

A Burning Issue: Tropical Forests and the Health of Global Ecosystems

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Abstract Tropical forests are in the front line of efforts to tackle climate change. This article provides an overview of the ecosystem services that tropical forests provide, the way in which rates of deforestation have changed over the past 20 years, and the economic drivers of tropical deforestation around the world. It describes recent intergovernmental efforts to reduce deforestation, both through a proposed UNFCCC REDD+ mechanism and through interim finance or ‘Fast Start’ partnerships that seek to achieve results between now and 2020. There has never been a better opportunity to forge international cooperation on this important environmental issue, but progress so far has been slow.

1 Introduction

Forests cover 3.7 billion hectares of the planet’s surface, or 30 % of the global land area. Almost half of these forests are found in tropical areas (44 % of the total area), about one-third in boreal (34 %) and smaller amounts in temperate (13 %) and sub-tropical (9 %) domains. But whereas the amount of land under forest is growing in the boreal, temperate and sub-tropical zones, tropical forests are shrinking. Millions of hectares of forest in South America, Africa and Southeast Asia are cleared each year and converted to other uses (FAO 2011). These forests – in particular the humid tropical forests (or rainforests) which occupy approximately 1.2 billion hectares – constitute some of the most carbon-rich and biodiverse ecosystems in the world (Hansen et al. 2008). This puts tropical forests in the front line of the struggle against climate change.

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This article will describe the valuable ecosystem services that tropical forests provide to the world. It will look at the scale and distribution of tropical deforestation and seek to understand why the trees are being cut down. It will consider the types of solution that have been put forward to reduce tropical deforestation, both through the UN Framework Convention on Climate Change (UNFCCC) and through more flexible interim measures that are not dependent on a comprehensive climate deal. Progress has been slow but there is growing consensus on the types of international programmes that can work; there is a greater desire than ever among forest nations and the international community to put these solutions into practice; and, encouragingly, there is evidence that the rate of tropical deforestation is beginning to slow.

2 Why Rainforests Matter

Rainforests provide important ecosystem services to all of us. They store water, regulate rainfall and contain over half the planet's biodiversity. Most importantly, they play a crucial role in climate change, both as cause and as part of the potential solution. The continued destruction of these forests could have serious consequences for human well-being.

2.1 The Front Line of Climate Change

Forest ecosystems draw down atmospheric carbon dioxide through photosynthesis and store it in biomass and other carbon stocks. Rainforests are particularly carbon-rich. Huge amounts of carbon are stored in the trunks, branches and leaves of trees: there can be 100–300 tonnes of carbon in each hectare of above-ground biomass. The roots and soils below often contain even more carbon: for example, the rich, black peatlands in Indonesia can store almost 1,500 tonnes per hectare. In aggregate, there is more carbon stored in tropical forests than in the atmosphere. Deforestation and forest degradation – through the decomposition and burning of plant matter and the oxidation and burning of soils, especially peatlands – release this carbon into the atmosphere.

The Intergovernmental Panel of Climate Change estimates that the global forest sector accounts for 17 % of anthropogenic greenhouse gas emissions – approximately 7–8 Gigatonnes of CO₂ equivalent (CO₂e) each year (IPCC 2007). This would mean that forest emissions are greater than the entire transport sector, or larger than the annual emissions of the USA or China. More recent research indicates that forest emissions are even higher, accounting for more than a quarter of all emissions stemming from human activity between 1990 and 2007 (Pan et al. 2011). It is estimated that more than 95 % of these emissions are caused by tropical deforestation (Houghton 2003).

But that is not the full story. Healthy tropical forests keep on absorbing carbon dioxide from the atmosphere, drawing it down through photosynthesis and storing it in trees, plants and soils. One study estimates that tropical forests may soak up an extra 4.8 billion tonnes of CO₂e each year, close to 10 % of the emissions caused each year by human activities (Lewis et al. 2009). Therefore, as we pump more and more carbon into the air by burning fossil fuels, trees take some of it out of the atmosphere and store it away. If we destroy the forests we will lose this natural balancing mechanism, and our carbon emissions will run even further out of control. Governments around the world are now channeling billions of dollars into developing carbon capture and storage technologies for coal-fired power stations. Tropical forests do the same for free.

It will be extremely difficult to develop a sufficiently fast and adequate response to climate change that does not include an effective programme to reduce tropical deforestation. Research by McKinsey & Company indicates that in order to keep global warming below 2 °C by the end of the century – and therefore avoid the worst effects of climate change – the world will need to reduce its global CO₂e emissions, relative to business-as-usual, by 17 Gigatonnes per year by 2020. Action must be taken immediately, as each year of delay makes it more difficult to get on the right pathway. The forest sector offers one of the largest opportunities for carbon abatement. Reducing tropical deforestation could contribute over 5 Gigatonnes of CO₂e per year of avoided carbon emissions between now and 2020. It could also do so rapidly and at a low cost relative to other measures. Without addressing the issue of tropical deforestation, it is difficult to see how the world can achieve climate stability (McKinsey & Company 2009).

2.2 *Biodiversity*

Apart from regulating the carbon cycle, tropical forests provide many other vital ecosystem services. Rainforests are the most biologically rich ecosystems on our planet, the product of tens of millions of years of evolution. Although they cover only 5 % of the earth, they contain over half of the world's animal and plant species (The Prince's Rainforests Project 2009). This biodiversity has great medical and economic value. Rainforests have been the source of compounds vital to the discovery of modern medicines. According to the US National Cancer Institute, more than 70 % of plants with anti-cancer properties are found in the rainforests (National Geographic 2012). Agricultural scientists have also used wild rainforest plants to breed cultivated crops that have higher yields and more resistance to pests and diseases. Most of the species that exist in rainforests are still inadequately researched, their potential value to humanity and to the maintenance of environmental sustainability, as yet unknown. This biodiversity is being lost because of deforestation.

2.3 *Rainforests and Water Regulation*

Rainforests also help to regulate water cycles and rainfall patterns. During tropical storms, roots hold the soil together and absorb water, while during dry periods trees transpire vast amounts of water vapour from their leaves. They also release tiny particles, called volatile organic compounds, around which water droplets condense to form clouds and eventually rain. A rainforest acts like a huge sponge, absorbing water when it is plentiful and releasing water when it is scarce.

This action prevents catastrophic flooding and soil erosion during wet seasons and ensures a regular flow of clean water during dry seasons: this is why vast river systems, such as the Amazon and the Congo, never run completely dry. In contrast, deforestation can lead to flash floods and soil erosion, the drying of rivers and the silting of irrigation channels, with devastating consequences for those who live in these regions.

This water regulating effect can also be felt much further away. Moisture from the forest is carried by high-altitude winds, falling as rain on centres of population and farming thousands of miles from the forest. Some models suggest that the removal of rainforests could result in reductions in rainfall globally, including in the American Mid-West and parts of Central Asia (Avassar and Werth 2004, 2005). At a regional scale, water vapour from the Amazon contributes to rainfall patterns that are vital to the agricultural heartlands of southern Brazil and the La Plata Basin in Argentina, as well as to Brazil's hydro-electric power system (Morengo 2009).

2.4 *Unique Human Cultures*

An estimated 1.6 billion of the world's poorest people (those surviving on less than \$2 per day) rely to some extent on forests for their welfare and livelihoods. About 300 million people depend on forests for their survival (World Bank 2008). These people include subsistence farmers, hunters, small-scale loggers, extractivists such as rubber-tappers, and harvesters of nuts, berries, fruits and medicinal plants. Wild products from the forest can be an important source of nutrition and income for local communities in developing countries, in particular during periods of food shortage.

The fate of indigenous people is especially closely linked to tropical forests. There are approximately 60 million indigenous people who rely on forests for their way of life (Secretariat of the Convention on Biological Diversity 2009). The destruction of tropical forests can have a catastrophic effect on indigenous people who live there. The encroachment of outsiders can lead to violence, land theft, the abuse of rights, and the destruction of the natural resources that provide sustenance. The introduction of 'new' diseases is sometimes the most devastating result. We have a duty to respect the rights of these people and to ensure that our demands do not lead to harm.

3 Rates and Causes of Deforestation

Whereas the area under forest is growing in temperate, boreal and sub-tropical regions, tropical forests are contracting. The latest figures from the UN Food and Agriculture Organization, based on analysis of satellite imagery, indicate that just over 8 million hectares of tropical forest were cleared each year between 1990 and 2000. The rate of deforestation rose to 10 million hectares per year between 2000 and 2005. (About 2 million hectares per year were also converted back to forest during this period, so net forest loss was slightly lower (FAO 2011).) Another study estimates that humid tropical forests, or rainforests, accounted for approximately 6 million hectares of deforestation per year between 2000 and 2005 (Hansen et al. 2008).

Tropical deforestation has slowed since then. One study estimates that the rate of deforestation has fallen by 42 % between 2006 and 2011. The biggest decline has taken place in Brazil, where the rate of deforestation has halved. This has a major impact on global figures, as Brazil accounted for three-quarters of tropical deforestation in 2005 (Wheeler et al. 2011). Indeed, Brazil's halving of deforestation represents the greatest single reduction in greenhouse gas emissions by any country over the past decade. The fall in deforestation is partly due to concerted government action at national and international level (progress that will be explored later in this article). But it is also a consequence of the slowdown in the global economy since 2008. This illustrates how tropical deforestation is increasingly driven by global commodity markets and global economic activity.

3.1 *From Axes to Chainsaws*

The nature of tropical deforestation has changed over the past three decades. Traditionally, deforestation was associated with the subsistence activities of local people. Poverty and land scarcity pushed farmers to clear native forest for agriculture, often using 'slash and burn' techniques. People chopped down trees to provide firewood, charcoal or timber for buildings. The products generated were either consumed by families or traded locally, but they did not reach foreign markets.

Increasingly, however, tropical deforestation is being driven by commercial operations linked to global markets. In Indonesia and Brazil, a growing proportion of deforestation is caused by export-led agricultural expansion. Palm oil, beef and soybeans are the key commodities. In other areas, cocoa, coffee and rubber production play a role, while mining and biofuels cause forest loss. The wood products industry is also a significant driver of destruction. Valuable trees are logged for hardwood timber and whole areas are clear-felled for pulp and paper factories. Much of the tropical timber – perhaps over half – is harvested illegally.

Rather than having a single cause, deforestation sometimes occurs because of the complex interplay between these activities. For instance, in South America land can be opened up with roads by logging companies, then slashed and burned by migrating subsistence farmers, cultivated for a few years, sold over to cattle ranchers and then

bought by soybean farmers. Each stage can generate very different economic returns: the small-scale farmer may earn \$2 or \$3 per hectare, the cattle rancher \$400 and the soybean farmer \$3,000 (Grieg-Gran 2008). The potential to convert the land to more valuable uses motivates each individual, as well as the land speculators who act as intermediaries. Much of this activity may be illegal under national laws. Unclear ownership and user rights to forested land further complicates the picture.

The dynamics of deforestation are local, but the commodities go to feed global demand. Much of the beef, soya and palm oil produced in tropical countries is exported. It ends up on supermarket shelves, in restaurants, or – in the case of palm oil used to produce biodiesel – in the fuel-tanks of cars. Growing demand from fast-developing economies such as China is turbo-charging this consumptive process. The relentless growth in the world population – expected to increase from 7 to 9 billion by 2050 – will provide further impetus. For example, the UK Government's Gallagher Review estimates that growing demand for food, feed and biofuels is likely to require an additional 200–500 million hectares of agricultural land in the next decade (The Gallagher Review of the Indirect Effects of Biofuels Production 2008). This will place even more pressure on the tropical forests of the world.

3.2 *Regional Differences*

The rates and causes of deforestation differ from continent to continent. In recent years, most rainforest destruction has taken place in South and Central America, which has the largest area of rainforest in the world. In Brazil, cattle ranching and associated land speculation are widely recognized as being the main drivers of deforestation. The clearing of land for cattle by poor families bestows de facto ownership rights to land, albeit often illegal. Cattle ranchers' migration into the Amazon biome is also partly caused by the expansion of soybean cultivation in drier areas, which has pushed ranchers north into the forest frontier.

Southeast Asia has the highest rate of deforestation relative to the size of its forests. Logging for timber and pulp and paper, as well as subsistence and commercial agriculture, are the main drivers of deforestation. In Indonesia and Malaysia, logging, often followed by the establishment of palm oil or pulpwood plantations, is the main cause of the disappearance of forests.

The African continent had the lowest rate of tropical deforestation between 2000 and 2005, relative to the size of its forests. The relatively low rate of deforestation in this region can be explained by the lesser importance of commercial agriculture and logging as drivers of deforestation; instead, most forest is still cleared for subsistence agriculture or fuelwood. However, commercial logging activities are multiplying, facilitated by improved transport infrastructure. Large-scale agriculture is also increasing and is likely to account for more deforestation in the future, as land for agricultural expansion grows scarce on other continents (Data on Rates of Deforestation is Taken from Hansen M et al. 2008; Drivers of Deforestation is from Blaser J and Robledo C 2007).

3.3 *A Market Failure*

The causes of deforestation may differ from region to region, but they have one feature in common: the people clearing the rainforests are acting rationally, given the economic incentives they face. Deforestation allows rural populations to practice agriculture, landless people to acquire a patch of their own, companies to engage in profitable commodity production, and governments to generate tax revenue and foreign exchange. These people are responding to the market signals of an increasingly globalised world. It should be remembered that today's richest countries actively pursued deforestation and land conversion to agriculture in early phases of development for exactly these reasons.

Fundamentally, deforestation occurs because the world places more value on the commodities produced from deforested land than on the environmental services that tropical forests provide. The local returns from deforestation are specific and financial; the global benefits of preserving forests are diffuse and not valued in monetary terms. In the final calculation, the trees are worth more dead than alive. Unless a way is found to rebalance this equation, and value standing forests, the trees will continue to disappear.

Encouragingly, there does not have to be trade-off between forest conservation and economic development. Research by WWF shows that it will be possible to substantially increase food, fibre and biofuel production in tropical countries without touching the forests, mainly because there are opportunities to use non-forested land much more efficiently (WWF 2011). Similarly, The Prince's Rainforests Project has worked with the private sector in Brazil, Indonesia and West Africa to identify practical ways to intensify cattle, palm oil and cocoa production on degraded and non-forested land (The Prince's Rainforests Project 2010). This will require upfront investment and sustained effort over many years, which is why deforestation often remains an easier option. But appropriate finance from the international community could tip the balance in favour of these approaches. It could help forest nations make the investments that would be needed to pursue an alternative low carbon development trajectory. If used in this way, forest finance would not only achieve environmental goals but would also provide vital investment that could reduce poverty, enhance food security and accelerate 'green growth' in developing countries.

4 Initiatives to Address Deforestation

There has long been a consensus that the international community should work with the governments of forest nations to slow or halt the destruction of tropical forests. However, traditional donor programmes have been unable to compete with the economic drivers of deforestation outlined above. There is great hope that a new climate deal, agreed as part of the UNFCCC, will finally place an appropriate value on tropical forests, but such a deal is still many years off. This has

created a gap that numerous international initiatives are now attempting to fill, with varying levels of success. It is still uncertain whether mechanisms of sufficient scale and ambition will emerge from this fragmented policy environment to have a significant impact on tropical deforestation in the next 10 years – but the opportunity exists.

4.1 Historical Approaches

Over the past three decades, a number of initiatives were established by the World Bank, UN agencies and donor countries to try to preserve forests in tropical countries. These included the Tropical Forestry Action Plan in the 1980s, National Environmental Action Plans from the 1990s, efforts to control international trade in illegal logs in the 2000s, and the integration of forestry into broader bi-lateral donor assistance programmes. In addition, dozens of international NGOs conducted project-level activities in tropical countries. While there have been some success stories, the overall results have been disappointing, as evidenced by the huge area of the world's tropical rainforests that has been cleared or heavily degraded during this period.

A number of reasons have been put forward to explain the failure of previous initiatives to reduce deforestation (The Prince's Rainforests Project [2009](#)).

- **Narrow scope:** Initiatives focused only on the forestry sector rather than addressing the broader drivers of deforestation and failed to create alternative economic opportunities for local people.
- **Lack of political buy-in:** In many cases, neither governments nor local communities within forest nations shared the goals of international donors.
- **Uncommitted institutions:** The importance of forests was not always shared within development agencies, nor was there coordination between agencies.
- **Inadequate funding:** Historically, less than US\$1 billion per year was available through Official Development Assistance for tropical forestry. This was never enough to compete with the drivers of deforestation.

In essence, political will was not been strong enough, nor sustained for long enough, to ensure the implementation of development approaches that could tackle the fundamental economic issues that caused deforestation in tropical countries. Clearing forests remained more lucrative than conserving them.

4.2 REDD+ and Climate Change

In recent years, the elevation of climate change to the top of the global policy-making agenda meant that, for the first time, there was a chance to harness enough political commitment and international funding to forge a long-lasting solution to

tropical deforestation. As part of the UNFCCC, countries have agreed to set up a new mechanism for Reducing Emissions from Deforestation and Degradation (REDD) in developing countries. This concept has been expanded to REDD+, the 'plus' signifying that the mechanism should also support forest conservation, sustainable management of forests and enhancement of forest carbon stocks.

The principle behind REDD+ is that industrialized nations (Annex 1 countries in the UNFCCC protocol) should pay forest nations for verified reductions in greenhouse gas emissions that come about through reducing deforestation or preserving or enhancing forest stocks at a national level. This could be a government-to-government transaction, using public finance from Annex 1 countries, or it could involve private finance from carbon markets. The details are yet to be worked out, as are many other technical issues such as how to set appropriate reference levels against which to measure avoided deforestation, how to conduct monitoring and reporting, and how to ensure safeguards for vulnerable groups. But the goal is to generate sufficient flows of finance to forest countries to incentivize and to facilitate low-deforestation development paths.

The economic rationale for REDD+ is compelling. The Eliasch Review, a study on the role of forests in climate change commissioned by the UK Government, estimated that it would cost between US\$17 billion and US\$33 billion per year to halve deforestation. The net present value of this halving of deforestation, based on the global savings from reduced climate change minus the costs of forest finance, was calculated at a massive US\$3.7 trillion (The Eliasch Review 2008). REDD+ is a good deal for Annex 1 countries looking to finance greenhouse gas reductions. It is potentially cheaper than most other mitigation options and could be achieved more rapidly. It should also be a good deal for forest nations, as it would provide much-needed finance for their development.

After much debate, at the UNFCCC conference in Cancun in December 2010 it was formally agreed that REDD+ would form part of the legally binding successor to the Kyoto Protocol. A technical working group was set up to work out the details of its operation. However, at the climate change conference in Durban in December 2011 it was agreed that any new protocol would not be adopted before 2016 and would not come into effect before 2020. Therefore, the REDD+ mechanism will not come into operation for at least 7 years. Moreover, there is no guarantee that this timetable will be kept. So, a UNFCCC REDD+ mechanism still remains a solution of the future, not the present.

In the meantime, carbon markets have provided only a tiny measure of support to REDD+ projects in developing countries. The total value of the global forest carbon market is around US\$149 million. About three-quarters of this funding has come from voluntary carbon markets such as the Chicago Climate Exchange. The rest is associated with forest projects approved under the Kyoto Protocol's Clean Development Mechanism. Combined, these projects cover an area of just 1.7 million hectares (Simula 2010). Private carbon finance is unlikely to be a significant factor before a REDD+ mechanism is agreed by governments as part of a global climate deal.

4.3 *Interim REDD+ Finance*

Delays in the implementation of a UNFCCC REDD+ mechanism were widely expected. As a result, steps have been taken to create programmes that could operate in the interim, outside of the formal UNFCCC process. In 2007 His Royal Highness The Prince of Wales established The Prince's Rainforests Project to help build consensus around near-term solutions to tropical deforestation. This project has worked with senior politicians, business leaders, non-governmental organizations and other interested stakeholders from around the world. On 1 April 2009 The Prince of Wales invited world leaders to a meeting in London at which it was agreed to establish an inter-governmental working group to develop proposals for a financing mechanism that could achieve rapid reductions in deforestation. The Informal Working Group on Interim Finance for REDD (IWG-IFR), representing 34 governments, produced its report in October 2009. Following a ministerial meeting in Paris in March 2010, a REDD+ Partnership was launched at the Oslo Climate and Forest Conference on 27 May 2010. The REDD+ Partnership is a voluntary, non-legally binding framework that brings together 58 countries committed to developing and implementing collaborative REDD+ efforts in the interim period before a UNFCCC agreement. It contains most tropical forest countries, as well as traditional donor countries. The latter made financing pledges exceeding US\$4 billion for the 2010–2012 period (Norwegian Government 2010). These formed part of a broader pledge of 'Fast Start Finance' for climate mitigation and adaptation in developing countries, made a few months earlier by Annex 1 countries at the UNFCCC conference in Copenhagen.

What progress has been made with this interim finance? The programmes that have been started can be divided into two types: 'payment for performance' schemes and REDD+ preparatory schemes.

'Payment for Performance' Schemes

A small number of REDD+ partnerships have been formed under which funding countries agree to make payments to forest nations based on changes in actual deforestation rates from year to year. Norway has been the most active, agreeing partnerships with Brazil, Guyana and Indonesia that will provide US\$2.25 billion in funding (although in the last case the 'payment for performance' component is not due to start until 2014). These schemes have some common features: the agreement of a price per tonne of CO₂ emissions abated (usually US\$5 per tonne); the use of proxies to calculate emissions reductions (usually based on hectares of deforestation avoided); simple verification mechanisms that will build in sophistication over the years; and considerable freedom for forest nations to decide on how payments are used, within a framework of safeguards. There are also differences between the partnerships, especially in terms of the channels through which payments flow. The Norway-Guyana deal is also different in that it does not reward Guyana for reducing its deforestation rate compared to a historical baseline (very little deforestation has

taken place in Guyana yet) but for making sure the deforestation rate does not rise in the future (Norad 2011).

Tropical forest nations have shown considerable initiative in driving these solutions. Brazil announced a goal to cut deforestation by 70 % by 2020, before signing up to a payment deal with Norway. The Indonesian government has committed to reduce its greenhouse gas emissions by 26 % through its own efforts and by 41 % if it receives international assistance. Guyana developed a comprehensive low carbon development plan before entering into its partnership with Norway. However, in each case the promise of international finance, in the form of payments for the ecosystem services provided by the forests, has been a catalyst for domestic action. It is too early to measure the full results of these partnerships but the recent falls in deforestation in Brazil, for example, indicate that positive steps are being taken on the ground.

Preparatory Schemes

The majority of interim finance has not gone to pay forest countries for actual reductions in deforestation but to fund programmes that are helping forest countries prepare themselves for a UNFCCC REDD+ mechanism or interim ‘payment for performance’ deals. These support activities such as strategy development, capacity building, institutional reform and establishment of forest monitoring systems. The argument is that forest countries need to be ‘REDD+ ready’ before they can engage with mechanisms that pay for performance. These activities are being funded by a wide range of donors through bi-lateral programmes, as well as by multi-lateral and regional programmes such as the UN-REDD Programme, the World Bank’s Forest Carbon Partnership Facility, the Forest Investment Program or, in Africa, the Congo Basin Forest Partnership (Simula 2010).

4.4 Remaining Challenges

Through the REDD+ Partnership and Fast Start Finance, more public money has been committed to slowing tropical deforestation than ever before. Most forest nations are participating in at least one international REDD+ programme. However, a number of challenges remain. First, with the exception of the financial support pledged by Norway, most funding to date has focused on strategy development, capacity building or small-scale pilot projects. There are few ‘payment for performance’ schemes achieving real results. This is partly because of a ‘chicken and egg’ problem: Annex 1 countries are reluctant to commit until they see strong leadership and clear plans in forest nations; forest nations won’t invest domestic political capital into developing these plans until they are certain there will be international funding available. Second, there have been many delays in REDD+ finance delivery and only a small proportion of the funds has actually been disbursed. One reason is that financing countries tend to view their support as Official Development Assistance, and have channeled their funds through traditional aid channels, whereas

forest nations prefer to see this as a partnership, and prefer more flexible implementation mechanisms. Third, the Fast Start Finance pledges were barely adequate for the 2010–2012 period and certainly cannot cover the period until 2020, which is the earliest that a new UNFCCC protocol will come into effect. Further pledges will be required to fill the financing gap between now and then (The Prince's Charities' International Sustainability Unit 2011).

5 Conclusions

Tropical forests provide important ecosystem services to the world. They regulate rainfall, contain vast amounts of biodiversity and play a crucial role in the carbon cycle. It will be difficult to attain climate stability in this century without action to reduce deforestation. Tropical forests are cleared for many reasons but the fundamental cause is that there are strong economic incentives driving deforestation, often linked to global commodity demand.

Past attempts to conserve tropical forests have mostly failed because they have not been able to out-compete these drivers of deforestation. The prospect of a global climate deal opens up the possibility of a REDD+ 'grand bargain' under which industrialized countries would pay tropical nations for the ecosystem services that their forests provide, which would finally make the trees worth more alive than dead. The technical elements of this mechanism are becoming clearer but the global policy landscape is such that it will not be in place before 2020 at the earliest. As a result, a series of smaller bargains have emerged, as countries try out various interim approaches. Some of these partnerships are developing novel mechanisms to reward forest nations for actual reductions in deforestation between 2010 and 2020. However, most are more cautious, employing traditional aid approaches and focusing on building 'REDD+ readiness' rather than paying for results.

On a number of occasions since 2009 tropical forest nations have expressed their willingness to protect their forests, so long as they receive appropriate international support. There has never been a better opportunity for the international community to forge ambitious partnerships with forest nations to achieve substantial reductions in tropical deforestation. On the other hand, there is a risk that forest nations will be discouraged by the small amount of international finance available, the slowness of its disbursement, and the prevalence of uncoordinated, piecemeal approaches. Bolder steps will need to be taken to translate the promise of recent years into real results on the ground.

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