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What is the carbon cycle?

Carbon is an essential element and makes up all life on this Earth. It is in you and me, in the trees around us, in the soil beneath your feet, and in the deep ocean. It moves constantly from state to state and compound to compound, creating a cycle within the Earth's system. You can picture carbon's movement among the Earth's systems as a flow in and out of reservoirs. A source is a reservoir that releases carbon and a sink is a reservoir that absorbs carbon. Carbon reservoirs store carbon for varying amounts of time—it can be as short as days or as long as hundreds of millions of years, such as carbon in coal deposits.

Is the carbon cycle related to climate change?

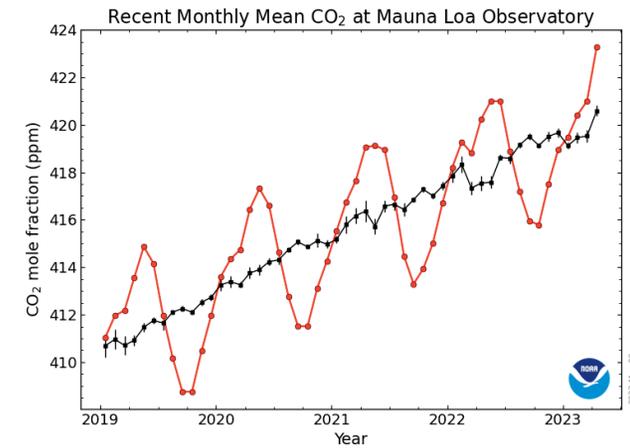
Yes! Climate change is the result of an imbalance in the carbon cycle. An increase of carbon in the atmosphere in the form of gases such as carbon dioxide (CO₂) and methane (CH₄) leads to rising temperatures because of the greenhouse effect.

In this pamphlet, we discuss the exchange, storage, and release of carbon among plants, animals, soil,

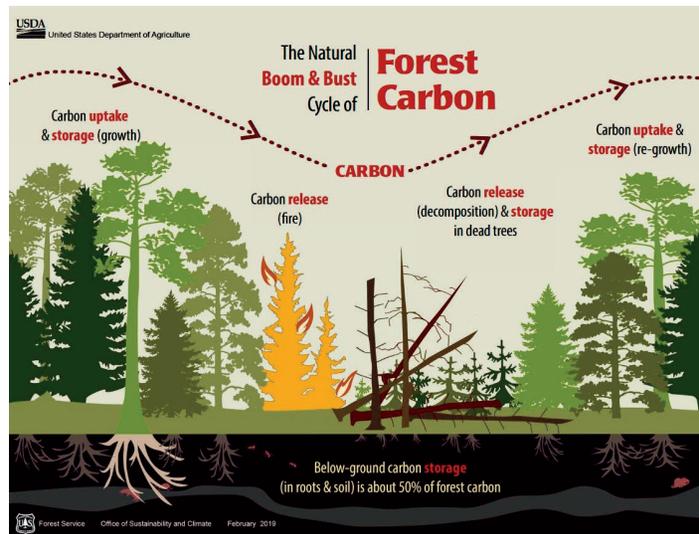
and the atmosphere. Key components and processes of the biological terrestrial carbon cycle include: photosynthesis, plant growth and productivity, decomposition, soil carbon storage, and human activities. Overall, the terrestrial life carbon cycle helps to maintain a balance in atmospheric carbon dioxide levels and plays a significant role in the global carbon cycle and Earth's climate system.

Plants

As you walk through the woods behind your home or tend to the succulent in your room, you don't always see the vital role that plants play in the carbon cycle's balancing act. Through photosynthesis, plants absorb CO₂ from the atmosphere, convert it into compounds, and store carbon in their tissues until they die and release it through burning or decomposition. As humans destroy increasingly many acres of forested land—to build farms or through uncontrolled wildfires—the planet is losing vital carbon sinks.

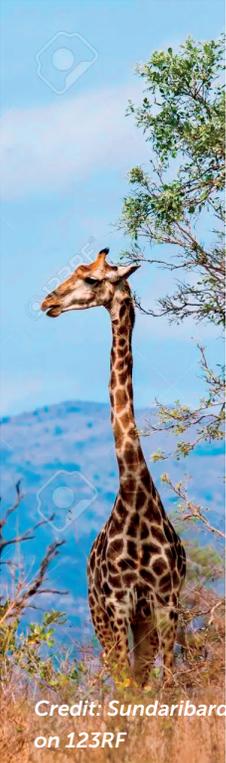


This graph shows atmospheric CO₂ measured at the Mauna Loa Observatory in Hawai'i. Although the average amount of CO₂ in the atmosphere increases steadily (seen by the black line), you can see a pattern of significant seasonal differences within a year (red line). In the Northern Hemisphere winter and early spring, CO₂ levels are high because many plants are dormant and not absorbing CO₂. In the summer, the CO₂ levels decrease since the leaves on trees are photosynthesizing and absorbing more CO₂ from the atmosphere. The data are dominated by the effects of plant life in the Northern Hemisphere because it contains much more land area than the Southern Hemisphere.



Animals

Life on Earth would not be possible without carbon. Be it the squirrel you saw running up a tree, a panda eating bamboo shoots, or you, we are all made up of carbon and are therefore actively participating in the carbon cycle. These are the impacts that animals have on the carbon cycle:



Credit: Sundaribardia on 123RF

- Emit carbon dioxide into the atmosphere through respiration.
- Release methane in the environment through manure and air releases from livestock.
- Decompose organic matter through the consumption of plants or other animals.
- Release carbon-rich waste products which can contribute nutrients and organic matter to soil.
- Decomposition of animal bodies by bacteria or fungi.
- Impact plant growth, soil structure, and other carbon storage through burrowing, eating, grazing, and many more activities.

It is important to understand that although animal respiration is part of the carbon cycle, we are not throwing it off balance by exhaling CO₂ when we breathe. Instead, it is human activity like the burning of fossil fuels that has the most significant impact. A person typically breathes out about 1 kg of CO₂ per day. Burning a gallon of gasoline releases over 8 kg of CO₂. In the U.S. we burn over 370 million gallons per day to power our vehicles.

Soil

Soil plays a vital role in the carbon cycle by storing and releasing carbon. Organic matter in soil, such as plant debris and animal waste, contributes to the buildup of carbon in soil. This results in carbon sequestration: removing carbon dioxide from the atmosphere and storing it in the soil.



Soil plays a part in the carbon cycle and climate change through land management systems and farming practices:

- Agricultural practices can affect soil carbon levels, with practices like no-till farming or cover cropping promoting carbon sequestration.
- Erosion and land degradation can reduce the soil's capacity for taking in atmospheric carbon dioxide.
- Composting or adding organic amendments can enhance soil carbon content.

Taking a holistic approach to land management, agriculture, and soil management is essential for mitigating climate change and ensuring the long-term health and productivity of our soils.

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CHANGING CLIMATE

OUR FUTURE, OUR CHOICE



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Terrestrial Life in the Carbon Cycle



1259 Trumansburg Rd.
Ithaca, NY 14850
(607) 273-6623 priweb.org