Woods Hole Research Center SCIENCE UPDATE

Forests: The Bridge to a Fossil-Free Future

Eliminating tropical deforestation can ease the transition to renewable energy

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KEY SCIENCE POINTS

- With proper management, forests, particularly those in the tropics, could remove significant quantities of CO_2 from the atmosphere, making it much easier to limit global warming to 2°C.
- Compared to continuing the present rates of deforestation and forest degradation, a scenario of aggressive management of tropical forests would increase by 10-15 years the time available to eliminate fossil fuel use and still be likely to limit global warming to 2°C.
- Deforestation causes large changes in local and regional climate; thus preserving and restoring forests helps to maintain conditions needed for agriculture, ecosystems, and water supplies.

ANALYSIS

To have a 75% chance of limiting global warming to 2°C, total emissions of carbon after 2000 must not exceed 273 PgC (Meinshausen et al., 2009). Between 2000 and 2015, cumulative global emissions were 152 PgC, leaving us with total allowable emissions of 120 PgC. That limit applies to total cumulative emissions from fossil fuel use plus land use (e.g. deforestation). This means that minimizing emissions from deforestation would allow additional emissions from fossil fuel use. Here, we illustrate how carbon-smart forest management can buy additional time to eliminate use of fossil fuels by comparing two possible scenarios of tropical forest management. The estimates reported here are the result of a new analysis that used the most recent (2015) Forest Resources Assessment of the UN Food and Agriculture Organization.

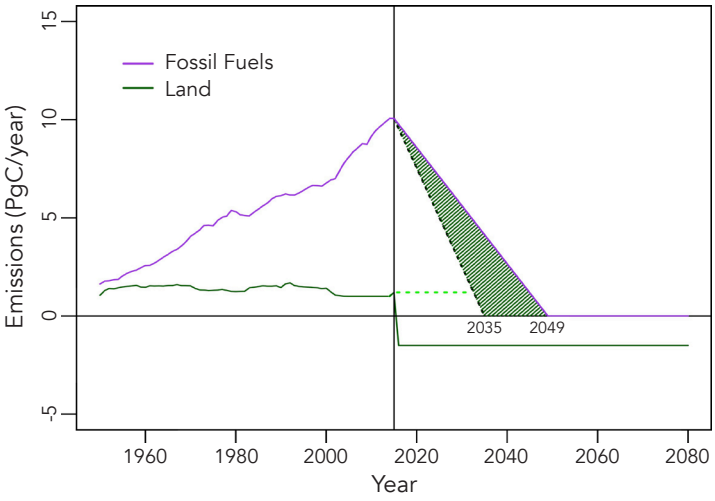
(1) At present, tropical forests release a net of about 1.2 PgC/yr of carbon to the atmosphere, through deforestation and forest degradation. These forest-based emissions "use up" some of the 120 Gt we can emit and still be likely to limit warming to 2°C: if they continue, we would need to ramp down fossil fuel use within 19-20 years in order to meet that goal.

(2) By contrast, management of tropical forests can help to meet the 2° goal by providing "negative emissions" for a limited time. The present net emissions from tropical forests of 1.2 PgC per year is the difference between gross emissions of 1.7 PgC/yr from forest loss and absorption of 0.5 PgC/yr from regrowth of previously deforested areas. Thus, stopping forest loss would make tropical forests a net sink of 0.5 GtC/yr. At the same time, reforesting as many as 500 million hectares of formerly forested land would remove another 1 PgC/yr. Tropical forests could potentially absorb as much as 1.5 GtC/yr. With those forest-management policies in place, we could ramp down fossil fuel use over 33 years and still be likely to limit global warming to 2°C. This is 10-15 years longer than under the scenario described above.

The accompanying table and figure (see back) illustrate and compare these two scenarios.

	Year when fossil fuel emissions reach zero	Cumulative emissions from fossil fuels (PgC)	Cumulative emissions from tropical forests (PgC)	Total cumulative emissions (PgC)
Scenario 1	2035 (19 years)	97	23	120
Scenario 2	2049 (33 years)	170	-50	120

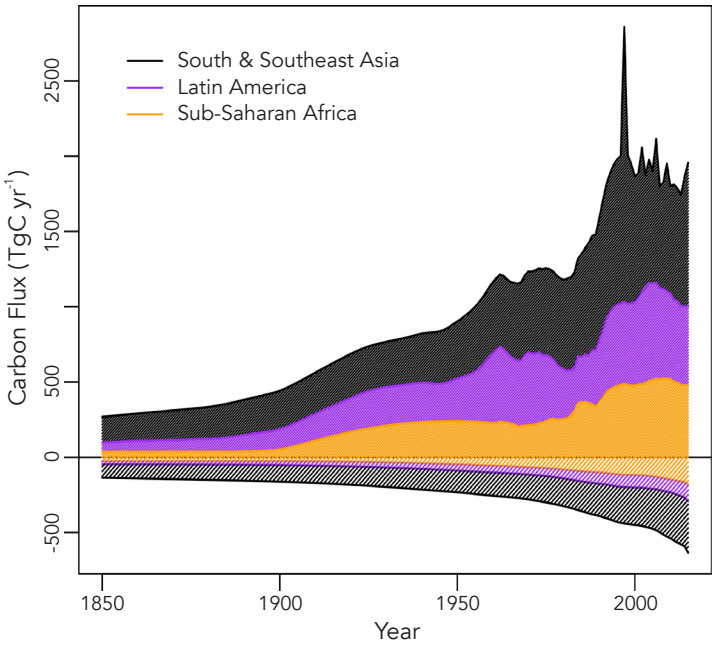
Role of Tropical Forests in Avoiding 2°C



In addition to tropical forests' potential to store large quantities of carbon, the co-benefits of forest protection would have a positive impact on the local and regional climate, regulate local temperature and rainfall, and provide ecosystem services for agricultural production.

Stopping tropical deforestation and removing carbon from the atmosphere through forest growth are not a complete solution for climate change, but they should be an important part of that solution. Without substantial negative emissions of CO_2, limiting warming to 2° will be daunting. Proper forest management is the only climate change mitigation technology that is: 1) available immediately; 2) capable of providing negative emissions at the necessary scale; and 3) proven to have additional benefits for the local and global climate.

TROPICS: Land-Use Change



Above: The annual emissions of carbon to, and removals from, the atmosphere in tropical regions as a result of forest management. Both emissions and removals have generally increased over time as forests have been cleared for agricultural lands. Emissions result from deforestation and forest degradation; removals result from forest growth following the harvest of wood and agricultural abandonment. The spikes in emissions since the late 1990s result from the burning of peatlands in Southeast Asia as forests are cleared for oil palm plantations.

RECOMMENDATIONS

TRANSITION FROM FOSSIL FUELS TO RENEWABLES within the next few decades, and use storage of carbon on land to limit the growth of CO_2 in the atmosphere during this transition.

SUPPORT POLICY FRAMEWORKS such as the New York Declaration of Forests targets and REDD+ economic incentives to reduce deforestation.

IDENTIFY AREAS with the greatest potential for accumulating more carbon on land, and focus restoration efforts there. Alert decision makers to the potential for their jurisdictions to help remove carbon from the atmosphere through land management.

MEASURE PROGRESS in meeting goals for increasing land carbon storage using satellite data and other means.

WHRC EXPERTS

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CITATIONS

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