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*International Forest Carbon and the Climate Change Challenge Series – Brief No. 1**

The Crucial Role of Forests in Combating Climate Change

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Tropical forests are *disappearing* rapidly – a process that accounts for some 17% of global greenhouse gas emissions. Saving tropical forests thus represents a *significant*, *cost-effective*, *timely*, and *multiple-benefit* opportunity for the United States and the international community in the fight against climate change. Seizing this opportunity will require *leadership* by the United States working in concert with tropical forest countries and the international community.

Disappearing – Tropical forests are disappearing at a rate of 5% each decade—the equivalent of two football fields per second—as a result of agricultural, timber and road expansion.[1] By 2050, 40% of the Amazon will be gone if current deforestation trends continue.[2] When these forests are cleared, most of the carbon is released into the atmosphere either through burning or decay of organic matter.[3] Once cleared, the opportunity to avoid emissions is permanently lost, making future mitigation targets more difficult to achieve.

Significant – Land-use change in the tropics accounts for roughly 17% of greenhouse gas emissions, more than the global transportation sector (see Figure 1.1).[4] The vast majority of these emissions come from deforestation.[5] Forests must be included in climate mitigation strategies to avoid dangerous levels of climate change; focusing exclusively on fossil fuel emissions will not be sufficient.[6]

Cost-effective – Including forests will lower the costs of climate change mitigation. Initial emission reductions from forest and land-use activities are expected to cost substantially less than reductions in other sectors, such as de-carbonizing the electric power or transportation sectors. Thus forest carbon activities can reduce the costs and increase the flexibility associated with emissions reduction efforts in the U.S. and globally. One recent estimate indicates that including international forest carbon in global climate policy could save US$2 trillion over the century.[10] If this $2 trillion were reinvested in climate mitigation activities, it could finance a 10% deeper cut in carbon emissions, which corresponds to a reduction in expected warming of 0.25°C over the 21st century.[11]

Economic models suggest that over the next 20 years, carbon prices of $10–$30 per ton CO_2 could reduce deforestation by up to 50% in the tropics, with central estimates of about 2–3 billion tons of CO_2 reductions per year—roughly equivalent to annual U.S. emissions in the electricity and heating sector. The models suggest that emissions reductions could be roughly doubled if other options such as afforestation and forest management were credited.[12] Initial reductions can be quite inexpensive, perhaps as low as US$2–5 per tCO_2 to reduce deforestation 10% below baseline levels.[13] Additional reductions, however, become progressively more expensive.

Because programmatic costs are not yet known, existing models do not fully account for capacity-building, administration, monitoring, contracting between buyers and sellers, enforcement, and other costs

How do forests affect climate change?

Forests are the most significant terrestrial carbon reservoir, containing 77% of all carbon stored in vegetation and storing roughly twice as much carbon as the atmosphere.[7] Forests also constantly cycle carbon: photosynthesis turns atmospheric carbon into biomass and sugars, while respiration burns up some of these sugars, returning carbon back to the atmosphere. Globally, forests are a net sink, meaning that they absorb more carbon out of the atmosphere than they emit. However, of the 2.6 billion tons of carbon that forests annually absorb, 60% (or 1.6 billion tons) is emitted back into the atmosphere by deforestation.[8]

Deforestation leads directly to carbon emissions in the same manner as a coal-fired power plant or any other emissions source. Further, if forests are converted to nonforest land uses, the new land cover will absorb less carbon from the atmosphere. Even if forests are allowed to regenerate after clearing occurs, it will take decades to rebuild the carbon once stored in the original forest, and the loss of biodiversity and indigenous forest cultures is irreversible.[9]

* Each brief in this series corresponds to a chapter in the Nicholas Institute's report on forest carbon, titled *International Forest Carbon and the Climate Change Challenge: Issues and Options*. The full report, and each brief in the series, can be found at http://www.nicholas.duke.edu/institute.

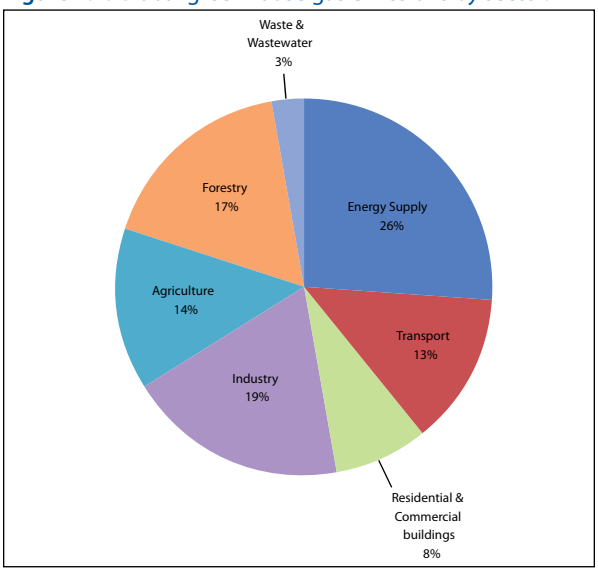
associated with putting in place an effective forest carbon program. These costs will vary depending on the country, the nature of the forest carbon activity, the scale of the intervention, and existing capacity. Many of these are programmatic startup costs and could be addressed by the various capacity-building initiatives (e.g., World Bank Forest Carbon Partnership Facility). Where forest carbon activities involve reforming the institutions that govern land use, the reforms can be difficult and relatively costly. There will also be initial costs and ongoing transaction costs borne by the market participants themselves (e.g., project startup costs). These project-level transaction costs can be large for small projects, but tend to diminish in significance as project size grows (e.g., less than $1 per ton, CO_2[14]). Taking all this together, there is a certain amount of friction associated with delivering forest carbon reductions to the market and thus the idea of very large volumes available at very low prices needs to be viewed a bit more critically. The analysis presented in the companion report on economics addresses some of these supply constraints and how they might affect market outcomes.[15]

Timely – Emission reductions from the forest sector can begin immediately. No technological breakthroughs, new physical infrastructure, or facility construction is needed to keep forest carbon out of the atmosphere and enhance forests' natural carbon capture and storage services. As with emission reductions strategies in other sectors, new administrative infrastructure will be needed. Reforming forest and land-use policies will require new governance institutions, greater administrative capacity, and addressing conflicts over land tenure. Policy reforms can result in substantial, long-term emissions reductions; meanwhile, complementary actions—such as strengthening enforcement of existing forest reserves or retiring logging concessions—can be taken immediately to begin curbing deforestation.

Multiple-Benefit – In addition to regulating climate, forests provide a number of important local services that can reduce communities' vulnerabilities to climate change. Forests are rich in biodiversity: they are home to the majority of terrestrial species.[16] They regulate water flow; reduce runoff, erosion, siltation, and flooding; and provide food, medicine, building materials, fuelwood, and income for local communities. These ecosystem services are critical to many rural and urban economies, provide environmental security, and can be thought of as "natural insurance" that helps buffer vulnerable communities against the negative impacts of climate change.

Developing countries are projected to encounter some of the most severe impacts of climate change, and are

Figure 1.1. Global greenhouse gas emissions by sector.



Note: Reproduced from the IPCC Climate Change 2007: Synthesis Report Summary for Policy Makers (Fourth Assessment Report). Total anthropogenic greenhouse gas emissions in 2004 in terms of CO_2 eq. Forestry data include CO_2 emissions from deforestation, CO_2 emissions from decay (decomposition) of above-ground biomass that remains after logging and deforestation and CO_2 from peat fires and decay of drained peat soils. Data does not include emissions from forest degradation, which would increase forestry emissions significantly.

the countries least able to cope.[17] In regions that already struggle to supply adequate food, water, shelter, and security resources, climate change will act as a threat multiplier, exacerbating environmental and resource crises while adding to problems of governance.[18] As environmental conditions deteriorate, disease will increase, and populations will likely be forced to migrate. Losing forests could further destabilize societies that are most vulnerable to climate change and lead to political upheaval, migration, and conflict.[19]

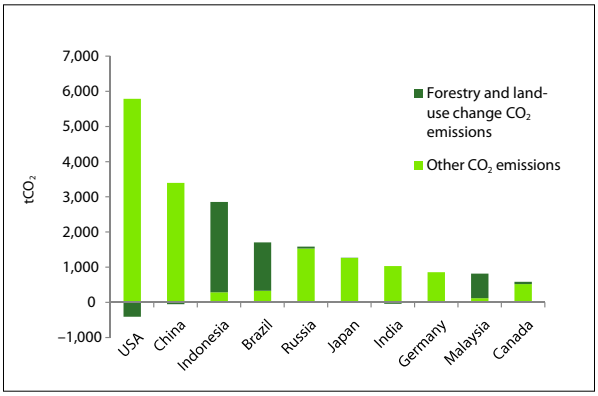
Opportunity – At a time when the world is seeking to broaden international participation in the global effort to reduce emissions, addressing deforestation is the most meaningful way for many developing countries to participate (see Figure 1.2). Although developing countries may not be prepared to make economy-wide emissions commitments at this time, some are considering taking on emissions targets in their forest sectors given the right incentives. For example in December 2008, Brazil announced that it would reduce its emissions from deforestation by 70% within ten years, and Norway pledged $1 billion to support the effort. Forest carbon can play a crucial role in facilitating an international climate agreement, and provides a key opportunity for the U.S. and the international community to foster active collaboration with developing countries in abating climate change.

Leadership – The United States has an opportunity to be a leader in the international community by addressing tropical deforestation through the incorporation of forest carbon activities in domestic climate change legislation and involvement in the international climate negotiations. U.S. leadership on forest carbon is likely critical for broad international acceptance and sufficient global funding. A number of developed countries are currently funding capacity building for forest carbon activities, and some are considering setting aside a portion of proceeds from their national climate programs for forestry. However, the U.S. is leading the way in actively exploring ways to allow international forest carbon credits to trade (like allowances) in a national emissions trading system (see Chapter 2 of full report).[20] Such leadership would build on the United States government's historic interest in tropical forest conservation demonstrated by the long-term efforts by USAID, the U.S. Forest Service, the State Department, and the Department of Treasury to conserve tropical forests (see Chapter 5 of full report). Furthermore, California, Illinois, and Wisconsin are already leading the way on forests and climate change by working with governors from Brazil and Indonesia to develop rules and incentives for generating compliance-grade international forest carbon.[21]

What might the U.S. do?

The U.S. will be one of the largest buyers of all types of carbon credits if it moves forward with an economy-wide cap-and-trade policy. If the U.S. decides to include international forest carbon in its cap-and-trade policy, there are several options for how to do so. The U.S. can allow capped entities to use international forest carbon allowances to meet compliance obligations as offsets. It can also use revenue generated from auctioning of allowances to support forest carbon as an independent program. Whichever policy approach is ultimately used, the U.S. could generate substantial demand and financing for reducing deforestation, having a major impact on the market globally. The U.S. is currently considering a policy which would begin funding international forest carbon activities and allow trading of international forest offsets as early as 2012 if they meet stringent standards (see Chapter 2 of full report). If this legislation fails to move forward, it may be 2011 before the U.S. tries again.

Figure 1.2. Forestry and land-use change emissions as a portion of total emissions for top ten emitters in 2000.



Notes: Emissions from deforestation are not spread evenly around the world, but are concentrated in a few forest-rich developing countries. For some of these countries, emissions from deforestation account for the vast majority of total domestic emissions. Brazil, Indonesia, and Malaysia are among the top ten CO_2-emitting countries in the world because of their emissions from deforestation.[23] Since 2000, China surpassed the United States in total emissions; however, the most recent global data on forestry and land-use change emissions comes from 2000.

Terminology

Policy discussions about forest carbon principally refer to deforestation and degradation, the two processes under which forest carbon stocks can be emitted to the atmosphere. The other main components are conservation—which maintains forest carbon stocks—and afforestation, reforestation, and forest management—which can build carbon stocks by removing CO_2 from the atmosphere. The international community is actively working to develop policy mechanisms that will incorporate tropical forests into a post-2012 climate regime. The current terminology in that process uses the phrase ***reduced emissions from deforestation and forest degradation*** or ***REDD***. Negotiations are under way regarding whether REDD will include other forest sector and land-use activities such as those mentioned above. When not referring specifically to the international negotiations, we will use the broader terms ***international forest carbon*** and ***forest carbon*** in this brief.

What would international forest carbon credits look like?

International forest carbon credits could be generated by a range of activities and approaches suited to the diversity in national circumstances and drivers of deforestation and forest degradation. For example, site-specific approaches could create and support forest reserves that protect threatened forests, implement sustainable forestry practices, or buy out palm oil concessions for forests that have not yet been converted. National- or regional-scale approaches could change land-use and infrastructure policies, improve forest governance, reform agricultural subsidies, and inject sustainability into development policy. Whether activities are at a project or national scale, they will generate credits based on their performance compared against an agreed-upon reference level like in other sectors. Reference scenarios are the benchmark against which emissions reductions are measured, and pose technical and political challenges for all sectors. In the forestry sector, there is confidence in the ability to use existing remote sensing imagery to establish reference scenarios.[22] Advances in remote sensing and continuing work on forest carbon measurement have greatly enhanced the ability to measure and monitor changes in forest carbon (see Chapter 4 of full report).

The devil is in the details

This paper is the first in a six-part series on forest carbon that discusses why tropical forests are a critical part of climate change policy discussions and provides policymakers, interested stakeholders, and international negotiators with an overview of the main issues associated with international forest carbon. The following papers will provide details about the outstanding questions regarding forest carbon policy design, the status and next steps for U.S. and international policy efforts, and ongoing endeavors to reduce deforestation and associated carbon emissions in developing countries.

Paper 2 reviews current efforts to bring international forest carbon into the post-2012 international climate regime, the European Emissions Trading Scheme, and emerging compliance regimes in the United States. The lesson here is that while international forest carbon is gaining traction at multiple levels of governance, there is urgent need (because forests are disappearing so rapidly) for the U.S. to lead by including robust international forest carbon provisions in its own cap-and-trade system and by advancing international negotiations toward integrating developing country forests into a Copenhagen agreement.

Paper 3 addresses some of the commonly voiced concerns about including international forest carbon in climate policy, including governance, capacity, equity, technical concerns, property rights, and impacts on indigenous and other forest-dependent peoples.

Paper 4 summarizes the critical policy design issues for international forest carbon. Given the need to move quickly before most forests disappear, a growing consensus points to a phased approach in which financing initiates forest conservation and builds in-country capacity and institutions, transitioning to a program in which payments are conditional on demonstrated forest emission reductions. Once this is achieved, it may be possible to link reductions in forest emissions to the global carbon market and generate substantial sustained financing. Developing forest carbon programs that are effective and forest carbon credits that have integrity requires addressing issues such as additionality (new reductions that result from the program, not those that would happen anyway) and leakage (the shifting of emissions to an area outside of the project or program). Proposed national-level accounting goes a long way towards solving these issues while incorporating subnational activities and local projects. Thoughtful ideas and approaches for policy design exist, and policies must be flexible to adapt as we learn through experience.

Paper 5 examines the drivers of forest loss and experiences from past efforts to conserve forests. The lesson here is that international forest carbon policy and programs may be more likely to succeed if they address the major drivers of deforestation (agriculture, timber, and infrastructure), and if rewards are contingent on performance. The carbon market could provide an unprecedented level of funding for forest conservation, greatly increasing its potential impact beyond those of previous efforts.

Paper 6 explores the recent proliferation of early international forest carbon activities by the public and private sectors, which are providing valuable lessons for the policy process. The lesson here is that there is tremendous interest from investors and donor governments to build capacity and invest in pilot projects throughout the tropics, but that scaling up such investment will require resolution of uncertainty in three key areas: carbon rights, the nature and direction of future policy mechanisms, and the criteria and standards for compliance-grade assets.

International forest carbon is critical to the success of international climate policy. It represents a significant mitigation opportunity that must be seized if we wish to avert dangerous levels of climate change. And it provides the only meaningful avenue for bringing many developing nations into international climate policy.

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7 Eliasch 2008 (see note 6).

8 Forests and other terrestrial sinks annually absorb 2.6 GtC from the atmosphere; however, deforestation and other land-use activities annually emit 1.6 GtC into the atmosphere. As a result, net carbon absorption rates are only 1.0 GtC, 40% of what they could be in the absence of emissions from deforestation and land-use change. From: K.L. Denman et al., 2007, Couplings between changes in the climate system and biogeochemistry, in *Climate Change 2007: The Physical Science Basis; Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al., eds. (Cambridge, UK and New York, NY, USA: Cambridge University Press, 2007).

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11 Tavoni et al. 2007 (see note 10); Lubowski 2008 (see note 10).

12 Murray, B., R. Lubowski, and B. Sohngen, 2009, *Including International Forest Carbon Incentives in Climate Policy: Understanding the Economics*, Nicholas Institute Report NI R 09-03 (Durham, North Carolina: Nicholas Institute for Environmental Policy Solutions, Duke University). Different studies use different economic modeling approaches to estimate costs. In this and similar reports that discuss the potential for forest carbon, the economic models are driven largely by opportunity costs of forest carbon activities. Models can be characterized as "top-down" or "bottom-up." This paper references top-down models, which are aggregated (e.g., national or regional level) and capture market feedback. In top-down models, carbon price is an input variable meaning that all activities face the same carbon price; the model output is the volume of carbon reductions at that carbon price (subject to other constraints). Bottom-up models employ local information on opportunity costs and emission factors to estimate costs per ton under different conditions. By design, bottom-up models assume the costs of reducing emissions will differ from place to place. Bottom-up studies often produce lower cost estimates than top-down studies.

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18 CNA 2007 (see note 17).

19 Ibid.

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