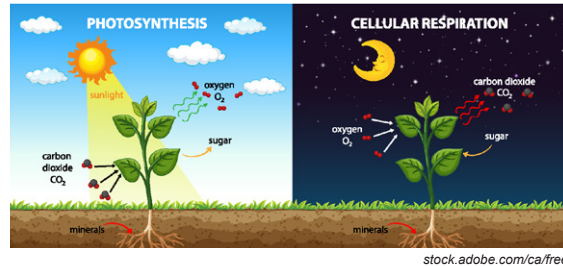


Carbon is everywhere, in the oceans, in rocks and soils, in all forms of life and in our atmosphere. Without carbon, life would not exist as we know it.

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 (CO<sub>2</sub>).



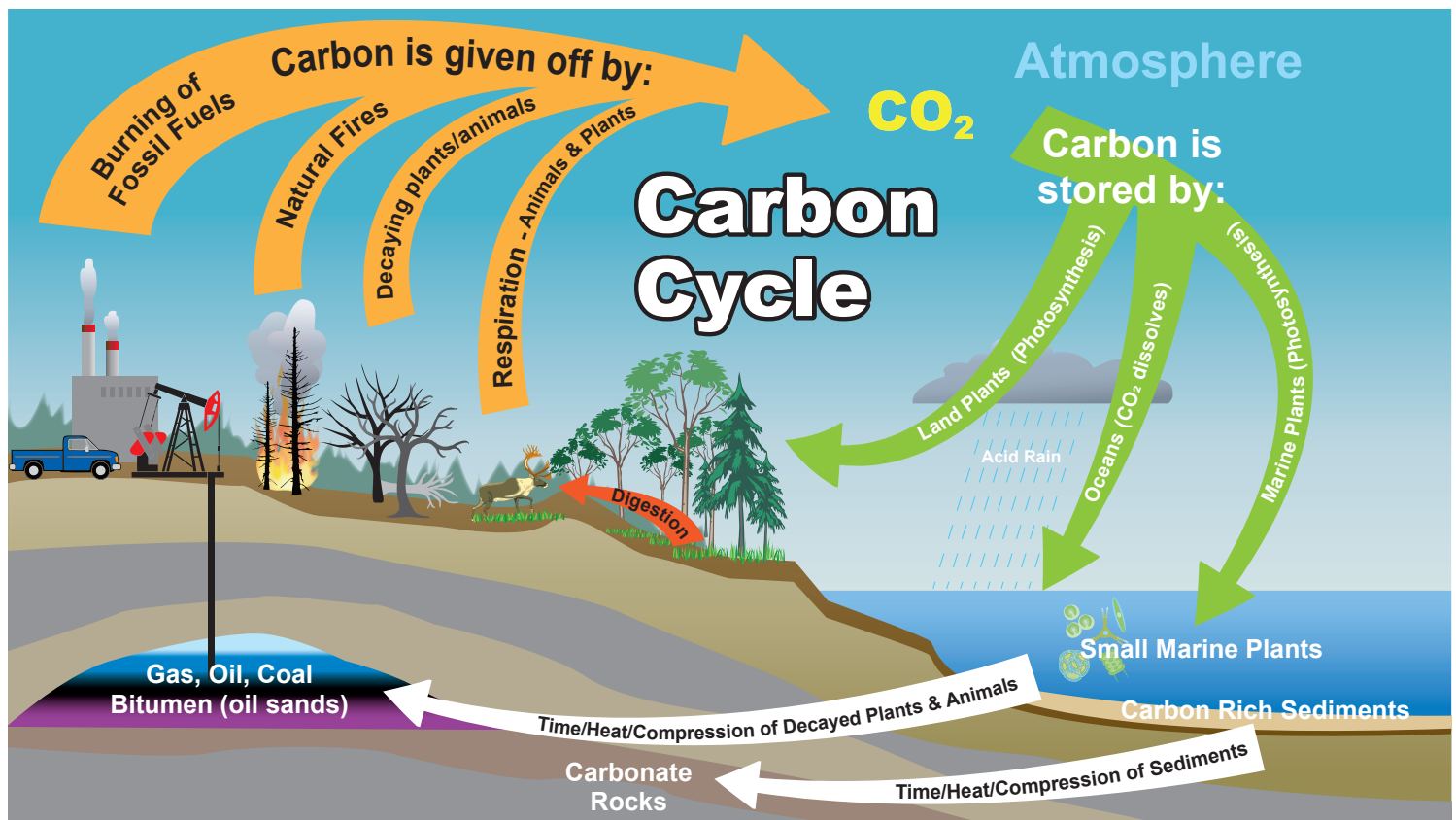
## The Carbon Cycle

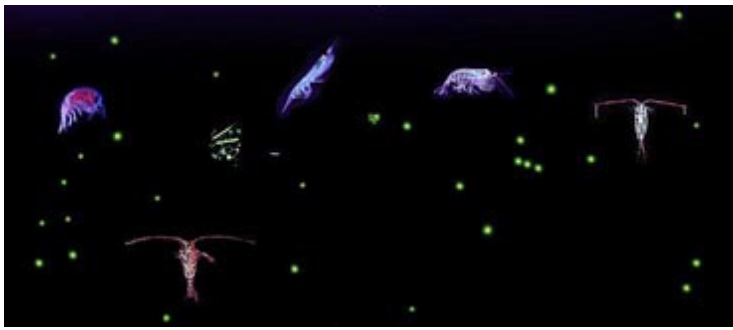
### On land

- 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 CO<sub>2</sub>.
- 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.
- CO<sub>2</sub> is also released when trees and other organisms are burned.

**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.**





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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 CO<sub>2</sub>.
- 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.



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### 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 CO<sub>2</sub> produced by human activities is taken up by plants or absorbed by the ocean, but more CO<sub>2</sub> is being made than can be taken in. So, CO<sub>2</sub> 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.



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### Deforestation/ Agricultural Clearing / Wetland Destruction

- Rapid destruction of forests and other plant life is also a major source of increasing CO<sub>2</sub> levels.
- Plants store carbon during photosynthesis but this is released when they are burned or left to rot.



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### Industry

- Many industries release additional CO<sub>2</sub>
  - Cement manufacturing produces large amounts of CO<sub>2</sub> when limestone is heated.
  - Steel production releases CO<sub>2</sub> when the iron is heated.
  - A lot of CO<sub>2</sub> is also released when many chemicals and plastics are made.



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## 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 CO<sub>2</sub>.

## Why does increasing carbon dioxide matter?

- CO<sub>2</sub> 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.
- CO<sub>2</sub> 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 CO<sub>2</sub> 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>

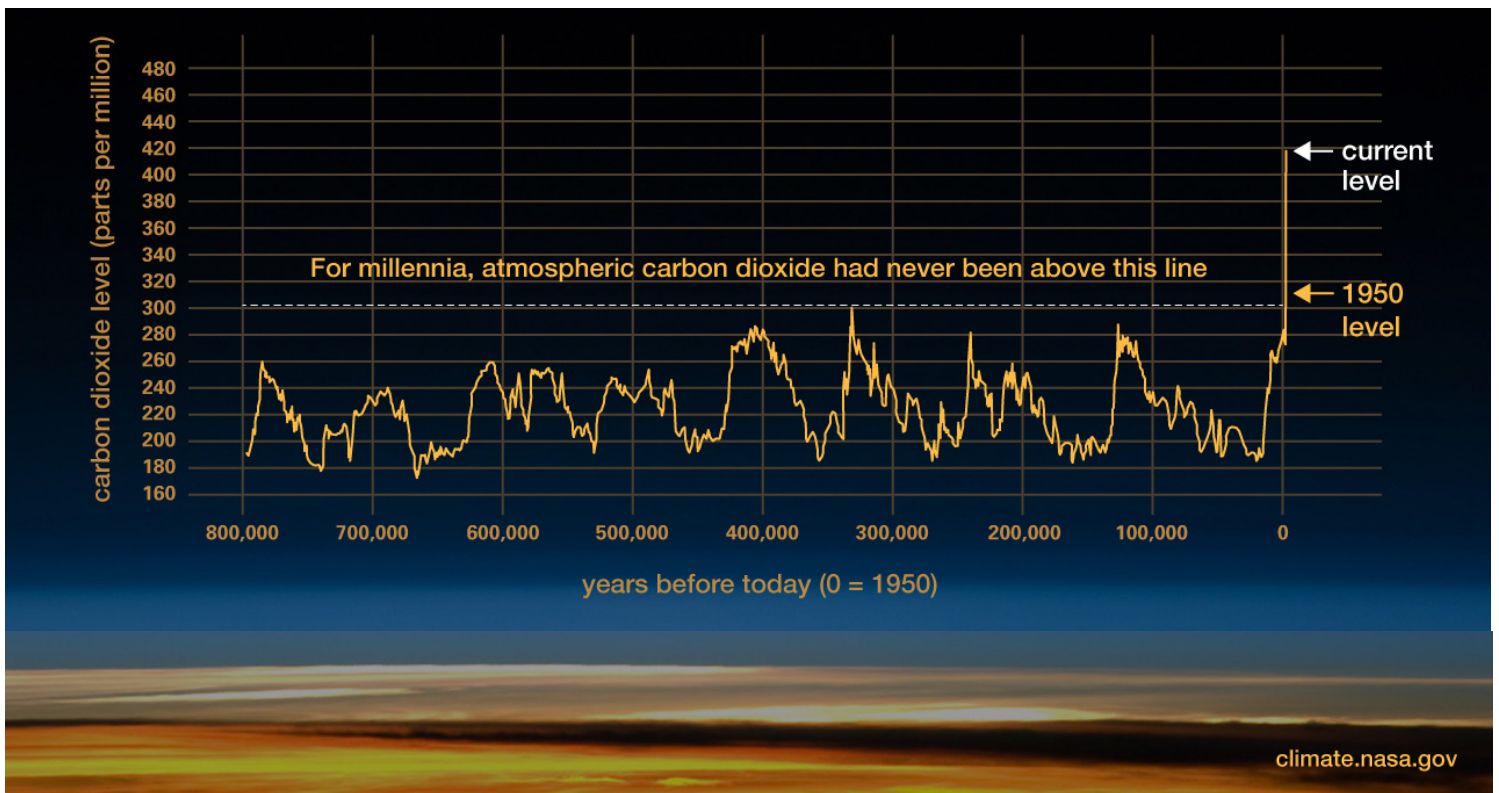
Carbon Cycle Interactive Diagram - Science Learning Hub  
[https://www.sciencelearn.org.nz/image\\_maps/3-carbon-cycle](https://www.sciencelearn.org.nz/image_maps/3-carbon-cycle)

## Videos

Human Influence – CO<sub>2</sub> 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, CO<sub>2</sub> levels ... are higher now than they have been in the past 400,000 years.”**



This chart shows carbon dioxide concentrations (vertical axis) over time (horizontal axis) - climate.nasa.gov