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Reducing Emissions from Deforestation and forest Degradation (REDD): which role for REDD in future climate regimes?

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ABSTRACT

Deforestation and forest degradation are responsible for approximately 17% of global greenhouse gas (GHG) emissions. The Kyoto Protocol currently excludes avoided deforestation in developing countries as an option to stabilize Greenhouse Gas (GHG) emissions, but a decision on the inclusion of Reducing Emissions from Deforestation and forest Degradation (REDD) is expected to be a key part of the overall negotiation for a future climate policy framework at the 15th COP, Copenhagen, 2009. Allowing REDD credits to be used for compliance in cap-and-trade programs not only has the potential to reduce the costs of compliance, but it could also create a strong incentive for the protection of tropical forests that would transform the dynamics for forest protection world-wide and encourage large emissions reductions in the forested developing world. Various concerns however still exist, including the concern that REDD would serve to 'offset' rather than supplement actions in industrialized countries and critical economic sectors, and that the risk of low-cost mitigation opportunities through REDD could 'flood' the market, reducing incentives for technological innovation. However recent research suggests that various options exist for containing this risk within a well-designed carbon market, which could provide significant immediate benefits in terms of climate change mitigation and forests preservation, globally.

Policy Challenge

What are the benefits of integrating Reductions in Emissions from Deforestation and Forest Degradation (REDD) into a more comprehensive future climate policy regime? When, how, and to what extent should REDD be integrated? Should REDD be directly included in a global carbon market system and/or financed through alternative sources, such as global or regional funding mechanisms?

Carbon emissions from deforestation

Recent estimates suggest that the destruction of tropical forests and peat lands contributes to approximately 17% of global greenhouse gas (GHG) emissions (IPCC, 2007). Humid tropical forests are disappearing at an average rate of almost 2.5 percent per year, largely due to the conversion of forests to agricultural land in South America and Asia (Hansen et al. 2008). If the trees are burned on site, deforestation results in the immediate release of the carbon originally stored (mainly as CO2 with small amounts of CO and CH4), and a slower release of emissions from the decay of organic matter. At current rates, without the implementation of effective policies to slow down deforestation, the clearing of tropical forests is estimated to generate climate damages of over $1 trillion per year by 2100 (Eliash Review 2008). Despite uncertainty surrounding the numbers, reducing and/or preventing deforestation has the potential to provide large global emissions reduction in the short term (Nabuurs et al., 2007). In addition, properly-designed mitigation activities related to land use, land-use changes and forestry can bring important multiple benefits not only in terms of climate change, but also in terms of biodiversity conservation, rural development and poverty reduction, particularly in developing countries.

What progress on REDD in climate policy negotiations?

During the past years, debates over approaches for Reducing Emissions from Deforestation and Forest Degradation (REDD) have risen to the forefront of negotiations on global climate change policy.

The Kyoto Protocol currently excludes avoided deforestation as an option to stabilize GHG emissions, because, at the time of its ratification, many environmental NGOs and European negotiators felt that the Annex I Kyoto commitments would be weakened by the unforeseeable quantities of allowances produced under a REDD scheme. Nonetheless, since Kyoto, steps have been taken to include the conservation of tropical forests in international agreements for mitigating climate change. The Conference of the Parties (COP) 13 meeting in Bali in December 2007 officially recognized avoided deforestation as a necessary mechanism for a global climate policy agreement, and launched a series of technical meetings and negotiating sessions aimed at a reaching agreement on a post-Kyoto treaty within two years. At the COP 14 in Poznan, Poland, in December 2008, Brazil announced a voluntary target to reduce its deforestation by 70% over 2006-2017 relative to the average deforestation levels over the previous 10 years and is seeking international contributions to help achieve this objective. REDD is positioned to be a key part of the overall negotiation for a future climate policy framework at the 15th COP, in Copenhagen, 2009.

Concerns against and in favour of REDD

Several arguments have been brought up against and in favour of the integration of REDD in future climate agreements.

Some of the concerns with REDD focus on the challenges to implementing REDD in a manner that assures the desired environmental and social outcomes. Concerns include: the possibility that REDD programs could be implemented in a manner that fails to benefit indigenous and other local communities, the potential for emissions "displacement" or "leakage", i.e. the possibility that reductions in deforestation could simply result in increases in emissions elsewhere, potentially due to differences in the adoption of emission reduction targets across countries; the challenges in the measurement and monitoring of changes in deforestation rates; the need to carefully evaluate property rights on forests and land use for the allocation of credits; and the definition of deforestation baselines. Setting the baseline for crediting deforestation reductions can also be challenging since individual countries may have strong incentives to overstate their baseline deforestation rates in order to gain a greater number of emission reduction credits to sell. On the other hand, basing projections on past

trends could provide few incentives for forest-rich countries that have not forested in the past but might face pressures to deforest in the future. Another concern is that REDD would serve to 'offset' rather than supplement emissions reductions in industrialized countries and critical economic sectors. Another concern relates to the financing of REDD through credits that are "fungible" (freely exchangeable) in a carbon market along with credits from mitigating GHG emissions in other sectors. The availability of low-cost mitigation through REDD could risk 'flooding' the market and detract from incentives to make necessary emissions reductions in industrialized countries as well as in the energy sector. This could also reduce long-term incentives for developing and deploying clean energy sources and industrial processes that are needed to 'decarbonize' the global economy. For example, Tavoni et al. (2007) estimated that REDD and other global forestry activities would delay deployment of some technologies and reduce investment in energy research and development by about 10% for a fixed emissions target.

Several arguments on the other hand exist in favour of REDD.

The availability of REDD could enable political agreement on more stringent global emissions targets, mainly due to the relatively lower costs of reducing deforestation compared to abatement costs in other sectors.

Tavoni et al. (2007) estimate that including global forestry in a global carbon market enables an atmospheric target of 550 CO2equivalent ppmv [1] for the same total cost as a 600 ppmv target without forestry mitigation. Emissions reductions from global forestry save about $2 trillion, which could finance an estimated additional 0.25C° less of warming by the end of the century at no added cost, compared to energy-sector only reductions. The impact of REDD on the carbon price and technological innovation will depend on the potential costs of REDD, as well as the overall emissions target and policy design. A strong argument in favour of allowing REDD credits to be used for compliance in cap-and-trade programs is that in addition to reducing the costs of compliance, REDD would also create a strong incentive for the protection of tropical forests, transforming the dynamics for forest protection world-wide and encouraging large emissions reductions in the forested developing world. In this way, REDD could leverage participation in GHGs reduction efforts from both developed and developing countries so as to achieve deeper total reductions in GHGs as well as other environmental and social benefits.

New findings on the economic and environmental impacts of REDD in a global carbon market

V. Bosetti and R. Lubowski [2] provide some additional preliminary results on the costs and environmental effectiveness of integrating REDD into a global carbon market, produced using an extended version of the WITCH model.

WITCH (Bosetti, Carraro et al., 2006- www.feem-web.it/witch) is a climate-energy-economy-climate model designed to assist in the study of the socio-economic dimension of climate change. It is structured to provide information on the optimal responses of world economies to climate damages and to identify impacts of climate policy on global and regional economic systems. WITCH is a hybrid model because it combines features of both top-down and bottom-up modeling: the top-down component consists of an inter-temporal optimal growth model in which the energy input of the aggregate production function has been expanded to yield a bottom-up description of the energy sector. The model provides a fully inter-temporal allocation of investments in energy technologies and R&D that are used to evaluate optimal and second best economic and technological responses to different policy measures. Countries are grouped in 12 regions that cover the world and whose strategic interactions are modeled through a dynamic game. The game theory set-up accounts for interdependencies and spillovers across regions of the world, and equilibrium strategies reflect inefficiencies induced by global strategic interactions. This allows analyses of both fully cooperative and partial/regional coalitional equilibria. In WITCH, technological progress in the energy sector is endogenous, thus enabling an accounting for the effects of different stabilization policies on induced technical change, via both innovation and diffusion processes. Feedbacks from economic variables into climatic ones, and vice versa, are also accounted for in the model dynamic system. A stochastic programming version of the model for uncertainty analysis is available.

[1] Parts per million by volume

[2] V. Bosetti and R. Lubowski, Global Carbon Market and REDD, international workshop on REDD, FEEM, Milan, 18th of November 2008

Given uncertainties over the costs of REDD and over which countries would eventually be both willing and able to effectively participate in a global REDD program, the WITCH model is integrated with three alternative sets of estimated supply curves for reducing tropical forest emissions.

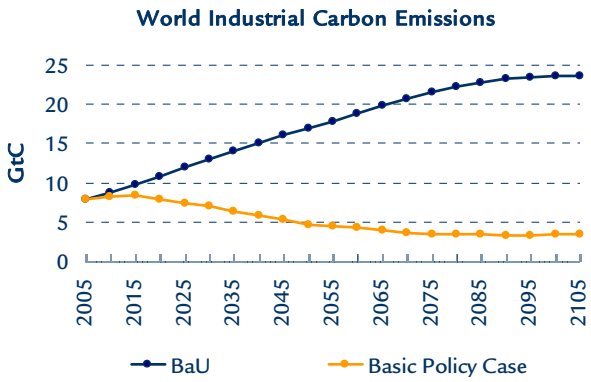
One set of supply curves comprise estimates of the opportunity costs of reducing deforestation emissions in the Brazilian Amazon based on data from the Woods Hole Research Center (Nepstad et al. 2007). While Brazil is only one out of many potential participating countries in a global REDD program, Brazil accounts for up to one half of global deforestation in the humid tropics (Hansen et al. 2008) and is the country with the most developed current infrastructure for monitoring and implementing REDD. Thus, Brazil-only REDD is a plausible scenario for near-term REDD potential. Two other datasets involve estimates of the global potential for reducing deforestation emissions, assuming that all tropical forest nations immediately joined a carbon trading system and had the capacity to implement REDD programs. These data are based on two of the leading economic models of global forests and land use.[3]

V.Bosetti and R. Lubowski assume a basic policy scenario, based on a set of hypotheses whereby Annex 1 countries (those with emissions reduction targets under the Kyoto protocol) begin reducing emissions in 2010, reducing 30% below 1990 levels by 2020 and 60% below 1990 levels by 2050, whereas developing countries continue along their "business as usual" (BAU) emissions path until 2020, and since then start reducing gradually (except for Africa, which continues along its BAU emissions path).

By the end of the century, this policy scenario results in a radiative forcing around 3.5 W/m2 and stabilizes atmospheric concentrations of GHG at around 550 ppmv of CO2 equivalent: a stabilization target that is consistent with avoiding average global warming greater than 2.5 C° above pre-industrial levels. V.Bosetti and R. Lubowski measure the effects of the integration of REDD into the global carbon market against this basic policy scenario.

[3] Results from the Global Timber Model (GTM), prepared for the Energy Model Forum 21 (Sohngen and Sedjo, 2006), and results from the IIASA cluster model prepared for the U.K. Office of Climate Change as part of the recent Eliasch Review (2008)

Figure 1. World Industrial Carbon Emissions

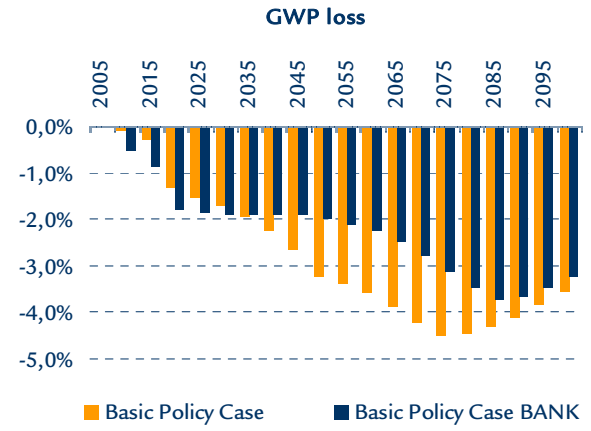


SOURCE: V. Bosetti and R. Lubowski (2008)

In the model the global market is limited until 2020 such that A1 countries can buy on carbon market only up to 10% of allocated emissions from developing countries. The study considers cases of the basic policy scenario with and without availability of REDD as a mitigation option, as well as with and without the possibility of emissions 'banking' (the flexibility to overcomply with targets in early years and save the excess emissions reductions to meet commitments in later periods).

The basic policy scenario leads to Global World Product (GWP) losses of 2.5% (2.1% with banking) at a 3% discount rate and 1.8% (1.6% with banking) at a 5% discount rate.

Figure 2. Global losses in the basic policy scenario

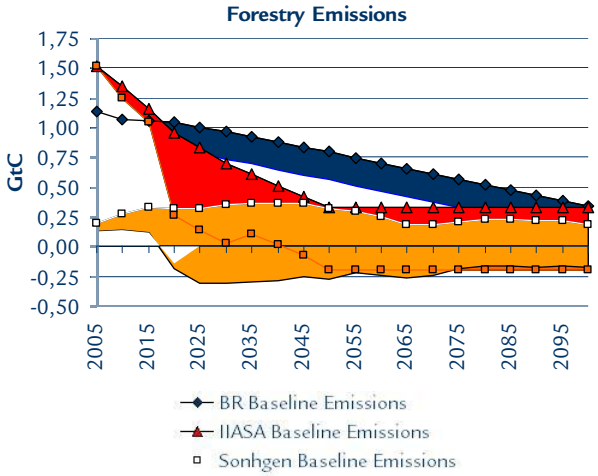


SOURCE: V. Bosetti and R. Lubowski (2008)

REDD can decrease the costs of meeting a global climate target, though the impact varies with the estimates for REDD potentials and costs and the possibility of banking. In the no-banking case, REDD reduces the costs of a 550 CO2

equivalent stabilization policy by 10 to 25%. Alternatively, REDD from all tropical forest nations could provide, for the same policy costs, a more stringent climate target of about 500 ppmv CO2 equivalent.
According to the study, the effect of linking REDD to a global carbon market is to significantly reduce global forestry emissions (with a reduction ranging from 28% in the Brazil-only case, to 88%, IIASA, and 89%, Songhen by the middle of the century).
The effect on prices is very small up to 2020, due to the limited trade scenario: this implies that such restrictions are one possible measure to contain the risk of "market flooding". Other results of the study suggest that banking increases REDD and technology R&D in the short term, up to 2020. The availability of REDD has only a modest effect on reducing innovation incentives up to 2020.

Figure 3. Reduction in net global forestry emissions



SOURCE: V. Bosetti and R. Lubowski (2008)

A comparison with other international studies: the Eliash review

The findings of the study by Bosetti and Lubowski are in line with the main results from the Eliash Review, presented in October 2008 by the Office of Climate Change, UK. The Review stresses the need to include the forest sector in the global carbon markets, with the twofold aim of mitigating global emissions at lower costs, and ensuring sustainable forest management to meet future wood demand requirements while preserving global forests.

Including REDD in a well-designed carbon trading system, supported by parallel actions on sustainable forests' management, could provide the financing and incentives to reduce deforestation rates by up to 75 per cent in 2030. Adding afforestation, reforestation and restoration could make the forest sector carbon neutral.
With regard to costs, the Review shows that the inclusion of the forest sector in the trading system could reduce the cost of halving global carbon emissions from 1990 levels by up to 50% in 2030 and by up to 40% in 2050. In line with the results by Bosetti and Lubowski, the Eliash Review also suggests that these lower costs would allow the international community to meet a more ambitious global emissions target.
This global market design including REDD will take some time to develop, and will require considerable funding; in its initial phase the Review recommends that forestry abatement should be supported through a combination of financing from carbon markets and other sources from the public and private sectors.

Other sources to finance REDD?

Several pilot projects and partnerships have already been designed and implemented to help developing countries to get ready and raise funds for a future REDD agreement. The World Bank Forest Carbon Partnership Facility (FCPF) is one example in this direction, aiming to develop capacity building (drawing reference scenarios and defining national strategies and monitoring systems for REDD), and to catalyse financial flows also from the private sector in the participating developing countries. The Partnership comprises two mechanisms: one readiness fund, aimed to capacity building, operational from 2008 to 2012, and a carbon fund, aimed to provide payments for REDD from 2009 onwards. The readiness process and its extended implementation should prepare future carbon markets, and act as a catalyst for investments from the private sector, as well as, among others, from ODA, GEF, IBRD. Other similar funds include the UN-REDD and the Global Forest Carbon (GFCM), two financial mechanism to reward emissions from REDD under the UN. On December 17, 2008 the EU Parliament reached agreement on a new Climate and Energy Package setting the rules for the third phase of its Emissions Trading Scheme (ETS) from 2013 to 2020. While opening the EU to REDD credits was considered, the EU voted to

keep its market closed to international forest carbon credits, though Member States must allocate 50% of revenues from allowance auctions to a fixed set of priorities, including REDD and adaptation. The EU proposal foresees a potential recognition of REDD and other forestry credits for compliance in the EU ETS only in the longer term (i.e. after 2020), though this is explicitly open to reconsideration in the event of agreement on a future global climate policy treaty.

What policy lessons from recent economic studies on REDD?

Recent research on the integration of REDD in the carbon market suggests that REDD has the potential to considerably reduce global mitigation costs, as well as global forestry emissions, while helping to preserve the world's forests. Current trends in global emissions and deforestation call for urgent action and research findings suggest that a well-designed carbon market could ensure significant financing for REDD, with limited disincentives for technological progress in the energy sector. A 'readiness' phase for REDD, through the funding mechanisms already in place, could provide an important foundation for the creation of a global REDD program. Even with limitations on early REDD trade, the availability of banking along with robust long-term emissions reductions targets including a graduated participation to a global carbon market by developing countries, could provide for immediate real benefits in terms of climate change mitigation and forests preservation, globally.

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This Policy Brief builds upon the work by V. Bosetti and R. Lubowski, Global Carbon Market and REDD, and other research papers presented at the *FEEM-EDF International Workshop on "Reducing Emissions from Deforestation and forest Degradation"*, November 18, 2008, FEEM - Milan, Italy