

Carbon is everywhere, in the oceans, in rocks and soils, in all forms of life and in our atmosphere. Without carbon, life would not exist as we know it.

The carbon cycle plays a key role in regulating Earth's global temperature and climate by controlling the amount of carbon dioxide in the atmosphere. Carbon dioxide is an important greenhouse gas, because it helps Earth's atmosphere to retain heat generated from the Sun. But too much carbon dioxide going into the atmosphere can lead to a planet that gets unnaturally hot.

Key Points

- Carbon is an important element in the bodies of living things. (About 18% of your body is made of carbon atoms.)
- Carbon exists in the air largely as carbon dioxide gas (CO₂).



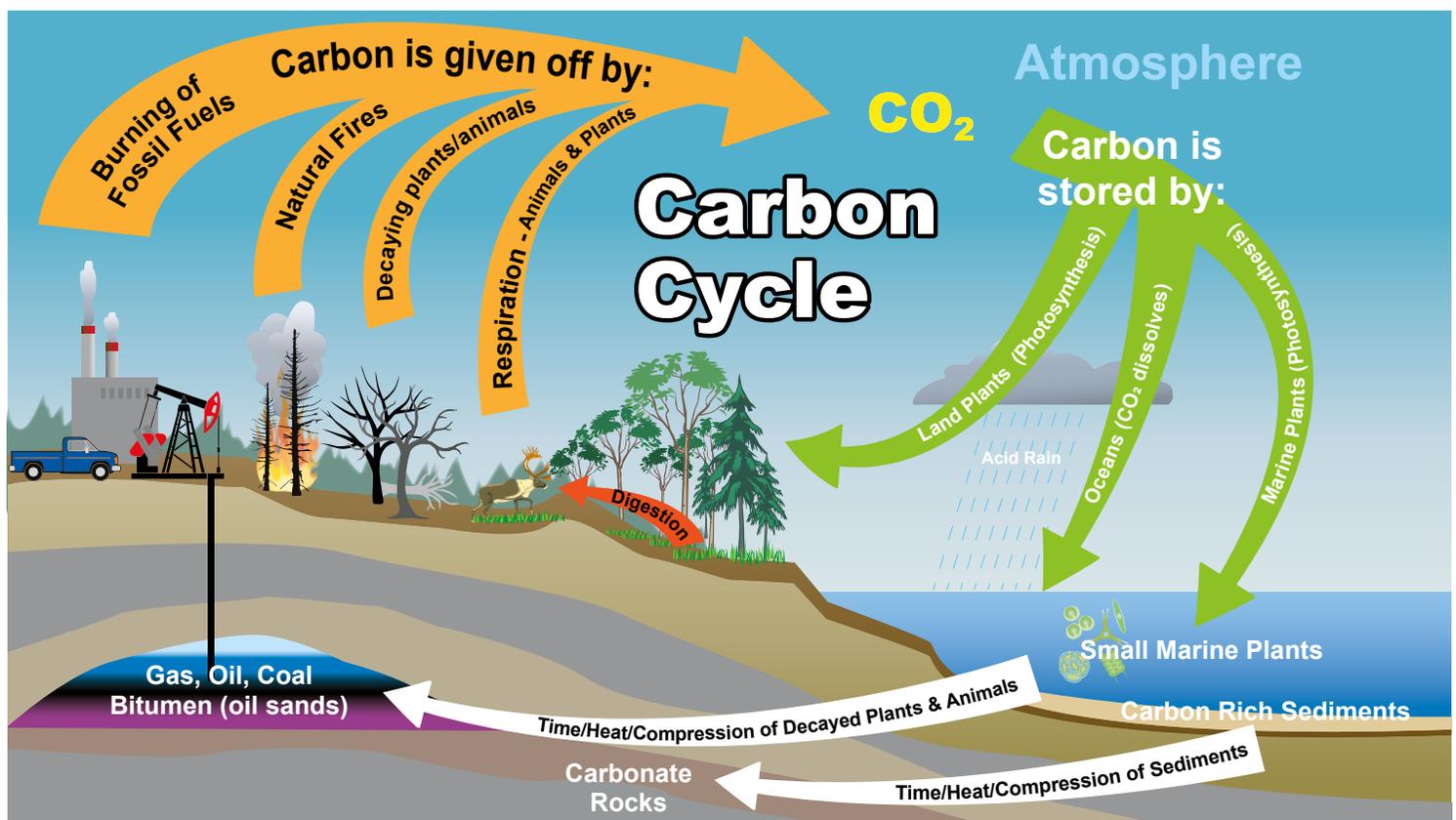
The Carbon Cycle

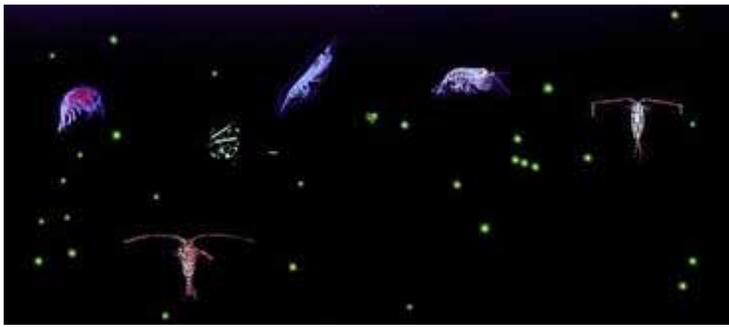
On land

- Plants (land, water plants, algae, etc.) use *photosynthesis* to convert carbon dioxide and light energy into sugar to use as food. In this way, they store CO₂.
- These sugars are used by animals, insects, etc. as food through digestion
- Living things use *respiration* to convert the sugars into energy and give off carbon dioxide in the process.
- Fungi and bacteria also release carbon dioxide when they break down dead organisms and waste products.
- CO₂ is also released when trees and other organisms are burned.

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In the oceans

- Marine plants use photosynthesis to convert carbon dioxide and light energy into carbohydrates, like they do on land, so they also store CO₂.
- Carbon dioxide from the atmosphere dissolves in the oceans and becomes a main part of the shells of small marine plants and animals.
- When these small plants and animals die, their remains sink and eventually become part of the sediment on the ocean floor.



Kyle Glenn / Unsplash

Under the ground

- Over thousands of years, the sediment from the ocean floors are buried and turned into limestone, which is the largest carbon reservoir on Earth.
- Carbon is also stored in soil from the breakdown of dead plants and animals.
- Carbon is stored in rocks and minerals which can be eroded and washed to the oceans by streams and rivers.
- Deeper underground, carbon is stored as fossil fuels such as oil, coal and natural gas, which are the remains of ancient decayed plants and animals.
- This carbon can be cycled back to the atmosphere naturally by the eruption of volcanoes, vents or hot springs.
- It usually takes millions of years for carbon to cycle through the ground in this way.

Human impacts on the carbon cycle

Some of the extra CO₂ produced by human activities is taken up by plants or absorbed by the ocean, but more CO₂ is being made than can be taken in. So, CO₂ levels have risen and continue to rise.

Fossil Fuels

- Fossil fuels take millions of years to form.
- When humans burn them, carbon is released into the atmosphere as carbon dioxide at a very rapid rate, faster than they can be absorbed.



Alexander Popov / Unsplash

Deforestation/ Agricultural Clearing / Wetland Destruction

- Rapid destruction of forests and other plant life is also a major source of increasing CO₂ levels.
- Plants store carbon during photosynthesis but this is released when they are burned or left to rot.



Roya-ann Miller / Unsplash

Industry

- Many industries release additional CO₂
 - Cement manufacturing produces large amounts of CO₂ when limestone is heated.
 - Steel production releases CO₂ when the iron is heated.
 - A lot of CO₂ is also released when many chemicals and plastics are made.



Caitlin Seaview Survey / Wikimedia



Kouji Tsuru / Unsplash

Ocean Acidification

- The excess carbon dioxide which is dissolving in the oceans is causing the water to become more acidic which, in turn, harms sea life.
- This also reduces the oceans ability to absorb more CO₂.

Why does increasing carbon dioxide matter?

- CO₂ levels naturally rise and fall in cycles over long periods of time, but they are higher now than they have been in the past 400,000 years.
- CO₂ is a greenhouse gas. In the atmosphere, it traps heat and keeps it from radiating into space.
- Based on extensive evidence, scientists think that elevated levels of CO₂ and other greenhouse gases are causing major changes in Earth's climate.

More Information

The Carbon Cycle - Earth Observatory - NASA

<https://earthobservatory.nasa.gov/features/CarbonCycle>

Main sources of carbon dioxide emissions -

What's Your Impact

<https://whatsyourimpact.org/greenhouse-gases/carbon-dioxide-emissions>

Carbon Cycle Interactive Diagram - Science Learning Hub

https://www.sciencelearn.org.nz/image_maps/3-carbon-cycle

Videos

Human Influence – CO₂ Cycle & Balance - PICS Canada

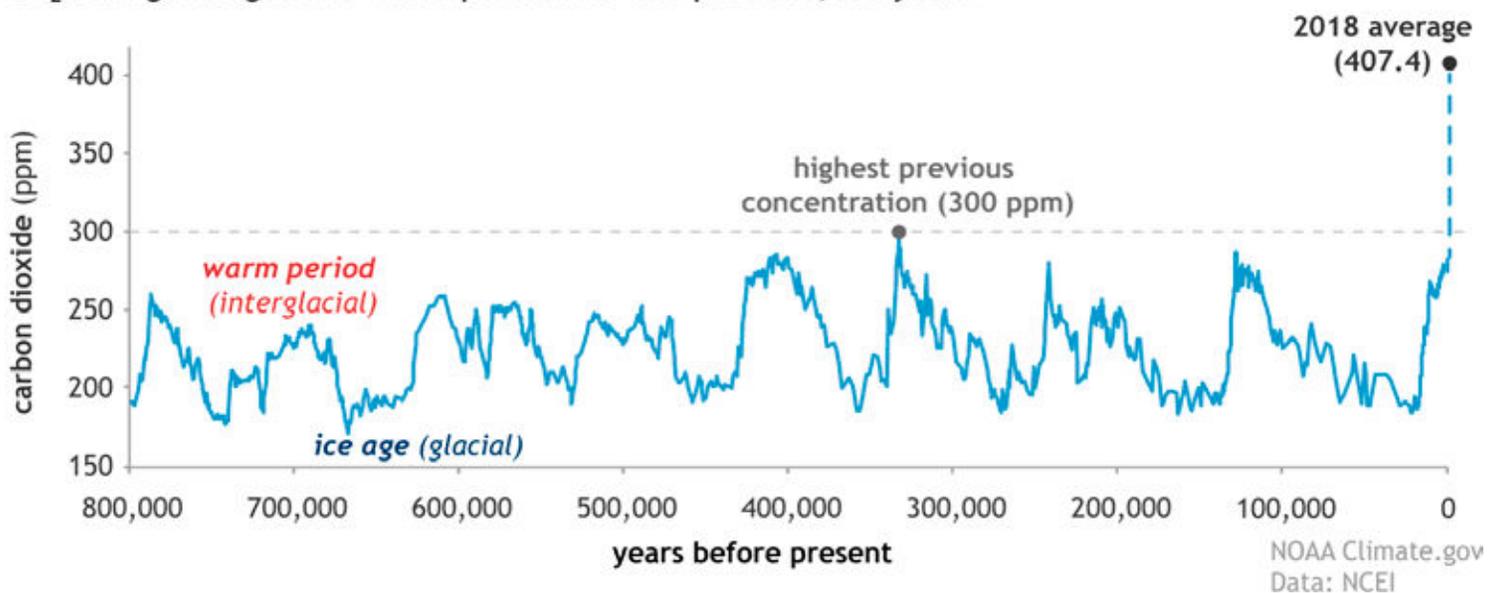
<https://www.youtube.com/watch?v=-X-AcS5bvDc>

How Does Earth's Carbon Cycle Work? - Smithsonian's National Museum of Natural History

<https://www.smithsonianmag.com/smithsonian-institution/how-does-earth-carbon-cycle-work-180972283/>

“... due to human activity, CO₂ levels ... are higher now than they have been in the past 400,000 years.”

CO₂ during ice ages and warm periods for the past 800,000 years



This chart shows carbon dioxide concentrations (vertical on left) over time (horizontal along bottom) - NOAA 2018