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How Does Deforestation Affect the Carbon Cycle?

CRISIS - ATMOSPHERIC CO2 LEVELS

BY CHARLIE LAI

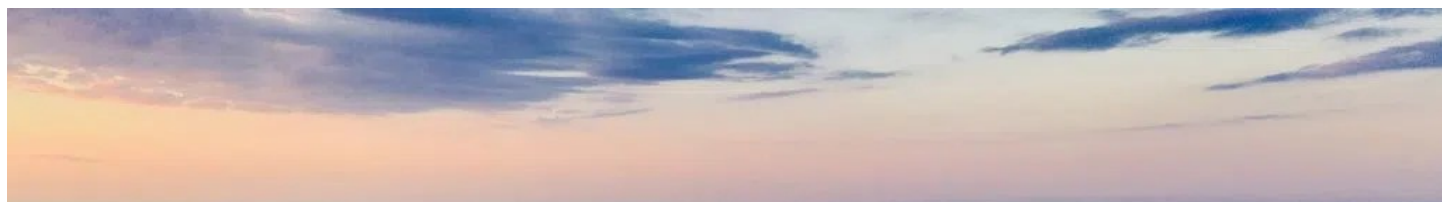
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Carbon is an essential element for all life forms on Earth. The [intake and output of carbon](#) are necessary components of all plant and animal life, whether these life forms absorb carbon to help manufacture food or release it as part of respiration. Maintaining the stability of the carbon cycle is therefore crucial for the well-being of living species. Yet, human activities such as burning fossil fuels and cutting down forests are disrupting the balance of the cycle, releasing huge amounts of greenhouse gases and contributing to climate change. How does deforestation affect the carbon cycle and what are some of the solutions that could reduce the impact of this phenomenon?

What is the carbon cycle?

[The carbon cycle](#) describes the process in which carbon atoms continually travel from the atmosphere into different organisms in the Earth and then back into the atmosphere, over and over again. These atoms encounter [several major reservoirs](#) along the cycle, including the atmosphere, oceans, lithosphere, terrestrial biosphere, aquatic biosphere, as well as fossil fuels. Since the Earth is a [closed system](#), the total amount of carbon found here remains unchanged.

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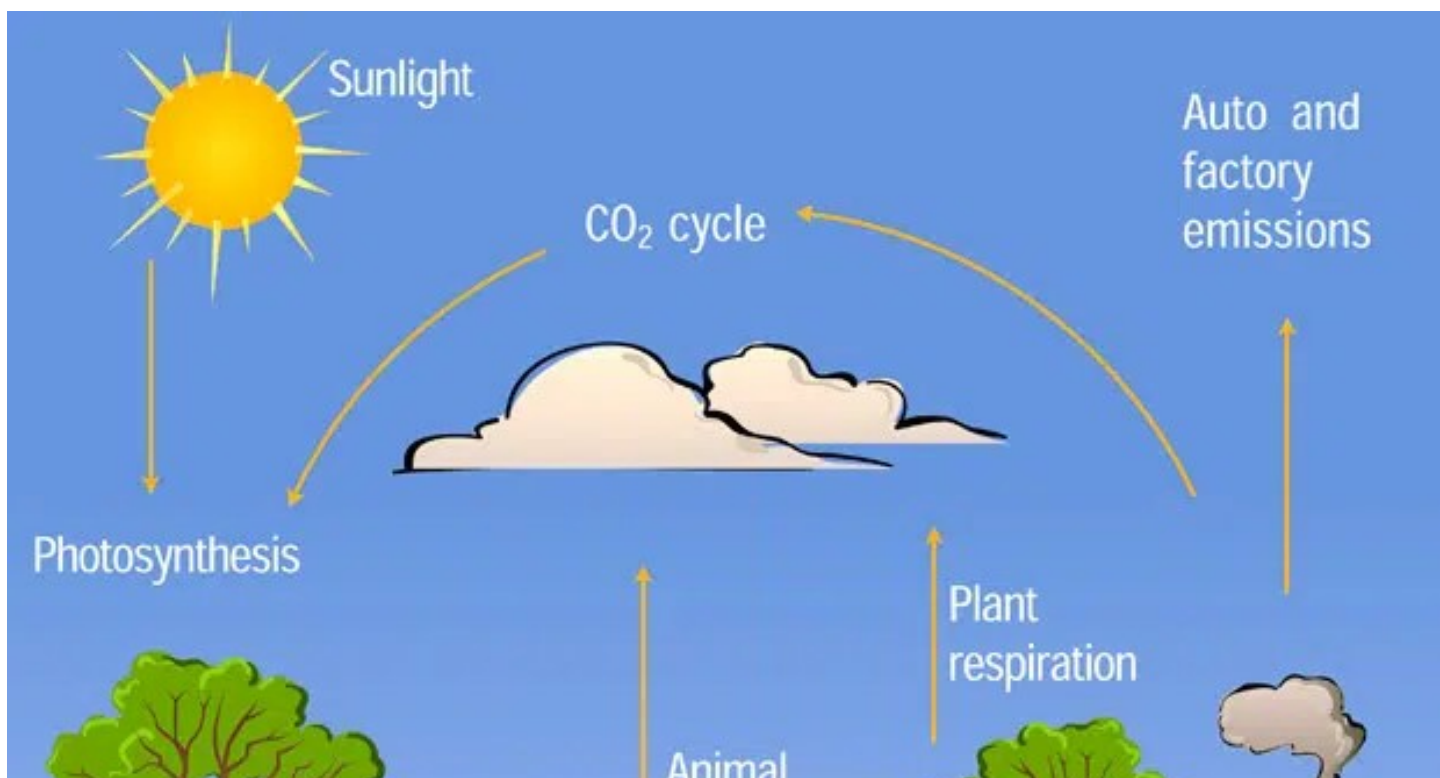
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the clearance of forests.

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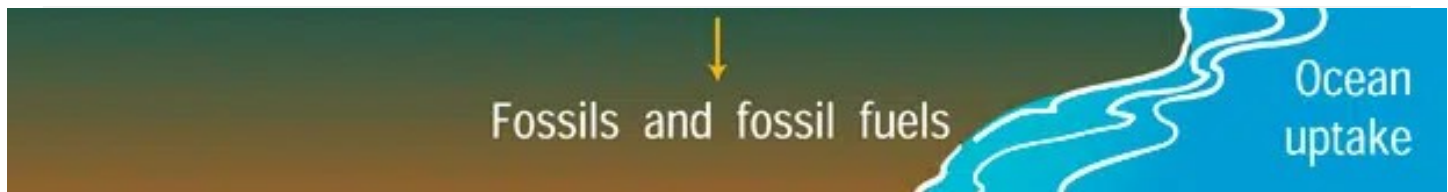


Figure 1: [The Carbon Cycle](#)

What is Deforestation?

Deforestation is the conversion of forested areas to non-forest land use such as arable land, urban use, logged area, or wasteland. Though its rate has been declining substantially, [deforestation remains a pressing problem](#) that cannot be ignored. Among the [direct causes of deforestation](#) is agricultural expansion, with forests being converted to cropland and pasture in order to grow crops and raise livestock, infrastructure expansion resulting from urbanization as well as logging – both illegal and legal.

Since 1990, humans have cleared around [420 million hectares](#) of forests worldwide. Tropical [rainforests](#) such as the Amazon rainforest in South America, the Congo rainforest in Africa, as well as the tropical islands in Southeast Asia, are among the most affected by deforestation. Around [17% of the Amazon](#) has been lost in the last 50 years, mainly owing to forest conversion for cattle ranching. In 2019, [1.17 million acres](#) of primary forest disappeared in Congo, second only to Brazil's total deforestation that year. This continuous and ongoing clearance of forests has a major impact on the environment and the carbon cycle.

Annual deforestation, 2015

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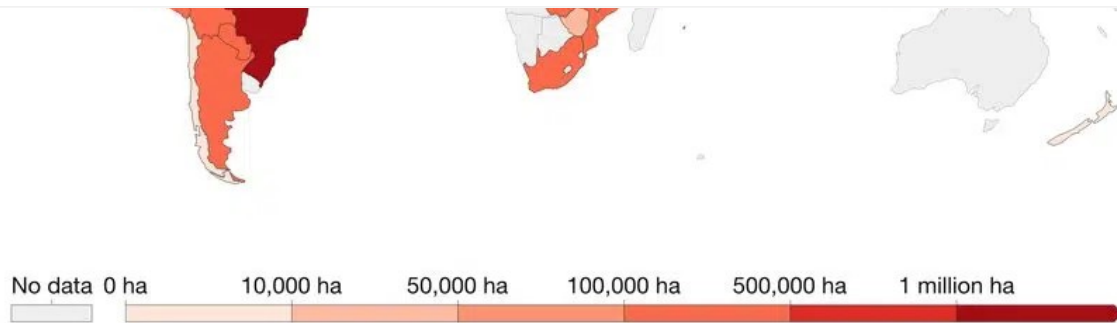
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Source: UN Food and Agriculture Organization (FAO). Forest Resources Assessment.

OurWorldInData.org/forests • CC BY

Note: The UN FAO publish forest data as the annual average on 10- or 5-year timescales. The following year allocation applies: "1990" is the annual average from 1990 to 2000; "2000" for 2000 to 2010; "2010" for 2010 to 2015; and "2015" for 2015 to 2020.

*Figure 2: [Annual Deforestation, 2015](#)**You Might Also Like: [8 Phenomenal Rainforest Facts That Will Blow Your Mind](#)*

How does deforestation affect the carbon cycle?

[Carbon](#) travels from the atmosphere to biomass reservoirs through [photosynthesis](#): in this process, plants absorb carbon dioxide and sunlight to create fuel required for the development of their structures, including tree trunks, roots, branches, and leaves.

Along with oceans, forests are important carbon sinks, capable of holding [861 gigatons of carbon](#). The Amazon, the world's largest rainforest, is a natural carbon sink and provides one of the greatest services for planet: absorbing and storing carbon dioxide from the atmosphere. Its ability to do so is crucial in our fight against the climate crisis. In trees and carbon-rich solid, the forest stores the equivalent of [four to five years worth of human-made carbon emissions](#), up to 200 gigatons of carbon. Yet, as a result of persistent deforestation and a sharp increase in

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stability of the carbon cycle. Through a technique called slash-and-burn – a farming method that involves the cutting and burning of plants in a forest or woodland – the carbon stored in trees is released, returning back to the atmosphere. Soil, without trees or vegetation, will also become a large source of accumulated carbon emissions, especially when the soil is rich in partially decayed organic matter known as [peat](#). Without forest cover, previously inundated peat soil is left exposed and will gradually [oxidise and decay](#). During these processes, huge amounts of carbon stored in the soil are released back into the atmosphere.

Depending on the [forest-clearing method](#), the release of carbon from the biosphere back to the atmosphere may take place at different speeds. For example, clearance by burning causes immediate release of carbon. However, twigs, branches or stumps, and many other components of the forest biomass that are left after harvesting will decay over time, releasing stored carbon back into the atmosphere in a much slower process that takes years or even decades.

Solution to deforestation

[Afforestation and reforestation](#) are common ways to restore forests. The first one is the conversion of long-time non-forested land into the forest, while reforestation refers to the replanting of trees on more recently deforested land. Since most emissions of carbon from deforestation occur immediately, afforestation and reforestation might not be adequate in removing carbon from the atmosphere due to their slow process and should be adopted only as a long-term solution. In the meantime, other short-term solutions are needed.

To begin with, local governments should provide financial incentives and actively work with [forest communities](#) to encourage the sustainable harvesting of non-wood forest products such

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(WWF) initiated the [Project Finance for Permanence \(PFP\)](#), a programme that creates funds to support the proper management of protected areas around the world as well as promote the creation of new ones.

Besides solutions on a local scale, international organisations such as the United Nations play a huge role. A great example of an effective campaign to reduce deforestation is [REDD \(Reducing Emissions From Deforestation and Forest Degradation\)](#), a collaborative programme first initiated by the UN in 2005. REDD provides incentives to change the ways in which forest resources are used. The programme funds environmentally-friendly forest management, restricts poor forest management, and introduces carbon trading as an economic incentive.

[REDD+](#) – an extension of the REDD programme – was introduced in 2013 by the United Nations Framework Convention on Climate Change (UNFCCC). This climate change mitigation solution puts further emphasis on the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries by developing and implementing national action plans and public policies. Once the action plan of a country is verified, REDD+ can provide financial support to implement strategies to tackle forest degradation and reduce deforestation.

As of January 2020, a total of 50 developing countries have submitted a REDD+ forest reference level or forest reference emission level for technical assessment to UNFCCC, covering more than 70% of the total forest area in developing countries. Through periodical assessments, the UNFCCC can keep track of the conservation progress made by the countries, providing further support and assistance when necessary.

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You Might Also Like: [10 Deforestation Facts You Should Know About](#)

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About the Author



Charlie Lai

Charlie is currently an undergraduate student at the University of Hong Kong. Majoring in Economics, she is interested in how public policies can be used to solve environmental problems, and how individuals can make a difference within the scope of microeconomics. After interning as a contributing writer for Earth.Org, she now works with the Data Team in creating data visualization and models building to provide data solutions to environmental problems.

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