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Climate Change and Forestry: An Introduction

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Climate change is one of the most significant global challenges of our time, and addressing it requires the urgent formulation of comprehensive and effective policy responses. A changing climate affects nearly every sector of the world's economy and is intricately intertwined with other major environmental threats such as population growth, desertification and land degradation, air and water pollution, loss of biodiversity, and deforestation. To date, most of the international attention directed toward combating climate change has been strikingly insufficient and focused primarily on the industrial and energy sectors. The agriculture, forestry, and other land use sector—AFOLU in current climate policy jargon—has so far been treated as an unwelcome distraction from tackling industrial and energy-related emissions, rather than being seen as an integral part of the climate change problem for which we must develop comprehensive solutions.[1]

The resulting bias has led international climate negotiators to disregard the major role forests and agricultural systems play in climate change. In the context of the Kyoto Protocol, widespread controversies and a lack of knowledge made negotiators agree to too little too late.[2] This result is not withstanding the recognition in 1997 that, with the adoption of the Kyoto Protocol, any attempt to stabilize atmospheric greenhouse gas (GHG) concentrations will have to bring land-use-related emissions and removals into the equation. According to a 2006 study led by former World Bank chief economist Nicholas Stern, the costs of reducing the effects of climate change can be significantly lowered if reduced

deforestation and reforestation options are used effectively: "Curbing deforestation is a highly cost-effective way of reducing greenhouse gas emissions and has the potential to offer significant reductions fairly quickly. It also helps preserve biodiversity and protect soil and water quality. Encouraging new forests and enhancing the potential of soils to store carbon offer further opportunities to reverse emissions from land use change."[3]

The idea for this book was triggered by the conviction that an effective post-Kyoto agreement must include a comprehensive system that allows for the accounting of land-use-related emissions and removals and establishes incentives to reduce emissions from deforestation. With a view to the forthcoming debate, we thought the time was ripe to compile existing knowledge, expertise, and experience and make it available in one volume. At the same time we sought to produce a practical reference manual outlining the history of AFOLU in international climate change negotiations, identifying key lessons learned from implementing the various policy frameworks and from actual forestry project experience to date, and drawing on all this to propose solutions for how best to move forward. This book has benefited from contributions and input by the leading forestry and climate change experts in government, international organizations, academe, civil society, and the private sector.

In this chapter we provide a short overview of the role of forestry and agriculture in current climate policies—a recurring theme throughout the book. Like the other contributors, we focus our review on potential approaches to incorporating carbon sequestration and emission avoidance into emerging climate policy frameworks, rather than addressing the scientific debate that has surrounded the topic of climate change and forestry, which has already been written about at length.

Forestry and Climate Change

Forests are the world's most important terrestrial storehouses of carbon, and they play an important role in controlling its climate. The world's remaining forest ecosystems store an estimated 638 gigatonnes (Gt) of carbon, 283 Gt of which are in the forest biomass alone.[4] This is a significant amount of carbon—approximately 50 percent more than all the carbon in the atmosphere. Forest ecosystems are sensitive to climatic change. Over long periods of time plants have adapted to local climatic, atmospheric, and soil conditions, and this, combined with temperature and rainfall patterns, is what characterizes an ecosystem. A change in these variables can dramatically affect species viability. Stress caused by a change in the conditions of an ecosystem may also increase its vulnerability to pests and fires. Thus, massive areas of forests could be lost from these climate-induced threats, which in turn could further accelerate climate change in a vicious positive feedback loop.

On the other hand, land-based activities represent one of the most significant untapped opportunities for mitigating climate change:

—Simply leaving mature forests intact will lock up significant amounts of carbon that might otherwise be released into the atmosphere. Land-use changes, predominately deforestation, currently contribute about one-fifth of global carbon emissions (see chapter 15). Deforestation is the greatest source of GHG emissions in many developing countries, including Brazil and Indonesia, the world's biggest GHG emitters after the United States and China. Reducing emissions from deforestation may be one of the most cost-effective tools for reducing GHG emissions globally and could give people the time needed to mobilize the resources and develop the technology for "decarbonizing" the world's energy and industrial production.

—Sustainably managed forests can produce wood and other biomass that is a renewable, carbon-neutral alternative to fossil fuels and other construction materials. In this way sustainable forest management can help to reduce energy-related emissions (chapter 7).

—Forest ecosystems contain the majority (approximately 60 percent) of the carbon stored in terrestrial ecosystems and have the potential to absorb about 10 percent of global carbon emissions projected for the first half of this century into their biomass, soils, and associated products and, in principle, to store them in perpetuity.[5]

Forestry in Climate Negotiations

Both the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol acknowledge the role that forests play in global climate (chapter 3).[6] Whereas the UNFCCC tends to refer to the reduction of GHG emissions and the increase of atmospheric GHG removals by sinks as parallel and equally important elements in any climate strategy, the Kyoto Protocol focuses on creating a framework for reducing industry- and energy-related emissions. The defining element of the Kyoto Protocol is a system of GHG emission targets with which all ratifying industrialized nations must comply. Reflecting the protocol's focus on energy and industrial emissions, the targets of individual countries are calculated without taking into account forestry- and land-use-related emissions. During the negotiations that led to the adoption of the Kyoto Protocol, controversy arose over whether parties should be allowed to offset emissions produced in other sectors with removals generated by biological sequestration or whether the effort to combat climate change should be concentrated on the reduction of emissions from the use of fossil fuels (chapter 4).

Those arguing against the accounting and use of forestry offsets were concerned that carbon offsets might be negated in cases where human action or natural events

such as wildfires reversed the carbon benefits. If a tree is felled, stored carbon is released and the temporary climate benefit reversed—that is, the benefit is "non-permanent." The existence of this permance risk distinguishes emission removals generated by the forestry section from emission reductions generated by the industrial and energy sectors. The issue has, therefore, been a core concern about credits from activities that rely on sequestration of carbon in trees or soils.

Eventually negotiators decided in Kyoto that "direct human-induced" changes in GHG emissions and removals by sinks since 1990 could be used to meet a portion of the parties' emission commitments. Furthermore, articles 6 and 12, which define the project-based mechanisms called Joint Implementation (JI) and the Clean Development Mechanism (CDM), refer directly, in the case of JI, or at least indirectly, in the case of the CDM, to carbon sinks. AFOLU under the CDM is limited, however, to afforestation and reforestation projects, which are granted credits that can be used only for a limited period of time to comply with Kyoto commitments (chapter 6). The regulatory limitations of forestry under the CDM have subsequently severely hampered the development of this sector (chapter 8).

Nevertheless, the experience with crediting carbon from afforestation and reforestation projects has helped to create knowledge and overcome the scientific uncertainties that, among other things, stood in the way of an early agreement on expanded consideration of the forestry sector (chapter 10). In parallel, countries gained experience in authorizing relevant projects, and lawyers engaged in defining legislative and contractual frameworks (chapters 11, 12). Yet the limitations of the Kyoto Protocol can only be described as deeply unsatisfactory, because they have led to a situation in which there is an incentive to restore and protect forest systems in industrialized countries (chapters 3, 4) but no incentive to reduce emissions from deforestation in developing countries—the most important source of emissions from the land-use sector.

Negotiations toward a post-Kyoto agreement started in the context of the UNFCCC and Kyoto Protocol annual meetings in December 2005. On this occasion Papua New Guinea and Costa Rica put forward a submission to consider whether and how incentives to reduce tropical deforestation could be included in the future climate regime. This submission created a great deal of interest and earned significant support from developing and industrialized countries alike. This kicked off discussions on ways to address emissions from deforestation in developing countries. Since then a number of ideas and policy approaches on how to expand the carbon market to create incentives for forest conservation have been proposed and are being discussed as part of a post-Kyoto agreement (chapters 13–17). There is some hope that progress will be made in formulating an incentive framework that might grant financial awards for reductions in deforestation even ahead of final discussions on a more comprehensive post-Kyoto framework. The Bali round of UNFCCC negotiations held in December 2007

produced encouraging results. Demonstration projects that reduce emissions from deforestation and degradation (REDD) will be formally encouraged and recognized, and REDD in developing countries will be included in the Bali Action Plan, which is the two-year process to negotiate a post-Kyoto agreement.

Forestry and the Carbon Market

Many of the benefits provided by forests are currently considered part of the global commons and are freely available for everybody. Forests purify air and water, stabilize soil, support biodiversity, produce pharmaceutical substances, and act as carbon storehouses—all of which humans treat as unlimited and free services. Typically, no legal rights and consequently no monetary value are assigned to these services. The value of a forest is usually defined solely in terms of things that can be owned and readily traded—the timber in the trees and the land on which the forest grows. This means that those who control or have access to forests often have greater incentives to clear them and turn them to economically productive uses than to conserve them.

These services provided by forests need to be appropriately priced if people are to make decisions about forests that are based on their true value. Schemes that envisage payments for "ecosystem services" try to address this market failure by creating financial incentives to conserve, protect, and restore forests (chapter 5). Assigning value to emission reductions or removals (carbon storage) by creating tradable carbon credits is one of the most developed and promising approaches for tapping the forestry sector in the fight against climate change, and it is therefore a key topic in this book.

The carbon market relies on emission trading and the transfer of carbon credits. The CDM and JI allow countries to invest in emission-reducing projects or programs in countries where abatement costs for emission reductions are lower than in their own economies. In return for their payments, investors or carbon purchasers receive a right to the carbon credits generated by the project. These carbon credits can be used to meet compliance obligations under international and national regulatory regimes. The carbon market created under the Kyoto Protocol and a number of regional and national emission-trading schemes is worth billions of dollars each year (chapters 6, 8, 18, 19).

Because the Kyoto Protocol does not address forest conservation—that is, the prevention of deforestation—in developing countries, these countries are restricted in their opportunities to benefit from the CDM. Most of the offsets generated by AFOLU projects are currently traded in the so-called voluntary market, where the rules are typically more flexible and accommodating of such projects (chapters 20, 21). Companies invest in voluntary offsets for marketing purposes, to meet voluntary corporate social responsibility objectives, or to get ahead of

emerging regulations. Increasing numbers of individuals are now joining them in wishing to offset their carbon "footprints."

A New International Framework

Despite a common understanding that the AFOLU sector is far too important, both as a sink and as a source, to be marginalized again, differences remain regarding when, to what extent, and how land-use-related sinks and emissions should be integrated into a post-Kyoto regime. Regardless of the design details, it is important that any post-Kyoto agreement provide the right framework and incentives for the following:

—Rewarding decreased deforestation; sustainable forest, land, and wetland management; forest restoration; and the sustainable use of biomass

—Establishing a reliable accounting system that includes the flux of biological carbon

—Promoting sustainable development and an inclusive climate policy

—Capturing synergies between the Convention on Biological Diversity, the Convention to Combat Desertification, and the Millennium Development Challenge goals

Far from having embraced the full complexity of the issue, negotiators have engaged in the initiative taken by Papua New Guinea and Costa Rica to narrowly focus on defining an instrument to reduce GHG emissions from deforestation in developing countries. Until now, the broader question of how to effectively integrate AFOLU emissions, sequestration, and emission reductions into a post-Kyoto regime has been sidelined.

At their annual summit held in Heiligendamm, Germany, in June 2007, the Group of Eight leading industrialized countries (G8) expressed their commitment to taking a leadership role in future efforts to reduce GHG emissions. The summit's declaration stressed, however, that developing countries had to contribute to a global effort to reduce emissions. In subsequent statements the European Union made it clear that it saw a commitment by developing countries to reduce emissions from deforestation as a promising example of how developing countries could demonstrate their commitment to mitigating climate change. The EU envisaged a system of national targets under which emission reductions would be rewarded with carbon credits. Although forestry per se still ranks low in the priority list of most EU member countries, developing countries' willingness to consider sectoral targets provides a welcome opportunity to negotiate industrial targets with major emitting, developing nations, which remains the priority of most EU negotiators.

When it comes to the debate over REDD, a number of options are being proposed, including both market- and non-market-based approaches. Market-based approaches rely on the carbon market and aim to create incentives for avoiding

further deforestation. In most cases they include the awarding of tradable carbon credits once a country or project has generated a proven climate benefit by reducing GHG emissions below the business-as-usual scenario.

A number of proposals are associated with baselines developed at the national level whereby countries take on voluntary commitments to reduce their national deforestation rates in the form of reduction targets vis-à-vis the national baselines (chapter 16). In order to account for challenges developing countries face in establishing national-scale systems, it has been proposed to combine national approaches with the authorization of a project or subnational approach. Those arguing in favor of including project-based activities refer to the required level of resource mobilization, which goes beyond what public funds could make available and thus must tap private capital (chapter 17). Proponents of other approaches, although less likely to prevail, argue that an efficient system has to move away from a baseline-and-credit approach toward a cap-and-trade approach, which will allow developing countries to access financing on the basis of a binding conservation commitment.

Another question—whether credits generated by activities or programs that reduce emissions from deforestation should be fully fungible with other carbon markets—gets back to the old debate of whether GHG reductions achieved in forestry should be fully fungible with industrialized-country reduction commitments. Taking into account the volume of reductions that may be achieved through REDD activities, and the need to avoid flooding the market, carbon credit fungibility must be matched by strict emission limitations in industrialized countries. Mandating a tighter overall cap than would be possible without REDD crediting could create a win-win situation for the environment and the global economy. Another option would be to create a separate or parallel market for REDD credits, although the economic viability of such an approach is questionable.

Conclusion

Omitting deforestation in developing countries from a post-Kyoto agreement would leave out a major source of carbon emissions, which could undermine many of the gains made through fossil fuel reductions. Many of the insecurities that made an international agreement at Kyoto impossible have been addressed in the last decade, including the development of robust measurement and monitoring (that is, accounting) protocols and various means for addressing the permanence problem.

Forest and biodiversity conservation are intrinsically linked to the mitigation of climate change and humans' adaptation to such change. If we lose our forests, we lose our biggest sink of terrestrial carbon and a system that regulates and influences

local and regional climate patterns and extreme weather events. It is therefore necessary that a post-Kyoto regime include a comprehensive carbon accounting mechanism with the necessary incentives for conserving our forests, especially in the tropics, where they are most threatened and can play a vital role in supporting sustainable livelihoods for the world's poor.

Certainly from a development perspective, AFOLU carbon projects represent one of the few means by which many of the world's poorest people, including most Africans, will be able to meaningfully participate in and benefit from the global carbon market. For the first time these people have the promise of being able to sustainably capture an ecosystem service value associated with their land, instead of being forced to liquidate forest resources just to survive.

Keeping in mind the broader context, we hope readers find the chapters in this book both interesting and useful for understanding the increasingly complex climate change negotiations under way today. We further hope that a deeper understanding of the interlinkages between climate policy and forestry will help negotiators define a robust and enduring international framework for reducing GHG emissions from all sources while providing the right incentives for the conservation and sustainable use of the earth's most precious natural resources.

Notes

1. International climate change experts have traditionally referred to "land use, land-use change, and forestry," or LULUCF, as the prevailing term for this sector. However, the most recent Intergovernmental Panel on Climate Change (IPCC) guidelines refer to AFOLU, a more consistent and complete term by which to describe this sector. See IPCC, *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* vol. 4, *Agriculture, Forestry, and Other Land Uses*, prepared by the National Greenhouse Gas Inventories Programme, H. S. Eggleston and others, eds. (Institute for Global Environmental Strategies, Japan).

2. FCCC/CP/1997/L.7/Add.1 Decision 1/CP.3, "Adoption of the Kyoto Protocol to the United Nations Framework Convention on Climate Change," Annex, reprinted in 37 ILM 22 (1998), entered into force February 16, 2005 (hereinafter "Kyoto Protocol").

3. N. Stern and others, *Stern Review on the Economics of Climate Change* (London, 2006), p. 537.

4. This is the amount of carbon stored in the world's biomass, deadwood, litter, and soil. See Food and Agriculture Organization (FAO), "Global Forest Resources Assessment 2005: Progress towards Sustainable Forest Management," Forestry Paper 147 (Rome: FAO, 2006).

5. IPCC, *Land Use, Land-Use Change, and Forestry: A Special Report of the IPCC* (Cambridge University Press, 2000).

6. UN Doc Distr General A/AC.237/18(Part II)/Add.1, May 15, 1992 (hereinafter "the UNFCCC"). The UNFCCC entered into force on March 21, 1994, and currently has near-universal membership, with 191 countries having ratified it.