REDD and Clean Technologies Innovations, is there a Trade-off

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A key policy question when discussing REDD is how to balance low-cost forestry emission reductions, available in the near term, with investments to drive technological innovation in energy, industry, and other sectors over the longer period. In this article we report a research effort showing that the link of REDD to an international carbon market is, as expected, economically efficient. In addition, provided that the climate policy is stringent (we explore here a 535 ppmv CO^2 e concentration target), the cost savings due to REDD should entail only a modest tradeoff in terms of reduced clean energy innovation. Reduced clean energy innovation could in principle handicap future efforts to reduce global emissions. However, this analysis suggests that the availability of REDD, in particular when combined with the possibility of banking emission allowances, could provide a head start on climate mitigation that is an aggregate hedge against uncertain future costs. Integrating REDD into global carbon markets could thus lower policy costs and facilitate more ambitious climate policies now and in the future

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While there is broad agreement that global strategies to combat climate change should include policies to reduce emissions from tropical deforestation, the linkage of international forestry and other land sectors to the carbon markets remains a critical policy issue. Policies for Reducing Emissions from tropical Deforestation and forest Degradation (REDD) offer the opportunity to mitigate a major share of global GHG emissions at low estimated costs based on existing technologies (Stern 2008). Investments in REDD are also a potentially attractive "wooden bridge" for reducing near-term emissions while buying time to reengineer other sectors of the economy (Chomitz 2006). The policy debate has been increasingly focusing on a specific issue: how to balance low-cost emission reductions from tropical forest conservation with innovation investments that are needed to drive down future mitigation costs. The research reported in this article has used a global climate-energy-economy model to investigate the implications of linking REDD credits to a global carbon market, with a focus on the consequences for technology innovation in the energy sector.

So far, the Kyoto Protocol excluded mechanisms to reduce tropical deforestation. However, there is growing consensus on including REDD as a critical element of a

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future global climate policy regime. The Copenhagen Accord of December 2009 calls for immediately establishing a mechanism to finance REDD and other forestry sequestration activities in developing countries (UNFCCC 2009). The Accord specifically calls for exploring both public and private market-based financing approaches, but the details remain to be determined and no major steps forward on this have been made during the Cancun COP in 2010. Governments and other organizations have put forth multiple proposals for financing REDD activities, including market-based approaches with different degrees of fungibility between forest carbon credits and GHG reductions in other countries and sectors.[1] Policymakers in the United States are also considering multiple means of financing international forest carbon activities within emerging regional compliance markets for GHG reductions as well as in recent legislative proposals for a cap-and-trade system at the Federal level.[2]

Measured at a national scale against a reference level[3], reduction of tropical forest emissions would generate credits that could be sold and traded in a carbon market for GHG. Trade of permits would allow abatement to take place where it is cheapest, lowering the costs of climate policies and generating significant financing for REDD over the near term. This would obviously produce additional ancillary benefits as biodiversity and ecosystem services preservation would derive as side benefits of the carbon market driven forest preservation.

Although seemingly a win-win solution, there exists several thorny issues associated with the linking of REDD to a carbon market, ranging from social to environmental concerns. One set of concerns, that we explicitly investigate in the research reported here, is that linking international forest carbon credits to GHG compliance markets could lower near-term costs at the expense of reductions in developed countries' mitigation efforts and associated incentives to develop critical low-carbon technologies.

Concerns over the potential of REDD credits to "flood" compliance markets and dampen clean technology innovation have been largely voiced with regard to the scale of potential forest carbon credits related to the size of the European Union's existing Emissions Trading Scheme (ETS) market. For example, the European Commission cited a potential "imbalance" between the supply and demand for REDD credits as one of the reasons for its recommendation to defer the inclusion of REDD from the EU ETS at the end of last year (EC 2008).

In previous research Tavoni et al, 2007, pointed out that in the case of a mild climate policy, REDD could reduce our ability to face the downward revision of climate targets that could follow the discovery of new information. The reason for this would in fact be the lower incentive to innovation that would derive from the presence of forestry emissions in the market. On the other hand, researchers have argued that relatively modest investments to preserve tropical forests could also generate additional near-term emissions reductions that could help preserve flexibility for achieving more ambitious emissions reductions that may be needed in the future.

In the research reported here we analyze the effects of linking REDD to a global carbon market when the climate target is stringent, i.e., in line with the 2 °C target agreed upon by most of the world economies. The analysis is performed through a dynamic integrated assessment framework (based on Bosetti et al., 2006), which explicitly models induced technological change in the energy sector. We incorporate expected patterns of global participation as well as institutional features considered likely, such as limits on initial international trading and potential for permit banking, and also use a range of scenarios for costs and potentials of REDD. The first set of supply curves comprises the estimated compensation needed to cover 30 years of opportunity costs of reducing deforestation emissions in

the Brazilian Amazon based on modeling from the Woods Hole Research Center (WHRC; Nepstad et al. 2007). We also consider two sets of estimates covering a global scale, based on a scenario in which all tropical forest nations immediately join a carbon trading system and have the institutional and governance capacity to fully implement deforestation-reduction programs. The first is based on results from the Global Timber Model (GTM) prepared for the Energy Model Forum 21 at Stanford University (Sohngen and Sedjo, 2006). The second is based on a estimates produced with a model developed at the International Institute for Applied Systems Analysis (Gusti et al. 2008) and prepared for the U.K. Office of Climate Change as part of the Eliasch Review (2008).

Our research confirms that integrating REDD into global carbon markets can provide significant incentives for reducing deforestation while lowering the costs of global climate change protection. We find that the cost savings from REDD have only modest tradeoffs in terms of reduced clean energy innovation. Investments in cleaner energy technologies over the next four decades are reduced by a maximum of 10% in the case of energy-intensity R&D investments. Figure 1 shows changes in cumulative investments in carbon-free technologies. It clearly shows how the presence of a stringent climate policy is such that the REDD plays only a modest role in lowering clean-technology deployment.

Moreover, while reduced clean energy innovation could in principle hinder future efforts to reduce emissions, our estimates suggest a positive net effect of REDD on the ability to adopt more stringent policies by the middle of the century. In particular, synergies between REDD and the possibility of banking provide a head start on climate mitigation that lower the costs of more ambitious targets that may be needed in the future.

The reported research concludes that concerns over REDD discouraging technological innovation are largely misplaced, as long as the climate policy is stringent (i.e., roughly in line with a 2 °C). Reducing the costs of climate change protection by steering efforts into the lowest marginal cost options for mitigation is precisely the economic rationale for an emissions trading system, providing a net gain for society as whole as long as the right long-term emissions reduction targets are in place. Furthermore, the interaction of REDD and banking helps cushion the risk of unanticipated higher costs when there is less than perfect anticipation of increases in future emission-reduction targets. Of course, if there is a concern that forest carbon credits will be too plentiful, policy makers al-

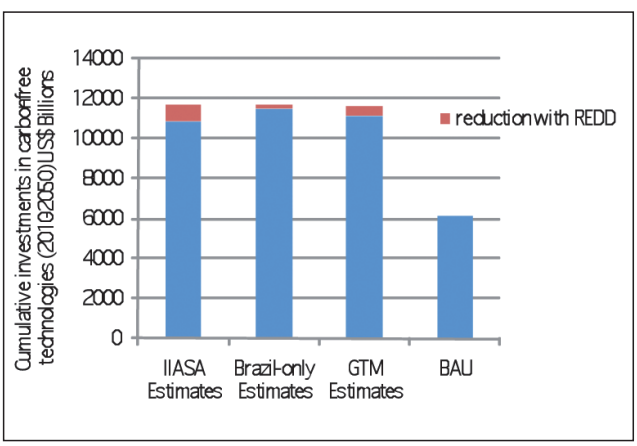

FIGURE 1 Impact of REDD on cumulative investments in carbon-free technologies (wind plus solar and nuclear) over 2010-49, under alternative REDD potentials and costs assumptions (in particular we use the WHRC Brazil study, the Global Timber Model, and the GLOBIUM Model)
Note: The entire height of each column indicates the case without REDD, while the red portion indicates the reduction with REDD. Business-as-usual (BAU) projections without any climate policy are provided for comparison
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ways have the option of limiting the numbers allowed in the system and it is surprising that this has not been taken up by the EU in its revised ETS proposals. At the same time we should not lose sight of the costs of excluding REDD from the carbon market: doing so risks making climate change protection policies unnecessarily expensive and misses important opportunities to enable political agreement on more stringent GHG reduction targets now and in the future. On top of these considerations we should not forget the many other sources of value that protecting the rain forest could imply for the planet and for us.

Notes

1 Parker et al. (2008) provide a user-friendly guide to the most recent and influential proposals for REDD, including the alternative financing options, while Parker et al. (2009) focus specifically on the financing alternatives.

2 The American Clean Energy and Security Act (H.R.2454) passed by the House of Representatives in June, 2009 sets an absolute limit of 1-1.5 billion tons per year on the allowed use reduced deforestation and other international mitigation credits from uncapped nations, although these "offsets" would be subject to a 20% discount after 2017. The bill includes a "strategic allowance reserve" that allows additional use of deforestation reduction credits if the carbon price hits particular levels. The bill also dedicates 5% of allowance auction revenues to fund additional international forest carbon activities.

3 On detailed discussion of how to compute the reference level, the issue of permanency and the efficiency of nation-wide rather than project-based systems is discussed elsewhere in the present issue.

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