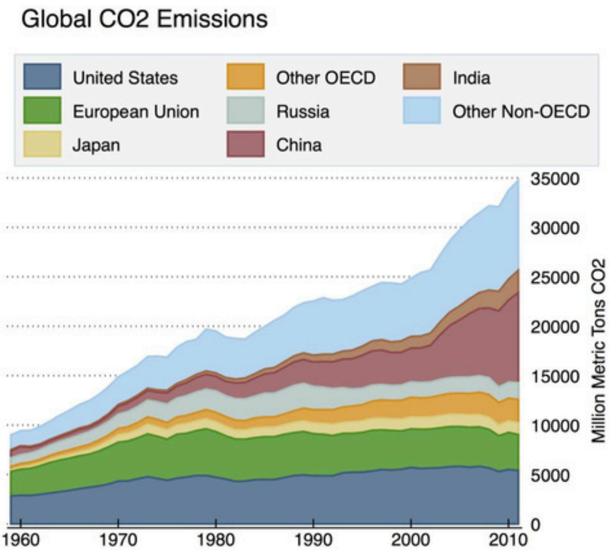
CO2 Emissions



Annual CO2 Emissions from Major Countries/Blocks, 1959-2011. Data from the Global Carbon Budget (2011).

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CO_2, or carbon dioxide, is the main anthropogenic (produced by human activities) greenhouse gas in terms of emissions. These emissions come from our use of fossil fuels and from deforestation.

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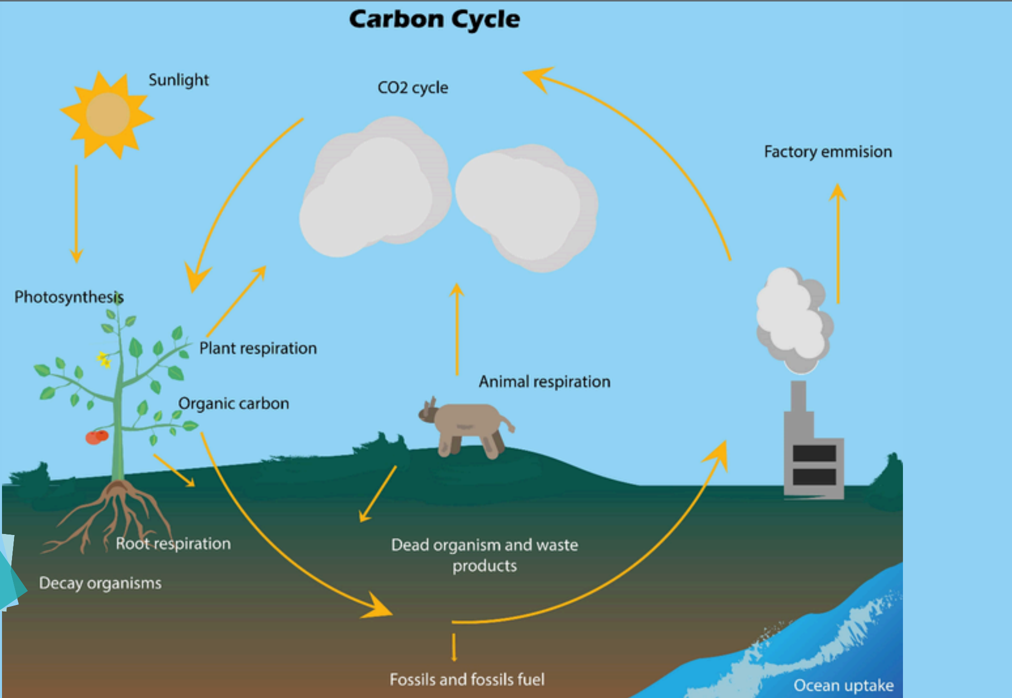
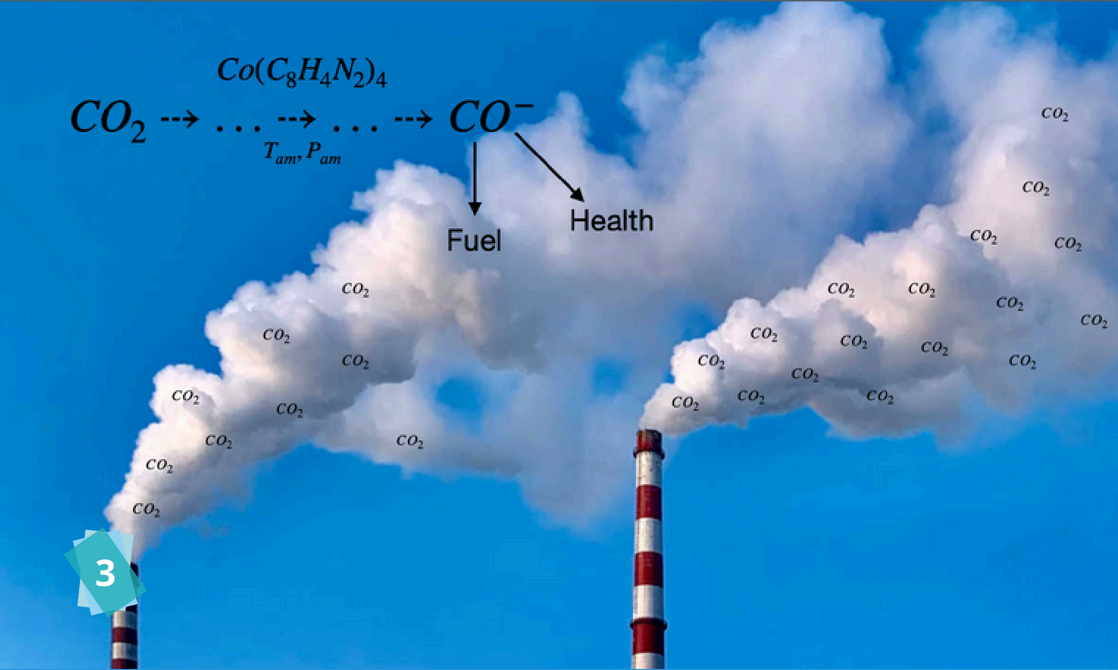
CO2 Cycle


Carbon Cycle
Sunlight
CO2 cycle
Factory emmision
Photosynthesis
Plant respiration
Organic carbon
Animal respiration
Root respiration
Decay organisms
Dead organism and waste products
Fossils and fossils fuel
Ocean uptake

2

CO2 emissions come from several sources, such as animal or plant respiration or factory emissions. Then thanks to the photosynthesis, carbon is transformed and feeds plants which feed the ground. And finally the ground is used by animals and humans for their consumption.

CO2 Transformation



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The idea is to directly transform the CO_2 emitted by factories through a chemical reaction (at ambient pressure and temperature) to produce carbon monoxide, which is used in the healthcare sector and for fuel production.

Technologies of decarbonation

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C02 is the major greenhouse gases and therefore the first that needs to be removed from the atmosphere. In order to do that, some technologies have been developed to capture it and/or transform it into something cleaner.

CO_2 Capture

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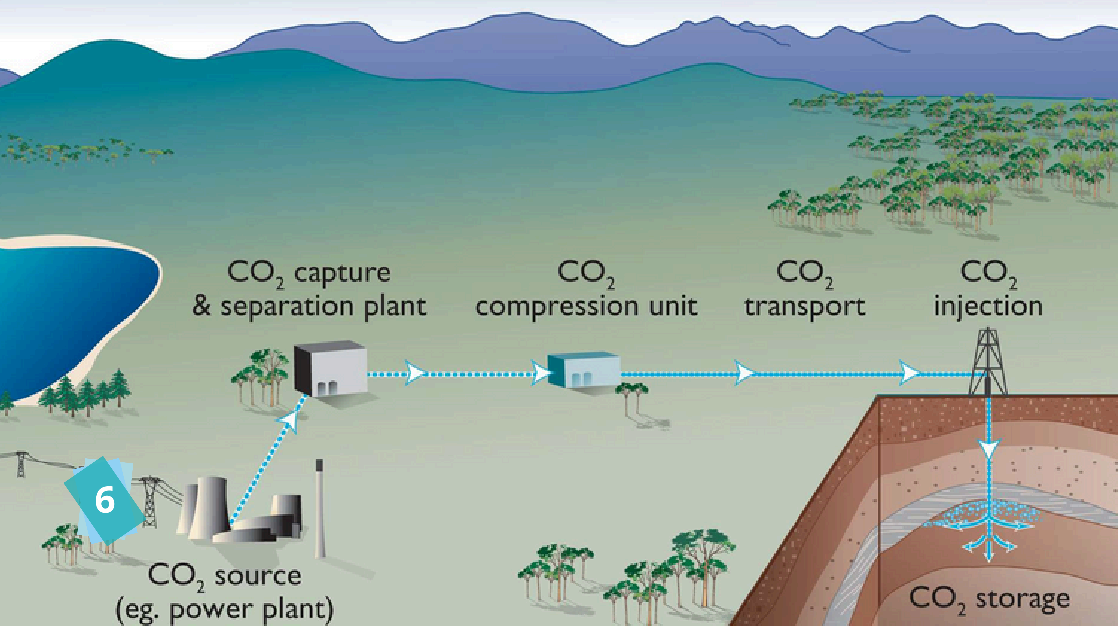
CO2 capture is a means of decarbonizing the atmosphere and reducing CO2 emissions from factories by capturing it directly from chimney exits.

CO2 Sequestration



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To avoid releasing $CO2$ into the atmosphere, one solution is to capture and sequestrate it at the factory outlet, compress it, and then transport it to an old oil reservoir, for example. However, this solution carries two major risks : leakage and explosion.

Permafrost

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Permafrost is permanently frozen ground. It is starting to thaw, releasing into the atmosphere previously locked in methane and CO2 from decomposed biomass. This creates a positive feedback loop, just like forest fires and albedo changes due to melting sea ice.

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Genetic engineering

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Some researchers envision creating several varieties of plants that are extremely CO_2-hungry to enhance the natural process of photosynthesis.

Ocean acidification

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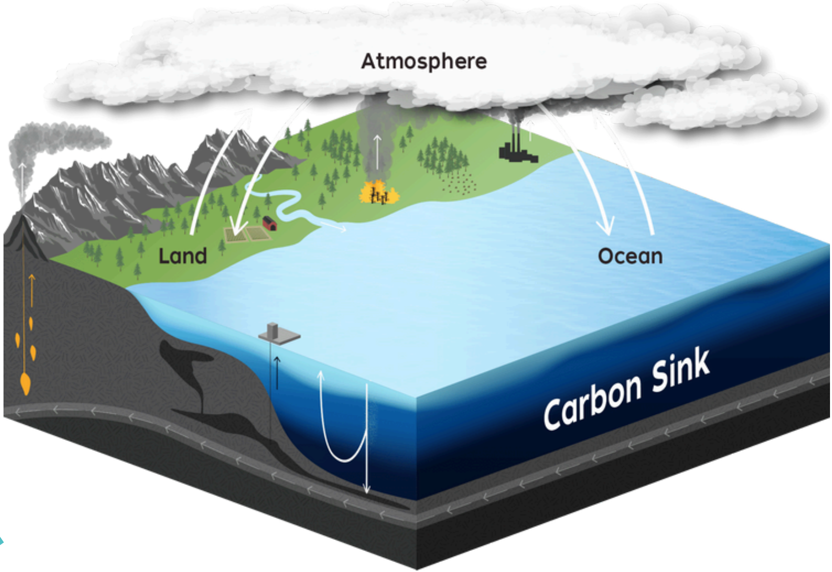
When CO2 dissolves in the ocean, it turns into acid ions (H2CO3 and HCO3-). This makes the oceans more acidic and the pH drops.

Carbon sinks



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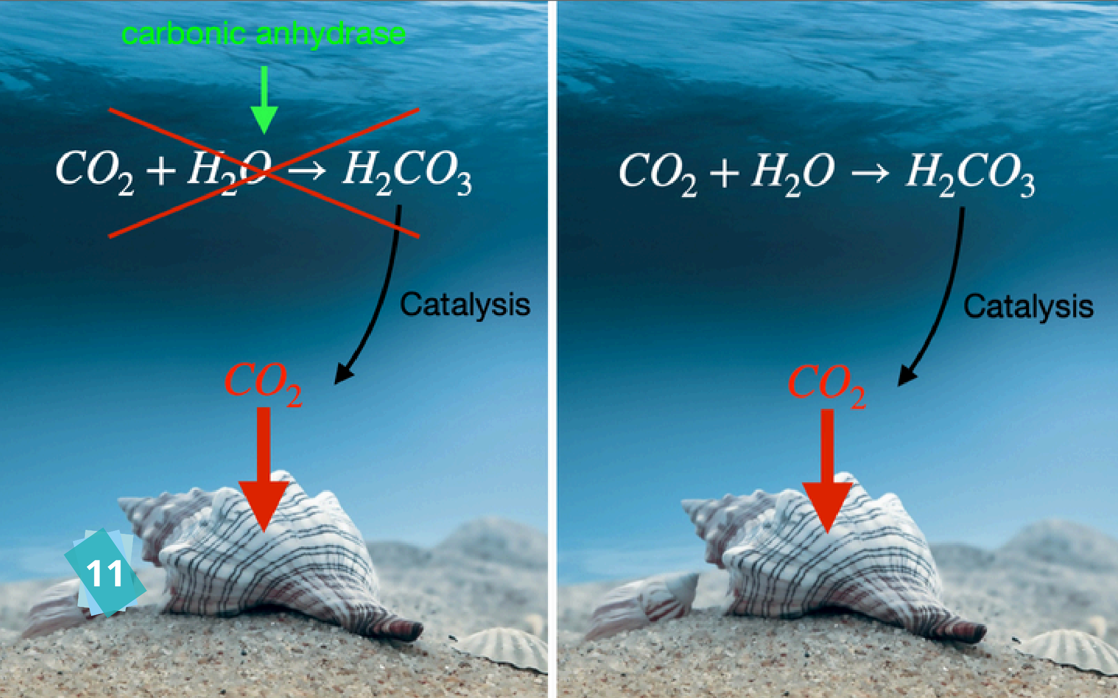
Half of the CO_2 we emit every year is absorbed by carbon sinks: 1/4 by vegetation via photosynthesis; 1/4 by the oceans. The remaining half stays in the atmosphere.

Enzymes



carbonic anhydrase
$CO_2 + H_2O \rightarrow H_2CO_3$
Catalysis
CO_2
$CO_2 + H_2O \rightarrow H_2CO_3$
Catalysis
CO_2

11

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Humans add enzymes to the ocean to catalyze the reaction between CO_2 and salt water. Through these reactions, nutrients are produced and marine life captures the remaining CO_2. This plays a role in the natural decarbonization of the ocean and its degree of acidification.

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Human Health

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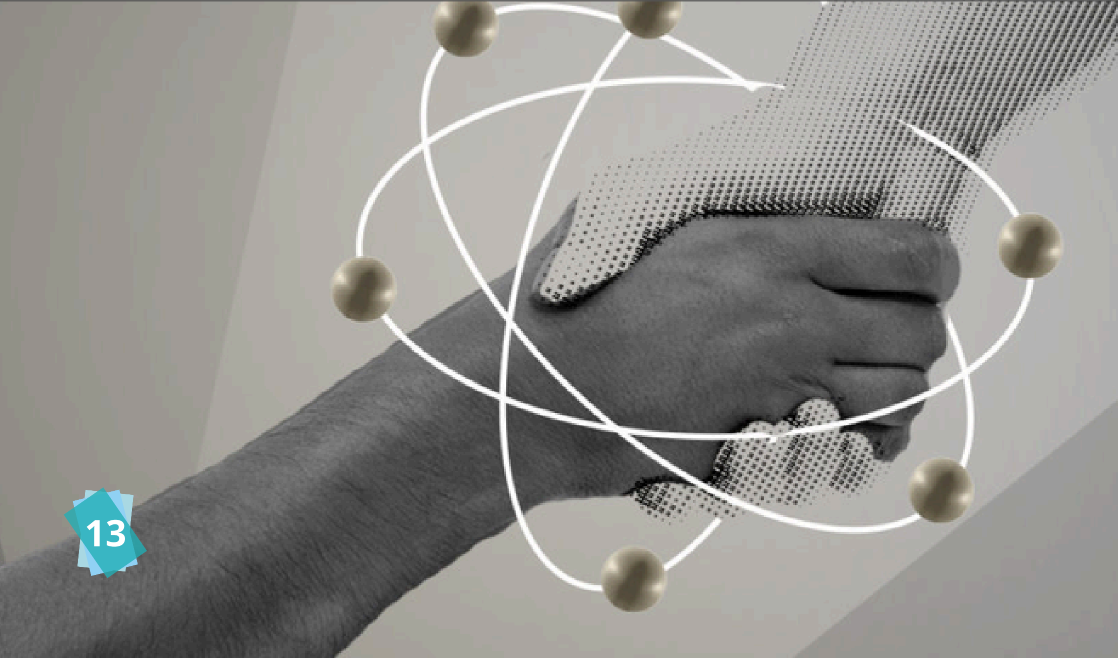
Efforts to reduce CO2 emissions and remove it from the atmosphere are crucial for both environmental sustainability and human health. Cleaner air resulting from these actions leads to improved respiratory health and overall well-being for individuals and communities.

Carbon Geopolitics



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Carbon geopolitics encompasses the strategic implications of climate change mitigation efforts, including the transition to renewable energy sources, energy security concerns, and the shifting balance of power in international relations.

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