Part II : Environmental crisis

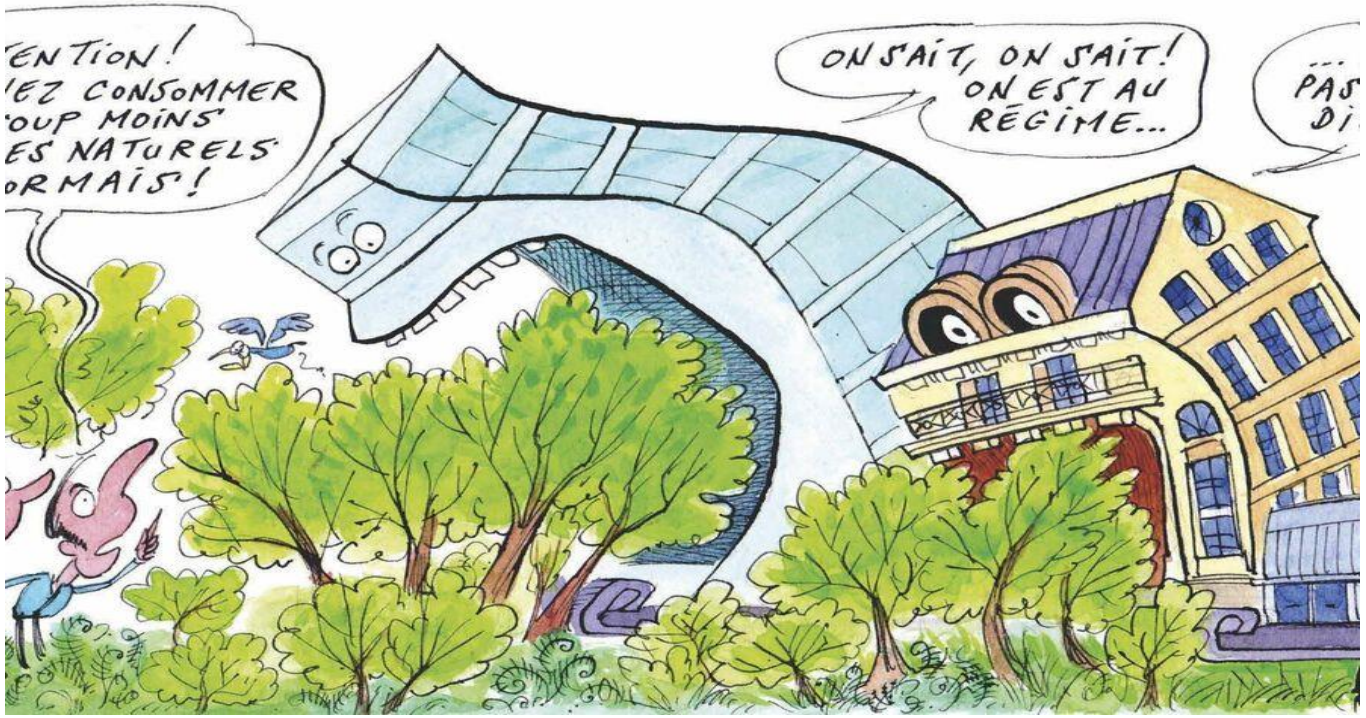
1. What is the environmental crisis?

Environmental crisis are distinguished by **rapid** and **largely** unexpected changes in environmental **quality** that are difficult if not impossible to reverse. Human technology (industrialism) causes the artificialization of natural environment. This generally manifests by:

- Excessive use of natural resources (oil, water, gas, etc);
- Disruption of ecological balances;
- Appearance of various pollution (water, air and soil) ;
- Expansion of urbanized land through agricultural ones,
- Etc,…

1. What is the environmental crisis?

An **environmental** crisis occurs when the artificialization of the natural environment is increasingly significant. However, **awareness** of the its scale remains marginal and only appears during the **United Nations Conference** on the Human Environment held in **Stockholm1972**.



2. The main dimensions of the environmental crisis

2.1. Human demography

2.2. Climate change

2.3. Fossil fuel problems

2.4. Water crisis

2.5. Agriculture problems

2.6. Desertification

2.7. Deforestation

2.8. Biodiversity crisis

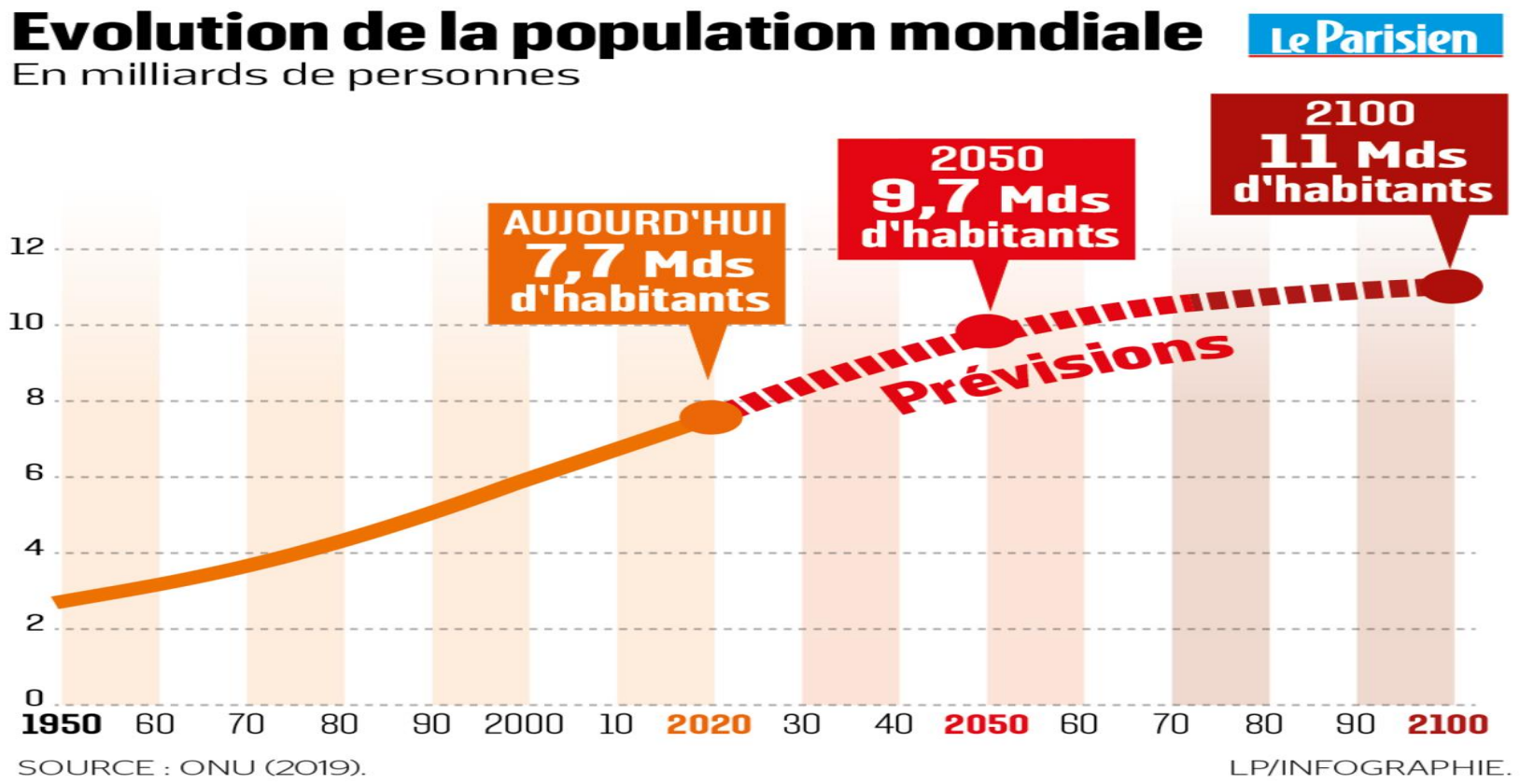
2. The main dimensions of the environmental crisis

2.1. Human demography

✓ **Rapid** demographic growth, environmental problems on an international, regional or rather local scale, poverty, etc. have given rise to a new problem "Population – Resources". A problem that has caught the attention of several scientists and economists who were already worried about population growth in the face of limited resources.

2.1. Human demography

✓ With a global population of **7** billion in 2011, population growth is expected to continue for at least four decades, with the population reaching **8** billion around 2025 and **9** billion by mid-century. More than **90%** of projected growth will take place in developing regions, **Asia, Africa and Latin America.**



2. The main dimensions of the environmental crisis

1. Human demography

- ✓ Currently, average **fertility** rates (the number of children per woman) are still quite high across the developing world in contrast to those in developed countries, which are in decline.

1. Human demography

- ✓ In **Europe**, the demographic transition process has come to an end and the population has stabilized.
- ✓ In the **United States**, population growth continues under the effect of annual immigration.
- ✓ In the **developing** world, the demographic transition is far from over. Economic growth, social equity, access to contraception, as well as many cultural factors play an important role in this evolution.

1. Human demography

✓If global population growth is **not controlled**, we will attend major environmental consequences such as:

- irreversible degradation of the biosphere;
- the acceleration of waste production;
- the destruction of forests;
- incessant soil erosion;
- increasing shortages of drinking water, etc.

1. Human demography

✓Faced with this **demographic growth** which exerts environmental pressure, more effective, coherent measures have been taken to adopt a more global approach like, improving the quality of life (access to care, better nutrition, social equity, women condition, by giving them access to education and to contraceptive methods.

2. Climate change

Definitions

Meteorology: est une science qui a pour objet l'étude des **phénomènes atmosphériques** (les nuages, les précipitations, le vent…) dans le but de comprendre comment ils se forment et évoluent en fonction des paramètres mesurés tels que la **pression**, la **température** et **l'humidité**. Elle étudie ces modifications à court terme (quelques jours).

Climatology: étude des conditions météorologiques typiques d'une région spécifique, sur le long terme, grâce à des statistiques basées sur au moins 20-30 ans de mesures. Cela permet de définir le climat d'une région (p.ex. continental, tropical humide, etc.).

2. Climate change

Climatic System: Le système climatique est formé par les interactions de ses cinq composantes : **l'atmosphère** (le mélange de gaz qui entoure la terre), **l'hydrosphère** (l'eau liquide de la terre, y compris l'eau douce et l'eau salée), la **cryosphère** (les masses de glace et de neige de la terre), la **lithosphère** (les continents et les fonds marins) et la **biosphère** (la biodiversité marine et terrestre de la terre). Le climat global de la Terre et les climats régionaux sont déterminés par le système climatique.

Definition of climate change

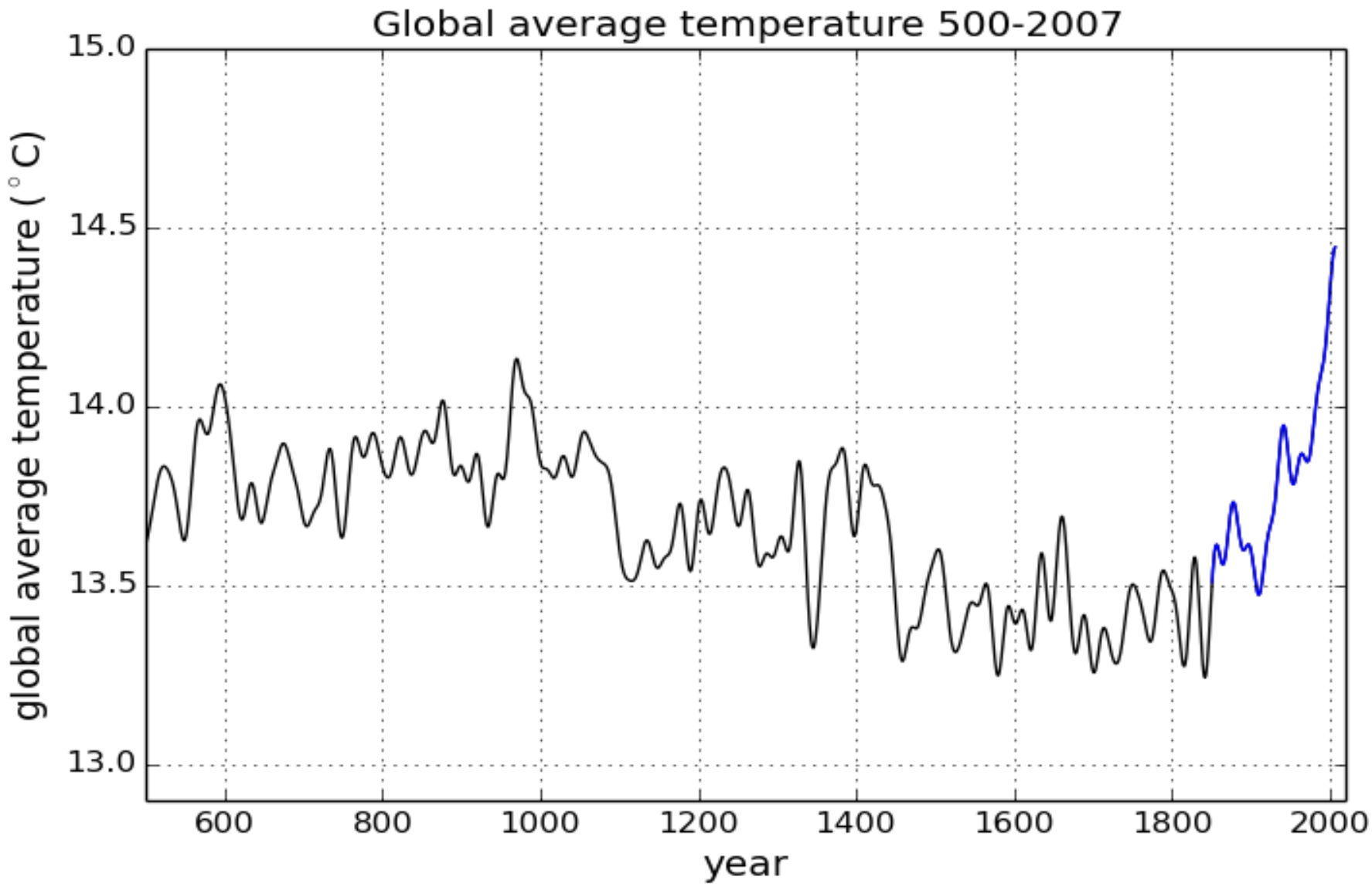
- **climate change** occurs when the Earth's global climate or all regional climates undergo a lasting change.
- It designates long-term variations (at least over a period of ten years) in temperature and weather patterns (precipitation, winds, soil humidity, etc.).

Definition of climate change

- Climate change is the long-term shift in the Earth's average temperatures and weather conditions. These may be natural variations, due to those of the solar cycle or to massive volcanic eruptions.

- However, since the 1800s, human activities have been the primary cause of climate change, due to the burning of fossil fuels such as **coal**, **oil** and **gas**.

Past and curent climate change



Past climate change

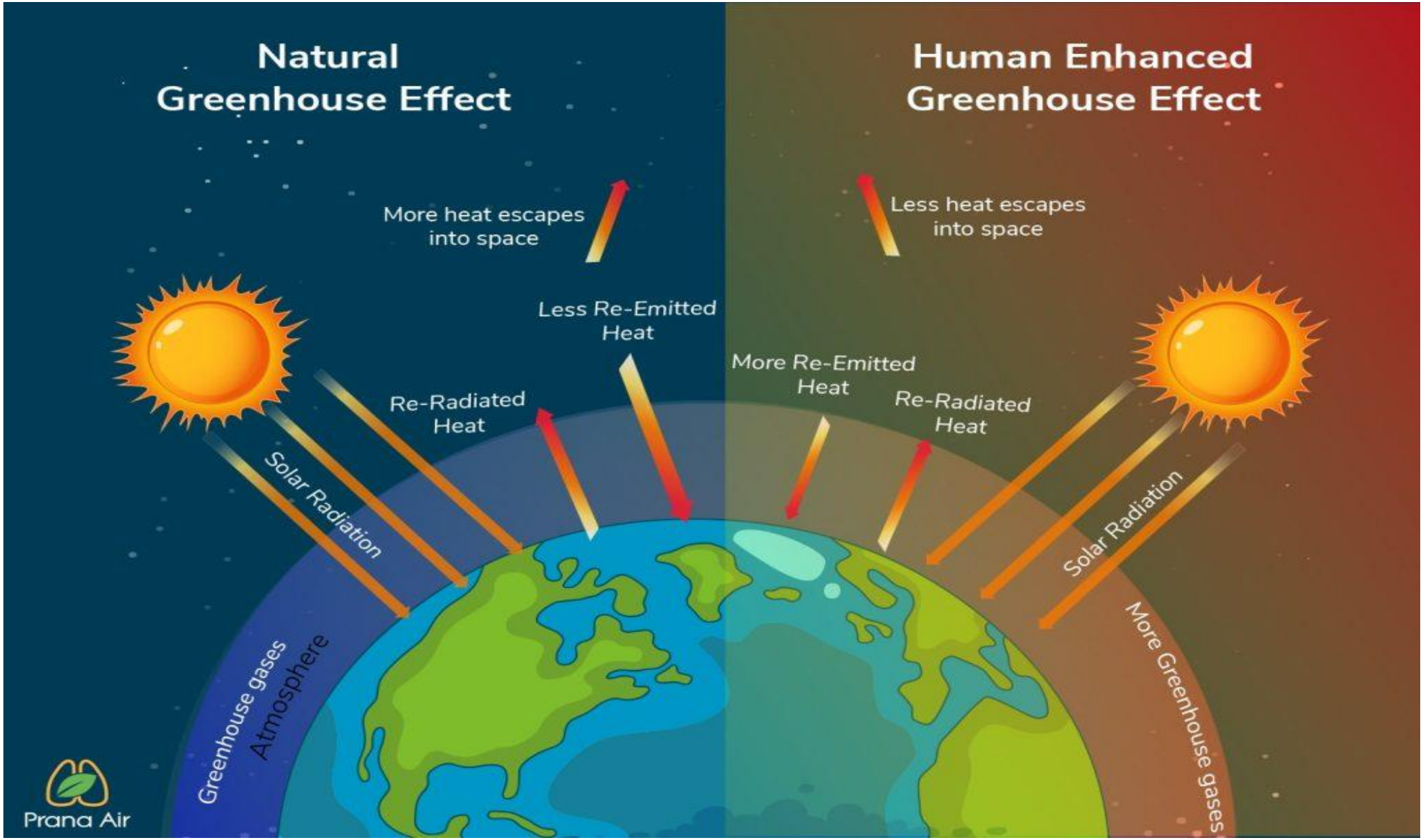
- Earth's climate has changed dramatically many times since the planet was formed 4.5 billion years ago.
- These changes have been triggered by the changing configuration of continents and oceans, changes in the Sun's intensity, and volcanic eruptions.
- Most past changes in global temperature occurred slowly, over tens of thousands or millions of years.

Current climate change

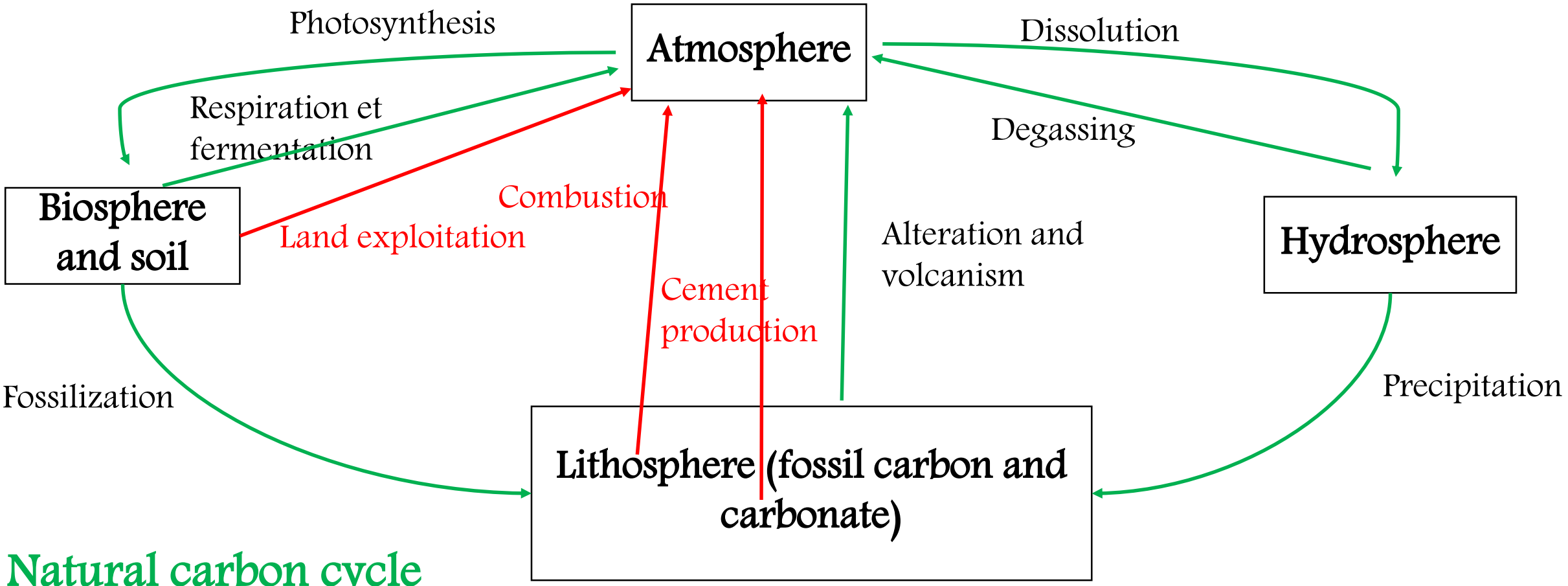
- Current climate change is **worrying** because it is very **rapid**, reducing the possibility of **adaptation** for many **animal** and **plant** species which risk disappearing. humans have played an important role in this imbalance.

- The major factor in current climate change is the modification of the atmosphere composition. To better understand this mechanism, we must distinguish the "natural" greenhouse effect from the "additional" one.

current climate change



Carbon cycle

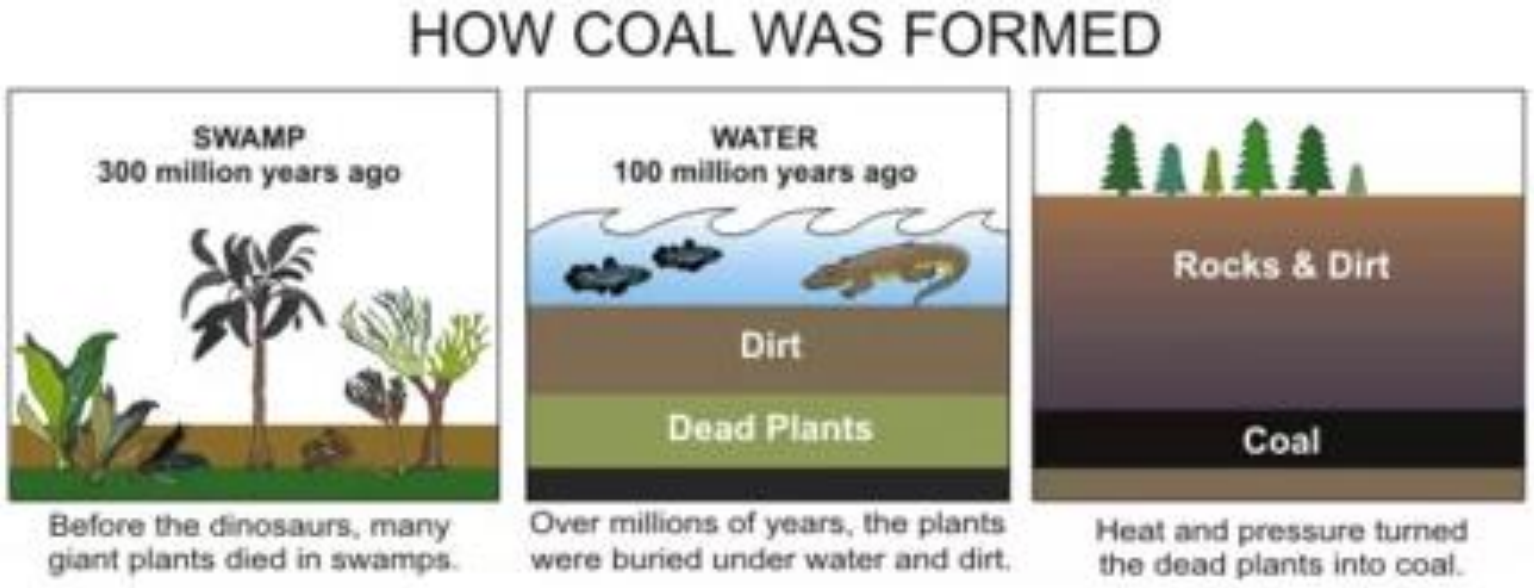


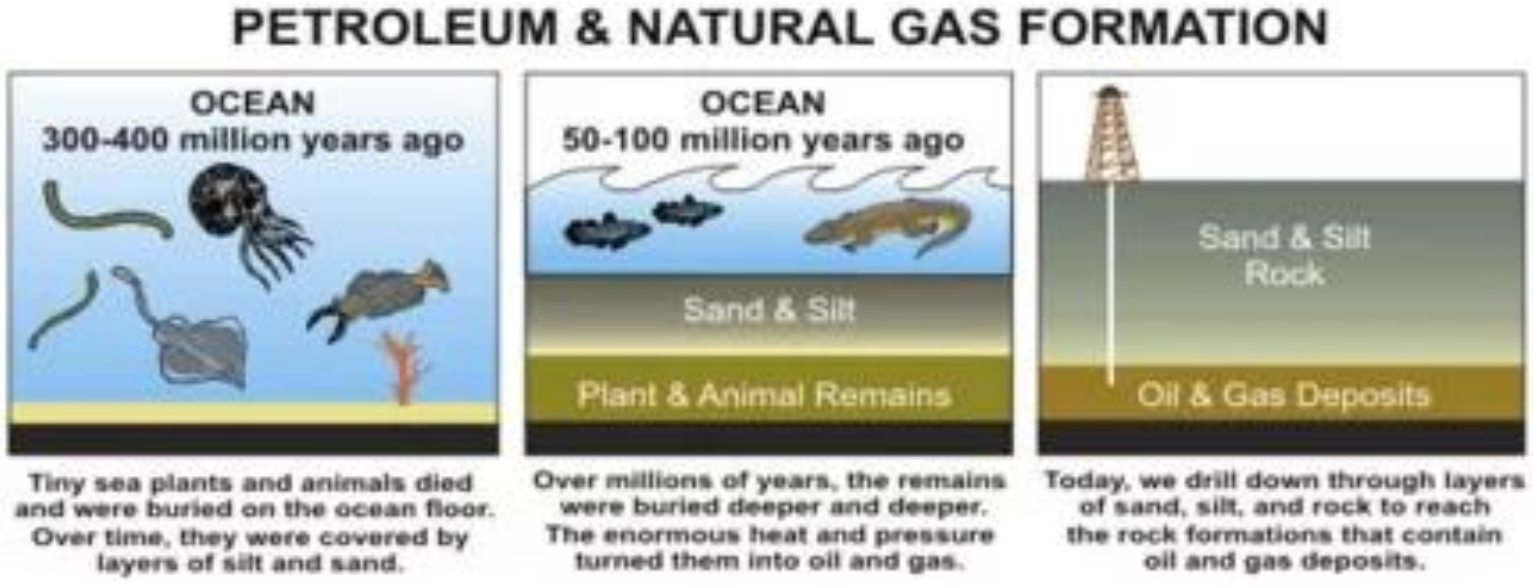
Natural carbon cycle

Modified carbone cycle

3. Fossil fuel problems

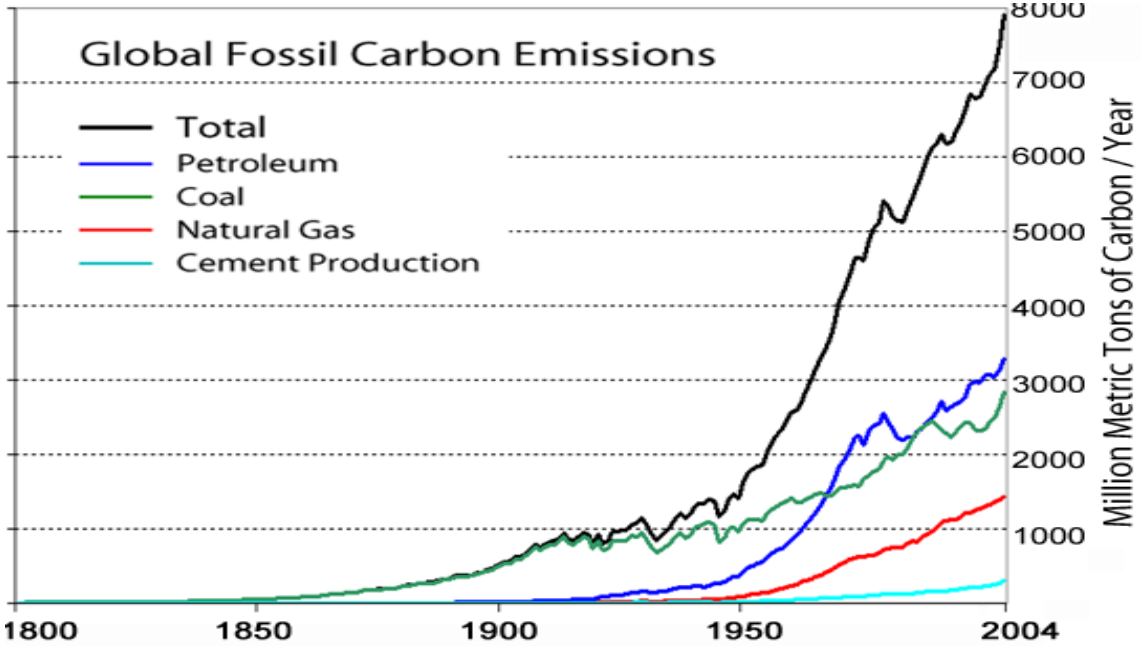
Fossil fuel are the fuel formed by natural processes such as decomposition and burid organismes (plants and animals).





impact of fossil fuels on greenhouse gas emissions

Based on a review of the distribution and sources of GHG emissions, it appears that by far the largest contribution to the greenhouse effect stems from emissions of carbon dioxide CO2. In turn, 75% of the global CO2 emissions result from the combustion of fossil fuels for the transformation and use of energy. This indicates that fossil fuel combustion is the largest single contributor to the greenhouse effect.



Marland *et al.*, 2007

Renewable energy

Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it derives directly from the sun, wind, rain, tides of ocean, biomass and geothermal resources from heat generated deep within the earth.

To overcome growing carbon emissions in developing economies stemming from industrial growth and higher consumption of non-renewables, it is necessary to adopt competitive and advanced technologies and transition to the use of renewable energy sources.

Renewable energy

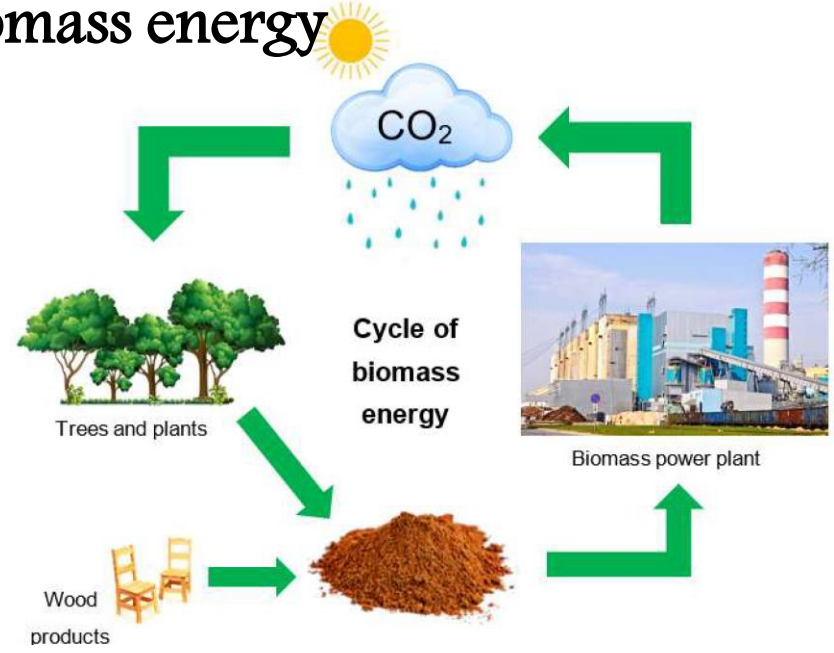
Solar energy

Wind power (energy)

Hydraulic energy

Geothermal energy

Biomass energy



4. Water crisis

The water crisis is a pressing global issue characterized by scarcity, pollution, and unequal distribution of clean water resources. It affects billions of people worldwide, posing significant challenges to health, agriculture, industry, and ecosystems.

Causes

- population growth,
- urbanization,
- pollution,
- climate change,
- inefficient water management, and unsustainable consumption patterns….

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4. Water crisis

Consequences

- **Health Impacts:** Limited access to clean water leads to waterborne diseases such as diarrhea, cholera, and typhoid, causing illness and death, particularly among children and vulnerable populations. Contaminated water also contributes to the spread of other diseases like malaria
- **Food Security:** Water scarcity affects agricultural productivity, reducing crop yields and livestock production. Farmers may struggle to irrigate their fields or may resort to using polluted water, compromising food safety and quality. This can lead to food shortages, price hikes, and malnutrition, exacerbating poverty and inequality.
- **Environmental Degradation:** Reduced water availability and pollution harm ecosystems, leading to loss of biodiversity, habitat destruction, and impaired ecosystem services. Wetlands, rivers, and lakes dry up, affecting aquatic species and disrupting ecosystems' balance. Over-extraction of groundwater can lead to land subsidence, saltwater intrusion, and irreversible damage to aquifers…

4. Water crisis

Struggle

- **Conservation and Efficiency:** Encouraging water-saving practices in households, agriculture, and industry through technology adoption, behavioral changes, and policy incentives.
- **Infrastructure Development:** Investing in water infrastructure such as dams, reservoirs, pipelines, and wastewater treatment facilities to improve water storage, distribution, and purification
- **Alternative Water Sources:** Exploring and investing in alternative water sources like desalination, rainwater harvesting, and wastewater reuse to augment freshwater supplies
- **Climate Change Mitigation:** Addressing the root causes of climate change to reduce its impacts on water availability and quality, including efforts to reduce greenhouse gas emissions and adapt to changing hydrological conditions.
- **Education and Awareness:** Raising public awareness about the importance of water conservation, pollution prevention, and sustainable water management practices through education, campaigns, and community engagement.

5. Agriculture

Conventional agriculture

Intensive agriculture

Ex: GMO

5. Agriculture

Organic farming (agriculture biologique) est une méthode de production agricole qui exclut le recours à la plupart des produit chimiques de synthèse, utilisés notamment par l'agriculture industrielle et intensive. Cette alternative respecte l'environnement, la biodiversité et assure le bien être animal et humain.

Organic farming

VERMICOMPOST

GREEN LEAF MANURES

CROP ROTATION

ORGANIC FARMING

MANURES

BIOFERTILIZERS

ANIMAL HUSBANDRY

BIOLOGICAL MANAGEMENT

Biological control (Lutte biologique)

6. Desertification

Desertification refers to the process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture. It involves the degradation of land in arid, semi-arid, and dry sub-humid areas due to various factors including climatic variations and human activities.

6. Desertification

Causes

- Overgrazing

- Soil Erosion
- Population Pressure
- Climate change and drought
- Poor Agricultural Practices
- Overexploitation of Water Resources
- Urbanization and Infrastructure Development…

6. Desertification

Conséquences Environnementales:

•Loss of Biodiversity: ;

•Soil Degradation ;

•Altered Water Cycles;

•Decrease in carbon storage capacity in soils and increase in global warming;

•Increased Soil Erosion.

Socio-économiques:

•Loss of Livelihoods;

•Food Insecurity;

•Rural Poverty;

•Migration and Displacement ;

•Migrations des populations ;

•Conflict Over Natural Resources;

•Impact on Health and tourism.

6. Desertification

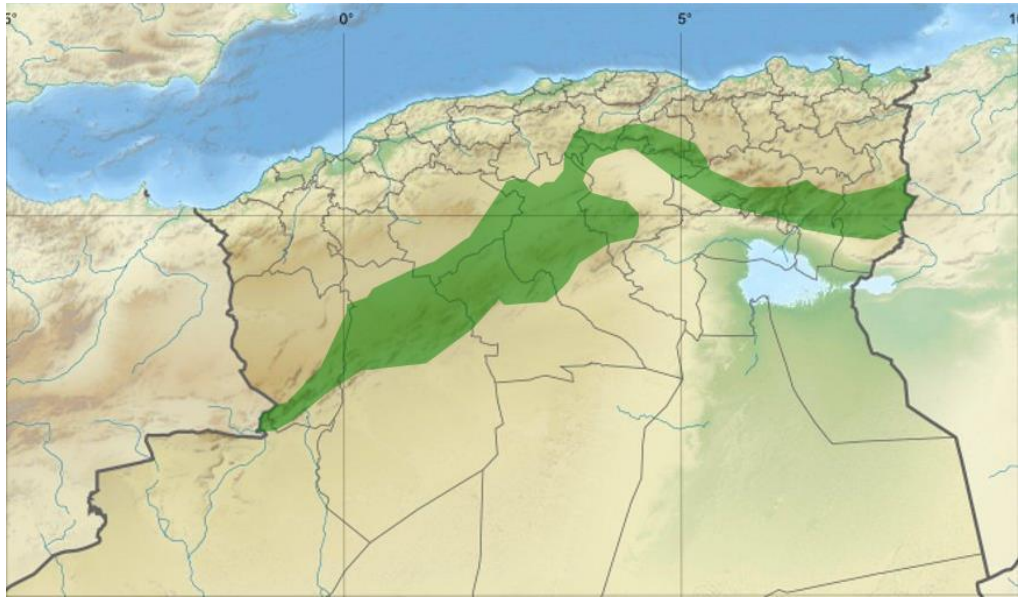
Struggle

- Integrated Watershed Management
- Policy and Institutional Support
- Education and Awareness
- Investment in Research and Innovation
- International Cooperation
- The development of green energies (solar, wind, etc.) to replace wood fuel
- Great Green Wall Project in Africa and China.

Struggle

6. Desertification

Algerian green dam



Great Green Wall Project in Africa

Great Green Wall Project in China

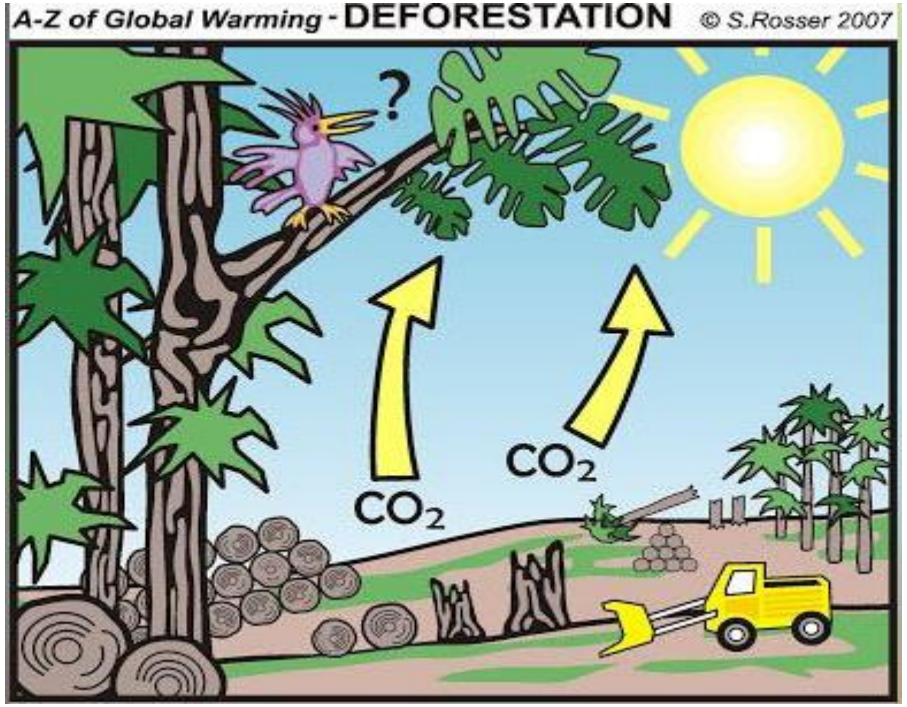
7. Deforestation

Deforestation is the process of clearing or removing forests or trees from a particular area, typically resulting in the conversion of forested land into non-forest uses such as agriculture, urban development, or infrastructure projects.

7. Deforestation

Causes

- Forest **fires**: ex: in Australia from June 2019 to May 2020, which, in addition to destroying forests and biodiversity, release huge quantities of carbon dioxide (CO2) into the atmosphere;
- Deforestation and industrial wood extraction;
- Climate change (abnormal development of insect pests);
- Urbanization.



7. Deforestation

Consequences

- Soil erosion;
- Loss of biodiversity and habitat fragmentation;

- Increase of poverty;
- Loss of water resources.

7. Deforestation

Struggle

- Reforestation;
- Preservation of biodiversity and habitats;
- Rewarding states and communities that fight effectively against deforestation…

8. Biodiversity crisis

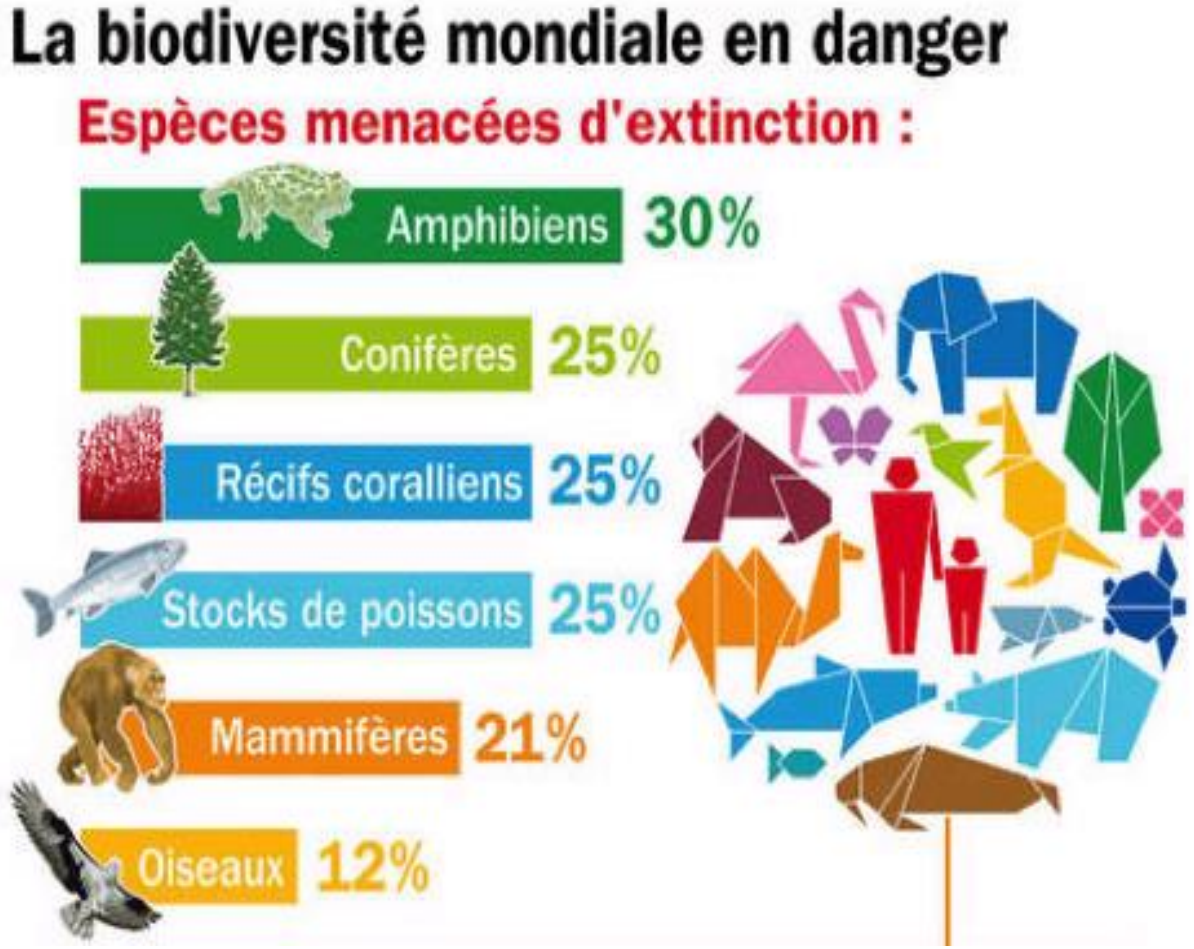
Biodiversity refers to the variety of life on Earth, including all living organisms, ecosystems, and the ecological processes that sustain them. Biodiversity encompasses three main levels of organization: **Genetic Diversity, Species Diversity and ecosystem diversity.**

8. Biodiversity crisis

The biodiversity crisis refers to the current unprecedented loss of biodiversity occurring worldwide, driven primarily by human activities. This crisis poses significant ecological, economic, and social challenges and threatens the health and resilience of ecosystems and the well-being of human societies.

Current **alarming** situation:

- A million species already threatened by extinction,
- 75% of the earth's surface damaged significantly by human activities ,
- Disappearance of 85% of wetlands,
- Rapid declines of insects.



8. Biodiversity crisis

Causes

- **Accelerated Extinction Rates:** Scientists estimate that the current rate of species extinction is hundreds to thousands of times higher than the natural background rate, primarily due to human activities such as habitat destruction, overexploitation, pollution, and climate change.
- **Invasive Species:** Invasive alien species introduced by human activities can have devastating impacts on native biodiversity, ecosystems, and ecosystem services. ex: In the Alpes-Maritimes, the Pallas squirrel, coming from Taiwan, threatens the red squirrel and fruit trees;
- **Direct exploitation:** Cutting wood, fishing and hunting directly destroy plant and animal species. This is particularly the case in the oceans, with the problems of overfishing

8. Biodiversity crisis

Causes

- **Pollution**: Plastic, fine particles, chemicals, pesticides...: "Marine pollution, by plastics in particular, has increased tenfold since 1980, affecting at least 267 species, including 86% of sea turtles, 44% of seabirds and 43% of marine mammals", noted the IPBES (Intergovernmental Scientific and Political Platform) in 2019.
- **Agriculture and population Pressure;**
- **Climate change.**





8. Biodiversity crisis

Consequences

- Changing our diet;
- Ecosysteme Fragilization ;
- Dégradation of life quality...

8. Biodiversity crisis

Struggle

- **Increase protected areas and ensure their high degree of protection.** The creation of natural parks and other reserves is an effective tool for protecting biodiversity;
- **Reduce our greenhouse gas emissions;**
- **Change agricultural practices;**

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