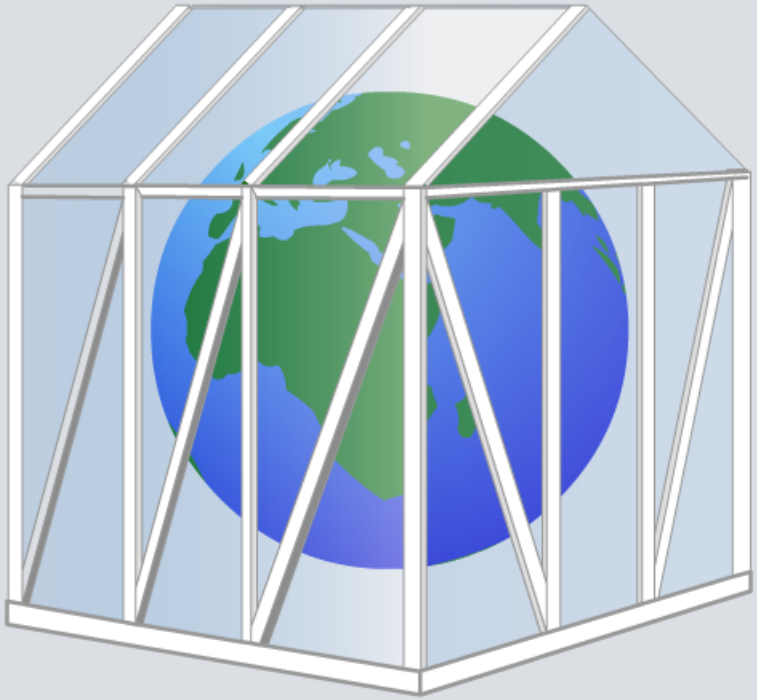
# Air Pollution



# Air pollution

Human activity produces two main types of air pollutant:

- **noxious gases** – These include carbon dioxide ($CO_2$), sulfur dioxide ($SO_2$) and nitrogen oxides ($NO_x$).
- **particulates** – These are tiny particles suspended in air (e.g. smoke), which are usually produced by the combustion of fossil fuels.

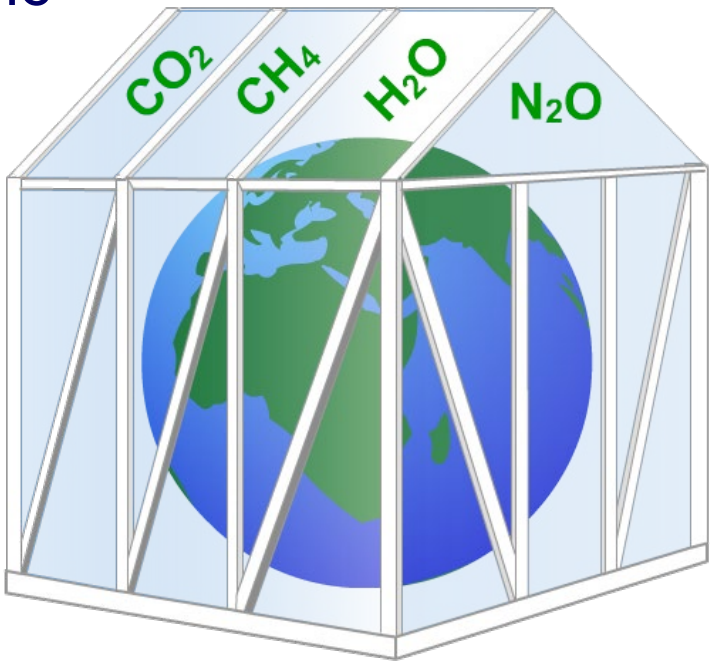
Air pollution has been a major problem since the Industrial Revolution of the late 18$^{th}$ century, and has been made worse by humans' reliance on burning fossil fuels for energy.

Air pollution, global warming, acid rain, damage to the ozone layer and smog. Each of these has serious implications for the environment and human health.

# Global warming and greenhouse gases

One of the greatest threats caused by air pollution is **global warming**. Global warming is caused by a buildup of greenhouses gases, which leads to an increase in the Earth's temperature.

A **greenhouse gas** is an atmospheric gas that absorbs infrared light.




Key greenhouses gases include:

- carbon dioxide ($CO_2$)
- methane ($CH_4$)
- water vapor ($H_2O$)
- nitrous oxide ($N_2O$)

# The greenhouse effect

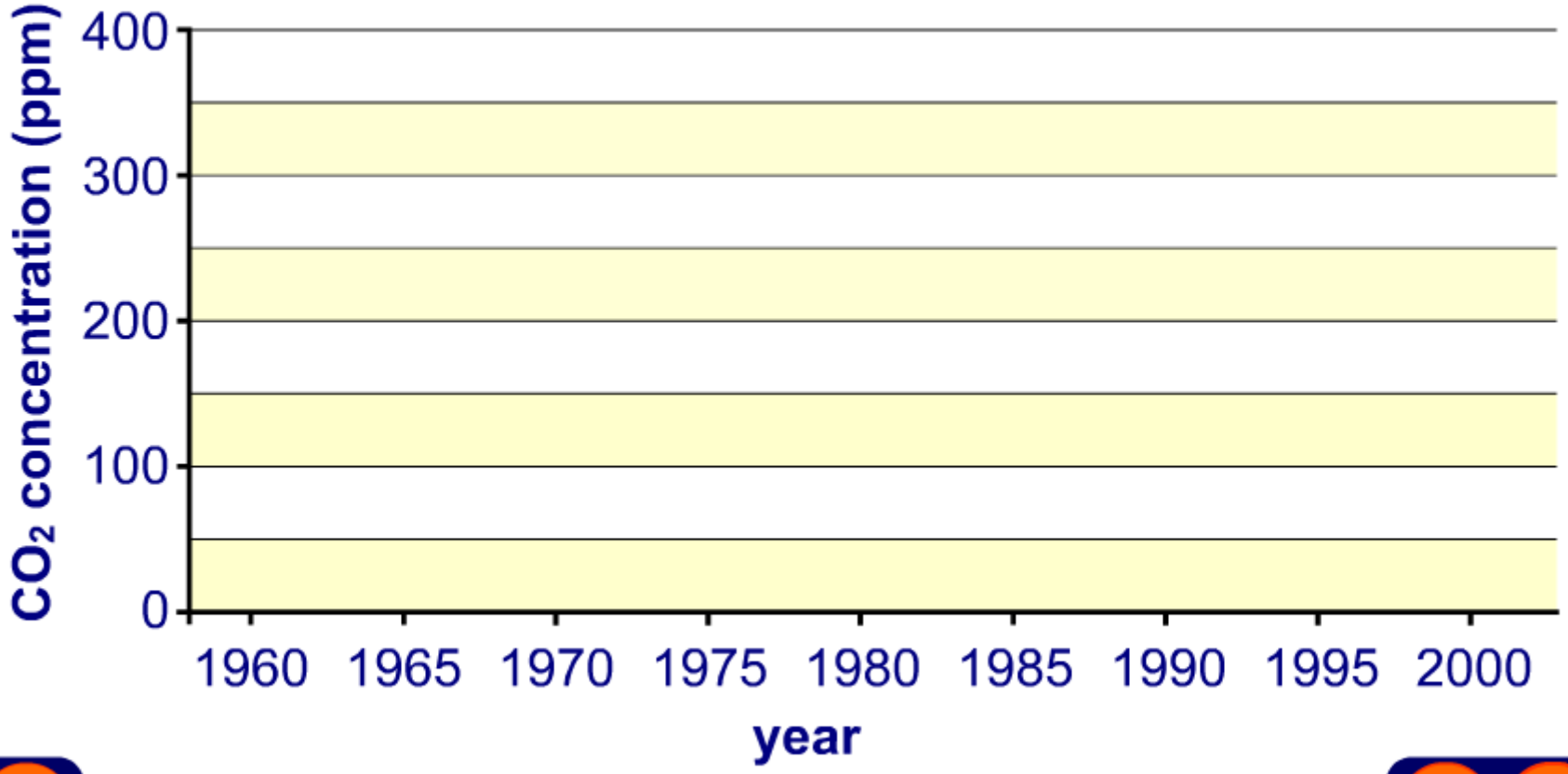
## What is the greenhouse effect?

The greenhouse effect has a major impact on the temperature of Earth.

Click "**play**" to find out how the greenhouse effect works.

# Atmospheric carbon dioxide

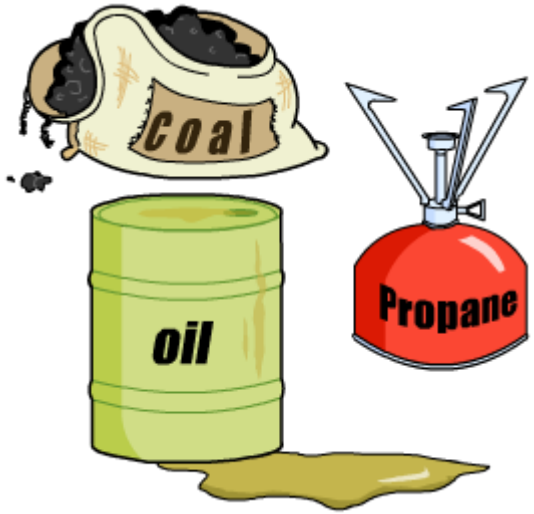
## What is the trend in atmospheric levels of carbon dioxide?



# Carbon dioxide levels

Carbon dioxide is one of the most important greenhouse gases because atmospheric concentrations have risen dramatically over the past century. Why do you think this is?

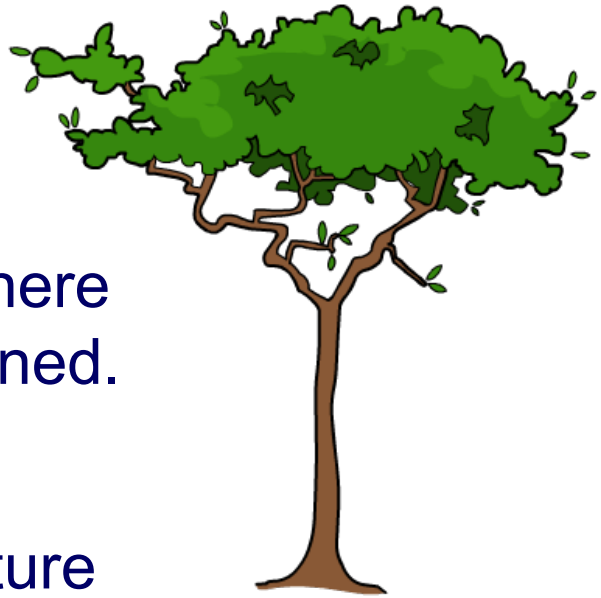
Burning fossil fuels, deforestation and flooding land for the construction of hydroelectric dams have all contributed to rising levels of carbon dioxide.




How many examples of burning fossil fuels can you think of? Are there any alternatives?

# What is the carbon sink?

Before the Industrial Revolution, carbon dioxide levels were usually kept in check by the **carbon sink** – forests and oceans that capture and store carbon.

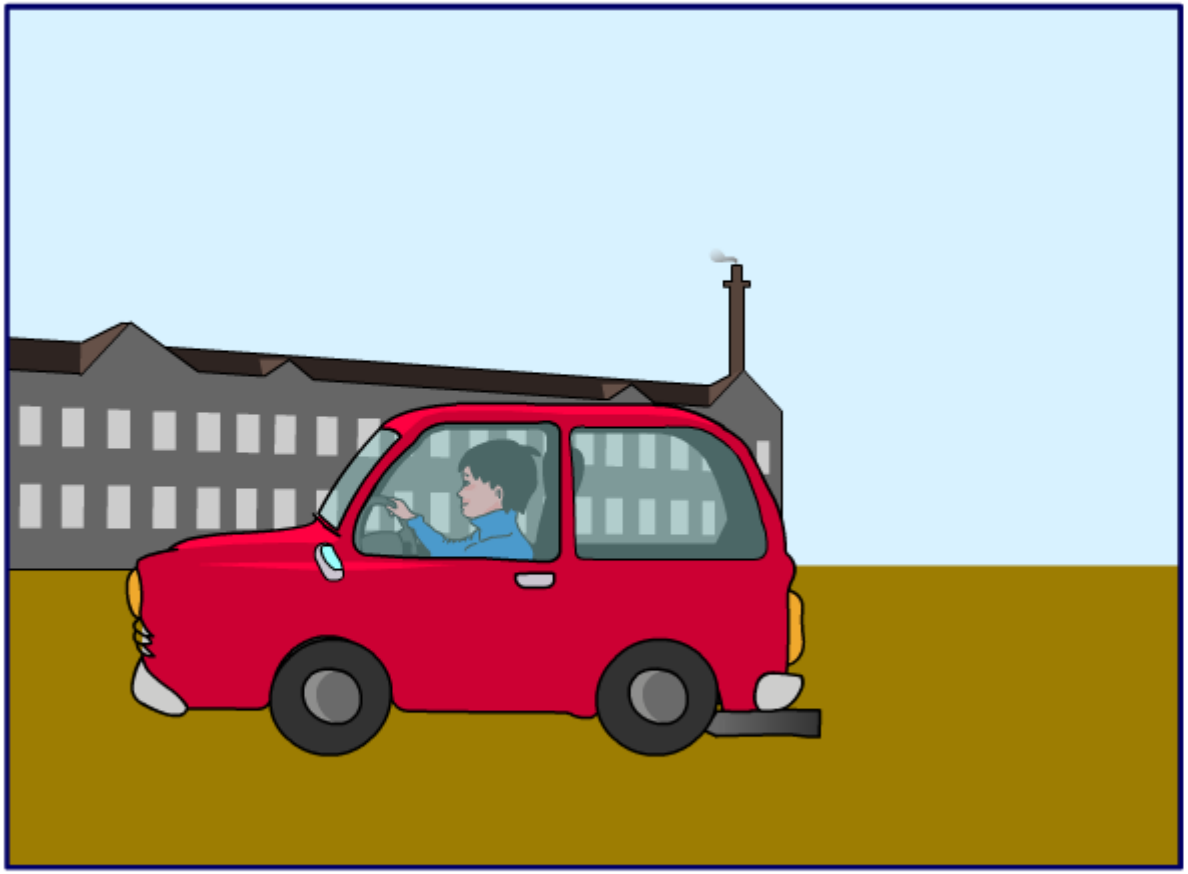


- **forests** – All green plants absorb carbon dioxide as part of photosynthesis. The absorbed carbon is only released back into the atmosphere when the plant dies and rots, or is burned.

- **oceans** – Carbon dioxide dissolves in sea water, depending on the temperature and pressure. Tiny marine animals called **phytoplankton** extract carbon from the carbon dioxide to make their skeletons and shells.

# The carbon sink

## What is acid rain?



Acid rain can cause a lot of damage to the environment.

Click "**play**" to find out about the causes and effects of acid rain.

# What damages the ozone layer?

The **ozone layer** is a protective part of the atmosphere that absorbs some of the Sun's damaging ultraviolet (UV) rays.

Damage to the ozone layer means that more UV rays reach Earth, increasing the risk of skin cancer.

The ozone layer is damaged by chemicals called **chlorofluorocarbons** (**CFCs**), which contain the elements carbon, hydrogen, chlorine and fluorine.

CFCs are used in fridges and freezers, aerosol sprays and packaging materials such as polystyrene. The production and use of CFCs is now banned in many countries and could be worldwide in a few years.

# What is smog?

**Smog** is a mixture of air pollutants and particulates that is sometimes found in the lower levels of the atmosphere. It has a distinctive brownish haze.

Smog can reach dangerous levels in built-up areas, causing irritation to the eyes and lungs.


A large part of smog is ground-level ozone, a highly toxic gas.

Ozone is formed when nitrogen oxides and hydrocarbons react with oxygen, in a reaction catalyzed by sunlight.