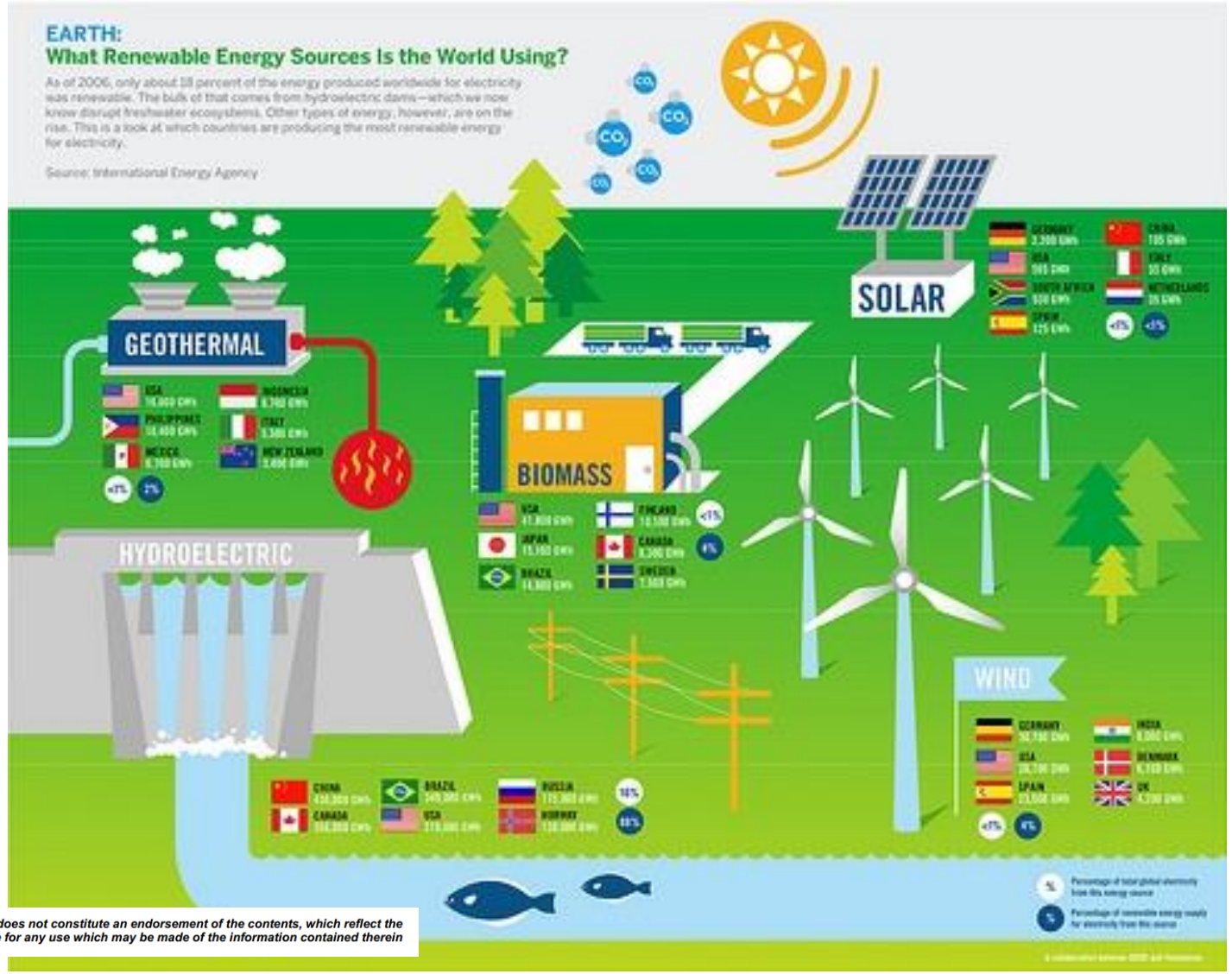
RENEWABLE ENERGY



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RENEWABLE ENERGY

Six types of renewable energy:

1. Solar
2. Hydropower
3. Wind
4. Biomass
5. Hydrogen
6. Geothermal

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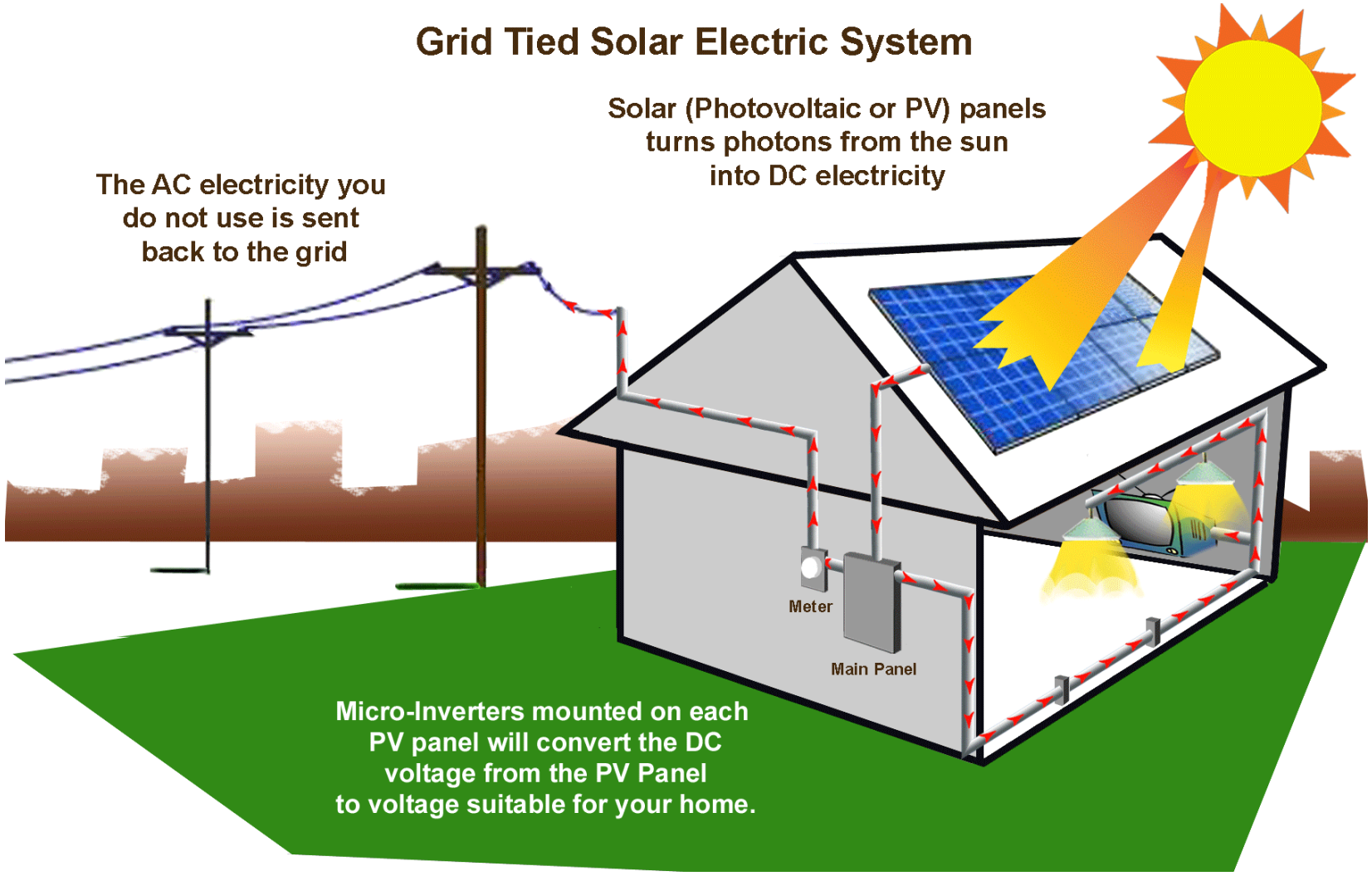
SOLAR ENERGY



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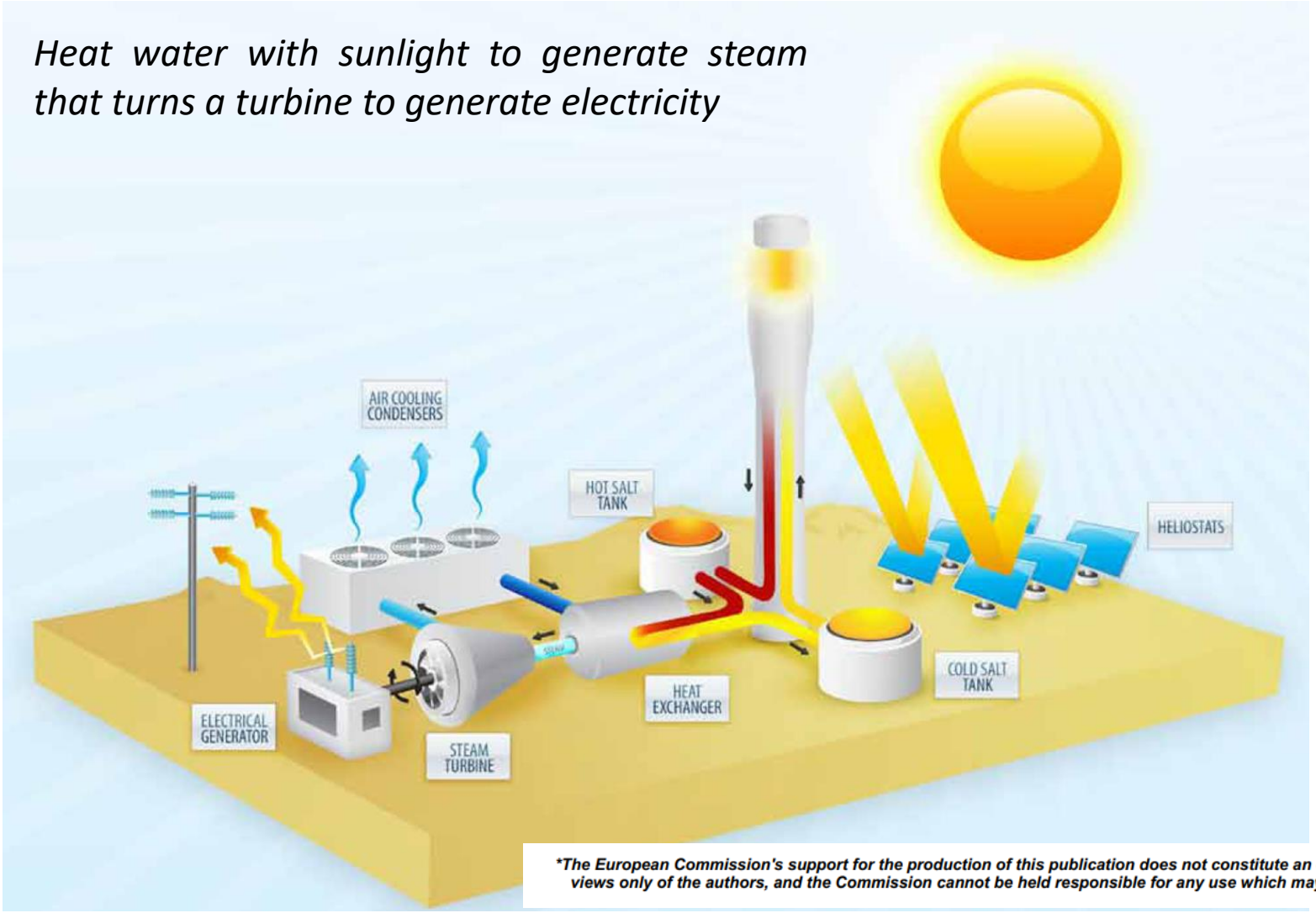
SOLAR ENERGY

Heat water with sunlight to generate steam that turns a turbine to generate electricity



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SOLAR ENERGY

Benefit of Solar Energy

1. Free energy resource
2. Clean form of energy
3. No pollution & other environmental problems
4. Can be integrated with building designs

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SOLAR ENERGY

Limitation of solar energy

1. Goes away at night, blocked on cloudy days
2. Must be stored & collected
3. Current storage technologies are limited
4. Do not compete well economically with conventional sources

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HYDROPOWER

- A huge hydroelectric dams, where water under high pressure flows through channels, driving turbo generators
- Generates 19% of electrical power throughout the world
- Non polluting, renewable energy source but hydroelectric dams still involves high ecological, social & cultural trade-off

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HYDROPOWER

- Example : Three Gorges Dam in China
  - The largest dam in the world
  - Capable of generating 18 gigawatts of hydro-electric power

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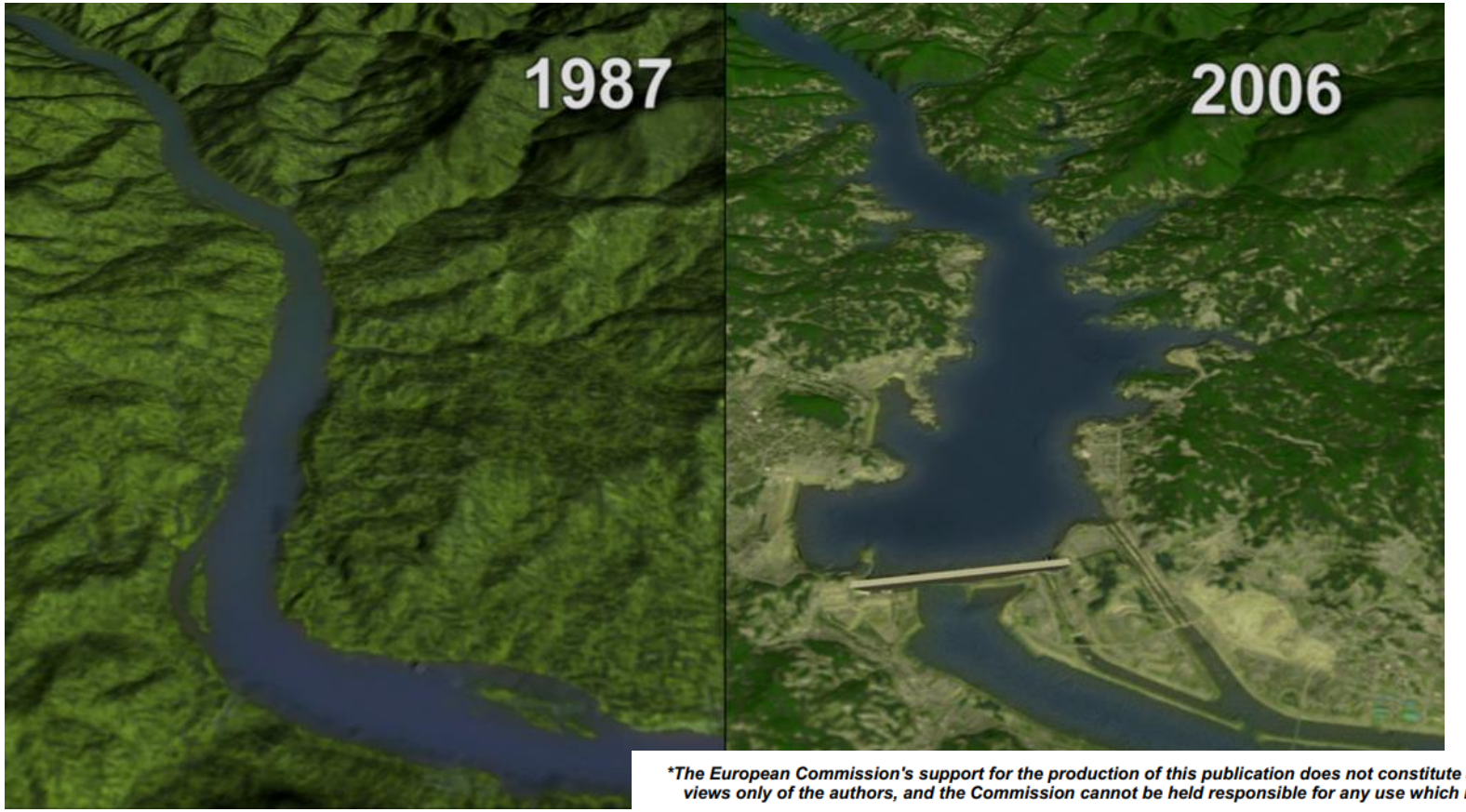
HYDROPOWER

- Example : Three Gorges Dam in China



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HYDROPOWER

Small Scale Hydro

- The main component are the turbine and the generator
- Convert the falling energy of water into electricity
- Environmental friendly hydro project is the “run-of-river” that does not change the flow of river or stream, does not requires reservoir or dam

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WIND ENERGY

- Currently supplying power in 30 countries
- Generate enough power 14,000 MW for 14 million modern households
- Cheaper than nuclear power and all other fuel-powered energy
- Commercial wind turbines need to be established at areas with wind speeds greater than 6m/s or 22 km/h

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BIOMASS ENERGY

- Derived from biomass (plant or animal) to produce biogas
- Main sources of sustainable biomass: industrial and agricultural wastes and residues, such as sugar cane waste (bagasse), wood waste from forestry operations, and residues from other short rotation crops
- Organic wastes from animal husbandry, energy crops, such as sugar cane, corn, and trees grown in short-rotation plantations,
- Domestic and municipal wastes such as sewage and garbage.

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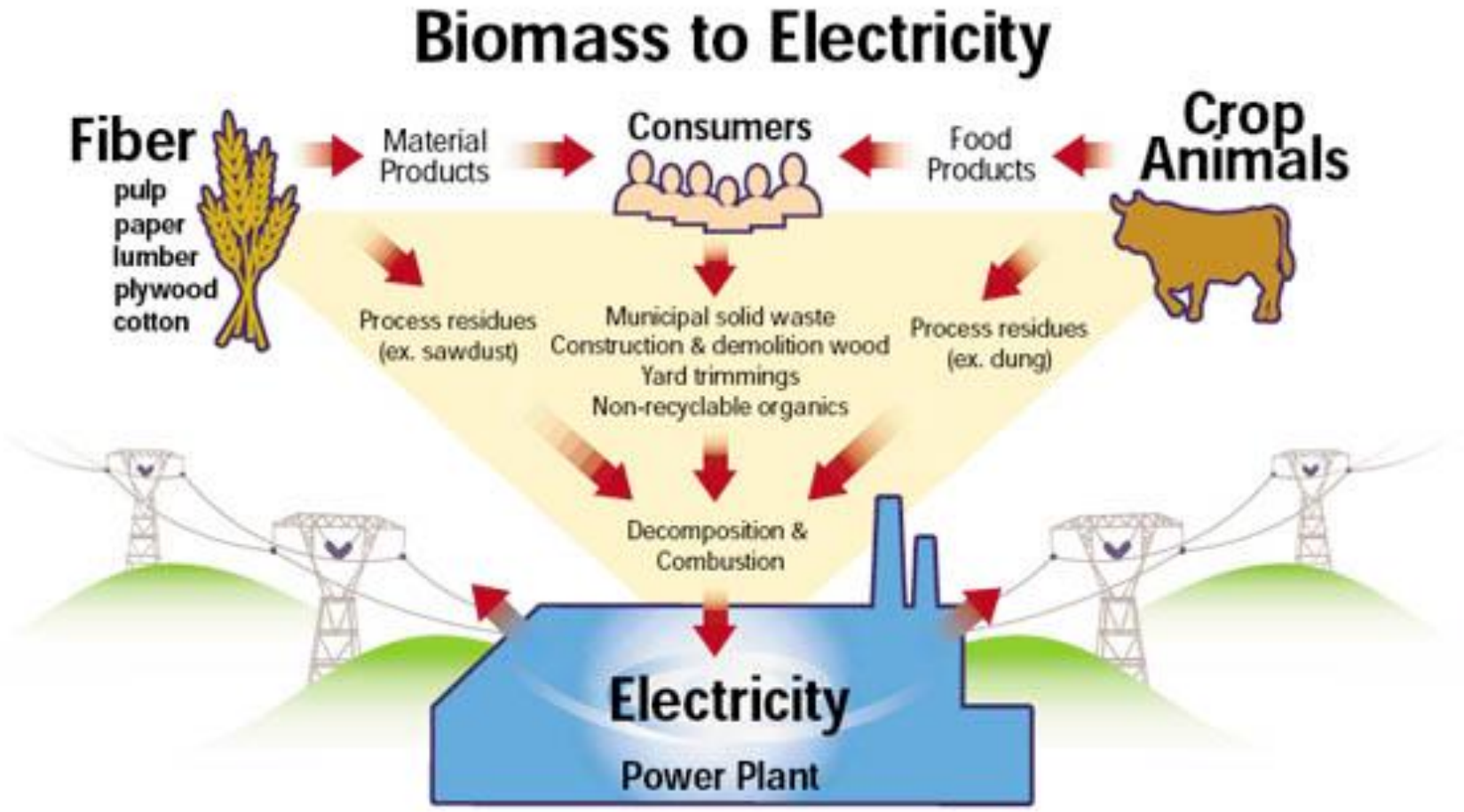
BIOMASS ENERGY



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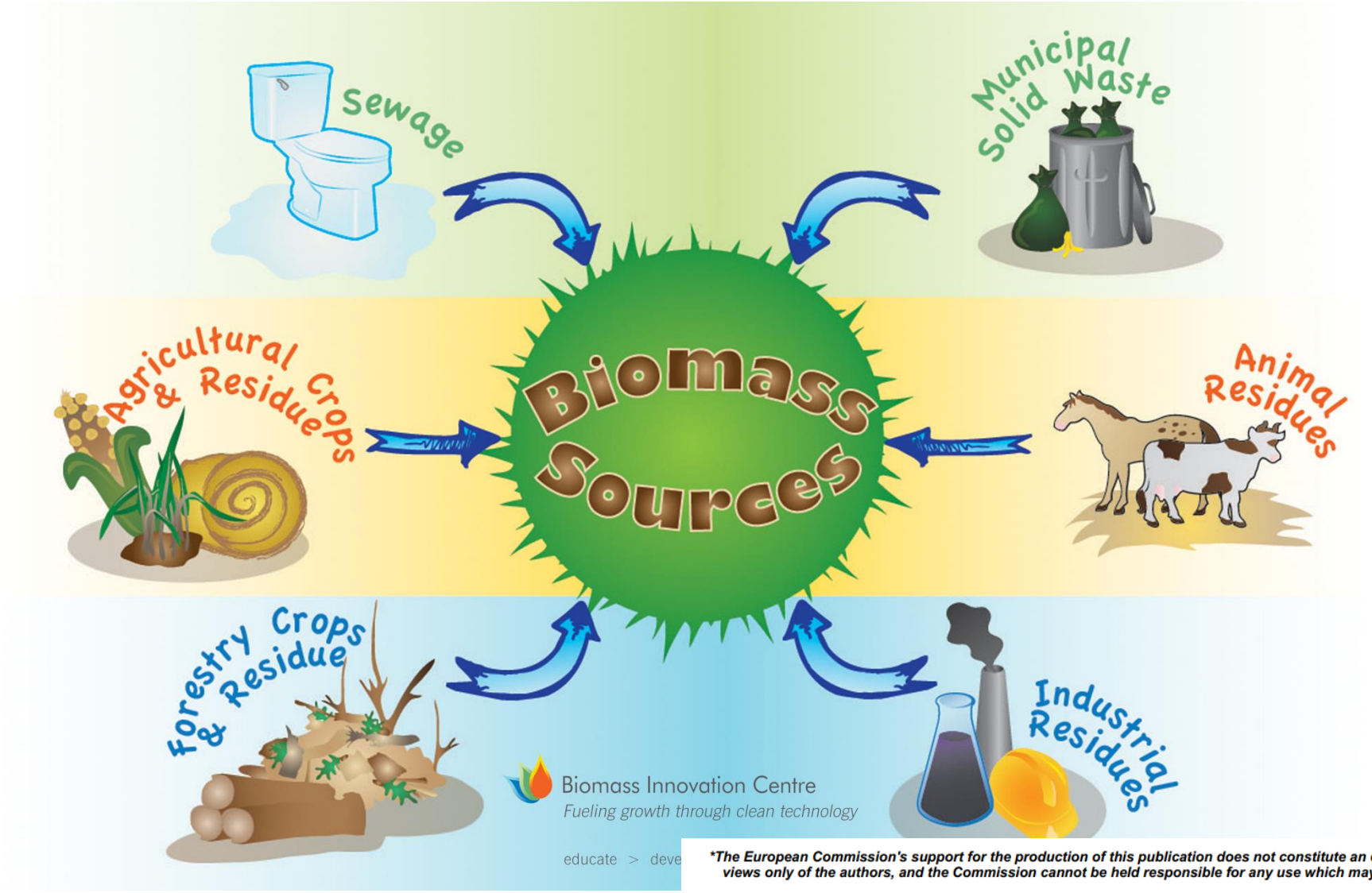
BIOMASS ENERGY



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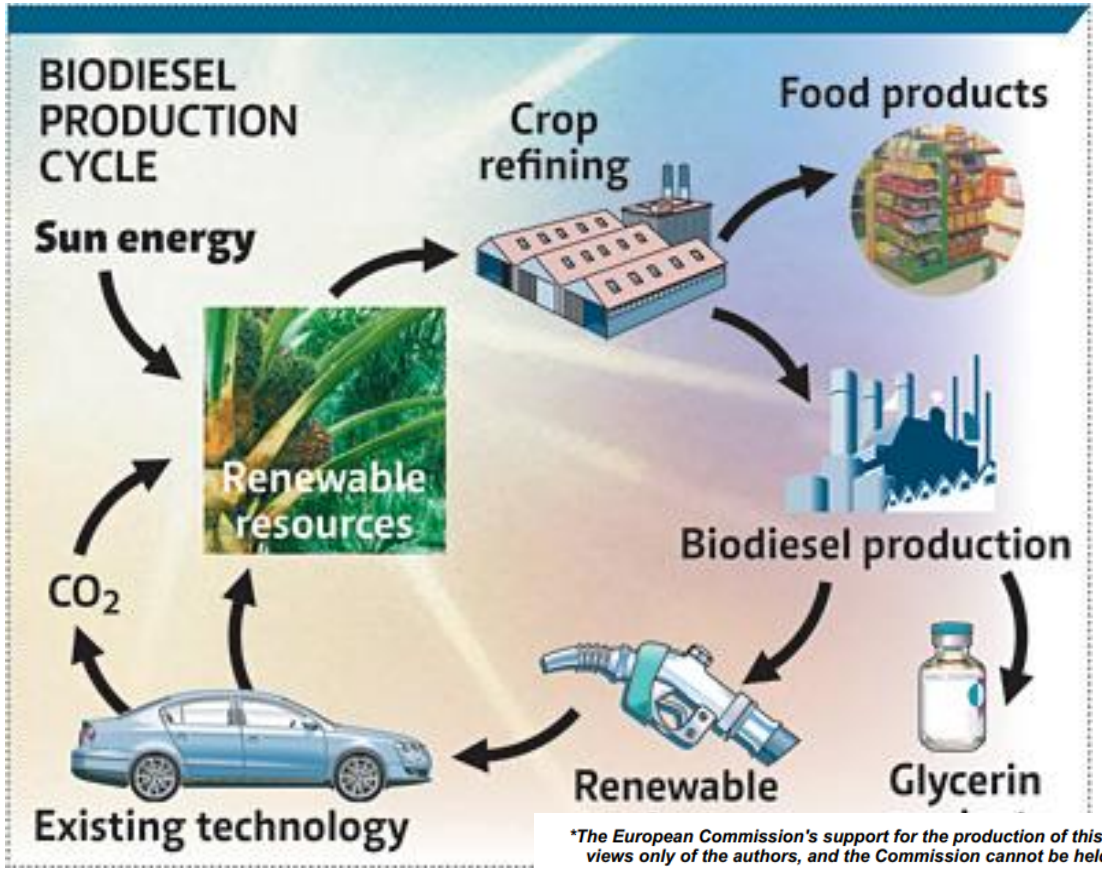
BIOMASS ENERGY

Biodiesel → clean burning alternative fuel, produced from domestic, renewable resources



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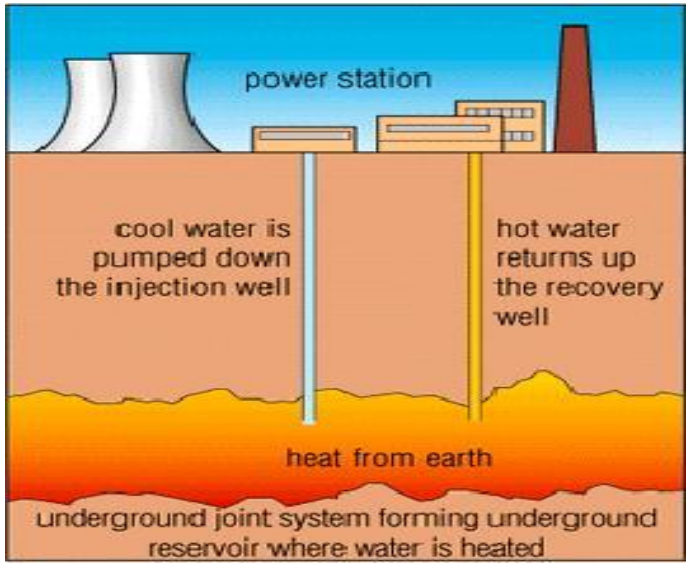
GEOTHERMAL ENERGY

- Geothermal = heat of the earth
- Generates around 9,000 MW heat and electricity around in world
- Has the potential to generate 120 times the current level
- Extracting energy via pumps and heat exchanger
- Drills 100 – 4,500 m below the earth's surface
- Adverse environmental impact is the emission of sulfur dioxide into the atmosphere



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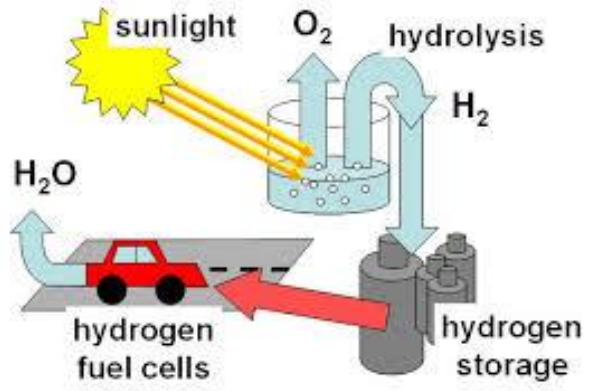
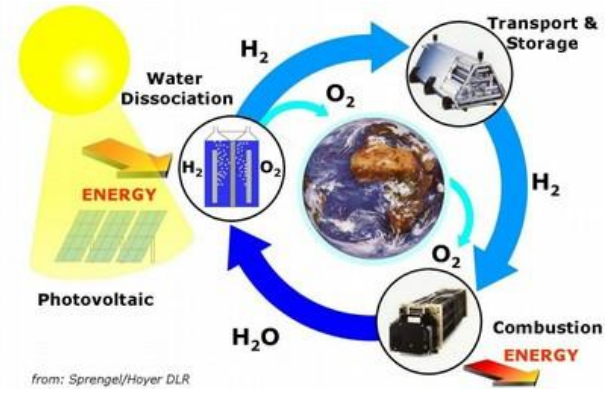
HYDROGEN FUEL

- Hydrogen is produced by heating or passing electricity through water in the presence of a catalyst
- Breakdown of water into oxygen & hydrogen
- Relatively clean-burning fuel
- At present, it is still an expensive form of energy





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ADVANTAGES OF RENEWABLE ENERGY

- Eliminating greenhouse gas emissions, improved air quality
- Can diversify energy supply, promoting energy security and price stability
- Reduced imported fuels in some nations
- Provide regional and local job opportunities. Three times more employment-intensive than fossil fuel power stations. In 2000, wind-energy industry provided 85,000 jobs worldwide and by 2020 – 1.8 million jobs (retailing, installation and system maintenance.

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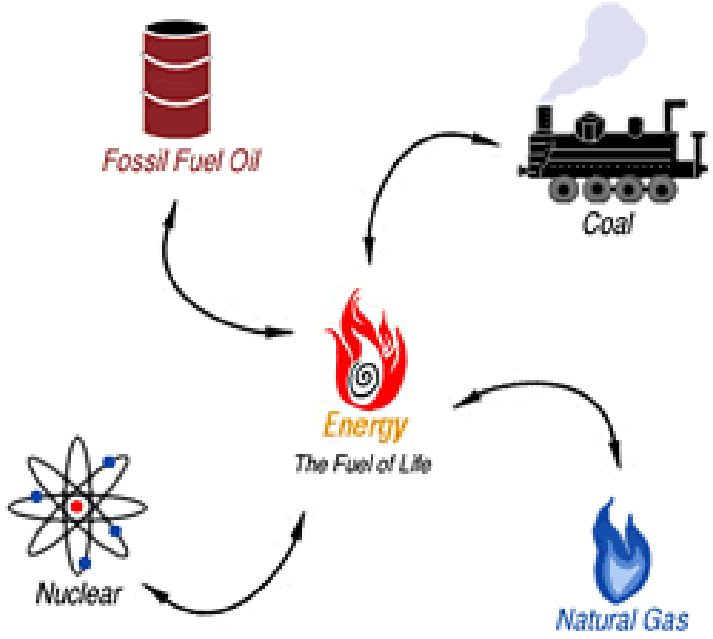
NON-RENEWABLE ENERGY

- **Renewable Energy or Green energy** - A non-renewable resource is a natural resource that cannot be readily replaced by natural means at a pace quick enough to keep up with consumption. An example is carbon-based fossil fuels.



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FOSSIL FUEL

- Three fossil fuels:
  1. Crude oil
  2. Natural gas
  3. Coal

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FOSSIL FUEL

- Derived from the remains of living organisms (100 – 500 million years ago)
- Dead organic matter gradually buried under layers, converted by heat & pressure
- Still forming through natural processes, however we are using it faster than they are formed

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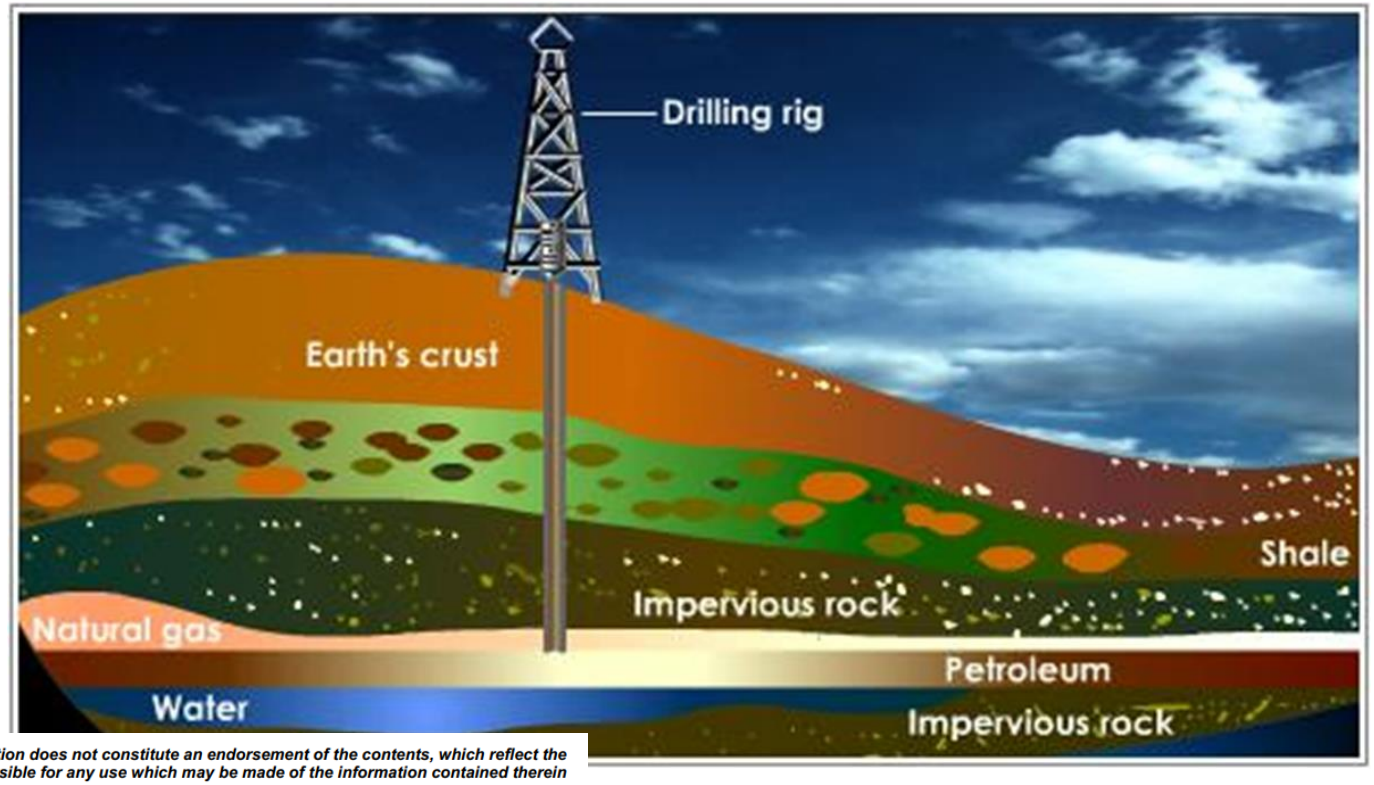
FOSSIL FUEL – CRUDE OIL

- Extracted from deep wells on seafloor & on land
- Impacts: oil spills & combustion of oils and its by-products



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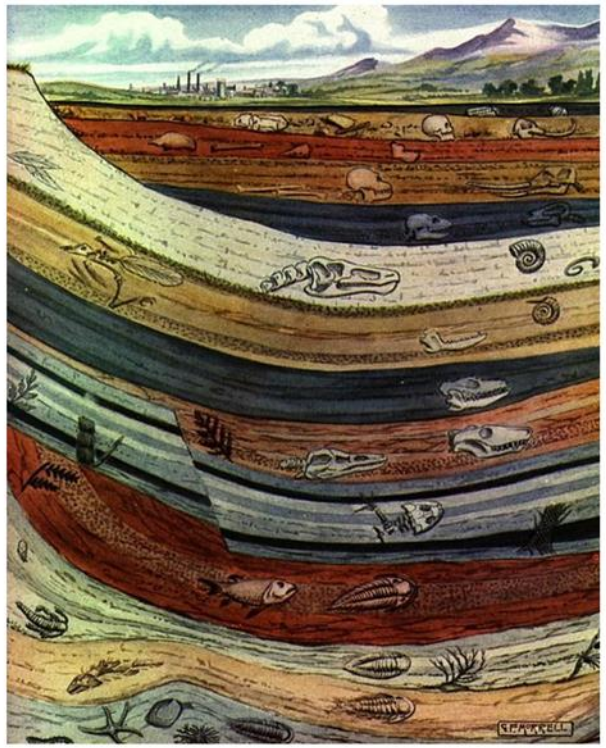
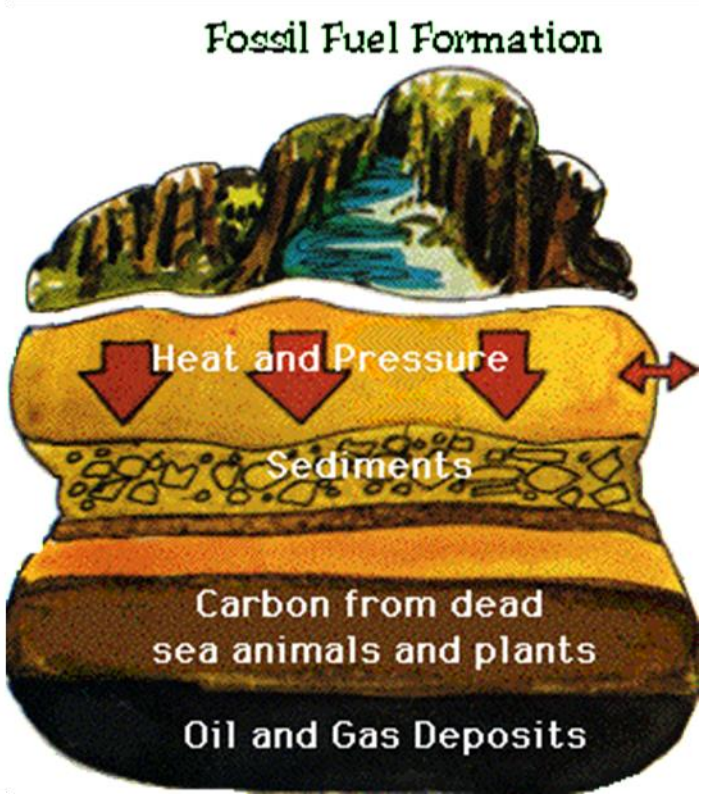
FOSSIL FUEL – CRUDE OIL



How Fossils Are Formed



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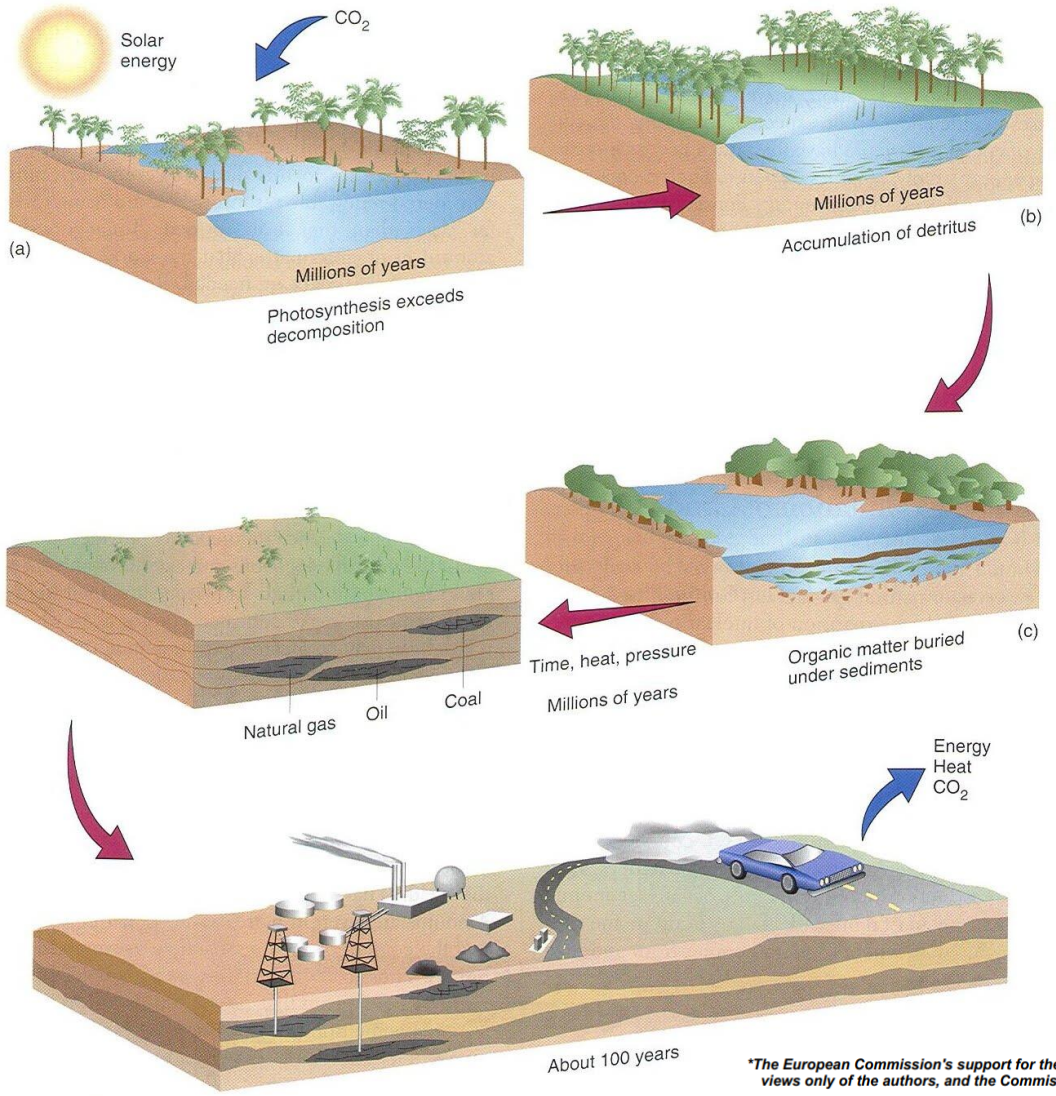
FOSSIL FUEL – CRUDE OIL



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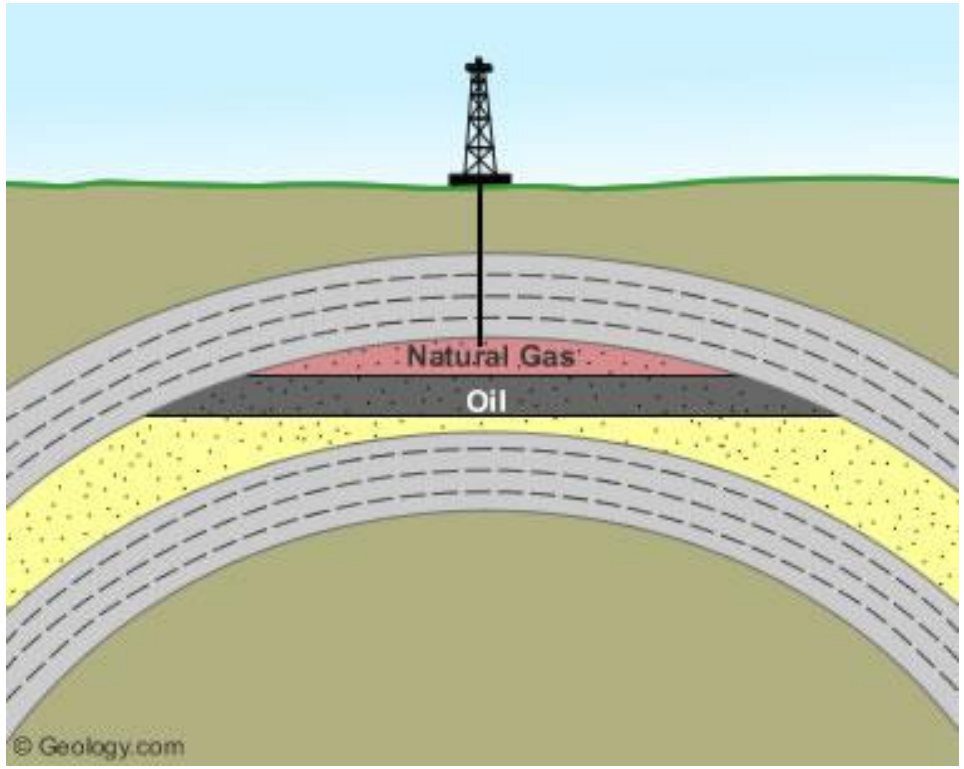
FOSSIL FUEL – NATURAL GAS

- Gas extracted from deep well
- Burned in homes, factories & electric utilities
- Contains few contaminants & burns cleanly



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FOSSIL FUEL – COAL

- The most abundant fossil fuel
- Inexpensive
- Production & consumption of coal are more environmentally disruptive

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FOSSIL FUEL – COAL

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ELECTRICAL POWER

- Clean energy?
- Using electricity creates no pollution
- But…….When demand high, more energy sources needed
  - Coal : air pollution
  - Hydroelectric : dam/reservoir alter ecosystem
  - Nuclear : dangerous

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ELECTRICAL POWER

- Most energy used : Electrical power
- Secondary energy source because it depends on a primary source (eg: coal, waterpower)
- Where does your electricity come from?

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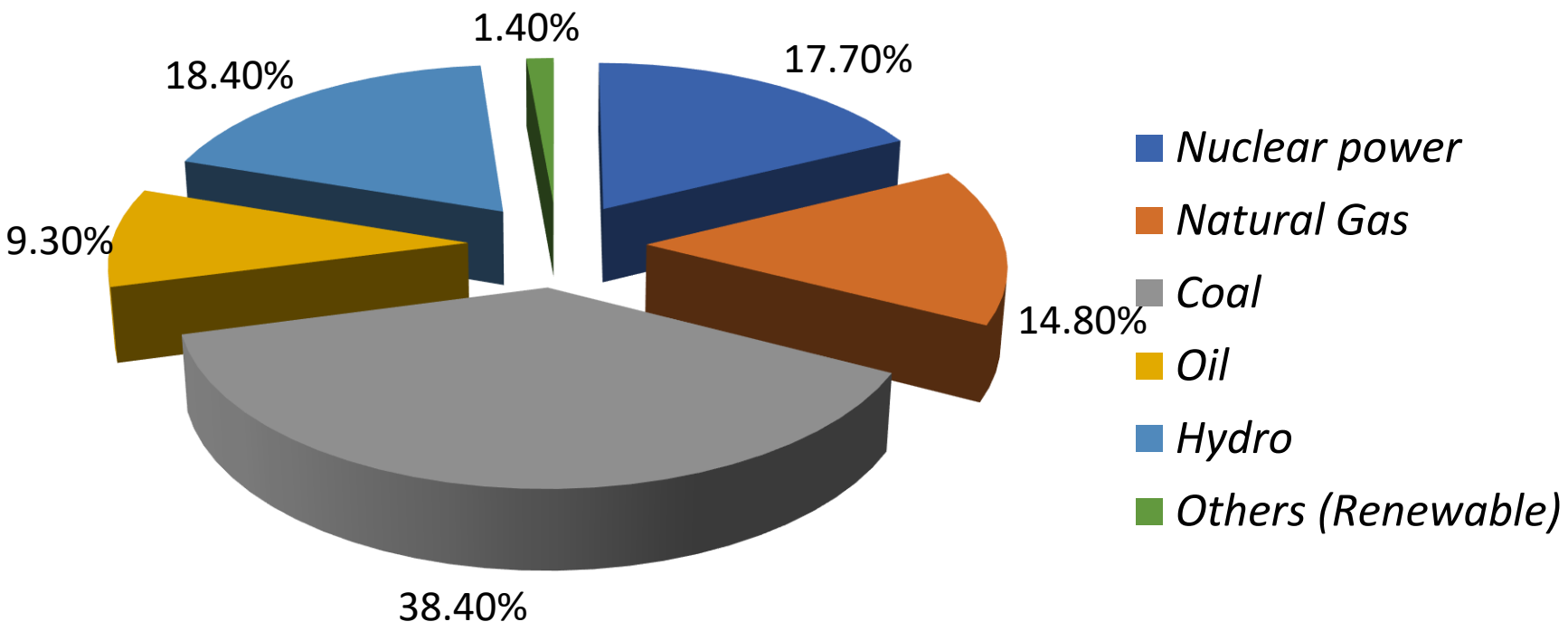
ELECTRICAL POWER



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ELECTRICAL POWER

- Most energy used : Electrical power
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- Where does your electricity come from?

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NUCLEAR POWER

- Do not contribute to global warming
- Alternative to fossil fuel → Uranium
- 433 operating nuclear plants, 37 under construction (17% of world's electricity)
- Japan & France: fully committed to use nuclear programs

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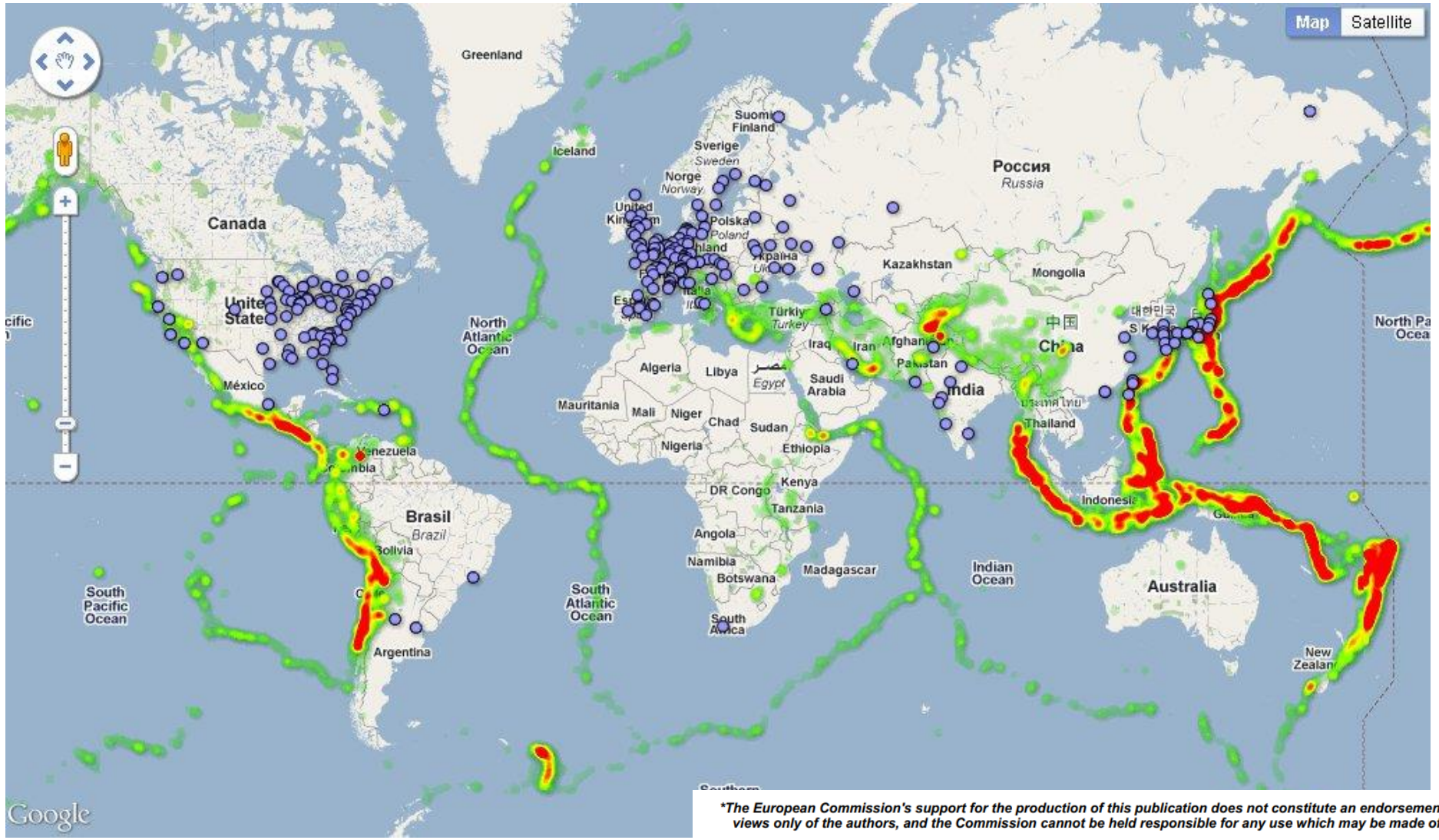
NUCLEAR POWER



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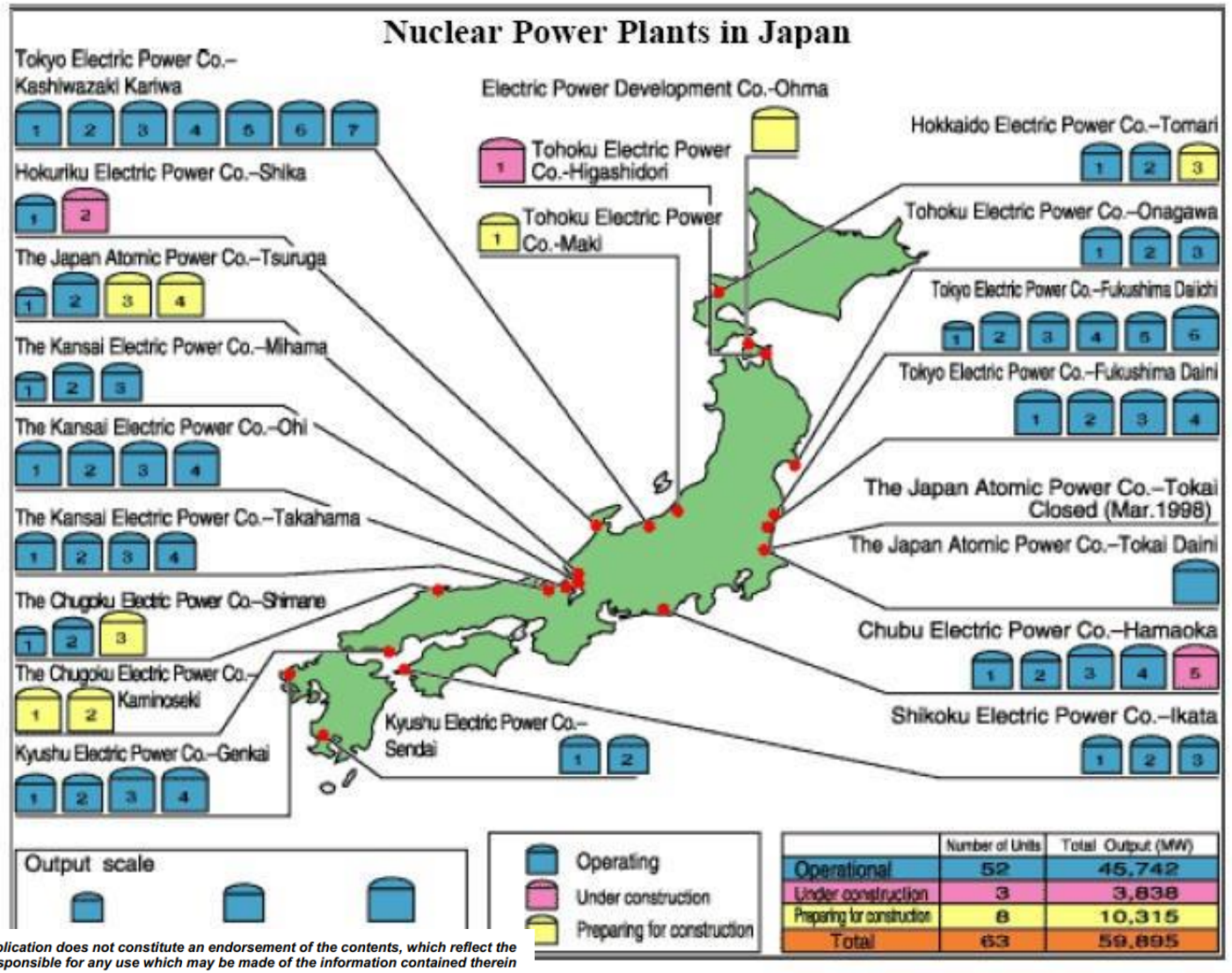
NUCLEAR POWER



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NUCLEAR POWER

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NUCLEAR POWER

- The benefits

1. Produce very little pollution
2. Do not produce Sulfur dioxide & Nitrogen dioxide
3. Less land disturbance

BUT

<< Most expensive >>

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NUCLEAR POWER

- The drawbacks

1. Waste disposal problems
2. Contamination of the environment with long-lasting radioactive materials from accident & transportation
3. Thermal pollution
4. Health impacts
5. Limited supplies of uranium
6. High construction costs

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NUCLEAR POWER

Dreams or delusion?

- **Chernobyl, Ukraine (25 & 26 April 1986) :**
  - Human error
  - 30 people died; 116,000 evacuated, 210,000 resettled
  - Local Ecosystems : Plants & animals died within 10km radius.
  - 1989 : ecosystem recovering, with possible long term genetic effects

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NUCLEAR POWER

Chernobyl, Ukraine (25 & 26 April 1986) :

Human error

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NUCLEAR POWER

Chernobyl, Ukraine (25 & 26 April 1986) :

Human error

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Three Mile Island (28 March 1978) :

malfunction valve in cooling system

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Tokaimura, Japan (30 Sept 1999)

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Fukushima, Japan (16 March 2011)

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SUSTAINABLE ENERGY SYSTEM

Many energy options, but not all are sustainable

- Sustainable energy will require careful analysis:
- Net energy yield
- Specific needs & efficiency
- Environmental impacts
- Abundance & renewability
- affordability


Q&A

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ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

THANK YOU

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— MMS3003 —
ENVIRONMENT – ISSUE AND GLOBAL PERSPECTIVE

CHAPTER 8
PERSPECTIVES OF HUMAN'S RELATION WITH NATURE

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PERSPECTIVES OF HUMAN'S RELATION WITH NATURE

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LECTURE OUTLINE

- Human-nature relationship
- How human degrade the environment
- What environmental activism can be conducted

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RESOURCISM

- Resourcism is the belief that the purpose of the environment is to serve the needs from humans, and that environmental resources do not have value until humans give it value.
- The ideas behind resourcism stem from the thought that humans are above and apart, rather than part of the “natural” world around them.
- The idea of recourcism began when it was a much more reasonable idea; populations were smaller and society consumed at a lesser rate than it does now.
- The problem that arises from resourcism today is that there are not enough resources for our modern society to consume at the rate we do for much longer.

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RESOURCISM

… human pressure risks causing widespread, abrupt and possibly irreversible changes to basic earth-system processes. Water shortages, extreme weather, deteriorating conditions for food production, ecosystem loss, ocean acidification and sea-level rise are real dangers that could threaten development and trigger humanitarian crises across the globe.

Griggs, D. J., M. Stafford-Smith, O. Gaffney, J. Rockstrom, M. Ohman, P. Shyamsundar, W. Steffen, G. Glaser, N. Kanie and I. Noble, 'Sustainable Development Goals for People and Planet', Nature, vol. 495, 2013, pp. 305–9, at p. 306.

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ENVIRONMENTAL CHANGE

- Sudden and dramatic natural changes to the environment have occurred in the distant past, but only relatively recently has one species had the potential to upset the whole balance of the Earth's ecosystem.
- The global population has risen dramatically during the last century.
- The rise of industry and its rapid expansion has been a major source of pollution. This has caused changes in the balance of our environment.

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ENVIRONMENTAL CHANGE

Numerous environmental changes have been identified as issues of global concern:

- desertification;
- the depletion of fuelwood;
- the destruction of tropical rainforest and rapid declines in forest cover;
- the modification of coastal ecosystems;
- the reduced availability and quality of drinking water;
- the depletion of soil resources; the over-exploitation of fisheries;
- food shortages;
- species extinction and the loss of biodiversity; stratospheric ozone depletion; rapidly rising levels of fossil fuel and demand for energy supplies;
- climate change.

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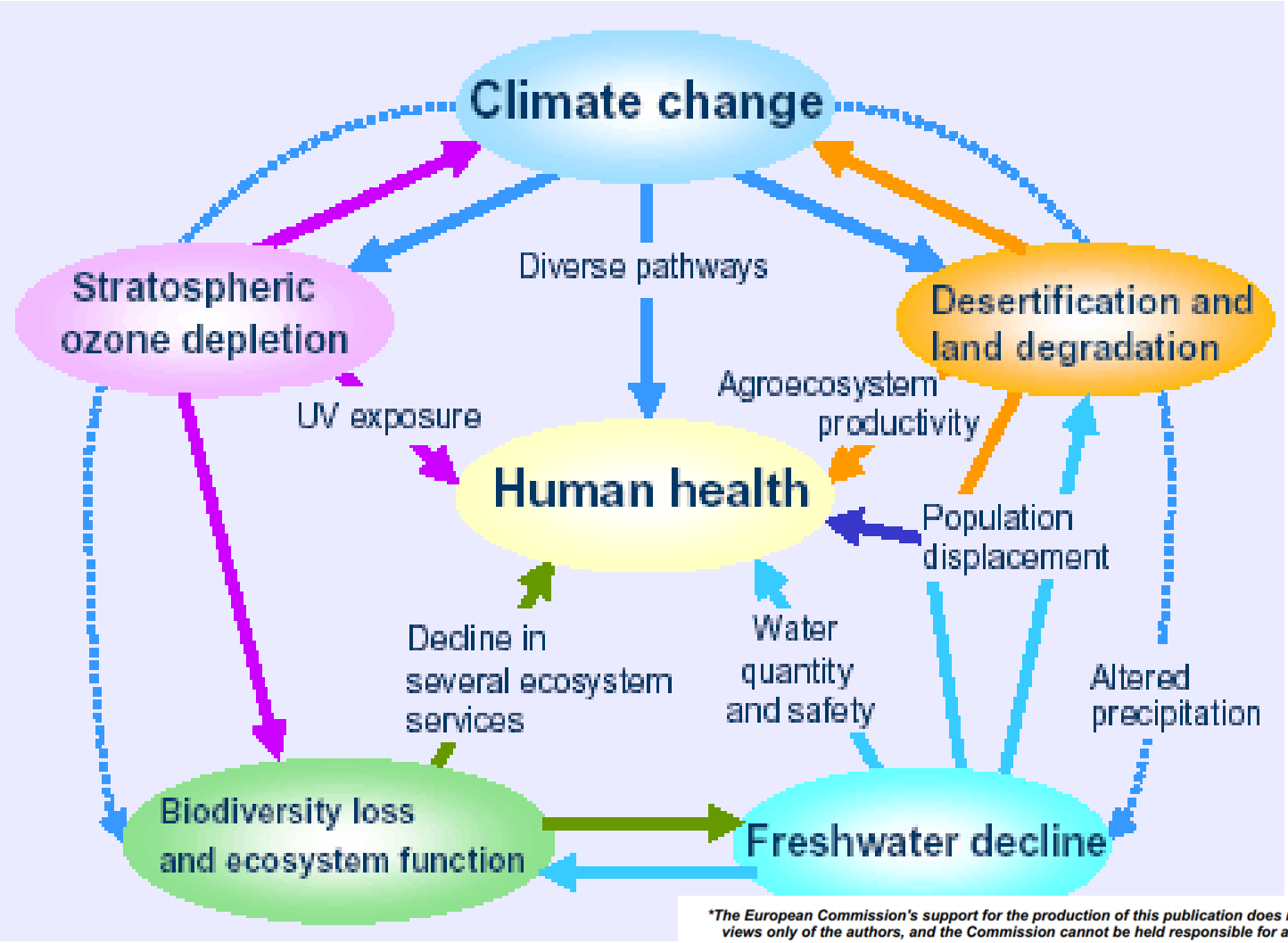
ENVIRONMENTAL CHANGE



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GLOBAL ENVIRONMENT FACILITIES (GEF)

- The Global Environment Facility (GEF), established on the eve of the 1992 Rio Earth Summit, is a catalyst for action on the environment. Through its strategic investments, the GEF works with partners to tackle the planet's biggest environmental issues.
- The funding also helps reduce poverty, strengthen governance and achieve greater equality between women and men. They occupy a unique space in the global partnership for a more sustainable planet.

gef GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

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GLOBAL ENVIRONMENT FACILITIES (GEF)

- A **UNIQUE PARTNERSHIP** of 18 agencies — including United Nations agencies, multilateral development banks, national entities and international NGOs — working with 183 countries to address the world's most challenging environmental issues. The GEF has a large network of civil society organizations, works closely with the private sector around the world, and receives continuous inputs from an independent evaluation office and a world-class scientific panel.
- A **FINANCIAL MECHANISM** for 5 major international environmental conventions: the Minamata Convention on Mercury, the Stockholm Convention on Persistent Organic Pollutants (POPs), the United Nations Convention on Biological Diversity (UNCBD), the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC).

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GLOBAL ENVIRONMENT FACILITIES (GEF)

- AN **INNOVATOR AND CATALYST** that supports multi-stakeholder alliances to preserve threatened ecosystems on land and in the oceans, build greener cities, boost food security and promote clean energy for a more prosperous, climate-resilient world

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ETHICAL ENVIRONMENT

- Ethics is assumed to **mean a moral philosophy** prescribing what is right and what is wrong. In other words it states how the world ought to be rather than describing how it is.
- Environmental ethics prescribes what is right because it is good for the environment, which means that it is good for the earth and for creation.
- What is good for the earth and creation is good for humanity although it may not necessarily follow that what is good for humanity is good for the earth and creation.

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ETHICAL ENVIRONMENT

- **MORAL AGENTS** : those who have the freedom and rational capacity to be responsible for choices; those capable moral reflection & decision; i.e. adults humans of sound minds, infants & mentally infirm adults are not moral agents
- **MORAL STANDING**: If you have moral standing; your continued existence or welfare is valuable in itself (intrinsic value); your interests and well-being must be weighed when deciding what is permissible to do. i.e. humans of all kinds, babies, children, adults, old people; women, different races, different cultures
- **MORAL DUTIES**: that which is owed by moral agents to those with moral standing. i.e. it is wrong to kill our children because we have a moral duty toward them

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ETHICAL ENVIRONMENT – BASIC PRINCIPLES

- The principle of minimum harm
- The principle of coordination
- The principle of moderate consumption
- The principle of distributive justice
- The principle of fair compensation

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ETHICAL VALUES OF POLLUTION CONTROL

- We should recognize our moral duty to protect the welfare not only human beings, but also of other non human parts of this system
- Usefulness of non-human world for human purposes
- Human have no rights to reduce the richness & diversity expect to satisfy vital needs
- The ideological changes is mainly that of appreciating life quality, rather than to increase higher standard of living

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CONSERVING DEPLETABLE RESOURCES

- Proper utilization of resources i.e. the people should maintain ecological balance
- We should adopt voluntary measures to conserve the resources
- If we are to preserve enough scarce resources, so that future generation can maintain their quality of life at a satisfactory level

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MORAL RESPONSIBILITY TOWARDS NATURE

- We know that we can cause permanent damage to natural landscapes, resources & ecosystems
- We know that we can cause them damage
- We know how we can prevent or remedy them

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BIOCENTRIC

Life-centred morality:

- All and the only living beings, specifically individual organisms have intrinsic value and moral standing
- Humans are not superior to other life forms nor privileged and must respect the inherent worth of every organism
- Humans should minimize harm and interference with nature; eat vegetarian since less land needs to be cultivated

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ECO-CENTRIC HOLISM

Ecosystem centred morality:

- Ecosystem centred morality
- Non-individuals (the earth as an interconnected ecosystem, species, natural processes) have moral standing or intrinsic value and are deserving of respect
- Individuals must be concerned about the whole community of life/nature
- Human should strive to preserve ecological balance and stability

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VARIOUS WORLD VIEWS & ETHICAL

Philosophy	Intrinsic Value	Instrumental Value	Role of Humans
Anthropocentric	Humans	Nature	Masters
Stewardship	Humans and Nature	Tools	Caretakers
Biocentric	Species	Abiotic Nature	One of many
Ecocentric	Processes	Individuals	Preservers
Ecofeminism	Relationships	Roles	Caregivers

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"The care of the Earth is our most ancient and most worthy, and after all our most pleasing responsibility. To cherish what remains of it and to foster its renewal is our only hope." ~ Wendell Berry

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Q&A

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CHAPTER 9
POLITIC, SOCIO-ECONOMIC, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

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POLITIC, SOCIO-ECONOMIC, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

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LECTURE OUTLINE

- Global commitment to control climate change and pollution
- Impact to social and economy
- How to minimize the problem if act as policy maker

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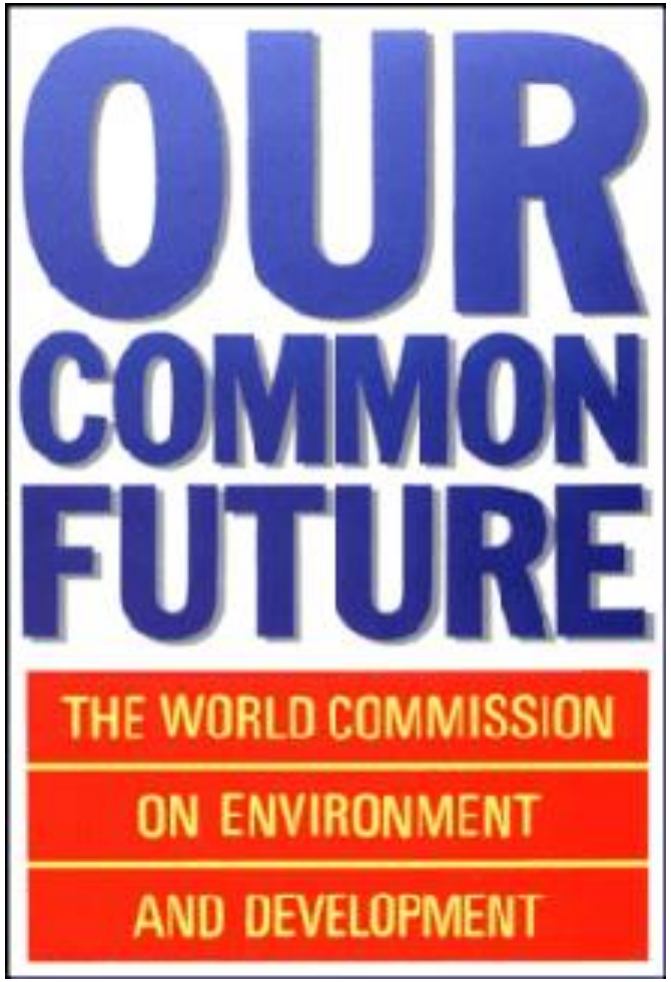
(World Commission on Environment and Development) The Brundtland Commission's report defined sustainable development as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs".



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The Brundtland Commission, named after Norway's former prime minister, Gro Harlem Brundtland, who chaired it, found an eager audience for its proposals at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992.

The documents approved at the Conference, notably the comprehensive Agenda 21, included ambitious commitments by world leaders to ensure sustainable development in many areas and on all levels of society.

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The Rio Conference gave a boost to both national and local action. National committees for sustainable development were established on a high political level in many countries.

Local Agenda 21 (the strategy and action programme for implementing sustainable development at a local level) documents and action plans were drawn up in a great number of municipalities. The newly established United Nations Commission for Sustainable Development started to scrutinize the implementation of the Rio decisions at its annual meetings.

Local Agenda 21 http://www.gdrc.org/uem/la21/la21.html

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The concept supports strong economic and social development, in particular for people with a low standard of living. At the same time it underlines the importance of protecting the natural resource base and the environment.

Economic and social well-being cannot be improved with measures that destroy the environment.

Intergenerational solidarity is also crucial: all development has to take into account its impact on the opportunities for future generations.

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The preparations for the 2002 Johannesburg Summit on Sustainable Development showed that the enthusiasm of Rio had started to wane, but high-level political support for the process persisted.

Johannesburg also highlighted the implementation of commitments rather than spending time on drafting new declarations. In this context the United Nations regional commissions were given stronger recognition than before. It was felt that better implementation demanded a devolution of the global process.

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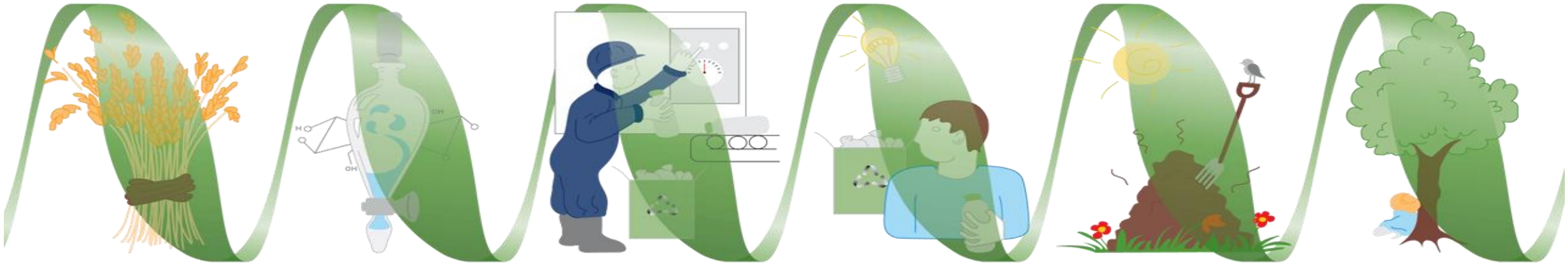
The Helix of Sustainability



Plants grow, making sugars, starches, oils, cellulose and other complex molecules from simple raw materials, mostly water, CO_2 and sunshine.

In addition to harvesting food, people extract fuel and base materials for industry and commerce.

Manufacturers make wares, measuring profitibility in environmental and social terms as well as financial.

The end-user reuses and repairs, only recycling after as long a useful life as possible.

At the end of its life the article decays, reducing large complex molecules to simple raw materials by the action of bacteria and fungi - composting

Plants grow, making sugars, starches, oils, cellulose and other complex molecules from simple raw materials, mostly water, CO_2 and sunshine.

Source: The New Zealand Institute for Crop and Food Research

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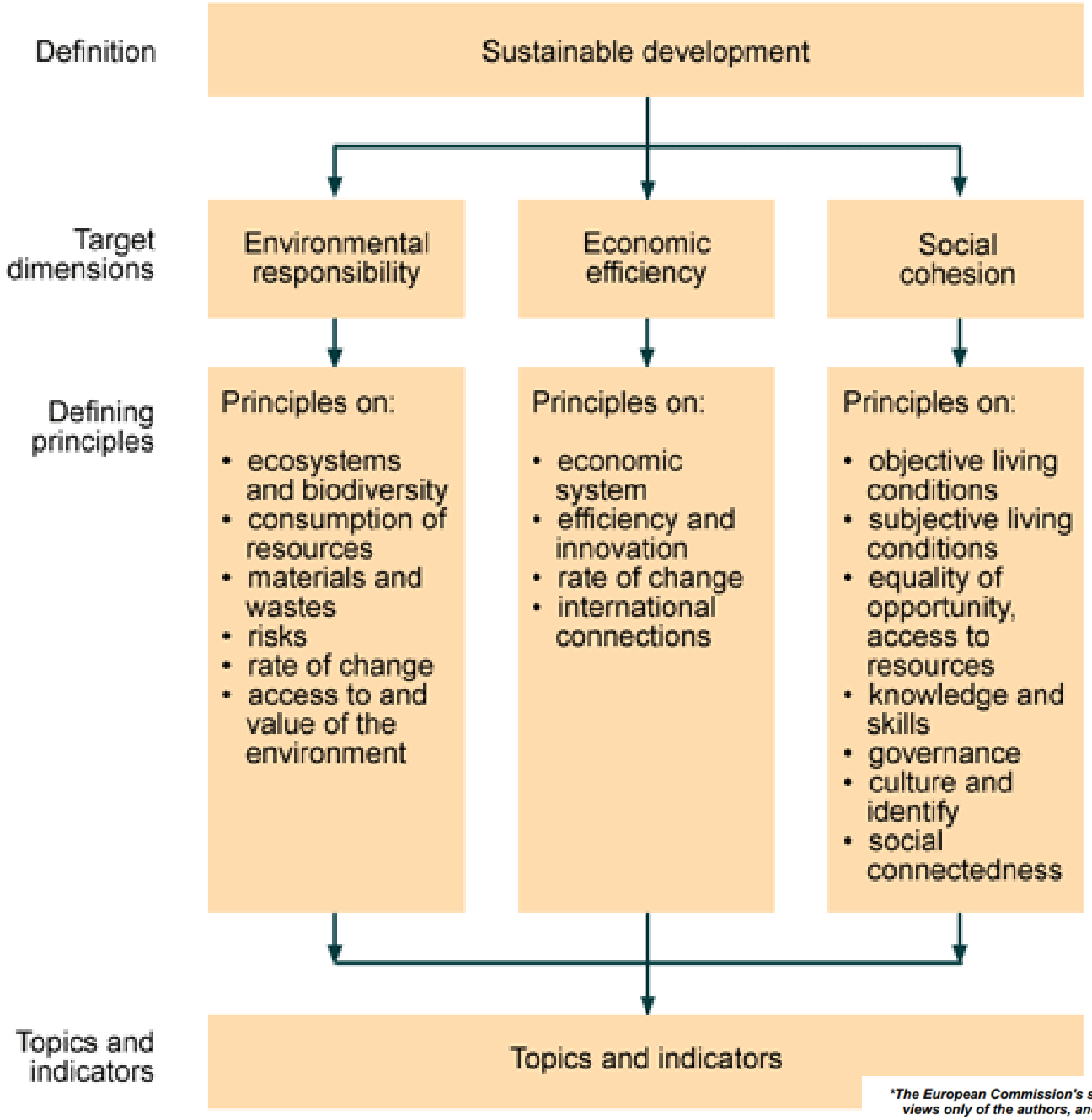

Example:
Statistics New Zealand's framework for measuring sustainable development

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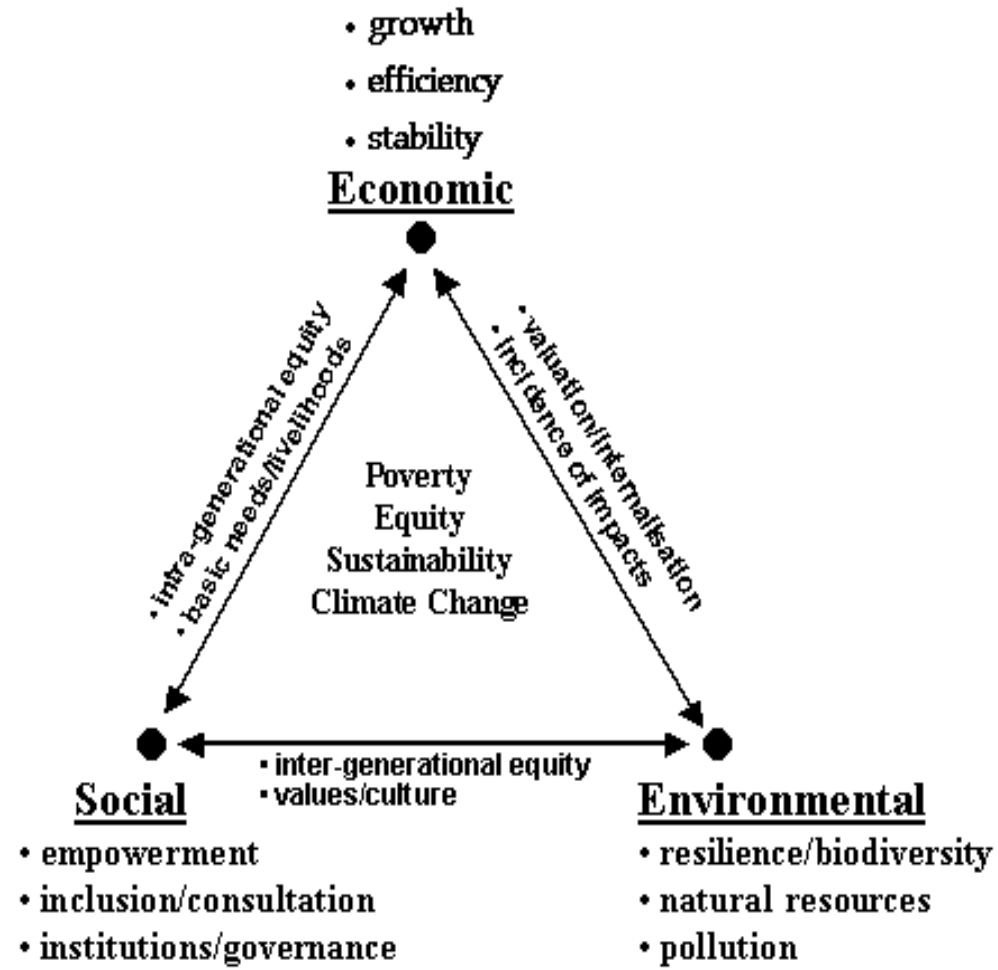

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SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

HOME ABOUT SECRETARY-GENERAL GOALS TAKE ACTION KEY DATES MEDIA WATCH AND LISTEN

Launch of new sustainable development ag to guide actions for next 15 years

1-6	7-12	13-17
POVERTY	ENERGY	CLIMATE CHANGE
HUNGER AND FOOD SECURITY	ECONOMIC GROWTH	OCEANS
HEALTH	INFRASTRUCTURE, INDUSTRIALIZATION	BIODIVERSITY, FORESTS, DESERTIFICATION
EDUCATION	INEQUALITY	PEACE AND JUSTICE
GENDER EQUALITY AND WOMEN'S EMPOWERMENT	CITIES	PARTNERSHIPS
WATER AND SANITATION	SUSTAINABLE CONSUMPTION AND PRODUCTION	

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SUSTAINABLE DEVELOPMENT GOALS

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If you are policy maker, suggest what you can do to save our environment?


Q&A

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