

## 1. Climate protection<sup>1</sup>

### 1.1 What is climate change

Climate change is a lasting change in the global climate of the Earth on its different regional climates. Since its creation, the Earth has experienced ice ages, in other words colder periods and warmer interglacial periods. Temperatures during these periods have however never varied more than a few degrees to an average of 15.1°C. Such stability of temperatures is remarkable compared to other planets like Venus or Mars which have converted into desert and furnace-like environments.

The recent climate is caused by human activities, changing the composition of the earth atmosphere. Contrary to climate variations observed in the past, the current rise in temperatures occurs in a very short time, a few decades. Climatologists have found that the average global temperature rose 0.6°C during the twentieth century.

According to these experts, the temperature should rise between 2.5 and 5°C by 2100. These changes might appear small, but will nevertheless have serious consequences.

### 1.2 Relationship between climate change and CO2 emissions

Climate change is directly related to the concentration of CO2 in the atmosphere. CO2 is a gas naturally part of our atmosphere. It is vital, especially for plant species that absorb and convert it into oxygen.

However, its concentration has risen sharply in recent years, upsetting the balance of the atmosphere. This increase is related to our consumption of energy and human activities: industry, transport, heating, etc.

### 1.3 What is greenhouse effect

The greenhouse is also a natural phenomenon, consisting of different gases. The main one is the famous CO2. The greenhouse effect allows us to maintain an average temperature of 15°C on the surface of the Earth by absorbing some of the thermal radiation from the sun. Without the greenhouse effect, the Earth's temperature would be about -18°C.

Indeed, part of radiations from the sun comes through the atmosphere and reaches the ground, which in return emits heat radiation, then absorbed by greenhouse gases, warming the atmosphere.

Today, the increase of greenhouse gases leads to higher absorption of radiation, and therefore an increase in average temperatures.

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<sup>1</sup> This chapter is based on training material prepared in the scope of IEE projects ACHIEVE (2011-2014) and REACH (2014-2017).

## 1.4 Consequences of climate change

Potential consequences of climate change are not evenly spread on the planet. In summary:

- Glaciers melting, diminishing or disappearance of large ice areas in Antarctica and Arctic. Accelerated melting of glaciers is known by scientists since 1992. The mountainous areas are also affected: Alps, for example, lost 1/3 of their glaciers' surface since 1950. This phenomenon could reduce the amount of drinking water available.
- Ice melting, added to the rise in water temperature (in fact warm water occupies more volume than cold one) might cause a rise in sea levels, causing flooding in coastal areas and forcing entire populations to move, strengthening international migration and poverty.
- Disappearance of some animals and plant species that do not adapt to this brutal climate change. The rate of species extinction is now and for decades 1000-times higher than the natural rate of extinction.
- More intensity and frequency of natural disasters such as hurricanes, cyclones, floods or droughts, these phenomena are directly related to water temperature and atmosphere.
- Extension of deserts, caused by rain decrease in some regions of the world, with consequences on livestock and agriculture, while causing the exodus of populations and increase of poverty, geopolitical instability, etc.

## 1.5 Energy related measures for reducing our impact on the climate

First and most important measure is to reduce our energy use. The energy sobriety is an approach aimed to reducing its need by changing behaviour. It's goal is to avoid unnecessary use of energy (and other resources, such as water). This is the first action and the easiest way to reduce energy or water use.

Energy efficiency goal is to reduce energy or water need firstly by improving the efficiency of equipment. This is the second step towards better energy efficiency and reduced CO2 emissions. The third step is to produce energy from renewable energy sources.

**Example with a light bulb:** The first step is to save energy by a rational behaviour, systematically turning off the light when it is not needed. The second step is to replace conventional bulb with energy efficient one, which uses at least 5 times less energy. The final step would be to produce the energy needed for lighting up the bulb with a photovoltaic solar power plant.