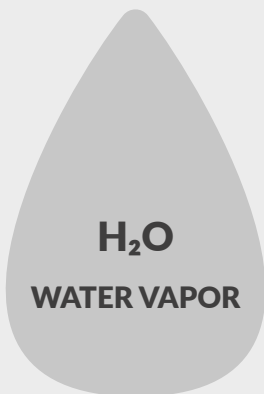
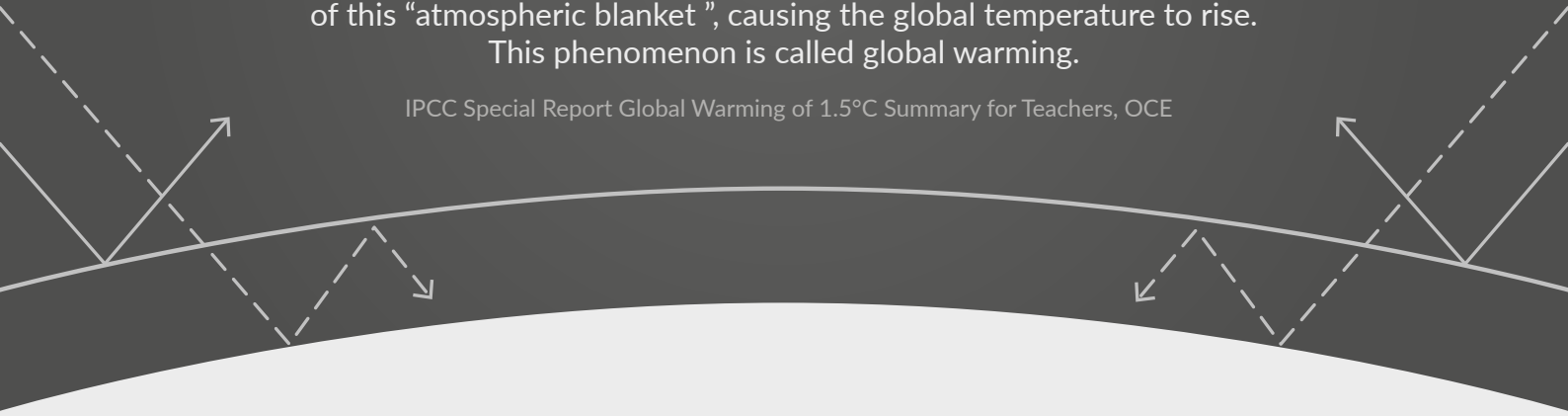


GREENHOUSE GASES (GHG)


The Sun's rays travel through the atmosphere and warm the Earth's surface, generating the upward emission of infrared heat (radiation). Some of this heat is trapped on its escape to space by greenhouse gases (GHG) in the atmosphere and sent back towards the Earth's surface. Greenhouse gases thus act like a "blanket", trapping heat, and causing the temperature of the lower atmosphere to rise.

Greenhouse gases released by human activities increase the thickness of this "atmospheric blanket", causing the global temperature to rise. This phenomenon is called global warming.


IPCC Special Report Global Warming of 1.5°C Summary for Teachers, OCE



H₂O
WATER VAPOR




CO₂
CARBON DIOXIDE
Main contributor to the anthropogenic greenhouse effect.




CH₄
METHANE
Significant contributor due to its high global warming potential.



O₃
OZONE



N₂O
NITROUS OXIDE
Known as "laughing gas", its emissions are constantly increasing.



HFC / PFC / SF₆ / NF₃
FLUORINATED GASES
These industrial gases, which are not naturally occurring, have extremely long lifespans in the atmosphere.

GREENHOUSE GASES (GHG)

WHERE DO THESE GASES COME FROM?



WATER VAPOR

From natural evaporation and clouds, it creates the natural greenhouse effect.

Main Source

The combustion of fossil fuels (coal, oil, gas).

Other sources

Deforestation and land occupation by human activities.



CARBON DIOXIDE

Main source

Intensive livestock farming and the fermentation of organic waste.

Other sources

The production of fossil fuels and the extension of immersed areas (rice fields, swamps).



METHANE



OZONE

- Naturally occurring at very high altitude (stratosphere), it filters the sun's ultraviolet rays and protects us from them.
- Its accumulation at low altitude (troposphere), due to thermal vehicles and industrial activity, causes a greenhouse effect.

Main source

Industrial agriculture using fertilizers containing nitrogen, and animal excrement.

Other sources

Certain industrial processes and vehicle catalytic converters.



NITROUS OXIDE

Main Source

Refrigeration and air conditioning.

Other sources

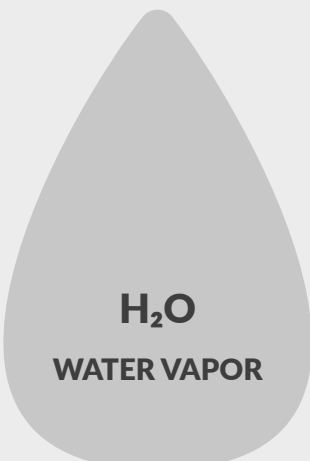
Insulating foams (devices, vehicles, buildings).



FLUORINATED GASES

GREENHOUSE GASES (GHG)

HOW CAN EMISSIONS BE REDUCED?




H₂O
WATER VAPOR

- Decarbonization of energy and mobility.
- Reducing energy consumption.
- Reforestation and landscaping.
- Atmospheric CO₂ capture.

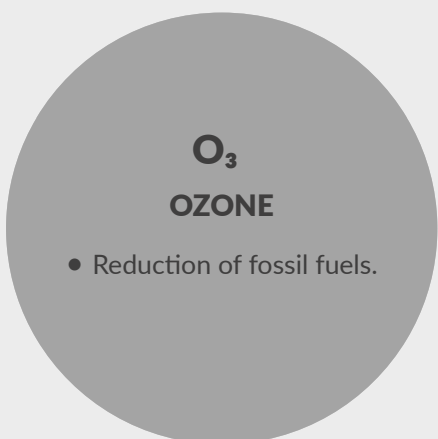


CO₂
CARBON DIOXIDE

- Reduction of intensive livestock farming.
- Better waste management.
- Reduction of fossil fuels.




CH₄
METHANE



O₃
OZONE

- Reduction of fossil fuels.

- Reduction of intensive agriculture and industrial livestock farming.
- Global reduction of meat consumption.



N₂O
NITROUS OXIDE

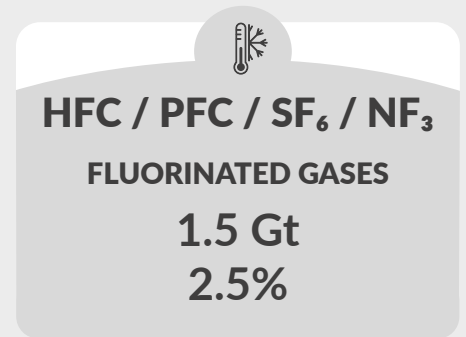
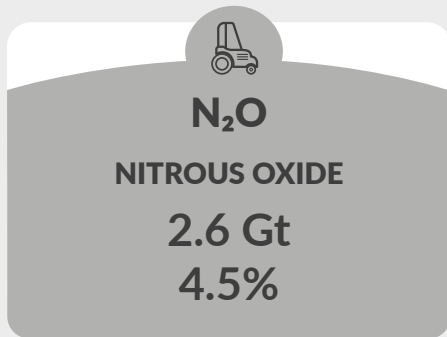
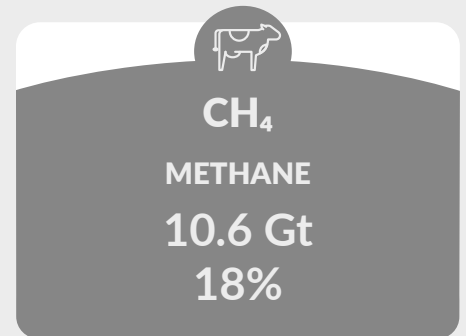
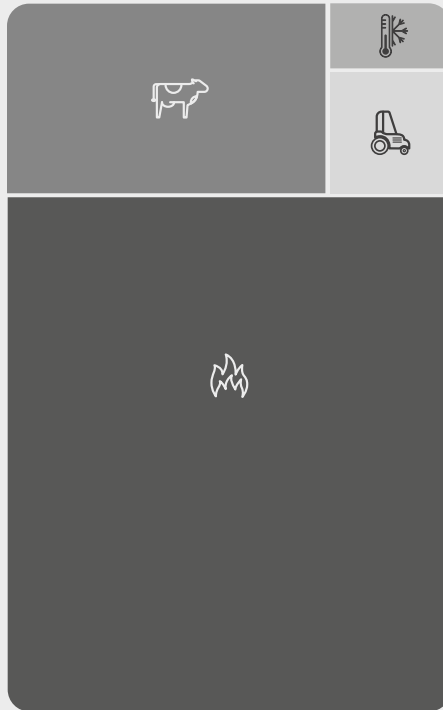
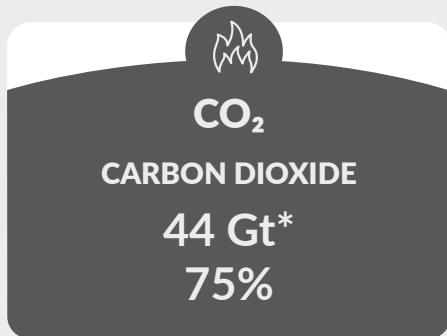
- Capture of these gases when dismantling refrigeration and air conditioning systems (buildings, vehicles, etc.).



HFC / PFC / SF₆ / NF₃
FLUORINATED GASES

GREENHOUSE GASES (GHG)

WHAT ARE THE QUANTITIES EMITTED IN A YEAR?

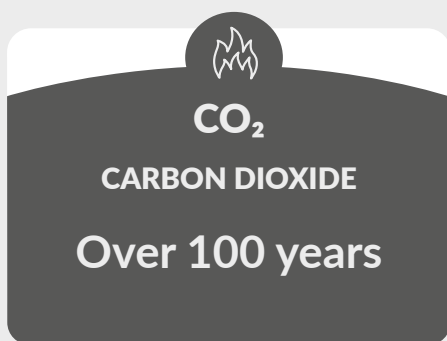


*1 Gt = 1 billion tons

Global anthropogenic GHG emissions in 2019

Source: IPCC report summary, 2022

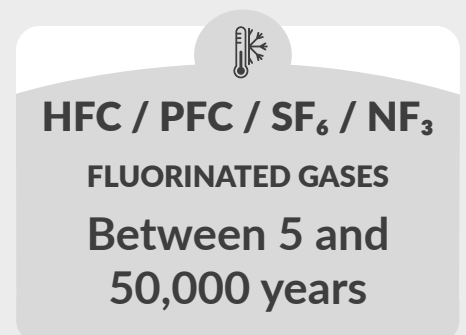
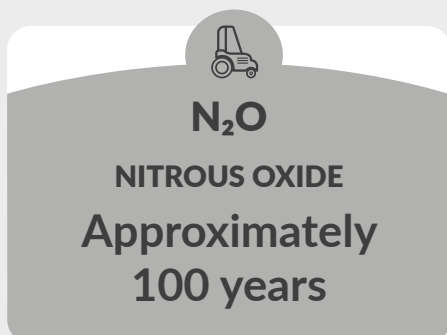
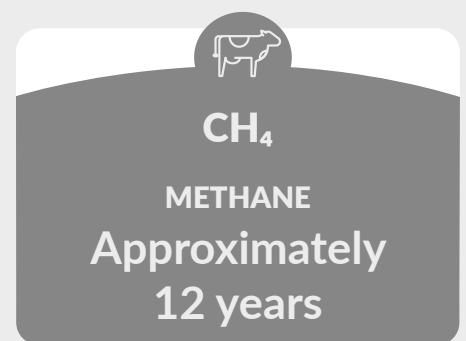
WHAT IS THEIR LIFESPAN IN THE ATMOSPHERE?



• Greenhouse gases have **very different lifespans.**

• **CO₂** has a lifespan of **more than 100 years.** Its accumulation makes it the most dangerous gas in the long term.

• **Methane** has an atmospheric lifespan of **approximately 12 years.** It is therefore its short-term concentration that determines its dangerousness.



Source: IPCC report, 2021

GREENHOUSE GASES (GHG)

WHAT IS THEIR GLOBAL WARMING POTENTIAL?



CO₂

CARBON DIOXIDE

at 20 years = 1
at 100 years = 1

- The global warming potential (GWP) of a greenhouse gas is the warming power of a mass of that gas, compared with the warming power of the same mass of carbon dioxide (CO₂).
The GWP of CO₂ is thus 1.



CH₄

METHANE

at 20 years = 82
at 100 years = 27

- The GWP of other greenhouse gases is calculated for a given time frame: usually **100 years**, but sometimes **20** or **500 years**.



N₂O

NITROUS OXIDE

at 20 years = 273
at 100 years = 273



HFC / PFC / SF₆ / NF₃

FLUORINATED GASES

between 770
and 23,000

GWP of methane



Due to its shorter lifespan compared to other gases, the GWP of methane is considerably lower at 100 years than at 20 years.

According to the IPCC, CH₄ is responsible for over a quarter of global warming, because of its greater warming potential.