



Supply

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Carbon Cycle and Storage

The carbon cycle is essential for life on Earth: through processes like photosynthesis, respiration, and fossilisation, carbon is stored in organic matter, fossils, and the atmosphere.



Carbon Cycle and Storage

To sustain life on earth, the carbon cycle must maintain equilibrium. This balance is essential to prevent atmospheric warming.

Carbon dioxide (CO₂) is transported through different media in a process known as the carbon cycle. Carbon atoms, which are required for the formation of proteins, DNA, and other building blocks of life, move back and forth between organisms and the atmosphere.

To sustain life on earth, the carbon cycle must maintain equilibrium. This balance is essential to prevent atmospheric warming. CO₂ can be stored in a variety of ways: within rocks and sediments, in structures, or even in trees.

While plants and soil store carbon, deforestation and land use changes contribute significantly to emissions. When managed sustainably, timber acts as a carbon sink through photosynthesis and can store more carbon than it releases, making it a sustainable material.

The Carbon Cycle

The carbon cycle is a natural process that refers to the movement of carbon between the atmosphere, land, and oceans. It involves the transfer of carbon through various processes, such as photosynthesis, respiration, and decay, which help to maintain the balance of carbon on Earth.

Human activities, such as burning fossil fuels and deforestation, disrupt this balance by releasing substantial amounts of carbon dioxide into the atmosphere, contributing to climate change.

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There are multiple phases of the carbon cycle:

- Carbon dioxide (CO₂) is a naturally occurring gas in the Earth's atmosphere. During photosynthesis, plants absorb CO₂ and combine it with water to produce oxygen and energy in the form of glucose.
- After converting carbon into glucose, the plant then stores the glucose in insoluble forms such as cellulose. This is the mechanism through which plants sequester carbon. For instance, most trees retain carbon until they die or are harvested, meaning that a significant amount of carbon is stored in forests and grasslands.
- If not harvested for human use, plant material is consumed by animals and the carbon compounds are bioaccumulated in their bodies.
- After animals die, the carbon dioxide is released back into the atmosphere as decomposers such as bacteria and fungi break down the organic matter in the soil.
- Fossilisation is another long-term form of carbon sequestration, in which dead plant and animal matter transforms into fossil fuels or sedimentary rocks. Fossil fuels are used in industry, construction, and manufacturing for the purpose of energy. When fossil fuels are burned, the stored CO₂ is released back into the atmosphere.
- The process of respiration in all living organisms also releases CO₂ into the atmosphere as a by-product of glucose breakdown.
- Marine life also plays a role in the carbon cycle, as marine animals convert carbon into calcium carbonate, which is used to build shells and other carbonate rocks. When these rocks are exposed to air, they can decompose, releasing CO₂ back into the atmosphere.

Carbon Stores

Carbon is stored in several major sinks, including organic molecules in living and dead organisms, organic matter in soils, fossils, and sedimentary rock, and as carbon dioxide in the atmosphere.

Carbon sequestration is a process of removal, isolation, and containment of CO₂ from the atmosphere into a long-term storage medium such as cellulose.

- **Organic matter in living organisms:** Carbon is contained within the organic molecules of plants, animals, and other living organisms. This carbon is stored within the organisms' molecular structure and is returned to the atmosphere when they die and decompose.
- **Organic matter in soil** contains substantial amounts of carbon that has been stored for centuries. This carbon is locked in the soil structure and can only be released when the soil is disturbed or the organic matter is decomposed, making soil a significant carbon sink.

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- **Fossils and sedimentary rocks** such as limestone are another important carbon sink. Limestone is formed from the accumulation of the shells of microscopic marine organisms composed of calcium carbonate. This carbonate reacts with the atmosphere to form calcium oxide and carbon dioxide. The calcium oxide reacts with water to form calcium hydroxide, which is then stored in the sedimentary rock.
- **Human Activities:** Carbon dioxide is stored in the atmosphere because of human activities, such as burning fossil fuels and deforestation. This carbon dioxide can remain in the atmosphere for many years, contributing to global warming and climate change.

Understanding the sources and sinks of carbon is crucial in managing and mitigating the impacts of climate change.

The carbon cycle serves as a crucial component in regulating global temperature by trapping longwave radiation from the sun. An imbalance in the carbon cycle caused by excessive release of carbon emissions can have severe consequences, such as increased atmospheric temperature, resulting in global warming and resulting climatic changes, such as droughts and flooding.

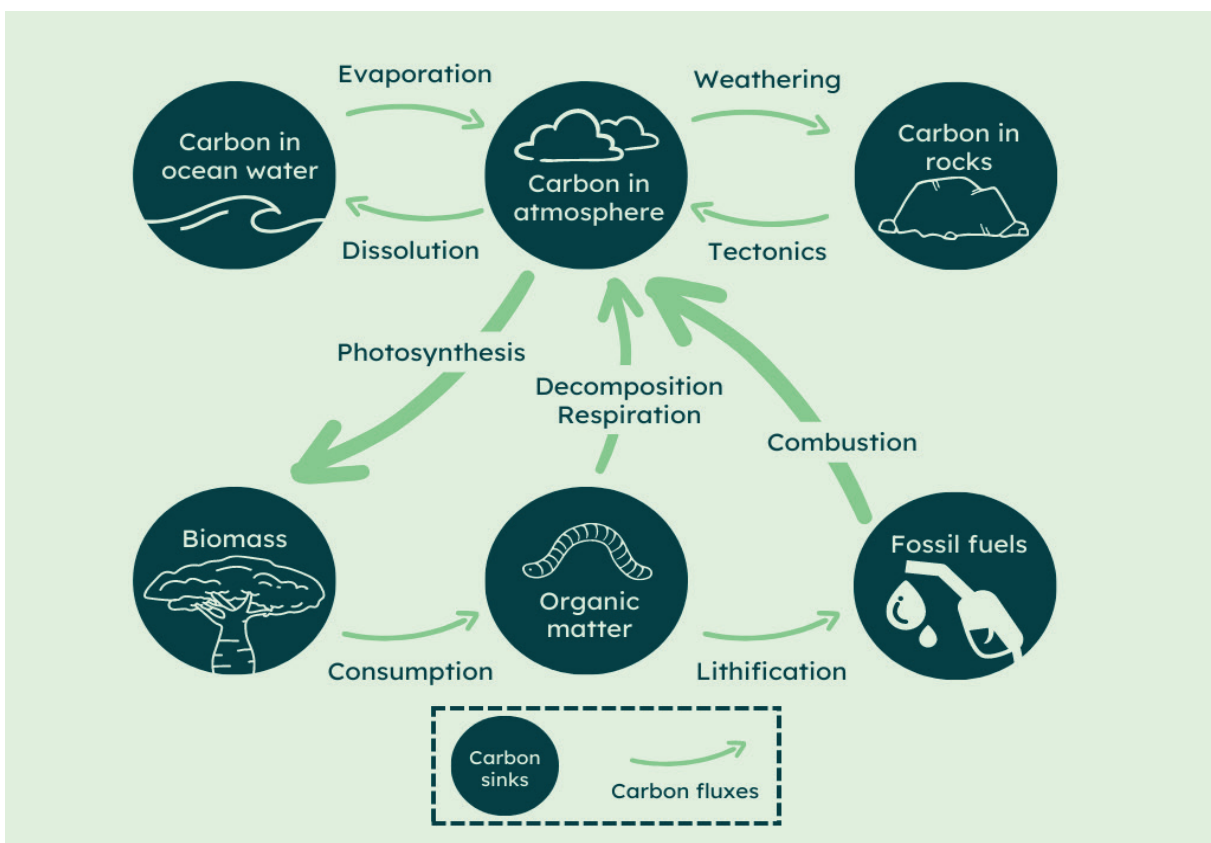


CHART: The carbon cycle

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Timber and the Carbon Cycle

Timber plays a crucial role in the carbon cycle, serving as a vital component of carbon sequestration. Through photosynthesis, it absorbs CO₂ and stores it as starch and cellulose, acting as a carbon sink that helps mitigate the impacts of global warming.

As a sustainable material for construction, timber has low embodied carbon, making it an ideal choice for reducing the carbon footprint of buildings. However, for these benefits to accrue, timber must be procured sustainably, in a way that incorporates best management practices that minimise disturbance to soil and forest stocks. Unsustainable harvesting practices and deforestation can lead to an increase in carbon emissions, as carbon sinks are depleted faster than they can be replenished. In fact, while plants and soil store the most carbon, deforestation, land use changes, and wildfires are the second largest contributors to carbon emissions after burning fossil fuels.

Timber has the potential to store even more carbon than that which is released during its production, making it a “drawdown material”. Organisations such as the FSC (Forest Stewardship Council) and the PEFC (Programme for the Endorsement of Forest Certification) and Grown in Britain are working to promote high standards in forestry to achieve carbon neutrality and beyond. They aim to minimise emissions throughout the entire life cycle of timber, including the stages of extraction, transportation, manufacturing, and usage. Additionally, they recognise the role of timber as a carbon sink and promote carbon sequestration through careful planning and management.