HELMHOLTZ KLIMA INITIATIVE

FACTSHEET

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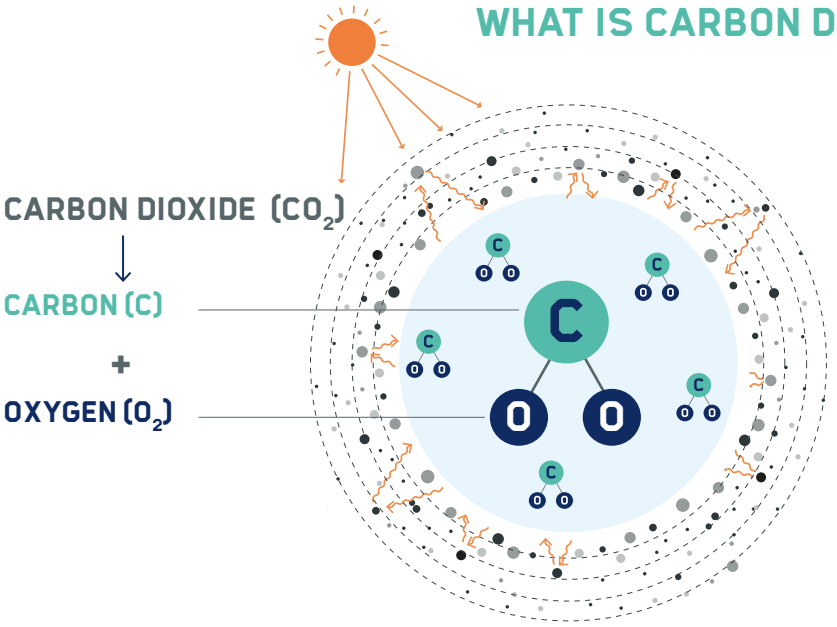
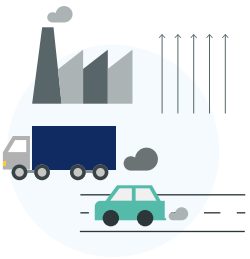
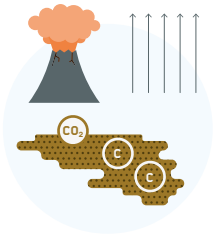
TOPIC: CARBON DIOXIDE

WHAT IS CARBON DIOXIDE?





CO_2 accounts for about **80 % OF HUMAN-PRODUCED** greenhouse gas emissions. That makes it the most important and best-known greenhouse gas.



CO_2 IS A NATURAL RESULT OF cellular respiration by living organisms. It is also released by the combustion of fossil fuels like coal, oil and gas.

Only about **0,04 %** of the air is **CO_2**. But even at this low concentration, it is very effective at preventing thermal radiation from escaping from the Earth back into space. The heat stays trapped in the atmosphere.

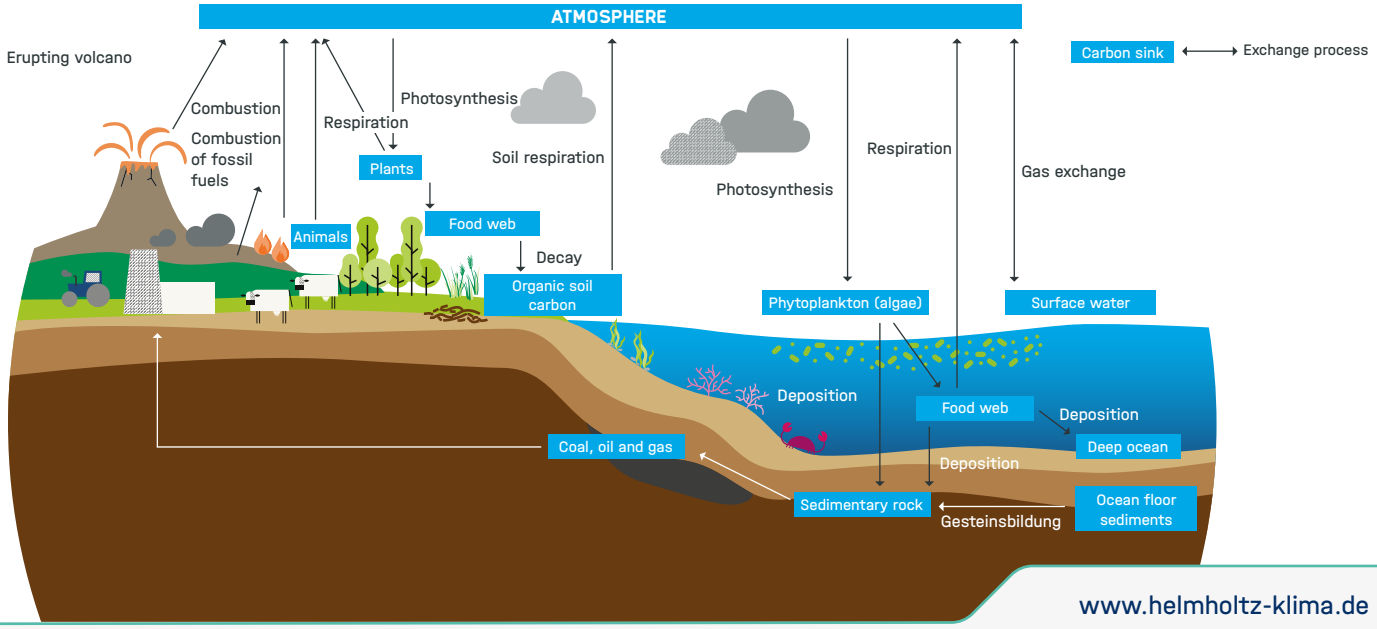
Since the beginning of industrialization, the global CO_2 concentration has risen by about 50 percent. !

THE CARBON CYCLE

The carbon cycle describes how carbon circulates in the Earth system. Some components, working as carbon sinks, can store carbon for a while.

Human-induced greenhouse gas emissions change the natural cycle, resulting in an increasing amount of carbon (in the form of CO_2) in the atmosphere.

Creating or enlarging natural carbon sinks – for example, by replanting forests and mangroves or rewetting bogs – can counteract global warming.



CARBON BUDGET

If the Earth is to warm up by no more than 1.5°C, then a maximum of **280 GIGATONS OF CO_2** can still be emitted.

(As of December 2022.
Note: A gigaton is 1,000,000,000 tons.)

CO_2-CONCENTRATION

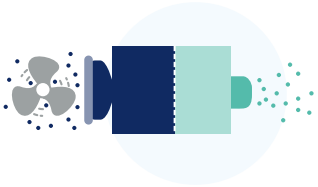
The concentration of CO_2 in the atmosphere must not exceed **462 PPM OF CO_2**. The current concentration in the air is approximately 415 parts per million (ppm).

CO_2-SURPLUS

Each year, human activity releases **ABOUT 18.8 GIGATONS MORE CO_2** than natural sinks such as forests or bogs can absorb.

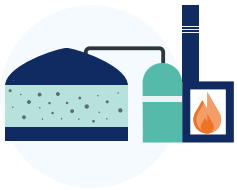
ARTIFICIAL CARBON SINKS

In addition to avoiding greenhouse gas emissions or enlarging natural carbon sinks, there are also technical approaches that can help us meet specified climate targets. Examples include the following:



DIRECT AIR CAPTURE

CO_2 is filtered out of the air and boundto a medium (solid or liquid) in a chemical reaction.



BIOENERGY WITH CARBON CAPTURE AND STORAGE (BECCS)

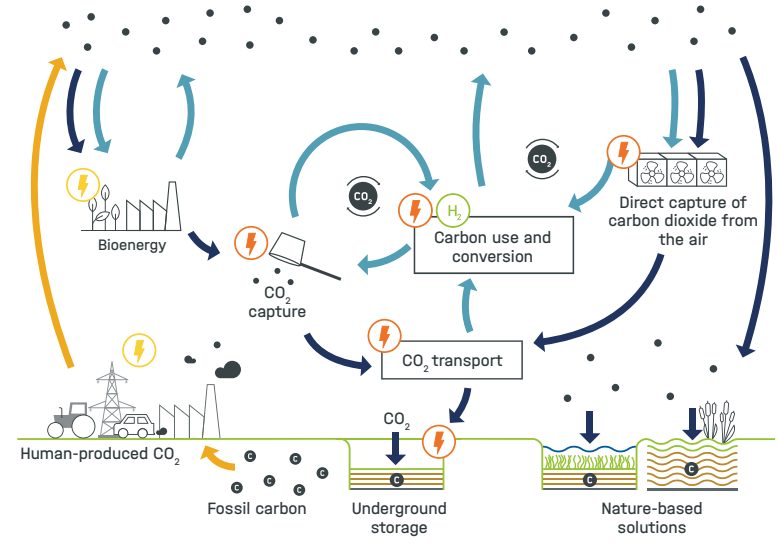
Plant biomass is burned in an industrial process. The resulting CO_2 is captured and stored.

BESCHLEUNIGTE VERWITTERUNG

Large amounts of rock are pulverized and distributed over a large area. This accelerates the natural weathering process and binds CO_2 from the air in the rock.

WHERE HELMHOLTZ RESEARCHES

ATMOSPHERIC CO_2



INFO

This research is part of the Helmholtz Climate Initiative's "Circular CO_2 approaches" project.

The aim of the circular CO_2 approach is - in view of the net-zero emission target - to extract CO_2 from the atmosphere and transform it into alternative fuels using CO_2-free (renewable) energy sources. These alternative fuels can be supplied in a carbon-neutral way, or they can be stored. This process brings substances containing carbon into a cycle similar to the circular economy for materials and products.

Would you like to learn more?

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