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Reduced Emissions from Deforestation and Degradation: Some Issues and Considerations

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Reducing Emissions from Deforestation and Degradation: Some Issues and Considerations

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Abstract: Forest commons are crucial for delivering a wide range of socio-economic and environmental benefits such as contribution to rural livelihoods, biodiversity conservation and carbon sequestration. Yet, a large proportion of the existing scholarly and policy literature on forest commons has been historically guided towards the direct benefits, but less on multiple outcomes of forest ecosystems. This review paper advances the argument for an integrated analysis of major ecosystem services provided by forest commons in order to make sure that any inter-government negotiations on forest and climate change such as Reducing Emissions from Deforestation and Degradation (REDD) would not miss the importance of either component. The paper also provides a review on the global carbon market and the Clean Development Mechanism (CDM) as well as some international insights on REDD.

Key words: climate change, ecosystem services, REDD, forest commons, adaptation, biodiversity, livelihoods

INTRODUCTION

The role of property rights and their effect on investment decisions with regard to management of natural resources are central issues in the political economy of environment and development. There is an increasing consensus that protection of forest resources in tropical countries is impossible without rewarding local people for the environmental services they provide from forests (Pearce 1996, Smith and Scherr 2003). Secure property rights or legal recognition is often considered to be a necessary - if not sufficient - condition for forest resource management. Community-based approaches to forest management have emerged as a new paradigm in managing forest resources in many countries in recent years (Agrawal 2001). Compared to the 1980s, at present local communities govern an additional 200 million hectares of forests (Agrawal *et al.* 2008) and these forests support local livelihoods through income generation, biodiversity conservation and carbon sequestration (Nelson *et al*. 2008, Klooster and Masera 2000). However, these services are often not widely appreciated while strategizing international development assistance and interventions related to poverty alleviation. Further, analysis of forest commons has historically been guided towards the direct benefits but less toward multiple outcomes.

Global deforestation of about 13 million hectares per year accounts for 20%-25% of global Greenhouse Gas (GHG) emissions and over a third of emissions from developing countries (IPCC 2007). Over the past 150 years, deforestation has contributed an estimated 30% of the atmospheric build-up of CO_2 (WRI and IUCN 1998). Curbing deforestation is a highly cost-effective way of mitigation in that it also has potential implications for climate change adaptation (Stern 2006). Many research findings already demonstrate the potential for using forests as an efficient method for reducing atmospheric concentrations of carbon dioxide (McKenny *et al*. 2004, Van Kooten *et al*. 1992, Cannel 1999). Forests are taking center stage for the first time in recent international negotiations on climate change, which univocally emphasized that action on deforestation in developing countries should be part of a future response to climate change. During the 13th Conference of Parties (CoP13) of the United Nations Framework Convention on Climate Change (UNFCCC) in Bali in 2007, the international community agreed that action must be initiated to address deforestation and forest degradation in developing countries and to establish the necessary financial mechanisms to ensure long term emission reductions. A new international legal framework for climate change mitigation through REDD is currently under discussion in order to provide incentives for developing countries to reduce emissions from deforestation. The proposed REDD policy has a provision for compensating developing countries in proportion to the amount of carbon emissions that are reduced (on voluntary basis) if they reduce their national deforestation rate below the baseline (Skutsch and Trines 2008). It is believed that tropical nations would receive a substantial amount of money from industrialized countries for the purpose of slowing GHG emissions by reducing deforestation rates. Together with the already existing Clean Development Mechanism (CDM), it is hoped that this kind of innovative financial mechanism would internalize multiple benefits of forest commons and encourage national governments and local communities to protect the forests while simultaneously enhancing climate-regulating functions.

At the same time, there is also some skepticisms about the REDD proposals, especially concerns over weak governance structures and institutional capacities in many developing countries that could compromise the delivery of these benefits at the local level. Indeed, institutional arrangements of REDD will be central to its success, because local institutions influence how different social groups gain access to and are able to use assets and resources (Agrawal 2008). If carbon density of forests is prioritized over biodiversity and any other ecological services, the livelihoods of millions of people who actually live in and depend on forests directly would

be at risk. By and large, carbon appears to be a rather elusive commodity to local people, as the mitigation measures for climate change are very much market-driven and non-market measures have not been given much attention. Skeptics have strongly emphasized that the REDD proposal, at least, should address three important aspects of forests - climate change, biodiversity, and local livelihoods - in order to make it more equitable and inclusive. Further, REDD activities need to be informed by the land use decisions of forest-dwelling communities and legitimate participation of local communities in REDD schemes should stand out as an essential condition for success.

The goal of this review paper is to raise awareness on forest and climate change issues, particularly the REDD mechanism. In doing so the paper emphasizes the multiple contributions of forest commons, arguing that any inter-governmental negotiations with regard to forest and climate change should not miss out the multiple outcomes of forest commons. This paper is organized into four principal sections. The first section provides a brief overview on multiple outcomes of forest commons. The second section discusses global carbon market and CDM to provide an overview of international regimes on climate change. The third section documents some international experience on REDD, and the final section discusses how REDD could be made more inclusive. Finally, some concluding remarks are provided.

MULTIPLICITY OF FOREST ECOSYSTEMS

Forest commons are crucial for delivering multiple outcomes such as livelihoods, carbon sequestration, and biodiversity conservation (Chhatre and Agrawal 2008, GEF 2000, Klooster and Masera 2000, Smith and Scherr 2003). Unfortunately, much of the debate on forest-based mitigation measures are dominated by technical issues and socio-ecological systems such as livelihoods and biodiversity tend to take a back seat (Smith and Scherr 2003). Forests play a key role in the world carbon cycle (WRI 2000) and also act as a "genetic library" that supports important human welfare functions such as the improvement of existing crops, introduction of new crops, and the creation of medicines and pharmaceuticals (Myers 1997, Sunderlin *et al.* 2005). They support the livelihoods of millions of people in the developing world and help alleviate poverty while capturing synergies between local and global environment/development goals (Klooster and Masera 2000). For these reasons, the multiplicity of forest commons needs to be an integral part of international debate on forests and climate change.

Livelihoods

On the issue of forest and livelihoods, a large body of literature from different parts of the world offer ample evidence with regard to the extensive use of Common Pool Resources (CPRs) by rural households in key economic activities such as consumption, production and asset formation (Jodha 1986, Cavendish 1998, Adhikari 2005). Forests contribute to the livelihoods of 1.2 billion poor people (including the food supplies of nearly half the population of the developing world). Further, 150 million native/indigenous people rely on the forest for their way of life. Reliance on forest resources often increases in times of economic and social hardship. Forests not only contribute significantly to household economy, but they also add to a nation's national Gross Domestic Product (GDP) through natural resource-based enterprises and industrial activities.

CPRs, mainly forest commons, currently contribute USD 5 billion a year to the income of poor rural households in India, or about 12% to the household income of poorer households (Beck and Nesmith 2001). A study from 80 villages in 21 districts in India concludes that CPRs contribute 15%-25% of total income of poorer households (Jodha 1986). Adhikari's study (2005) showed that community forestry contributes 14%-22% of household incomes of rural households in the mid-hill region of Nepal. Cavendish (1998) documented that environmental resources in some rural areas of Zimbabwe account for more than 30% of average total household income and the poorer the household the greater the share of income from CPR.

In the forest zone of southern Ghana, 10% of rural people and 38% of households sell Non-Timber Forest Products (NTFPs) (Townson 1995). Studies in forest-rich areas adjacent to large urban markets show even higher levels of involvement - e.g. 68% of households surveyed in villages around the large market centre of Kumasi in Ghana (Falconer 1994). The high incidence of women's involvement in NTFP activities in most situations (e.g. 40%-50% in Ghana and the six countries of eastern and southern Africa) appears to reflect easy access to the resources and low thresholds of skill and capital (Arnold 1996). In western Niger, income from products of the commons was found to represent 27% of women's local non-farm income, as compared to 10% for men (Hopkins *et al.* 1994). In six countries in eastern and southern Africa (i.e. Botswana, Kenya, Lesotho, Malawi, Swaziland and Zimbabwe), about 2.3% of rural populations and 0.8% of urban populations derived income from selling more than half of wood products and grass, cane and bamboo products that they were gathering from forests (Liedholm and Mead 1993).

Community forestry has been implemented in many countries mainly for supplying day to day needs of rural households such as fuel, fodder and timber. Enterprise-based models of community forestry have also been practiced especially for value addition through the processing of NTFPs at the local level. Therefore, forests could contribute directly to the Millenium Development Goals (MDGs) of halving the number of people suffering from extreme poverty and hunger by 2015.

Biodiversity

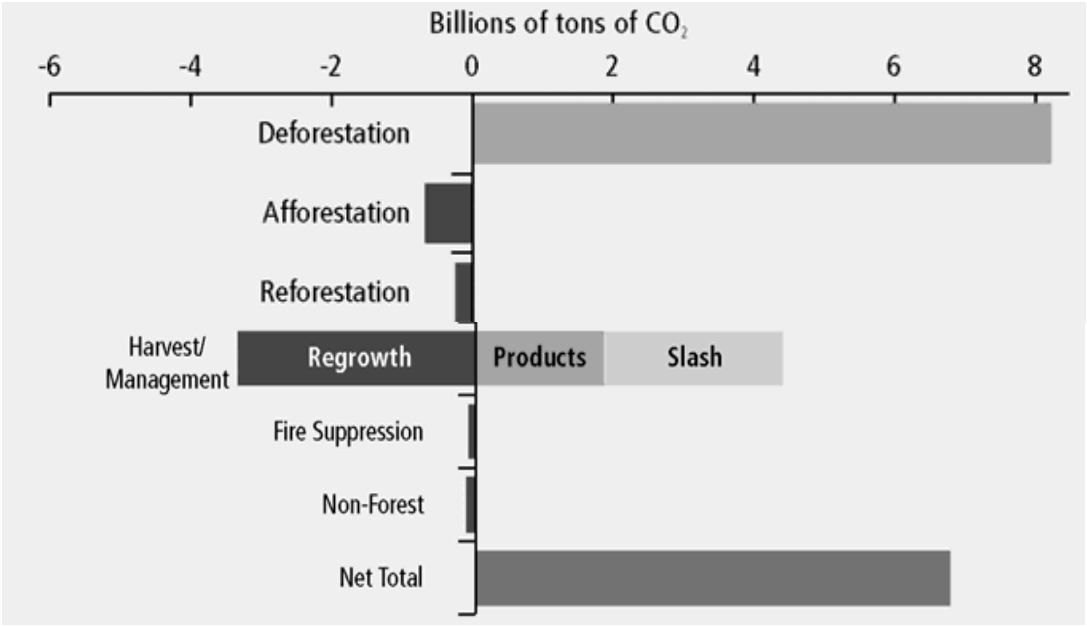
Forests contain the greatest assemblages of species found in any terrestrial ecosystem, and the status of biodiversity is, in itself, an indicator of forest condition (Matthews *et al.* 2000). They have the highest species diversity and endemism of any terrestrial ecosystem in the world (Sunderlin *et al*. 2005). Tropical forests are among the biodiversity rich terrestrial ecosystems, containing up to 50% of all species. Many species are dependent on large intact forest ecosystems. Ecosystem services have a rough postitive correlation with biodiversity. The World Wildlife Fund (WWF) has identified more than 200 eco-regions around the world as outstanding representatives of the world's diverse ecosystems, of which forest types account for two-thirds of all terrestrial eco-regions. Most of the biodiversity hotspots throughout the world are located in the tropics and most of them are forests. Nearly three quarters of the world's threatened bird species have restricted breeding ranges and more than 80% of these birds are found in forests (Matthews *et al.* 2000). Many aspects of the stability, functioning, and sustainability of global ecosystems rely heavily on the diversity of plant and animal species found in forests (Tillman 1997).

The genetic diversity of forest, flora and fauna is a resource of great potential value to the agricultural and pharmaceutical biotechnology industry. Moreover, the biological richness and beauty of forest ecosystems are at the core of material and spiritual well being of humanity (Matthews *et al.* 2000). Community-based approaches to forest management have a large impact on biodiversity conservation by preventing local extinction of species and increasing vegetation and wildlife. Nonetheless, not much has been written about the impact of tenure on biodiversity values (Lawrence *et al.* 2006). Scholars have shown that community forests are significant not only for their political and social achievements in areas of tenurial reforms and legislative amendments, but also for their implications for biodiversity conservation (Jeanrenaud and Jeanrenaud 1996/97). Conserving forests has become an important objective of biodiversity conservation.

Carbon Sequestration

Climate regulation through carbon sequestration is another important ecological service provided by forest commons. Forest-based measures can be an effective complement to abatement options focused on fossil fuel emissions. Although interest in forest carbon historically focused on Afforestation and Reforestation (AR), the potential of reducing deforestation and degradation is many times the potential of AR activities in climate change mitigation (Myers 2007). Figure 1 below shows the carbon emissions and absorption from different forestry activities and it is clear that deforestation has far greater impact than reforestation. This is part of the reason why there is a growing interest in REDD which could provide substantial benefits through the selling of forest carbon in international markets. Including community forestry initiatives into the CDM mechanism would be much more cost-effective than undertaking a large scale monoculture plantation.

Figure 1: *Annual Emissions and Absorptions from Selected Forest Activities*



Source: Adopted from Myers 2007 (Houghton 2003, reproduced from Baumert *et al.* 2005)

As a matter of fact, avoiding deforestation and regeneration of degraded forests are much more cost-effective methods of reducing atmospheric carbon than other means of forest restoration. For instance, Klooster and Masera (2000) claimed that reducing deforestation and promoting natural regeneration could reduce 12%-15% of expected emissions by 2050. Forests currently store approximately 800 billion tons of carbon in trees and soil. The Intergovernmental Panel on Climate Change (IPCC) experts suggested the world's forests can sequester up to 87 billion tons of carbon by 2050. Niles *et al*. (2001) estimated that over the next ten years 48 major developing countries have the potential to reduce the atmospheric carbon burden by about 2.3 billion tones. This mitigation would generate a net present value of about US$16.8 billion collectively for these countries (using a USD 10 per ton @ 3% discount rate). Some forest rich countries such as Indonesia alone could earn between 400 million and 2 billion USD per year in a forest carbon market which would generate a new source of recurrent revenue. Based on two cases from Nepal, Tewari and Phartiyal (2006, cited in ANSAB 2006) estimated that community forestry can sequester an average of 2.1 tons CO_2/ha/yr. At this rate, a community forest area of 100 ha could yield about US $2,730 (Nepali Rs 196,560) in the mid-hill region of Nepal (estimated at the rate of US $13 per t carbon).

Climate Change Adaptation

Adaptation refers to actions and adjustments undertaken to maintain the capacity to deal with stresses included as a result of current and future external changes (Nelson *et al.* 2007: 396). The IPCC defines adaptation as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC 2007). Forests provide a number of ecological services such as climate regulation, hazard protection, and water conservation. They are not only at the frontline in mitigating adverse climate impacts but also increasing social resilience to major disturbances such as floods, heat waves, large scale forest fires and intense drought. Many economic activities such as hydropower or drinking water are dependent on forest ecosystem services and at the same time they are highly vulnerable to climate change. Adaptive management of forest resources help to maintain economic and ecological viability of these sectors. Preserving large intact forest ecosystems will therefore, increase the ability of species to naturally adapt to climate change. Forest based adaptation strategy especially community forestry have the potential not only to protect land and people from some of the harmful effects of climate change, but also to provide opportunities for sustainable rural development and poverty alleviation through income generation and employment opportunities (Patosaari 2007).

INTERNATIONAL REGIMES ON CLIMATE CHANGE

The UNFCCC has established two courses of action as main institutional responses to the problem of climate change – mitigation and adaptation. While mitigation focuses on the problem source, such as activities that aim to reduce GHG emissions, adaptation focuses on the impacts and affected systems, especially activities aimed at reducing the vulnerability of society and its natural resource base. Parties with commitments under the Kyoto Protocol (KP) (Annex B Parties) have accepted targets for limiting or reducing emissions through three market-based mechanisms: a) Emissions Trading (ET) or the carbon market, b) the CDM, and c) Joint Implementation (JI). ET allows countries that have spare emission units (emissions permitted them but not used) to sell this excess capacity to any other countries that are over their emission targets. CDM permits a country with an emission-limitation commitment to implement an emission-reduction project in developing countries. Such CDM projects can earn saleable Certified Emission Reduction (CER) credits, each equivalent to one ton of CO_2 and that these credits could be counted towards meeting Kyoto targets. Under JI, any Annex B countries earn Emission Reduction Units (ERUs) from an emission-reduction or emission removal project in another Annex B country.

Global Carbon Markets at a Glance

According to World Bank sources (WBI 2007), the global carbon market has expanded quickly over the past two years. Worldwide, carbon trading reached a total value of $59.2 billion in 2007, up 80% over 2006 (Chafe 2008). In 2006 about 23.7 million tons of CO_2 equivalent were exchanged on the voluntary market, including about 10.3 million tons exchanged through Chicago Climate Exchange. Although the carbon market is almost ad hoc in most developing countries with transactions at various levels, carbon trading systems are more sophisticated in industrialized nations especially in Organization for Economic Co-operation and Development (OECD) countries. This is partly due to clearly defined rules and regulations to facilitate systematic transaction and trading. Perhaps the most important emission trading scheme in Europe is the European Union Emissions Trading Scheme (EU ETS), which is instrumental in simulating emissions abetments both in Europe and developing countries. Carbon markets are gaining further momentum due to some interesting developments in Canada (calls for carbon intensity lending to an emission target of 20%), Japan, USA (California is debating whether emission trading including offsets from overseas will be allowed) and Australia (WBI 2007).

Table 1: Carbon Market Volumes and Values in 2005-06

	2005		2006	
	Volume (MtCo2e)	Value (MUS$)	Volume (MtCo2e)	Value (MUS$)
Allowances				
EU ETS	321	7,908	1,101	24,357
New South Wales	6	59	20	225
Chicago Climate Exchange	1	3	10	38
UK-ETS	0	1	na	na
Subtotal	328	7,971	1,131	24,620
Project-based Transactions				
Primary CDM	341	2,417	450	4,813
Secondary CDM	10	221	25	444
Joint Implementation	11	68	16	141
Other Compliance	20	187	17	79
Sub Total	382	2,894	508	5,477
Total	710	10,864	1,639	30,098

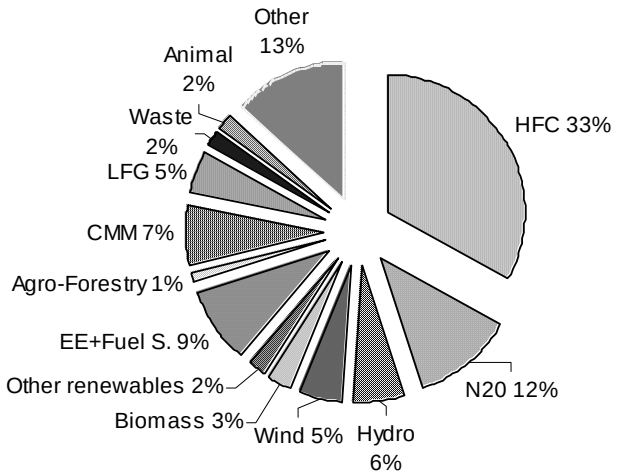
Source: World Bank Institute 2007

Forestry received major attention at the United Nations Conference on Environment and Development (UNCED) in Brazil in 1992. After the UNFCCC (1992) and Convention on Biological Diversity (CBD 1992), many countries started appreciating ecological services provided by forest commons. There is a high degree of consensus that linking forest-based climate change mitigation would deliver substantial benefits to GHG emissions reduction. This, in turn, would provide countries with an opportunity to promote and attract investments in sustainable forestry, land restoration, energy efficiency and renewable energy projects (Satyanarayana 2004). The inclusion of Land Use, Land-use Change and Forestry (LULUCF) in the CDM triggered interest towards a forest-based projects as they could earn credits under the CDM. Determining forest carbon stock and rate of carbon sequestration in different types of forests has also become a concern of governments, businesses, and many international organizations (Smith *et al.* 2004).

Carbon sink forestry projects are underway through CDM mechanisms in many developing countries in recent years. Under this mechanism (Article 12 of the KP), industrialized countries (Annex 1 Parties) could acquire CERs from project activities implemented in developing countries (non-Annex 1Parties). The CERs generated by such project activities can be used by Annex 1 Parties to help meet their emissions reduction targets under the KP. At the same time, CDM project activities are considered to be helping developing countries achieve sustainable development goals and contributing to the ultimate objectives of the UNFCCC. Since its inception, almost 1000 projects have been registered under the CDM. Under these CDM projects, 421 million CERs have already been traded, representing nearly 20% of transactions in the global carbon market (Neeff and Henders 2007). These projects are anticipated to produce CERs amounting to more than 2.7 billion tons of CO_2 in the first commitment period of the KP, 2008–2012 (UNFCCC).

Primary CDM projects comprise the second largest carbon market after the EU ETS. Within CDM, Hydrofluorocarbon's (HFC's) market share is about 34%, making it the largest CDM sector project. Biomass and agro-forestry account for about 4% of CDM share. In terms of geographical distribution of CDM projects, the CDM market is currently dominated by Asia in which clean technology projects make up approximately 75% of a portfolio worth $US 30 billion (World Bank 2007). LULUCF projects accounted for only 4% of the volume of all CDM projects in 2005 (World Bank 2007). This is often viewed as a major shortcoming of the CDM due to its poor presence in other areas of the developing world where there is a greater need for clean development technology, particularly in Africa. Further, Africa has benefited from less than 10% of the overall activity in the voluntary carbon markets.

Figure2: Asset Classes of CDM Projects



Source: World Bank Institute (2007): As a Share of Volumes Contracted in 2006

Clean Development Mechanisms (CDM)

CDM projects are coming under high scrutiny as there is still a large degree of controversy about the livelihood implications of AR schemes. They are often seen as large-scale, fast growing and mono-species carbon farming plantations (Smith and Scherr 2003), without due consideration to the livelihood needs of local communities. Large-scale plantations often result in lower biodiversity and rural development benefits than forests restored through natural generation. Many authors have pointed out the environmental risks associated with industrial plantations such as the lowering of water tables in semi-arid areas and surface run-off in wetter areas (Bull *et al.* 2006). There is also a possibility of displacement of indigenous people in favor of large-scale CDM projects (Sawyer 1993, Gundimeda 2004). The scarcity of fuel wood induced by CDM projects may lead to decreases in welfare of the rural poor because of rising prices of alternative products. Scholars argue that CDM pilot projects have fallen short of their equity and development objectives (Brown *et al.* 2004, Boyd *et al.* 2007). In addition, concerns arose as to whether CDM crediting for AR will act as an incentive to clear natural forest for the purpose of establishing carbon plantations (Niesten *et al.* 2002). Furthermore, the asymmetry between capacity of communities and LULUCF provision of the CDM, as well as insufficient capacity of community, mean insufficient uptake of AR projects through the CDM (Minang *et al.* 2007).

CDM mechanisms allow only AR activities to be considered for emission trading. If carbon sequestered through AR is subsidized but not for sequestration from the existing forests, a shift to new carbon plantations at the expense of existing forests could mean significant loss of biodiversity and other associated ecological services provided by natural forests. The large contribution of tropical deforestation to global carbon emissions, together with some controversial issues related to CDM projects, have prompted re-negotiation of climate change policy to include REDD in the Bali conference in Indonesia in 2007. REDD is basically the forest mitigation option with the largest and most immediate carbon stock impact. By including REDD in the international climate policy regime, both society and nature would gain in the long-run as it provides a higher level of social and environmental benefits.

Reducing Emissions from Deforestation and Degradation (REDD)

The 13th CoP of the UNFCCC in Indonesia in 2007, which is supposed to provide a "road map" for post-Kyoto (after 2012) scenario, was instrumental in affirming the role of forests in the global carbon budget. So far tropical forests have been excluded from international climate agreements. In Bali however there was a vigorous debate on REDD with a realization that halting tropical deforestation should be a top agenda item as the destruction of tropical forests accounts for about 20% of global GHG emissions. Although REDD is still in its infancy, this new agreement brought forests to center stage of the global climate change debate. By the end of 2007, developed countries pledged almost $300 million to help forest-rich developing countries prepare for their new roles and responsibilities in the post-Kyoto international climate-change agreement.

The World Bank launched a forest carbon fund for the REDD initiative called "Forest Carbon Partnership Facility (FCPF)" at the 13th session of the CoP to the UNFCCC. FCPF will have the dual objectives of building capacity for REDD in developing countries (readiness mechanisms), and testing a program of performance-based incentive payments in some pilot countries. This forest carbon

finance mechanism will select a few countries to participate in this mechanism through which the facility would implement and evaluate pilot incentive programs for REDD based on a system of compensated reductions (World Bank 2007).

REDD: REVIEW OF INTERNATIONAL EXPERIENCES

The global carbon market will obviously get bigger both in terms of volume and coverage through the inclusion of REDD into international climate change regimes. Among the forest-rich countries, Indonesia has vigorously pursued the REDD agenda for the past 5 years with the aim of developing a national REDD strategy informed by a few significant demonstration activities by 2012. This will not only prepare Indonesia to receive large REDD payments but it will also set a stage for the development of methodologies and political commitment for testing REDD activities which eventually trigger a REDD based carbon market on a global scale. According to statistics, Indonesia could alone earn $US 15 billion if the current level of deforestation could be avoided. However, numerous challenges lie ahead. Indonesia has lost approximately 25%-40% (40 million to 60 million hectares) of its forest cover since the 1950s, more than half of it during the last twenty years (IFCA 2007). But the country has started promising interventions to reduce deforestation including measures to tackle illegal logging, rehabilitation of degraded areas, and tracking of forest cover change.

Indonesia is establishing appropriate infrastructure facilities to measure actual deforestation and addressing a lack of effective forest governance that may hinder equitable distribution of carbon payments achieved through reduced deforestation. These considerations are very central to the implementation of pilot schemes (sub-sector and/or sub-national level) which deliver sustained reduced deforestation rates and conserve forest ecosystems. More importantly, a number of consultations with various stakeholders, including indigenous people, forest-dependent countries, the private sector, civil society, sub-national administrative agencies, and other government entities, is going on to achieve a broad based consensus on REDD. This will help to increase transparency, strengthen forest law enforcement, and empower decentralized institutions and community organizations. These demonstration activities will eventually provide support for a viable forest-based carbon market in the future. Recently, Indonesia joined Australia to establish the Indonesia - Australia Forest Carbon Partnership on reducing GHG emissions from deforestation and forest degradation. This partnership incorporates the existing $30 million Kalimantan Forests and Climate Partnership and the $10 million bilateral package of support for Indonesia on forests and climate. This financial package will assist Indonesia in three key areas - strategic policy dialogue on climate change, increasing Indonesia's carbon accounting capacity, and identifying and implementing incentive-based demonstration activities.

Brazil is also developing a REDD strategy for the country based on its past experience in Payments for Environmental Services (PES), although it had a strong reservation to using forests as a carbon sink just a few years back. Since 1980 the Amazon Basin has lost around 200,000 square miles (520,000 sq km) of forest. Researchers estimate that the old-growth forest sink in the Amazon sequesters about 790 million tons of carbon per year, an amount roughly equal to the carbon emissions from Amazon deforestation (Philips *et al.* 2008). Creating an effective system for forest monitoring and compliance, however, is a major challenge for the country. For instance, roughly 80% of all timber cutting is illegal, meaning that the timber is effectively stolen, with no environmental control over harvest operations or payment of government royalties (Laurance 1998). Nonetheless, Brazilian government efforts to reduce deforestation and degradation in the last five years are highly commendable.

The Brazilian government has already prepared a REDD strategy. According to a study, the Brazilian REDD program would be able to double the income of 200,000 rural forest-based families, reduce fire-based costs to society (respiratory illness, deaths, agricultural and forestry damages) of $10 to $80 million per year, and protect the rainfall system that supplies much of the Brazilian grain belt and hydro-electric energy production for the industrial southwest of the country (Nepstad *et al.* 2007). In addition, a substantial indirect benefit in terms of biodiversity conservation would be achieved simultaneously. On the costs side, full payment of the opportunity costs of these reduced emissions would be approximately $18 billion. However, the REDD program would be able to compensate the opportunity cost as the program provides very substantial benefits to Brazilian society.

The Brazilian experience would be interesting to other developing countries especially its ground-breaking successes in reducing and monitoring deforestation and forest degradation in the Amazon region. Nepal could also learn a lot from Indonesia in developing a REDD strategy, especially building capacities for monitoring, reporting and verification of forest-based carbon emissions. If properly implemented, REDD schemes could generate a substantial recurrent revenue that would help local communities and the country to manage forests more sustainably and reduce poverty. However, a serious commitment is required to improve forest governance, ensure conservation and sustainable use of biological diversity, and ensure continuity of programs and policies that help secure the rights of local communities on forest resources.

A number of methodological concerns related to REDD measures emerged from field experiences from Brazil and Indonesia. For instance, the means for estimating and monitoring changes in forest cover and carbon stocks and emissions is perhaps one of the most important prerequisites for REDD projects (IISD 2008). Establishing national reference emission levels and addressing displacement of emissions is another area of concern. Implications of national and sub-national approaches to REDD, capacity building measures, criteria for evaluating effectiveness of action, cross-cutting issues (such as non-permanence, comparability and transparency, implications of different definitions) and measures to deal with uncertainties in estimates are obviously daunting tasks that need to be addressed for any viable REDD project (IISD 2008).

REDD AND EQUITY

As already discussed, forests cannot only solve the climate change problem but also deliver substantial biodiversity and rural development co-benefits. They provide a number of vital services, notably as repositories of biodiversity, regulators of the hydrological cycle, and sources of livelihoods to millions of people. Reducing deforestation and land degradation and improving forest cover are notable for their potential to contribute to both mitigation and adaptation strategies. REDD measures also provide an opportunity for combining adaptation and mitigation efforts. Adaptation concerns could thus provide an appropriate entry point for delivering pro-poor REDD. Community-based forestry has made impressive progress in Nepal, which has a great opportunity to reconcile biodiversity conservation, carbon sequestration and rural development through the REDD mechanism.

Although it's too early to judge the livelihood impacts of REDD mechanism, since it has not yet been implemented, scholars argue that REDD's success will largely be contingent on its capacity to fully integrate a broad range of stakeholders, especially indigenous people and forest-dependent communities from the very beginning of the project design process. As indigenous people are still reluctant to accept REDD-related measures, addressing their reservations in decisions regarding REDD activities would be crucial to garnering future support and legitimacy. It is equally important to gain support from civil society and citizen groups by convincing them that any REDD financing mechanism will ensure equitable distribution of benefits, including financial payments for forest protection and access to forest resources. Social implications of REDD projects, particularly for indigenous people and local communities, need to be fully understood. The distributive aspects of REDD, such as mechanisms regarding access to payments by different stakeholders also deserve serious attention. In this regard, many issues still need to be resolved. For example, who will decide the payment strategy? Who will receive REDD payments? What are the conditions for accessing REDD benefits? Is this a concern for the international community or should this be handled by the concerned national authority?

A number of other actions also need to be taken at the sub-national level in order to have a fully functioning REDD program (Chomitz *et al.* 2006). Some of these actions include: a) paying communities for reduced deforestation, b) funding fire prevention programs, c) strategic planning of road improvements, d) enforcing regulations against illegal logging, e) improving tenure security, f) supporting community forestry, g) taxation of large-scale land clearance, h) promotion of off-farm employment, and i) agricultural intensification in favorable areas. Further, fully functioning monitoring systems are a necessary element for a successful national REDD program.

REDD also raises questions about whether the creation of a new trading scheme for forest-related emissions will encourage over-consumption and pollution in developed countries. In other words, REDD measures could be used to satisfy the emissions in the North at the expenses of biodiversity value of tropical forests and rights of forest-dependent peoples to use their forests for sustaining subsistence livelihoods. There is a great need to ensure that REDD initiative will not be driven solely by a carbon emissions avoidance agenda. Creating the infrastructure to support REDD programs (e.g. monitoring and accounting systems for changes in deforestation rates and emissions) and addressing the rights and roles of all relevant stakeholders that would be impacted by the REDD mechanism is vital for its success.

CONCLUSION

This paper briefly reviews forest and climate change issues and argues that any international negotiations about forest and climate change should consider the multiple outcomes of forest commons. A case was made that the omission of any of these benefits in the climate policy debate would encourage a sub-optimal policy prescription. In other words, contemporary policy debates must evaluate the contributions of forest commons not only in terms of a single objective, but rather by appreciating the broad spectrum of ecological services that they provide, such as biodiversity conservation, climate change mitigation and poverty alleviation. The paper also provides a brief overview of forest-based climate change mitigation initiatives, including the current state of the global carbon market, and concludes that carbon markets are a prominent part of the international response to climate change and

could be instrumental in future climate change mitigation.

There is also a fear that the proposed REDD initiative would only serve the interests of developed countries and large multinational companies, rather than those of the people who live in and rely on forests for their livelihoods. Therefore, REDD activities need to be focused on improving the livelihoods of local communities by strengthening customary property or user rights to their forest land, and promoting forest products which could help ensure more effective and equitable outcomes from REDD investments. Past evidence on community-based approaches to the management of forest commons have shown that communities are capable of managing their forests sustainably. REDD activities should build on these past experiences and achievements.

A greater realization of the potential role of forest commons for providing multiple benefits would help to shape the international debate on forest and climate change, which will have implications for both the sustainability of forest commons and poverty alleviation. REDD could offer enormous potential for supporting poverty alleviation and climate change mitigation goals, but its success is likely dependent on careful design of REDD projects and meaningful participation by local stakeholders in their implementation and maintenance. Furthermore, adequate measures of safeguarding interests of local communities and indigenous people should be in place as there is some degree of apprehension that carbon sequestration through REDD could further marginalize the forest-dependent communities, especially in light of existing insecure rights over forest resources in many countries in the global south. Most of the issues related to REDD also have political implications. The existing industrial practices in the forestry, energy, and agricultural sectors need to be fully addressed if REDD is to achieve a large reduction of global GHG emissions (Daviet *et al.* 2007).

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