

Logging and burning cause the loss of 54 million tons of carbon a year in Amazonia

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A study conducted by scientists in Brazil and the United Kingdom has quantified the impact that selective logging, partial destruction by burning, and fragmentation resulting from the development of pastures and plantations have had on the Amazon rainforest. In combination, these factors could be removing nearly 54 million tons of carbon from the forest each year, introduced into the atmosphere as greenhouse gases. This total represents up to 40% of the carbon loss caused by deforestation in the region.

The study, which was conducted by 10 researchers from 11 institutions in Brazil and the United Kingdom, was published in the May issue of the journal *Global Change Biology*.

"The impacts of timber extraction, burning and [fragmentation](#) have received little notice because all the efforts have been focused on preventing further deforestation. This attitude has resulted in tremendous progress in conserving the Brazilian Amazon, whose deforestation rate fell more than 70% over the past 10 years. However, our study has shown that this other type of degradation is having a severe impact on the forest, with enormous quantities of previously stored carbon being lost into the [atmosphere](#)," said Erika Berenguer, researcher from the Lancaster Environment Centre at Lancaster University, in the United Kingdom, first author on the study.

According to Joice Ferreira, researcher at the Brazilian Agricultural Research Corporation (Embrapa Amazônia Oriental) in Belém, state of

Pará, and second author on the study, one of the reasons that this degradation has gone unnoticed is that it is difficult to monitor. "Satellite imagery allows much easier detection of areas that are totally deforested," she said.

"Our research combined satellite imagery with field study. We conducted a pixel-by-pixel assessment [each pixel in the image corresponds to an area measuring 900 meters squared (m²)] regarding what has happened over the past 20 years. In the field research, we studied 225 plots (each 3,000 m²) in two large regions in an area measuring 3 million hectares [30,000 square meters], which we used as a model to estimate what occurred in the Amazon as a whole," Ferreira explained.

The satellite images, compared every two years, have enabled researchers to put together an extensive overview of the degradation of the forest along a 20-year timeline. The field research assessed scarring from burning, timber extraction and other disturbances. The combination of the two investigations resulted in the estimate of carbon stock available today.

Two regions were studied in loco: Santarém and Paragominas, in the eastern part of the Amazon region, both under strong degradation pressures. Two hundred twenty-five areas were investigated in these two regions.

"We collected data from more than 70,000 trees and took more than 5,000 samples of soil, dead wood and other components of what is known as carbon stock. It was the largest study conducted to date regarding carbon loss from tropical forests due to selective logging and wildfires," Ferreira said.

According to her, the research included four of the five functionally

distinct carbon pools whose study is recommended by the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC): aboveground biomass (live plants), dead organic matter, leaf litter (layer that contains a combination of fragments of leaves, branches and other decomposing organic matter) and soil (up to 30 centimeters (cm) in depth). "The only thing we didn't measure was the [carbon stock](#) in the roots," she said.

For comparative purposes, five categories of forest were considered: primary (totally intact) forest; forest affected by logging; forest affected by fires; forest affected by [selective logging](#) and fires; and secondary forests (regenerating after complete clearance).

The forests that were disturbed by logging or fire had from 18% to 57% less carbon than primary forests. One area of primary forest ended up having more than 300 tons of carbon per hectare, while areas of [forest](#) that had been burned or subjected to timber extraction had, at most, 200 tons per hectare and, on average, less than 100 tons of carbon per hectare.

More information: A large-scale field assessment of carbon stocks in human-modified tropical forests" , [DOI: 10.1111/gcb.12627](https://doi.org/10.1111/gcb.12627)

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