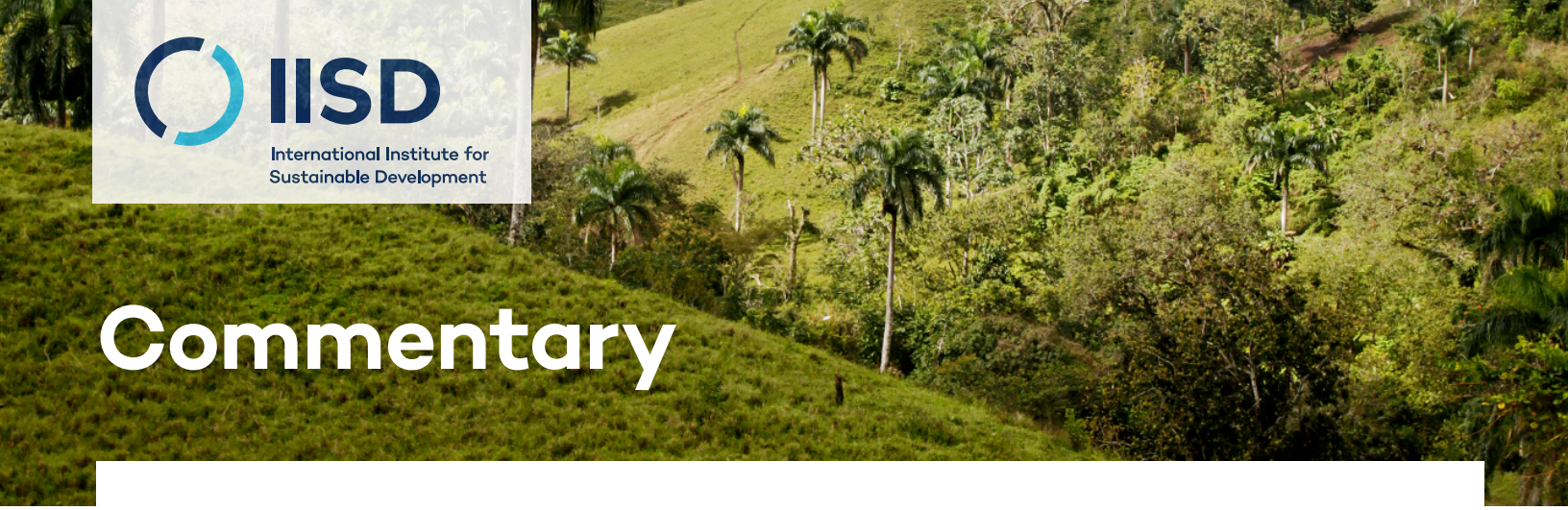

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Commentary

The State and Fate of Tropical Rainforests

Scott Vaughan, IISD President and CEO
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Among the early sparks that awakened the global ecological movement was the concern about the world's tropical rainforests. Some of the world's most talented and pioneering scientists helped the world discover the remarkable labyrinths of tropical rainforests. P. W. Richards's monumental 1952 work, *The Tropical Rainforest*, coined the term in the book's title. Richards noted the differences between the regenerative rates of temperate forests' ability to withstand large-scale land-clearing and those of more fragile tropical forests. Warning of the devastating consequences of large-scale land-use change sixty years ago, Richards warned that "whole chapters of biology may never be written" due to accelerating tropical rainforest losses.

E. O. Wilson helped us understand what those whole chapters likely contained. Wilson's fieldwork remains almost unparalleled. For example, he collected 43 different ant species from a single tree in the rainforests of Peru, roughly equivalent to the ant diversity found in the entire United Kingdom. Decades, ago, Wilson estimated that while comprising roughly seven per cent of the total land surface of the planet, tropical rainforests are home to more than half of world's species.

More recent assessments show that Wilson got it about right, both in diversity and density. For example, one hectare of rainforest is on average home to roughly 8 million ants and 1 million termites. There are as many as 50,000 different tree species to be found in the great rainforests of South America, Africa and Asia. In the Amazonia, an estimated 15,000 to 16,000 tree species are likely to exist. In one hectare of the Peruvian rainforest, some 41,000 arthropod species have been identified, one quarter of these being beetles.


Thomas Lovejoy

Another scientific hero who continues to unveil the remarkable endowment of the tropical rainforests is Thomas Lovejoy. 2015 marks the 50th anniversary of his pioneering fieldwork near Manaus in central Amazonia. The *Biological Dynamics of Forest Fragments Project* ranks as one of the great, sustained scientific endeavours: Lovejoy's work confirmed that the fragmentation of forests from roads and other disturbances are a major force behind global biodiversity loss.


Claude Martin

The remarkable story of these and many other scientists is part of the release of an important, comprehensive and accessible book released by another hero in the struggle to understand and save tropical rainforests. Claude Martin[1]'s ***On the Edge: The State and Fate of the World's Tropical Rainforests*** is a comprehensive history that is still being

[1] Claude Martin served on the IISD board as International Vice-Chair for seven years, ending his term in 2013.

written of scientific efforts to define, assess and save the tropical rainforests.

Martin is one of the planet's champions in conservation and sustainable development. As the former head of WWF International, his leadership has made a lasting difference in translating good intentions into impressive actions. One example of his leadership was the launch in 2003 of the Amazon Region Protected Areas Plan (ARPA). This partnership among the Brazilian government, the World Bank, the Global Environment Facility (GEF), WWF International and others to advance large-scale conservation has resulted in hundreds of thousands of square kilometers set aside for strict conservation use, hundreds of millions channeled into supporting this goal, and the blossoming of people-based and market focused sustainable forest management practices and land-use planning.

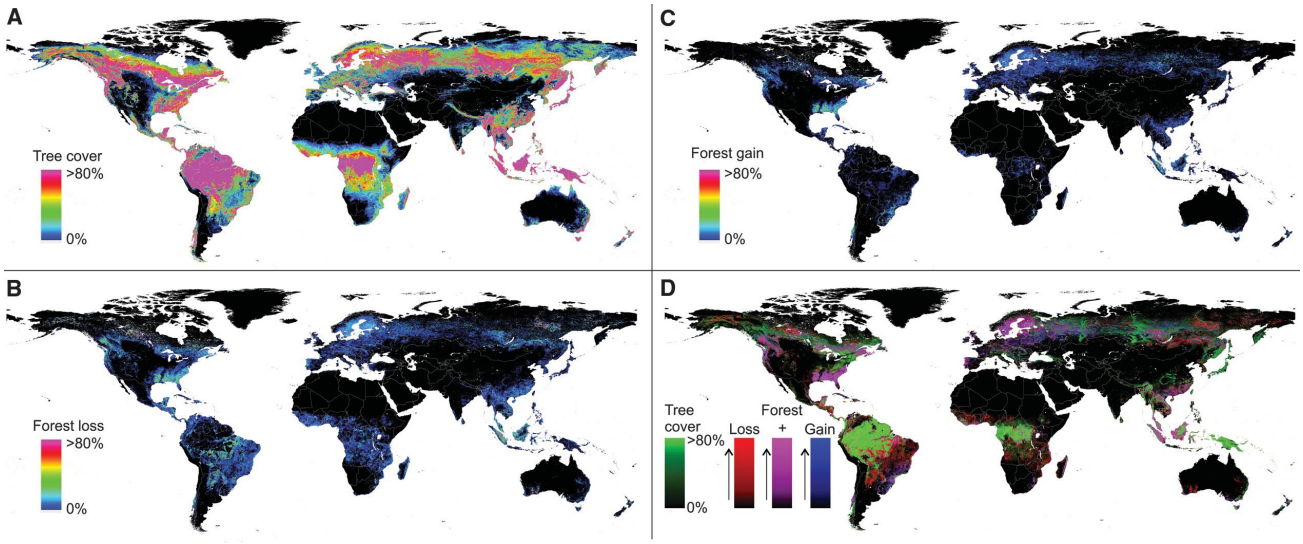
Martin's description of efforts and false starts in assessing tropical rainforests is fascinating. Today some 60 satellites with remote sensing from 25 countries provide more detailed and timely monitoring. Mathew Hansen's 2013 Global Forest Cover Change map—published in Science—has revolutionized these assessments: the online map pulls together 143 billion pixels from 650,000 satellite images to show an accurate map at a global scale of the planet's forests. It is equivalent to the mapping of the human genome.

Better assessments are of course critical in their own right in the pursuit of scientific discovery. Since Richards early warning, there has always been an urgency in understanding the features and conditions of tropical rainforests in order to save them.

Tracing our changing understanding of how to define tropical rainforests, assess their overall state and tackle the drivers behind their loss is a key part of Martin's story. For years, it was conventional wisdom that commercial logging was the main driver of deforestation. Both campaigns led by international non-governmental organizations like WWF, Greenpeace, Rainforest Alliance and International Union for Conservation of Nature (IUCN) focussed on large-scale tropical wood product producers and buyers, while innovative market-based initiatives like the Forestry Stewardship Council (FSC) identified viable alternatives.

Martin's story shows that science and advocacy can change markets for the better of conservation. Yet he also warns that FSC and other schemes are constantly under pressure, including from less stringent imitators.

Martin also focuses on the central role of agriculture - especially in the Amazonian region – as being the key driver of tropical forest losses: historically as much as 70 per cent of deforestation has been linked to both cash and subsistence crops. For example, roughly one half of



Source: Hansen et al. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. In *Science 342*, 850 (2013).

Brazil's forest loss and 12 per cent of Indonesia's has been linked to large-scale agro-industrial land conversion. Commercial agriculture—from cattle to cash crops like soy, palm oil and cocoa—remain with the roads and other infrastructure needed to develop those markets, key drivers of deforestation in Amazonia and Asia. Based on current trends, Martin warns that as much as 30 per cent of tropical rainforests in central Africa could be lost to plantations in coming decades. Recent large-scale land grabs are a new threat.

In the 1960s, Côte d'Ivoire housed roughly 14 million hectares of tropical forests. Today, as the world's most important cocoa producer, it has one million hectares. Along with immediate economic benefits like jobs linked to cocoa exports, the country faces growing pressures associated with deforestation and degradation, including desertification, drinking water shortages and the loss of biodiversity. Martin notes that the decoupling of soybean production from overall rates of deforestation in Brazil gives hope to other crops.

While some progress has been made, both familiar and newer threats continue. Martin cautions, for example, that FSC has lost ground in the tropics in recent years, as buyers move to schemes with weaker standards. Newer threats include the opening of remote, indigenous regions rich in biodiversity to oil and gas developments: a recent report warns of the increase in oil and gas exploration licenses in south Ecuador and Brazil.[2]

Twenty-five years ago, the murder of Chico Mendes was a forceful rallying point that accelerated action to bolster conservation. Yet today, human rights groups like Global Watch report a sharp jump in the murder of environmental advocates. According to that report, in 2014 an estimated 114 murders were linked to stopping individuals—especially indigenous leaders—that tried to halt illegal logging, land clearing for commercial crops and large-scale hydropower development. Last year, Peruvian campaigner Edwin Chota and three other indigenous leaders were murdered trying to stop logging.

Thus, understanding the complex economic and social drivers behind deforestation has never been merely an academic research exercise; rather, it is a matter of absolute urgency.

What does the data show? In the past decades, some 4.9 million hectares of tropical rainforests were lost each year—equivalent, Martin reminds the reader, to 1.2 times the size of Switzerland. The WWF Living Planet Index shows an overall decline of more than half of all tropical vertebrate species populations between 1970 and 2010.

Today, some 700 million hectares of primary forests remain unaffected by logging or other major disturbances. Martin makes the important point that secondary forests also have an important role to play in supporting diverse species, provided they have time to recover: biomass from secondary forests can reach the level of primary forest over 100 years.

Martin notes signs of progress more broadly. Today, planted forests comprise 7 per cent of the world forest areas but provide more than half of total annual industrial wood supply. This is expected to increase to 80 per cent of all industrial round-wood by 2030. Martin also notes the increase in urban forests, as well as evidence of positive forest transitions to recovery, starting with Switzerland in the 19th century to examples in the United States, Costa Rica and El Salvador in its post-conflict period.

Perhaps the biggest sign of progress has been the increase in protected areas worldwide. There was a fourfold increase in protected areas for tropical rainforest from 1990 to 2013. Martin comments that they are now better protected than the world average of all forest types. The Amazon now represents perhaps the largest and best protected large natural area on earth: the Brazilian government's decision to protect 25 per cent of its Amazon forests contributed to the 166 million hectares of tropical rainforest now under protection in a network of 400 protected areas across the nine Amazonian countries. Due to Brazil's PRODES project, Brazil's deforestation rate has slowed considerably since 2004.

Other countries have followed similar—though as-yet not as ambitious—initiatives to increase conservation through protected areas. Martin also notes that smaller

[2] Rebecca Ray, Kevin Gallagher, et al. (2015). *China in Latin America: Lessons from South-South cooperation and sustainable development*. Boston, MA: Boston University Global Economic Governance Initiative.

conservation areas, including corridors, can have a powerful impact.

The role of protected areas thus signals a profound sign of progress. One long-standing challenge is to ensure protected areas are not paper parks—that is to say, merely lines on a map without the means to enforce conservation and without programs to ensure ecological integrity.

Another and more profoundly worrying risk is climate change. Martin notes that the disappearance of the Monteverde harlequin frog in 1989—a species located within a reserve and less likely subject to direct human disturbance such as land-use change—sent shockwaves through the conservation community. The cause of the likely extinction of this species was a fungus linked to increased cloud cover, which in turn could be indirectly associated with climate change. Martin warns that this loss could be the "tip of the iceberg," presaging possible climate-related extinctions to follow.

Martin argues that, since 2000, a major focus of efforts to safeguard tropical rainforests have thus shifted from deforestation impacts on biodiversity to a climate perspective, notably the role of tropical forests in relation to carbon storage and greenhouse gas (GHG) emissions linked with deforestation. Martin notes work by the Intergovernmental Panel on Climate Change (IPCC), which has estimated that 15 per cent of total GHG emissions are the result of deforestation.

The risk that with higher temperatures and longer drought periods plant respiration may exceed photosynthetic rates so as to make forests a net source of GHG emissions is being more fully understood based on direct observation. The 2005 and 2010 Amazonian droughts have been linked to an estimated loss of up to 2.2 billion metric tonnes of carbon storage. With increased temperatures, there is now real concern about the potentially substantial loss of the Amazonian forest by end of this century, driven by both gradual dieback and a spike in forest fires. Martin applauds the work of reducing emissions from deforestation and forest degradation (REDD+) to accelerate forest conservation. But he also warns not to believe in miracles - the real policy challenge is whether this is enough to protect tropical rainforests.

And that is the challenge Martin leaves the reader with: there is urgency to get it right so that the 700 million hectares of primary forests that remain on the planet—roughly the size of Australia when combined—are conserved and managed properly. The risks against that happening are endless, ranging from population growth and climate to changing diets among the middle class favouring more meat to the shortcomings of the United Nations process to kick-start real, meaningful actions.

One of the signs of promise, Martin notes, is the changing way we think about values, including estimating the economic consequences of ecosystem and forestry losses, as well as the value of conservation and wise use more broadly. Martin cites one estimate that places the environmental cost of land conversion in South America at over $300 billion; this amount is second only to damages from coal-fired power plants in East Asia in overall global damages to ecosystems. Yet the real hope is in linking research around natural capital to economic policy signals that make explicit the real value of sustainable stewardship.

In 2015 the Government of China indicated that it would not measure progress solely by GDP, but also through environmental protection. IISD continues to conduct work in this critically important area.

Martin's work is an important contribution, both in its impressive and readable summary of hundreds of scientific articles as well as his unique and impressive leadership in bridging scientific evidence with forceful, courageous and innovative action. Going into another intergovernmental series of negotiations to tackle climate and accelerate sustainable development, those qualities are needed today more than ever.

On the Edge is available for purchase from the Grey Stone Books website **here**.