



Topic summary:

Although it is an ancient phenomenon, climate change is increasingly the subject of current affairs. As a result of the increase in greenhouse gases, the average temperature is warming causing meteorological changes, changes in biodiversity, but also has socio-economic impacts.

Main concepts covered:

- * Temperature
- * Biodiversity
- * Climate
- * Economy

Transversal competencies acquired:

- * Communicating orally / writing in mother/foreign language
- * Managing information
- * Mobilizing reasoning
- * Knowing how to adopt according the difficulties



Definition of key notions:



Greenhouse effect:

Gases form a protective layer around the earth retaining the heat of the sun, much like the gardener's greenhouse



Carbonic dioxide:

Naturally present in the environment, it is stored in plants and oceans. Humans release billions of tonnes of CO₂ from the burning of fossil fuels, deforestation and agricultural practices



Ocean acidification:

The ocean pH by absorbing part of the additional CO₂ decreases and has negative effects on the growth and the reproduction of certain marine organisms.





Climate change is defined as the variation of the climate due to natural or human factors. It is characterized by a global increase in average temperatures (= global warming) which causes regional, seasonal and extreme meteorological disturbances (= climate change) such as droughts, storms, cyclones, typhoons ...

This phenomenon is being monitored by IPCC (Intergovernmental Panel on Climate Change). Created in 1988, it regularly assesses scientific, technical and socio-economic information related to climate change.

Be careful to not confuse meteorology and climate. The weather is the weather at a given time and place, while the climate is observed over a period greater than 30 years.

Although this problem has received media attention in recent years, this phenomenon is not new: it started with the industrial area. Indeed, each of the past three decades has been successively warmer on the surface of the Earth than all previous decades since 1850. And there has been an increase of 1°C between 1850 and today (climate variability can only explain a difference of 0.2°C). However, it is now urgent to act: if we continue on the current trends, we will reach in 20 years the 1.5°C that we should reach in 2100.

The first description of the greenhouse effect was made in 1827 by Joseph Fourier. Present in the atmosphere, certain gases retain a part of the solar energy allowing an average temperature of 15°C (which would otherwise be -18°C). Currently, the earth is warming due to an increase in greenhouse gases.



Sustainable development issues identified in this topic:

What are its causes, consequences and solutions in the Mediterranean territory? What are the effects already visible and its prospects?

1. What is link between climate change and human activities?

Present in the atmosphere, gases such as CO₂ trap a part of the solar energy allowing an average temperature of 15°C (which would otherwise be -18°C).

Since the beginning of the industrial era, humans have been using fossil fuels and releasing more CO₂ into the atmosphere than the Earth could absorb. This higher greenhouse gases concentration leads to a reduction in the radiation reflected back into space and an increase in the radiation reflected back to the ground. This phenomenon is the cause of global warming and therefore of climate change.

2. What is the impact on the climate and the sea?

Climate change is characterized by an overall increase in average temperatures. It results in an increase in temperatures and a decrease in precipitations. In the Mediterranean:

Presently, we are observing:	The projections are:
<ul style="list-style-type: none"> - An increase in hot days, hot nights; - An increase in heat waves and heat peaks; - No clear trend in the evolution of annual precipitation; - Increasing droughts. 	<ul style="list-style-type: none"> - Substantial increase in temperatures; - The waves of heat and heat peaks are more frequent, more long and / or intense; - Significant increase in droughts.

The hot seasons will therefore be warmer and drier. On land, it is expected that soil degradation combined with periods of drought and fires will contribute to the desertification. We are also talking about a potential runaway effect, which could occur beyond a tipping point, leading to an acceleration of the phenomenon and an amplification of the harmful effects.

At the level of the Mediterranean Sea:

Presently, we are observing:	The projections are:
<ul style="list-style-type: none"> - Average surface water temperature rises; - Deep waters have already warmed by almost 1 ° C since 1980; - The thermocline goes down. 	<ul style="list-style-type: none"> - Surface waters are expected to warm by 2.5 ° C by 20100; - Freshwater deficit will lead to increased salinity; - An increase in sea level from 0.3 to 0.5m by 20100 following the melting of glaciers and ice caps. (The increase in temperature causes a decrease in the density and thus the volume of water. In contrast, an increase in salinity causes a decrease in density. This is compensated).

In addition, the increase in extreme phenomena and the rising waters contribute to increasing coastal erosion.

3. What impact does this warming have on flora and fauna?

Due to the high temperatures, the life cycles of the species are disturbed (early flowering, late leaf fall, etc.). The ranges are moving north.

In the Mediterranean:

Presently, we are observing:	The projections are:
<ul style="list-style-type: none"> - The rise in temperature impacts marine habitats and causes mortalities in deep seagrass meadows, gorgonians and sponges; - The prosperity growth of exotic species and modification of migration habits of certain fish species; - The early return of some birds, wintering further north of large waders (former flamingos) and reduction in the number of wintering waterbirds. 	<ul style="list-style-type: none"> - An increase mass mortality phenomena; - The simplification of ecosystems and modifications of food chains which could have an impact in particular on the distribution of certain cetacean species; - The extension of the area of distribution and abundance of exotic species; - The reduction of marine fish affected by exploitation - Strengthening of threats to birds and favoring the breeding of some species.

4. What socio-economic consequences?

Climate change has also an impact on human activities and populations.

Presently, we are observing:	The projections are:
<ul style="list-style-type: none"> - Change in the behavior of certain commercial species, but allow the exploitation of new resources; - Increase in fires since 1970. 	<ul style="list-style-type: none"> - Future of uncertain fisheries; - Water scarcity and increased research for water; - Decrease in summer tourism and tourist sites; - Deterioration of tourism reception conditions in summer due to the heat and increase in spring and autumn; - Agriculture impacted by changing precipitation patterns; - Flooding in coastal areas and threat to coastal development due to erosion and rising sea levels, resulting in forced migration of populations.

5. A little history

The first description of the greenhouse effect dates from 1927 by Joseph Fourier.

In 1988, Intergovernmental Panel on Climate Change (IPCC) was created, which regularly assesses scientific, technical and socio-economic information related to climate change. This group presented its first report in 1990.

At the Earth Summit in Rio de Janeiro in 1992, the Conference of the Parties (COP) has been established with the adoption of the UN Framework Convention on Climate Change. Each year, it brings together the

signatory countries, non-governmental organizations (NGOs), local authorities, trade unions, companies, etc. The objective of COP is to develop the United Nations Framework Convention on Climate Change by taking stock of the implementation of the commitments made in favour of the climate, by specifying them, and by negotiating new commitments.

In 1997, the Kyoto Protocol came into force, which requires 38 industrialized countries to reduce their emissions by 5% (compared to 1990 levels) between 2008 and 2012.

In 2012, new emission reduction targets were set under the Kyoto Protocol for the period 2013-2020 (unfortunately in a reduced number of countries).

In 2015, COP 21 took place in Paris. For the first time, upstream of this meeting, MedCOP was set up (a kind of COP centred on the Mediterranean).

The objective is to limit the increase in the average temperature of the earth to 2°C, by reducing greenhouse gas emissions and promoting sobriety and energy efficiency as well as renewable energies. Furthermore, we have to adapt to this change while respecting the needs of the ecosystems and populations.



Position of the topic in the school program:

	11	12	13	14	15	16	17
Mother / Foreign language / Litterature							
History							
Geography	X	X	X	X	X	X	X
Mathematics							
Biology / Geology			X	X	X	X	X
Physic / Chemistry	X	X	X	X			
Social Science / Economy / Law						X	X
Art / Musics							
Technology / Computer science							



Ressources:

- ADEME: le changement climatique en 10 questions – Mai 2018
- Plan Bleu: Les enjeux du développement durable en Méditerranée dans un contexte de changements climatiques – Septembre 2013
- Réseau Action Climat France: kit pédagogique sur les changements climatiques – 2015
- IUCN: Changement climatique et milieu marine n Corse – 2018
- MedPAN: La méditerranée : un environnement marin côtier en mutation selon les scénarios sur l'évolution du climat – 2012