Global Warming, Forests, and Biodiversity.

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We examine the role that terrestrial sinks of CO_2, and more particularly forests, could play in reducing global warming. After a review of the most recent scientific evidence on global warming and its consequences, we highlight the contribution of deforestation (particularly tropical deforestation) to global warming and the importance of tropical forests in the preservation of biodiversity. We then argue for the need to include forestry projects in the options available to reduce atmospheric CO_2 concentrations, provided they are inscribed in the larger context of sustainable development and the rights of indigenous people.

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I. Introduction

What role, if any, should forestry play in the reduction of atmospheric concentration of CO_2, the main greenhouse gas (GHG) contributing to global warming? This is one of the lingering questions after the failure of the COP6 meeting at the end of 2000. Forestry and land use policies (more generally land use, land use change, and forestry or LULUCF) is one of the four mechanisms proposed in the Kyoto Protocol, along with an international market for GHG emission permits, the Clean Development Mechanism (CDM), and Joint Implementation (JI).[1]

LULUCF measures are controversial. Their proponents, chief among them the United States but also Canada, argue that biological sinks should be an internationally recognized option to reduce GHG concentrations because the extra

[1] The Kyoto Protocol is the first step towards implementing the United Nations Framework Convention on Climate Change (UNFCCC). It sets targets for developed countries to reduce their collective emissions of six greenhouse gases by at least 5% by the period 2008-2012. Cuts in carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are to be measured against 1990 emissions. Cuts in hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride, three long-lived industrial gases, are to be measured either against 1990 or 1995 emissions. To-date, approximately 80% of the CO_2 buildup in the atmosphere has been contributed by industrialized countries. Since most of them did not meet earlier non-binding goals of returning to 1990 emissions by the year 2000, collective cuts under the Protocol could in fact represent a 20% reduction compared with emission levels projected for 2010 under a business-as-usual scenario. For information on the politics of the Kyoto Protocol, see Schneider 1998.

flexibility they provide would decrease the cost of reducing net CO_2 emissions. They make the case that finding cheaper ways to reduce GHG emissions is essential to allow continued economic growth and thus global development. Opponents to biological sinks have several concerns. First, many believe that the best way to fight global warming is to reduce our consumption of fossil fuels, to switch to renewable energy sources, and to make available to developing countries clean energy technologies. Some fear that LULUCF measures are a way for developed countries to escape their obligations and continue in their energy guzzling ways. In addition, they see many practical obstacles to the effective implementation of LULUCF projects. These include agreeing on how to account for various forest activities, setting verifiable emission baselines, dealing with uncertainties related to the measurement of forests and soils carbon, or preventing "carbon leakage" (the displacement of carbon emitting activities). Finally they argue that LULUCF activities cannot be a long-term solution because forests have a net absorbing effect on CO_2 only during their growth.

In this paper, we try to make a case for the inclusion of some forestry activities in the international arsenal of measures to reduce the atmospheric concentration of CO_2, provided several conditions are met. Deforestation is an important source of CO_2, but it is much more than that. Deforestation currently devastates tropical forests and is a major cause of biodiversity loss. Indigenous people are disproportionately affected by tropical deforestation. The clearing without their permission of forests on their territories causes the collapse of their traditional ways of life. It leads to impoverishment, and marginalization. There is thus an opportunity to promote sustainable forestry projects that would be good for the local population while contributing to two global public goods: biodiversity and climate.

This paper is organized as follows. In the next section, we summarize the latest scientific evidence on global warming. In Section 3, we investigate the links between deforestation and global warming; we then present evidence on the importance of tropical forests for biodiversity (Section 4). In Section 5, we consider some obstacles to the use of forests as viable CO_2 sinks and we review some forestry experiences. In Section 6, we highlight the essential role of indigenous people for sustainable forest management. Section 7 presents our conclusions.

II. Background on Global Warming

The increase of the atmospheric concentration of GHG since the industrial revolution is now a well-established scientific fact. The atmospheric concentration of carbon dioxide (CO_2) has gone up 31% since 1750 and CO_2 levels in the atmosphere are currently increasing at an annual rate of about 1.5 parts per million (PPM) from human activities (Houghton et al., 1996). The atmospheric concentration of other greenhouse gases such as methane (CH_4) or nitrous oxide (N_2O) is also on the rise. While all the impacts of rising GHG concentrations on the atmosphere are not yet fully understood, the International Panel on Climate Change (IPCC) estimates that one consequence has been an increase of $0.6 \pm 0.2°$ C in the average earth surface temperature during the 20^{th} century.[2] As a result, the freeze-free season in many mid- and high latitude regions has lengthened, and average sea levels have gone up between 0.1 and 0.2 meters. Moreover, there has been an increase in extreme weather events: heavy rainfall events as well as large-scale droughts have become more common, and warm episodes of the El Niño-Southern Oscillations have been more frequent, persistent and intense (IPCC 2001a).

Current models predict that, with current emission patterns, the Earth's average temperature will go up another 1.4° C to 5.8° C between 1990 and 2100. Global rainfall and its year-to-year variations are likely to increase; we can thus expect more intense rainstorms, more tropical cyclones, and more severe droughts. Glaciers and ice caps will continue their retreat, causing mean sea levels to rise another 9 to 88 centimeters (IPCC 2001a).

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[2] This is a 95% confidence interval for global average temperatures.

The process set in motion with the industrial revolution will not be reversed easily: even if emissions were maintained at today's level, CO_2 concentration in the atmosphere would stabilize only by the end of the 22nd century. The mean sea level and the average surface temperature would continue to rise for decades, although at a much slower pace.

Climate change is likely to have many consequences. First, many ecosystems will undergo "significant and irreversible damage," in the words of the IPCC. The most threatened include coral reefs, mangroves, and tropical forests, but polar ecosystems, boreal forests, glaciers, and alpine ecosystems, will not be spared. The rate of species extinction is expected to go up sharply, even if some current species may increase in abundance or range (IPCC 2001b).

Humans will also directly suffer from projected climate changes, but not uniformly. The benefits and costs of potential climate changes cannot be quantified with great accuracy given, for example, the difficulties in predicting climate variability or in valuing goods not traded in markets (such as biodiversity). Nevertheless, published studies predict net economic losses proportional to the magnitude of warming for many developing countries. In agriculture for example, a general reduction in potential crop yields is projected in most tropical and sub-tropical regions. Many populations in the sub-tropics could also face dwindling water supplies and increased exposure to diseases such as malaria or cholera. By contrast, some regions in mid-latitudes could benefit from slightly higher temperatures, although increases of more than a few degrees Celsius would reduce crop yields. In developed countries, a small increase in mean temperatures could produce a mixture of gains and losses but still higher temperatures would cause net economic losses. Depending on its magnitude, global warming may thus not be an economic "bad," contrary to popular beliefs.

In general, global warming is likely to affect disproportionately the poor, especially in developing countries. The poor have fewer resources and will be less able to adapt to projected hardships. In the most vulnerable countries, these hardships will be compounded by fast population growth, resource depletion, and political instability. The economic gap between developed and developing countries will thus widen if nothing is done. Policies designed to reduce vulnerability to climate stresses should also address these problems. They offer an opportunity to advance sustainability and equity at the same time, although this is by no means an easy task.

III. Deforestation and Global Warming

While the combustion of fossil fuels is the main source of current anthropogenic GHG emissions, tropical deforestation alone is responsible for 20 to 30% of the total (Kremen et al. 2000). The contribution of forest ecosystems to the global carbon cycle is often under appreciated: they store approximately 46% of the terrestrial carbon, although a large share of this percentage is in soils (IUCN 2000).

It is estimated that half of all tropical forests have already been lost (Myers 1991). Current rates of deforestation are imprecise and subject to interpretations. Indeed, deforestation data from many developing countries is still quite poor, but data for temperate and boreal forests from Canada and Russia (which account for 65% of all forests in developed countries) are also plagued with methodological inconsistencies (WRI 2001). According to recent estimates, natural forests in the tropics are being lost at the rate of approximately 16 million hectares per year. Deforestation rates have increased in tropical Africa, remained constant in Central America, and declined slightly in Asia and South America (WRI 2001).

Immediate causes of deforestation include agriculture, fuelwood collection, commercial logging, and to a lesser extent, large dams and mining operations. However, the underlying causes of deforestation are complex. While tropical timber is a valuable resource, massive deforestation stems from a combination of factors. These include the lack of adequate property rights, the external debt burden (which forces many developing countries to sell too many forest or mining concessions), poverty, and land policies that promote deforestation as an outlet for landless peasants while a few landowners control huge properties.

Population growth has long been seen as the main underlying force behind deforestation, but recent research by the World Wide Fund for Nature finds that commercial logging for international use is currently, directly or indirectly, the most important cause of forest loss and degradation (Dudley, Jeanrenaud, and Sullivan 1996). Indeed, heavy machinery used in industrial forestry causes severe damage by compacting soils. This prevents natural regeneration, which ultimately causes soil erosion. Moreover, landless farmers often follow logging roads to access forests and practice slash and burn agriculture. Commercial logging can also severely degrade biodiversity because it targets the largest trees, which are often located in old-growth forests. Illegal logging, which is widespread in many countries - until recently, 50% of the mahogany leaving Brazil was exported illegally (Dudley, Jeanrenaud, and Sullivan 1996) -, also has devastating impacts.

Deforestation, especially in tropical forests, is believed to affect regional as well as global climates (Andrews 2000). At the regional level, large-scale losses of tropical forests increase local earth surface temperature and evaporation, and reduce rainfall (approximately 50% of tropical moisture could be generated locally.) Global climatic effects from tropical deforestation are not understood as well yet, but the contribution of tropical deforestation to global CO_2 emissions is well established.[3] Forests, therefore, are much more than collections of trees.

IV. Forests and Biodiversity

Tropical forests house between 50 and 90 percent of all species on earth, which total approximately 10 million according to the best estimates (but only 1.4 million have actually been named). The rate of species extinction is difficult to calculate precisely but biologists estimate it to be between 100 and 1000 times greater today compared to pre-human levels (Pimm et al., 1995). Losses are most severe in tropical forests where 14,000 to 40,000 species disappear yearly (Kremen et al. 2000).

Tropical forests, along with coral reefs and deep ocean floor sediments, have the greatest variety of organisms of all ecosystems (UNEP, 1995). They provide the gene pool that can protect commercial plant strains against pests; they are thus essential to agriculture. They are also the source of many pharmaceutical drugs and widely used chemicals, not to mention an important source of timber. In addition, tropical forests offer essential ecological services to which it is typically very difficult to assign a dollar value. Apart from carbon sequestration, habitats for biodiversity, and climate regulation, these local or global public goods include watershed protection, water purification, and soil production.

V. Mitigating Climate Change through Forest Management

A number of methodological problems need to be addressed before LULUCF activities become widely accepted, either in the context of the Kyoto Protocol or as part of a post-Kyoto treaty.

First, there needs to be an agreement on the meaning of "forest," "deforestation," "reforestation," and "afforestation." For example, forests are usually defined based on canopy cover, but alternatives could refer to land use, biomass density, legal, administrative, or cultural considerations. A second hurdle is the need to distinguish between natural and human-induced activities. A related problem is to choose between an activity-based (e.g., fertilization, or the selection of a tillage method in the context of land-use) and a land-based carbon accounting system. Monitoring costs are also an important consideration.

The determination of a baseline is also critical to measure the carbon sequestration contribution of a project. Do the carbon credits claimed really correspond to the carbon sequestered over and above a "business as

[3] For a recent study of the interaction between deforestation and global climate change, see Zhang, Henderson-Sellers, and McGuffie 2001.

usual" policy (project additionality)? Indeed, there could be "leakage" and some gains obtained at the project level could be lost through activity displacement. Setting baselines has so far remained a scientific challenge. In addition, there is the danger that biologically rich natural forests will be replaced with biologically poor forest plantations of tree species. This would result in a dramatic loss of essential ecological functions provided by natural forests. This rightly concerns many environmentalists.

Finally, there are substantial uncertainties regarding the measurement of carbon stocks, sequestration activities, and their costs. While developed countries have the technical capacity to measure carbon stocks and net GHG emissions, these measurements are not done on a regular basis, particularly in soils.

To assess the potential cost effectiveness of forestry projects for carbon sequestration, it is useful to review the experience accumulated to date with projects undertaken as part of the "Activities Implemented Jointly" (AIJ) program.[4] At the end of April 2001, only 14 out of the 145 AIJ projects are forestry-based: 8 projects deal with forest preservation, 5 with reforestation, and 1 focuses on afforestation. The US funds all but two of these projects; the Netherlands (through the Face Foundation) and Norway fund the other two. Globally, 10 projects are located in Latin America, 3 in Europe, and 1 in Asia (Indonesia). Africa has no AIJ forestry project.[5]

A quick analysis shows that AIJ forestry projects are bigger and usually more cost effective than other AIJ projects. Indeed, they make up only 10% of all AIJ projects but account for approximately 40% of all GHG reductions. Schwarze (2000) calculates the gross average reduction cost by activity type. He finds \$2.6 per ton of CO_2 for LULUCF projects. This compares very favorably with projects based on efficient energy (\$3.2 / ton of CO_2), renewable energy (\$14.0 / ton of CO_2), and fuel substitution (\$15.4 / ton of CO_2), although these numbers do not take into account fuel savings.[6] Fugitive gas capture is, however, the cheapest option with a cost of only \$0.1 / ton of CO_2.[7]

How do AIJ projects deal with baseline and verification issues? According to Schwarze (2000), 95% of all AIJ projects have a fixed baseline (set at the start of the project). In two thirds of them, the baseline is also static: the status quo is extrapolated over the lifetime of the project and current trends in technology, policy, or economic conditions are ignored. In addition, indirect effects such as leakage from shifting deforestation are excluded in almost all AIJ projects. Fortunately, 70% of all projects undergo relatively expensive external verifications, following pressure from countries like the US or Costa Rica.

Detailed information on AIJ projects is still lacking. For example, we do not know how issues related to the long-term management of project areas or the preservation of biodiversity have been addressed. Baseline choices suggest that expected benefits have been overestimated, but the cost data reported above indicate that even if stricter requirements drive up their costs,

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[4] AIJ was established by the first Conference of the Parties (COP1) in Berlin (1995) to gather experience on the transfer of technology and know-how that could reduce global warming. Under this program, sequestration or GHG reduction projects are carried out jointly between an investor from a developed country and a host in a developing country or an economy in transition. In 1998, the AIJ pilot phase was extended beyond 1999. Source: UNFCCC web site as of April 30, 2001 (http://maindb.unfccc.int:8080/aij/).

[5] Most AIJ projects are intra-European, intra-Asian, and intra-American; they follow institutional links of development cooperation. Investor country preferences have a big impact on the type of project undertaken: U.S. projects are usually large in cost and effects, not very focused on technology, privately funded, and located in South America. By contrast, European projects are usually small, related to energy efficiency or fuel substitution, publicly funded, and located in Eastern Europe. For a global analysis of AIJ projects, see Schwarze (2000).

[6] In a detailed case study in Madagascar, Kremen et al. (2000) find similar costs for forest conservation (between \$0.23 and \$4.34 per ton of CO_2).

[7] Calculations of net project costs are impossible because of incomplete and inconsistent data in official project reports (Schwarze 2000).

forestry projects may still be competitive.

Many poor countries in Africa and Asia with biologically rich tropical forests have been left out of AIJ. This is problematic if the fight against global warming is to contribute to poverty alleviation, sustainability and to the preservation of forest biodiversity. This situation may be partly explainable by chronic political instability, the lack of secure land rights, and legacies from colonial times. When some minimum requirements can be met, however, experience with projects such as those managed by the FACE foundation (see box) proves the feasibility of successful carbon-sequestration forestry projects that promote sustainability and the well-being of local populations. A necessary condition for long-term success is the active involvement of local stakeholders, especially indigenous people, both at the design and execution level of a project (IPCC 2000). Unfortunately, this has more often than not been the exception in practice.

VI. Indigenous People and Sustainable Forest Management

Indigenous people have long been living in most tropical forests and mangroves (but also in many temperate and boreal forests). From either a legal or an ethical point of view, they should thus have the right to at least use these areas. However, development or forest management projects as well as conventional forestry practices have typically denied indigenous people their land rights, destroyed their customary tenure system, and ignored their knowledge. This has had severe consequences for biodiversity, forest preservation, and global warming.

Ever since the colonial era, logging, especially industrial timber extraction, has caused major problems for indigenous peoples. They have sometimes welcomed logging operations with the promise of jobs, roads, clinics, or schools. Commonly, however, if they are at all provided, such services fall into disrepair when the industry moves on. Moreover, indigenous people are usually employed in dangerous, low-paid occupations, with no concerns for health and safety (Colchester 2000). Industrial-scale tree plantations or even the establishment of forest reserves on indigenous peoples' lands have not proven better for them.

Industrial forestry practices often modify adversely the hydrological cycle. Effluents from plantations and processing works pollute water supplies. This reduces the availability of water for drinking and bathing, and limits fishing opportunities. Changes in disease ecology are often accompanied with rising incidences of malaria, dengue fever, or typhus.

The loss of forest territories usually causes the breakdown of traditional resource management systems. It leads to impoverishment and political marginalization. The destruction of social networks causes cultural and social collapse. Many indigenous people end up migrating to slums in mushrooming urban areas.

About 1 billion people are dependent on forest products for their livelihoods and as many as two billion people continue to rely indirectly on forests to satisfy their fuelwood needs. Consequently, forestry projects motivated by the fight against global warming should not be only about carbon sequestration. As recommended in the UNFCCC, they should be designed around the goals of poverty alleviation and sustainability in close association with indigenous people. They should abide by the terms of the Charter prepared before the 1992 Rio Summit by the International Alliance of Indigenous and Tribal Peoples of the Tropical Forests.[8]

VII. Conclusions and Policy Recommendations

A review of experiences accumulated to date shows that some forestry-based projects could be economically attractive for mitigating the build-up of CO_2 in the atmosphere.

[8] Charter principles include: 1) the right to the ownership and use of their territory; 2) the need to obtain the prior, free and informed consent of indigenous people for projects on their territories; 3) the institution of mechanisms to ensure benefit sharing, shared management, and community-involvement in monitoring and evaluation.

Although forestry projects would clearly not solve the global warming problem by themselves, reducing tropical deforestation or growing new forests could also buy time for developing cheaper renewable energy technologies. However, some methodological problems must first be addressed and a number of pitfalls must be avoided.

First, to implement a credible and equitable GHG accounting system, baselines should take into account known trends in technology, economic conditions, and policy. Indirect effects such as leakage from shifting deforestation should also be accounted for, whenever possible. External verifications of benefits by recognized, independent third parties are essential.

Reforestation or afforestation may be economically attractive, but promoting the conservation of tropical forests is better because of all the external benefits they provide. Given the importance of tropical forests for local people, forest conservation projects should meet UNFCCC guidelines and contribute to poverty alleviation. A preliminary step is to establish enforceable property rights that take into account the historical rights of indigenous people.

It is of course essential that developing countries be compensated for the opportunity cost to them of forgoing income from logging and agriculture in order to provide the rest of the world with global public goods (e.g., biodiversity and climate). Compensation revenues could help fund painful structural measures, including land reform and redistributional policies.

To track progress, green satellite accounts to supplement national accounting systems should be implemented (see Bartelmus 1996). Their development in developing countries will require substantial capacity building as well as technical and financial assistance. With green accounts, biodiversity and sustainability could begin to be monitored.

Tropical forestry projects give us an opportunity to mitigate global warming while preserving biodiversity and reducing poverty. They should be seriously considered.

References

Andrews, S. 2000. "The Effect of Tropical Deforestation on Climate Change." http://www.geog.ucl.ac.uk/~sandrews/gcm_essay.html.

Bartelmus, P. 1996. "Green Accounting for Sustainable Development," Peter May and Ronaldo da Motta, eds. *Pricing the planet: Economic analysis for sustainable development*. New York: Columbia University Press, p. 180-96.

Colchester, M. 2000. "Indigenous Peoples and the new 'Global Vision' on Forests: Implications and Prospects," http://greatrestoration.rockefeller.edu/21Jan2000/Colchester.htm.

Dudley N., J.-P. Jeanrenaud, and F. Sullivan, 1996. *Bad Harvest: The Timber Trade and the Degradation of Global Forests*, report to the WWF. Earthscan Publications Ltd.

Houghton, R. A. 2001. "Counting Terrestrial Sources and Sinks of Carbon," *Climatic Change* 48: 525-534.

IPCC, 2000. "Summary for Policymakers: Land Use, Land-Use Change, and Forestry." Summary approved at IPCC Plenary XVI, Montreal, Canada, 1-8 May.

IPCC, 2001a. "Summary for Policymakers – A Report of Working Group 1 on the Intergovernmental Panel on Climate Change," http://www.ipcc.ch/index.html.

IPCC, 2001b. "Summary for Policymakers – Climate Change 2001: Impacts, Adaptation, and Vulnerability," http://www.ipcc.ch/index.html.

IUCN, 2000. "Carbon Sequestration, Biodiversity, and Sustainable Livelihoods," November.Http://www.iucn.org/themes/climate.

Kremen C., J. O. Niles, M. G. Dalton, G. C. Daily, P. R. Ehrlich, J. P. Fay, D. Grewal, and R. P. Guillery, 2000. "Economic Incentives for Rainforest Conservation Across Scales," *Science* 288 (June 9): 1828-1832.

Myers, N. 1991. *Deforestation Rates in Tropical Forests and their Climatic Implications*. Friends of the Earth, London, UK.

Pimm, S. L., G. J. Russell, J. L. Gittleman et T. M. Brooks, 1995. "The Future of Biodiversity," *Science* 269: 347-350.

Schwarze, R., 2000. "Activities Implemented Jointly: Another Look at the Facts," *Ecological Economics* 32: 255-267.

Schneider, S. H. 1998. "Kyoto Protocol: The Unfinished Agenda – An Editorial Essay," *Climatic Change* 39: 1-21.
UNEP, 1995. *Global Biodiversity Assessment.* Nairobi, Kenya.
World Resources Institute, 2001. "WRI study reports deforestation may be higher than FAOestimates," News Releases, March 12 http://www/wri.org/press/fao_fra5.html
Zhang, H., A. Henderson-Sellers, & K.McGuffie,2001. "The Compounding Effects of Tropical Deforestation and Greenhouse Warming on Climate," *Climatic Change* 49(3): 309-338.

The FACE Foundation

The FACE Foundation is a non-profit organization, created in 1990 in the Netherlands. Its goal is to sequester CO_2 by planting, restoring and conserving forest. CO_2 sequestration is certified and monitored by an international accredited certification agency.

Through its forestry projects, FACE and Triodos Bank (a European bank, which has set up a Climate Clearing House to facilitate transactions in certified, sequestered CO_2), give firms and households a way to compensate for their yearly emissions of CO_2. They can enter into a one-year contract with Triodos Bank and get credit for an agreed-upon amount of CO_2 sequestered in one of FACE's projects. FACE owns only the forest's CO_2 absorbing capacity while an independent party owns the land and the trees. The money goes to fund other FACE afforestation projects to sequester more CO_2.

All FACE projects are recognized jointly by the Dutch government and the government of the host country. FACE adheres to the UNFCCC guidelines, which means that: 1) Afforestation activities must result in the plantation of additional forests. This establishes the link between the sale of CO_2 credits and actual CO_2 sequestration. 2) Host countries must have sufficient physical and financial capacity, the technical expertise to plant and manage large-scale forests, long-term land rights, and adequate forestry legislation. 3) Each project must satisfy stringent ecological (use indigenous species and abstain from chemical treatment) and economic (cost-effectiveness) criteria, have broad social acceptance and contribute to the socioeconomic well being of the local population. 4) To minimize profit-seeking destruction of old growth forests, the area to be afforested may not have been deforested after 1989, or, in the case of damaged forest, such damage may not have occurred after 1989.

FACE does not a-priori discard any country when searching for suitable project locations. However, tropical areas are preferred because of faster tree growth and thus faster CO_2 sequestration. Tropical areas also need reforestation and assistance the most. Hence, FACE has projects across Africa (Uganda), Asia, Latin America (Ecuador), but some projects have also been undertaken in Poland, the Czech Republic, and in the Netherlands.

For more information, see http://www.facefoundation.nl/Eng/introFaceE.html.