



Tropical Forests: Conserving Climate and Culture

Michael T. Coe, Alessandro Baccini, Paulo Brando, Paul Lefebvre, Marcia N. Macedo, Paulo Moutinho, Julia Shimbo, Divino Silvério, and Wayne Walker

EXECUTIVE SUMMARY

- More than 600,000 km² of tropical forests have been cleared in this century alone. The Earth's future climate and the well-being of its people will depend on how much of the remaining forest receives permanent protection.
- Tropical forests store 230 billion tons of carbon. Each year they absorb over 1 billion tons of carbon from the atmosphere, more than 10% of fossil fuel emissions. They also return almost 20,000 km³ of water to the atmosphere, nearly 30% of the global land total.
- Deforestation disrupts these important processes and has already fundamentally changed tropical climate at the local scale.
 - Surface temperature has increased by 5°C.
 - Water recycled to the atmosphere has decreased by one third.
 - Ecosystem services are threatened, including rainfall regulation, agricultural production, and hydropower generation.
- Indigenous territories and protected areas serve as a climate insurance policy by preserving tropical forests. They protect 125 billion tons of carbon – more than half of all of the carbon in tropical forests and over 10 times the annual global carbon emissions by humans. They return 13,000 km³ of water each year to the atmosphere, 20% of the global land total.
- Climate change is occurring now in many places in the tropics. Avoiding large future changes will require empowerment of indigenous peoples and traditional communities as land stewards. Further, scientists must work with stakeholders and policymakers to understand what constitutes a climatically dangerous level of deforestation.



BACKGROUND

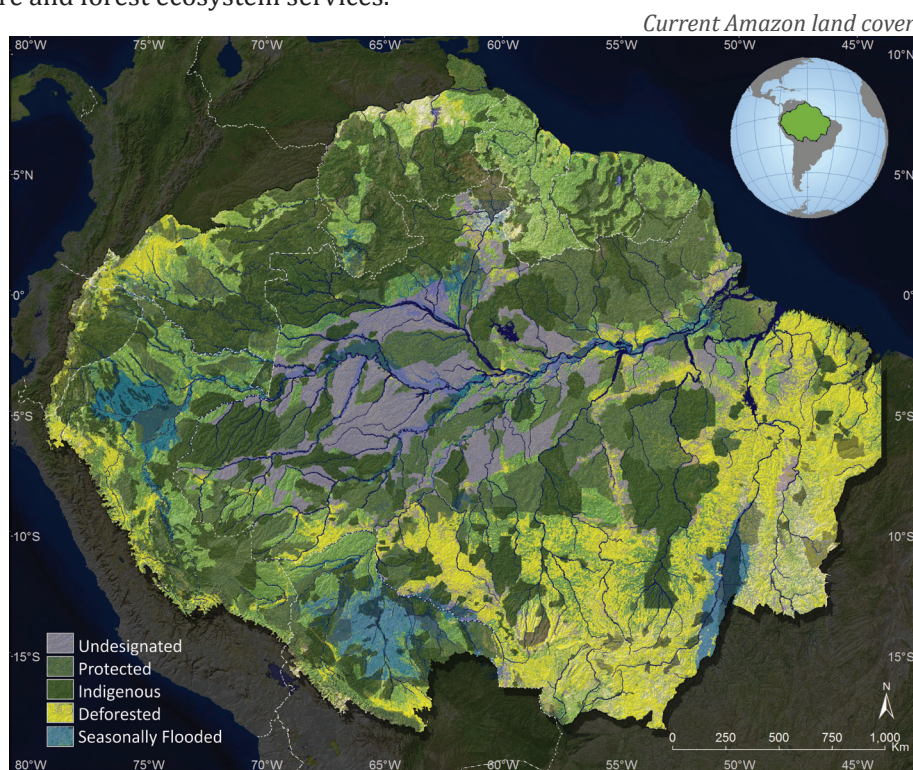
- Climate change due to global CO₂ emissions will fundamentally alter tropical forests and agriculture by warming air temperature, altering rainfall regimes, and changing the frequency and intensity of extreme weather events. Tropical deforestation greatly contributes to this problem in three ways. First, it produces CO₂ emissions that are equal to over 30% of global fossil fuel emissions. This important role is often unrecognized because other parts of the land biosphere absorb large amounts of CO₂. Second, it warms local land surfaces by decreasing the evaporative cooling that forests provide. Third, it reduces the recycling of water back to the atmosphere, ultimately decreasing rainfall.
- The impacts of deforestation on the regional climate are evident in southeastern Amazonia, where conversion of forests to croplands and pastures has already increased surface temperatures by 5°C. Because tropical regions contain the largest remaining supply of arable land for agriculture, these impacts are likely to become widespread as agricultural demand increases.
- Tropical protected areas, particularly indigenous territories, are effective barriers to deforestation, stabilizing regional temperature and providing water for nearby agribusiness. Increased protection and expansion of the global network of indigenous territories and protected areas thus provide a strategic hedge against global and regional climate changes, while guaranteeing the rights of indigenous people and smallholders who depend on these forested lands for their livelihoods.

IMPLICATIONS

- In addition to releasing CO₂, deforestation changes local climate directly by decreasing evaporation and altering the energy balance. These changes from deforestation are more than 20 times greater than those from greenhouse gases.
- The direct impacts of tropical deforestation have already caused local temperature changes larger than those predicted from greenhouse gases by 2100.
- Although the threshold remains uncertain, additional deforestation will eventually reduce rainfall across a wide region of the tropics and will negatively impact agriculture and forest ecosystem services.
- Indigenous territories and other protected natural areas are the most effective buffers against these climate changes.
- Increased forest protection, particularly through indigenous and traditional community territorial provisions, may be the single best strategy for mitigating future tropical climate change.

RECOMMENDATIONS

- **Empower indigenous peoples and traditional communities** – Continue to promote land stewardship and expand effective participation of indigenous groups and representatives of traditional communities in climate change negotiations.
- **Identify deforestation-climate change thresholds** – Support the field research, numerical modeling, and data analysis needed to understand what constitutes a climatically dangerous level deforestation.
- **Eliminate tropical deforestation** – Encourage policies favoring agricultural intensification on already degraded lands. Support the New York Declaration on Forests targets and REDD+ economic incentives to reduce deforestation.
- **Reward national commitment** – Allow tropical nations that invest in protecting indigenous territories, designated natural areas, and currently undesignated lands to count some proportion of those carbon stocks toward post-2020 emissions reductions targets under the UNFCCC.



FURTHER READING

Silvério, D.V., P.M. Brando, M.N. Macedo, P.S.A. Beck, M. Bustamante, and M.T. Coe, 2015: Agricultural expansion dominates climate changes in southeastern Amazonia: The overlooked non-GHG forcing. *Env. Res. Lett.*, 10, 104105.

Soares-Filho, B., P. Moutinho, D. Nepstad, A. Anderson, H. Rodrigues, R. Garcia, L. Dietzsch, F. Merry, M. Bowman, L. Hissaa, R. Silvestrini, and C. Maretti, 2010: Role of Brazilian Amazon protected areas in climate change mitigation. www.pnas.org/cgi/doi/10.1073/pnas.0913048107.

Walker, W., A. Baccini, S. Schwartzman, S. Ríos, M. Oliveira-Miranda, C. Augusto, M. Romero Ruiz, C. Soria Arrasco, B. Ricardo, R. Smith, C. Meyer, J.C. Jintach, and E. Vasquez Campos, 2014: Forest carbon in Amazonia: The unrecognized contribution of indigenous territories and protected natural areas. *Carbon Management*, 5:5-6, 479-485, DOI: 10.1080/17583004.2014.990680.

WHRC EXPERTS

Michael T. Coe
508-444-1536 • mtcoe@whrc.org

Wayne Walker
508-444-1541 • wwalker@whrc.org

Marcia Macedo
508-444-1538 • mmacedo@whrc.org

Paulo Brando
508-444-1571 • pbrando@whrc.org



Woods Hole Research Center is an independent research institute where scientists investigate the causes and effects of climate change to identify and implement opportunities for conservation, restoration and economic development around the world.

WOODS HOLE RESEARCH CENTER 149 Woods Hole Road, Falmouth, MA 02540 508-540-9900 whrc.org