

# Indigenous-managed forests in Brazil's Amazon absorb thousands of dangerous pollutants from wildfires

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Aerial view of the Amazon Rainforest. Credit: [lubasi](#)/Wikimedia Commons, [CC BY-SA](#)

New research published today in *Communications Earth & Environment* suggests that the Amazon rainforest and its Indigenous territories can

absorb as much as 26,000 metric tons of dangerous pollutants released by fires every year, thus preventing thousands of cases of deadly respiratory and cardiovascular diseases and significantly reducing health care costs in some of the region's most deforested cities.

Based on an analysis of ten years of data, the authors of the new study found that each hectare of burning forest costs cities at least US\$2 million for treating associated illnesses, while showing that Indigenous forests—by absorbing pollutants from the fires—prevent an estimated 15 million cases of respiratory and cardiovascular disease every year that would otherwise cost the health care system US\$2 billion.

The paper also finds that heavily forested Indigenous lands are protecting urban and rural populations, often on the other side of the Amazon, in the "arc of deforestation," the southeastern region of the rainforest that has lost the most forest cover to agroindustry and other legal and illegal activities.

"Worldwide, forests are known for absorbing pollutants from fires through pores on the surface of the leaves, but this is the first time we have estimated the capacity of tropical forests to do this," said Dr. Paula Prist, senior research scientist at the EcoHealth Alliance and lead author on the study. "Our results indicate that the Amazon rainforest can absorb as much as 26,000 metric tons of the particles every year, and Indigenous territories are responsible for 27% of this absorption, while covering only 22% of the rainforest."

Released just days before President Lula completes his first 100 days in office, the findings could add urgency to the Brazilian leader's promise to recognize and enforce the land rights of Indigenous peoples, already proven to play an outsize role in reducing the deforestation and biodiversity loss in the Amazon.

"Science has shown that Indigenous-managed forests suffer less of the deforestation that drives climate change and pandemic risk, but this is the first effort to quantify how they benefit human and economic health, indicating that the benefits go far beyond the borders of these territories," said Dr. Florencia Sangermano, a co-author of the new study and an expert in the use of geospatial analysis and satellite remote sensing to evaluate changes in the Earth system, and to assess their effect on ecosystems and biodiversity.

The team of researchers, from Clark University, EcoHealth Alliance, George Mason University, the National Autonomous University of Mexico and the University of São Paulo, focused their analysis on the Brazilian Legal Amazon, an area that covers more than half the Brazilian territory, including 722 towns and cities. During the fire season, from the end of July through November, the region becomes "among the most polluted places on Earth," Prist and her co-authors noted.

Forest fires in tropical forest countries are responsible for 90% of global emissions of the particulate matter released by fires, including those in the Amazon basin. And the evergreen broadleaf forests of the Amazon are more likely than forests in other biomes to release black and organic carbonaceous aerosols, the primary components of the fine particulate matter implicated in the rising rate of respiratory and cardiovascular diseases in the region.

Between May 19 and October 31, 2021, fires in the Amazon consumed 519,000 hectares of forest, with Brazil losing the most forest cover to fires, according to the report. "The number of fires has been increasing in the last few years," Prist said. "And in 2020, deforestation rates reached the highest levels of the decade in the Brazilian Amazon."

Other researchers have shown that Indigenous stewardship of land is protecting large pockets of forest from being burned, concluding that

Amazon forests are preventing damage from smoke in surrounding areas and protecting communities in neighboring lands. The new paper goes further. Looking at the ability of the pollutants to travel long distances and the capacity of the rainforest to absorb them, the authors concluded that Indigenous territories are providing the health and economic benefits to populations that could be as far as 500 kilometers from where the fires are burning.

"Our results suggest there is a need to act now—in advance of the [fire](#) season—to protect Indigenous peoples and their forests as a matter of public health," Prist said. "Failure to recognize and enforce the land rights of Indigenous peoples in the Amazon could lead to deforestation of their lands and an increase in the number of reported infections, as well as a significant rise in health care costs, particularly in already deforested areas."

Currently, there are 383 recognized Indigenous territories in the Brazilian Legal Amazon, covering more than 1,160,000 square km. The new study found that five territories alone, mostly in the heavily forested western region of the Brazilian Amazon, represent 8% of the rainforest's capacity for absorbing particles from forest fires.

Relying on a decade of reports of cardiovascular and [respiratory diseases](#) across the Amazon, as well as data on pollutants and forest cover, the scientists traced two million cases of respiratory and cardiovascular disease to an estimated 1.7 metric tons of particles released every year by fires during the dry season, which usually begins in late July—suggesting that harming the rainforest could lead to a far greater number of pollutants and higher rates of disease.

Lacking precise meteorological data, the scientists depended on satellite data alone to quantify emissions from fires, which are often intentionally set to illegally clear land for crops or pasture.

The researchers did not measure the rainforest's actual removal rates; rather, they estimated the capacity of the Amazon to absorb the particles that fires emit during the dry season, making assumptions based on studies made in temperate regions.

"Despite the challenges, we were able to evaluate the contribution of the Amazon forest and the Indigenous territories to the maintenance of human health, and the economic benefits that its conservation can bring," said Sangermano, an assistant professor of geography at Clark University. "Our numbers probably underestimate the ecosystem services provided by the Amazon rainforest and its Indigenous territories because there are no calculations for the pollutant absorption rates of tropical trees."

**More information:** Paula R. Prist, Protecting Brazilian Amazon Indigenous territories reduces atmospheric particulates and avoids associated health impacts and costs, *Communications Earth & Environment* (2023). [DOI: 10.1038/s43247-023-00704-w](https://doi.org/10.1038/s43247-023-00704-w).  
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