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Impacts of environmental degradation in the Amazon: Brazilian forest losing carbon over the past decade

The effects of climate change and human activity like deforestation threaten the rainforest and its vital capacity to stock carbon. INRAE teamed up with researchers from CEA and the University of Oklahoma to use satellite observations of plant biomass and deforestation monitoring to study the evolution of carbon stocks in the Brazilian Amazon between 2010 and 2019. Their findings, published in *Nature Climate Change,* show that deforestation gained considerable ground in 2019: approximately 3.9 million hectares compared with 1 million in 2017 and 2018. But first and foremost, the study's findings reveal that over the past ten years, the Brazilian Amazon released more carbon than it absorbed and that forest degradation, caused by both human activity and climate change, are the main culprits.

A change of government in Brazil in 2019 brought a sharp decline in the country's environmental protection policies. But no study had ever quantified the impact of this policy change on carbon stocks in the Amazon. Indeed, while the extent of deforestation can be more or less accurately evaluated thanks to satellite images, many other types of forest degradation – any event that damages a forest without destroying it such as occasional cutting down of trees, forest fires or drought – are much harder to track. To date, one of the rare means of measuring the impact of degradation related to climate and human activity on carbon stocks (the forest biomass) depends on the satellite vegetation index L-VOD developed by scientists at INRAE, CEA and the CNRS (see 2020 press release). Using this index and a new technique for monitoring deforestation developed by the University of Oklahoma, the study evaluated changes in carbon stocks in the Brazilian Amazon between 2010 and 2019.

The study shows a sharp increase in deforestation in 2019 (3.9 million hectares), a 30% rise from 2015 when El Niño brought extreme drought, and a four-fold increase from 2017 and 2018. But in analysing the evolution of carbon stocks - in other words adding forest degradation to the equation - it turns out that carbon losses were three times higher in 2015 than in 2019. This points to a very significant climate impact on the forest during El Niño, linked to increased tree mortality and degradation due to fires.

The findings, which reveal the bigger picture of the carbon-neutral balance of the whole of the Amazon between 2010 and 2017 (see 2020 press release), show a historic trend reversal for the Brazilian forest. During the 2010-2019 period, carbon losses from the Brazilian Amazon outweighed gains by about 18%. This means that the Brazilian Amazon as a whole has lost some of its biomass, and therefore released carbon. The findings also show that at the root of these carbon losses is forest degradation, which is three times more detrimental than deforestation.

Beyond deforestation, the study shows that environmental protection policies must take forest degradations into account, in order to best protect forests and preserve their capacity to stock carbon, which is crucial for combatting climate change.

What is forest degradation?

The term forest degradation refers to any event that damages a forest without destroying it. Unsurprisingly, degradation is linked to deforestation, especially in weakened portions of a forest located on the perimeter of deforested zones. But it is also a direct result of the occasional cutting down of trees and forest fires. Moreover, climate events, such as drought, increase tree mortality and take a toll on a forest's branches and leaves. While the extent of deforestation can be more or less accurately evaluated thanks to satellite images, many other types of forest degradation are much harder to track. To date, one of the rare means of measuring the impact of degradation related to climate and human activity on carbon stocks (the forest biomass) depends on the satellite vegetation index L-VOD developed by scientists at INRAE, CEA and the CNRS.

Reference

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