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Narayan Dhital
Laval University, Canada

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Satdobato, Lalitpur
PO Box: 12207, Kathmandu, Nepal
Contact number: +977 1 5552924; 5550631 **Fax:** +977 1 5535190
Email: forestaction@wlink.com.np; **URL:** www.forestaction.org

Reducing Emissions from Deforestation and Forest Degradation (REDD) in Nepal: Exploring the Possibilities

Narayan Dhital
Laval University, Canada
Email: Narayan-prasad.dhital@ulaval.ca

Abstract: This article argues that Nepal can benefit from the REDD mechanism by proactively acting to curb the rate of deforestation and forest degradation. Successful participation can bring biodiversity, ecological and economic benefits to the community as well as the country. Nevertheless, technical complexities in assessing the market, elite domination in contract negotiation and risk of ignoring the voices of forest-dwelling communities pose serious threats to the success of the plan.

Key words: REDD, community-managed forests, carbon sequestration, deforestation, climate change

INTRODUCTION

In Nepal, forests are considered the second most important natural resource after water. Forests serve three important functions: production of timber and Non-timber Forest Products (NTFPs), protection of natural environment and regulation of atmospheric condition. In the Nepalese context, the production function of the forest enhances economic benefits for the community, while the protection and regulation functions are for ecological betterment and climate regulation respectively.

The forest area of Nepal is estimated to be about 5.8 million hectares (ha) (40% of the total geographical area of the country), out of which 4.2 million ha (29%) is forest and 1.6 million ha (10.6%) is shrub land (DFRS 1999). Tables 1 and 2 present the historical forest cover and deforestation rates in different years of modern Nepal. The overall deforestation rate of Nepal is currently 1.7%, which is well above the Asian average (1%) and the global average (1.3%) (MFSC 2008). Globally, deforestation results in the annual loss of 13 million ha of forests (FAO 2005).

A comparison of the results of the National Forest Inventory (NFI) with those of the Land Resources Mapping Project (LRMP) shows that the forest area in the country decreased by 24% at an annual rate of 1.6% over a period of 15 years (1979-94) and the shrub land area increased by 126% during the same period (MFSC 2008). Higher increase in the proportion of shrub land contiguous with continuing decrease in overall forest area gives a clear picture of the state of deforestation and forest degradation in Nepal.

Deforestation contributes to global climate change. It is considered to be the cause of about 20% total Greenhouse Gas (GHG) emissions. To avoid the worst impact of human-induced climate change, average global surface temperature rise needs to be stabilized as far as possible below 2^{o}C above the pre-industrial level (IPCC 2007). Limiting warming to this level is likely to be critical to the protection of forests, which are considered the major natural sink for GHGs. Reducing emission from deforestation is the key to achieving such goal.

Table 1: Deforestation and Forest Cover of Nepal

Period	Cover (million ha)		Total forest area (million ha)	Deforestation rate (in %)		
				Terai	Hill	Overall
	Forest	Shrub land				
1964	6.4	-	-	-	-	-
1979	5.6	0.7	6.3	1.3	2.3	1.7
1986	5.5	0.7	6.2			
1999	4.27	1.56	5.83			
2000-2005	3.74	-	-	1.4		

Source: MEST 2001

Table 2: Percentile Change in Area of Woody Vegetation over Time

Woody Vegetation	First Forest Survey 1964	LRMP 1978-79	Master Plan 1985-86	NFI 1994
Forest	45	38.0	37.4	29.0
Shrub	NA	4.7	4.8	10.6
Total	45	42.7	42.2	39.6

Source: MFSC 1989, DFRS 1999

Although Nepal doesn't play a significant role in anthropogenic GHG emission, it is already facing the consequences of climate change due to its fragile and mountainous geography. Nepalese people, who cannot easily afford mitigation measures for climate change, are the first to be affected by such changes. They have no choice but to adapt to the changed scenario.

As mentioned earlier, about 39% of Nepal's area is covered by forests. The forest cover is necessary to stabilize the country's farming system and fragile geography. If people could be compensated for their efforts to conserve forest areas, it would provide twin benefits: conservation, which has an enormous impact on biodiversity and the local environment and rural economic development due to additional cash flow in the rural economy.

Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries is a mechanism that allows industrialized countries to offset their emissions by purchasing carbon credits from developing countries, which reduce emissions from deforestation and forest degradation by avoiding such activities. In fact, REDD is a win-win strategy whereby host countries can be compensated for their land use, while industrialized countries are expected to pay less than half of the prices of other types of carbon credits.

After long deliberations, the link between forests and climate change was acknowledged at the Bali Climate Conference 2007. The Bali Action Plan (UNFCCC 2007) acknowledges that forests cannot be ignored in any future strategy to combat climate change, and that REDD also has enormous potential to deliver biodiversity conservation and poverty alleviation outcomes. However, the provisions for REDD lack specific measurable targets. Rather than committing to REDD, the Conference of Parties (CoP) has expressed its commitment to investigate the possibility of committing to REDD. Nevertheless, developing countries, including Nepal, should ensure that forests remain high on the agenda of any future climate change policy negotiations. The scientific community should also formulate a future global climate strategy with the most relevant, up-to-date and thorough research possible. A clear post-Kyoto mechanism is expected by the end of 2009, which may include REDD as a key emissions reduction mechanism.

DRIVERS OF DEFORESTATION AND FOREST DEGRADATION

Logging, shifting cultivation, agricultural expansion, encroachment and urbanization/industrialization are the key drivers of global deforestation in general (Leo *et al*. 2008). In Nepal, lack of tenurial clarity has significantly contributed to deforestation in mountains and the Terai. The nationalization of private forests by the government (HMGN 1957) was a key factor in accelerating deforestation throughout the country. In the Terai and Siwalik Hills, deforestation gained momentum due to the government's resettlement programme, unauthorized settlements, illegal clearing of forests for agriculture and illicit felling of timber for smuggling across the border. Other causes of deforestation and degradation in the country are expansion of agricultural land for food production, extraction of firewood for cooking and domestic heating, forage gathering for livestock and forest grazing, inadequate management of public forests and restrictive forest management regulations (MFSC 2008). Continuous political instability during the last decade and lack of land use plans have also exacerbated deforestation. Forest fires and disturbances due to floods and landslides are other important factors. However, the rates of deforestation and degradation are lower in the mid-hills, where the community forestry programme has been more successful.

HOW REDD WORKS

Under the REDD mechanism, payments (likely to be made per ton of emissions reduced) are made for emission reductions achieved by reducing deforestation or forest degradation in developing countries at national level. The amount of emission reductions is determined by comparing the achieved deforestation and forest degradation rates against a baseline scenario. The baseline reflects what would happen in the absence of the REDD policy. This can be established by looking at the historical trends in deforestation and forest degradation and extrapolating these into the future; by modelling the future trends using the knowledge of drivers of deforestation and forest degradation; or by a combination of these methods (Leo *et al*. 2008). As time progresses, payments are made, usually once emission reductions have been verified independently.

Three types of basic information are required by the REDD mechanism. First, the host country should have a REDD strategy in place that explains the system to stakeholders, acknowledges their concerns, and presents a plan to address them. It should also define an incentive system for forest-dependent communities whose support and participation is crucial for the plan's success. Second, the host country should establish a reference deforestation rate, based on an examination of historical deforestation trends, and using a credible and verifiable methodology. Finally, a monitoring mechanism capable of providing data on deforestation and forest degradation on an annual basis should be developed. This monitoring mechanism is the key to independent verification of emission reductions from deforestation and degradation.

HOW REDD IS BENEFICIAL TO COUNTRIES LIKE NEPAL

In Nepal, 72% of the population living below the poverty line (31% of the total population of the country) are forest dwellers, largely comprising indigenous communities (MFSC 2008). These people not only extract timber, firewood, fodder and other NTFPs for subsistence use, but also sell these products to earn a living. Furthermore, they convert the forest land for farming or practise slash and burn cultivation, or both. The forest these people use has the highest potential to be included in the REDD mechanism.

Bringing these forests under the REDD mechanism can benefit the country and rural communities in many ways. It outweighs the payments received by other livelihood activities that contribute to land use change (e.g. agriculture, slash and burn, etc). Maintaining land in forest has biodiversity implications. Shrestha and Singh (2008) mention an increasing trend of Soil Organic Carbon (SOC) pool in forest plots with greater richness of vegetation species. Compensation paid for conservation would have direct impact on earnings and employment at local level. By avoiding deforestation and forest degradation, local environmental quality would be improved. The REDD strategy can also strengthen local institutions, which is critical to fostering collective responsibility.

However, assessment of the potential of carbon sequestration by different forest types and management systems in Nepal is essential. Although some documents are available on the issue (e.g. the example below taken from Baskota *et al*. 2007), more studies of other forest types as well as forests under other tenurial systems (e.g. government-managed forests, forest under protected areas, etc) may be needed. Moreover, both aboveground tree biomass and belowground root biomass need to be measured to better understand forest carbon dynamics (Hamburg 2000). Although Shrestha and Singh (2008) estimate the total soil carbon pool in different land uses and forest types at watershed level in the mid-hills of Nepal, data on annual carbon exchanges in such environments are still necessary to determine whether such ecosystems are net carbon sinks or sources.

CARBON SEQUESTRATION IN COMMUNITY-MANAGED FORESTS: A BRIEF REVIEW

As deforestation was acknowledged as a source of anthropogenic emissions at the 13th CoP meeting, interest is growing in finding ways to include the reduction in deforestation in non-industrialized countries in the United Nations Framework Convention on Climate Change (UNFCCC) beyond the first commitment period of the Kyoto Protocol (after 2012). Therefore, it is important for the authorities in the regions concerned to take early cognizance of the potential that forest conservation offers and lobby for a mechanism that brings benefits to local communities, which will conserve forests locally while extending the benefits globally.

Banskota *et al.* (2007) studies the rate of carbon sequestration in community-managed forests located in different geographical and climatic conditions in Nepal and India. Their findings, which are presented in Tables 3 (Nepal) and 4 (India), include biomass of aboveground plants greater than 5 cm diameter at breast height (dbh) and belowground biomass, but excludes SOC, carbon in herbs/grass and litter, and those smaller than 5 cm dbh. Therefore, it represents a conservative estimate of the total carbon stock in these forests.

According to Banskota *et al.* (2007,) Lamatar Community Forest Users Group (CFUG) has a mean carbon sequestration rate of 1.41 $tCha^{-1}yr^{-1}$ (5.17 $tCO_2ha^{-1}yr^{-1}$), with an average carbon pool size of 52.5 $tCha^{-1}$ (192.52 tCO_2ha^{-1}), excluding carbon stored in the soil. This indicates the C pool in this community forest (CF) provides an important additional environmental service, but without compensation. Assuming the value for a ton of CO_2 to be US$12, Lamatar CFUG can earn US$62.04 $ha^{-1}yr^{-1}$ (NRs 4,963 $ha^{-1}yr^{-1}$). If we assume this rate as the mean carbon sequestration rate, Nepal sequesters 6.3 million tons of CO_2yr^{-1} from the CFs already handed over to communities. This sequestration can be multiplied manifold if all the forests in the country are brought under the mechanism. Even by such a conservative estimate of CO_2 sequestration and similarly conservative price estimation, community forests in Nepal such as Lamatar CF would have substantial income compared to the present income communities are realizing from their community-managed forests.

Table 3: Carbon Stock in Community Forests in Different Geographical Locations in Nepal

Annual variation in carbon stock in three community-managed forests of Nepal Himalayas and their mean carbon sequestration rates

CFUGs	**Carbon mass** (t/ha)			**Mean carbon sequestration rate** (tC/ha/yr)
	Year 1	**Year 2**	**Year 3**	
Ilam	57.94	60.75	64.13	3.1
Lamatar	51.19	52.32	54.00	1.41
Manang	30.94	NA	33.19	1.13
Mean carbon sequestration rate across community forests				1.88 (6.89 tCO_2/ha/yr)

Source: Baskota *et al.* 2007

Table 4: Carbon Stock in Community Managed Forests in Uttarakhanda, India

Annual variation in carbon stock by forest type in the *Van Panchayats* (VP) of Uttarakhanda, India and their mean carbon sequestration rates				
Forest type	**Carbon mass** (t/ha)			**Mean c sequestration rate** (tC/ha/yr)
	Year 1	**Year 2**	**Year 3**	
Dhaili VP Forest				
Even-aged Banj Oak forests	172.1	176.5	179	3.4
Dense mixed Banj Oak Forest	255.7	260.2	264	4.15
Mixed Banj Oak Chirpine degraded forest	18.8	20.8	23.25	2.2
Toli VP Forest				
Young Banj Oak Chirpine forest	156.9	161.2	165	4.05
Chirpine forest with bushy Banj Oak	58.9	62.4	65	3.05
Young pure Chirpine forest	69.5	74	78	4.25
Guna VP Forest				
Young pure Chirpine forest	NA	10.3	14.1	3.8
Mixed Banj Oak forest	NA	154	158.4	4.4
Mean C- sequestration rate across the VP forests				3.7 (13.57 tCO_2/ha/yr)

Source: Baskota *et al.* 2007

Van Panchayat forests (forests managed under Joint Forest Management [JFM] mechanism) of different types in subtropical and temperate climates of Uttarakhanda, India show almost double (3.7 to 1.88 $tCha^{-1}yr^{-1}$) the rate of carbon sequestration rate than that observed in Nepal's community forests (Banskota *et al.* 2007). This may be explained partly by the younger age of forests studied in Nepal and the proportion of products removed from forests by communities who manage such forests.

However, both of these studies report lower than the range reported for the Central Himalayan forests by Rana *et al.* (1989). Rana *et al.* (1989) reports a rate of 4.5 to 8.4 $tCha^{-1}yr^{-1}$ of carbon sequestration in Chirpine forests in the central Himalayan region. A study carried out in the inner Terai region in Nepal shows carbon sequestration rates of 2 $tCha^{-1}yr^{-1}$ from aboveground biomass, including understory biomass, and SOC of up to 0-20 cm depth (Aune *et al.* 2005). This information is important to analyse the potential of government-managed forests and protected areas in bringing them under the REDD mechanism as most of the forests in Terai are still under government control and a significant area of the Terai and inner Terai is set aside under the country's protected area network.

With 100,000 ha of annual deforestation, the Philippines also could benefit from the REDD mechanism. Community-based forest management is being seen as a potential strategy of carbon sequestration there as well. To date, close to 6 million ha of forestlands are under some form of community management. Being a humid tropical country, trees planted there have a high growth rate and thus a high rate of carbon sequestration of 8 $tCha^{-1}yr^{-1}$ (Lasco and Pulhin 2003), though the community forestry concept and mechanism may be different there than in Nepal and India.

The above cases illustrate that community-based forest management can be a viable strategy for reducing permanent emissions by avoiding deforestation in countries like Nepal. Data indicate that the mean carbon sequestration rate in the CFs in Nepal (1.88 t $ha^{-1}yr^{-1}$) is close to 2.79 t ha^{-1} yr^{-1} or 10.23 $tCO_2ha^{-1}yr^{-1}$ under normal management conditions. That is, after local people have extracted various forest products to meet their subsistence needs. This figure translates to the income of US$122.76 $ha^{-1}yr^{-1}$ of forest land at US$12 per ton of CO_2.

The current REDD proposition requires that the average national rate of deforestation be determined by a valid methodology to establish a baseline scenario to enter the mechanism. Therefore, not only community-managed forests but also other categories of forest across the country (government-managed forests, private forests and forests inside protected areas) should be studied to determine their deforestation rate and carbon sequestration potential. As managed forests have a higher potential for carbon sequestration and old growth forests (e.g. forests in protected areas) store higher amounts of carbon above and below ground, all forest tenures have similar prospects in terms of the carbon market. However, challenges faced by different forest management strategies may be different. In Nepal, the intensity of degradation is high in government-managed forests compared to other forest management modes (MFSC 2008). It is evident that once the forest is handed over to communities, the rates of deforestation and degradation are substantially reduced, even though some arguments suggest that community forests have been protected at the cost of government-managed forests (i.e. leakage). This explains the challenges faced by different forest management regimes in terms of realizing the perpetual environmental services they may provide, including carbon capture. As the current REDD proposition involves transactions, not at stand, landscape or ecosystem level, but at country level, all forest regimes in the country have equal potential for incorporation in carbon trading collectively.

Nevertheless, since about 22% of Nepal's geographical area (3.6 million ha) is identified as potential community forests (MFSC 1989), preventing deforestation in community forests may significantly bring down the current annual deforestation rate of 1.7%, thereby increasing the prospects for REDD compensation.

RISKS AND OPPORTUNITIES OF THE REDD MECHANISM

None of the new initiatives are risk-free, including the REDD mechanism. It is difficult to predict the REDD market due to technical complexities, high implementation costs and insecurity of land tenure for the forest-dependent communities that may lead to inequality in benefit-sharing. There is an increasing possibility that forest-dwelling communities might not have their say in the REDD contract negotiations, which could create tensions at local level during implementation. It may be noted here that, without support from forest-dependent communities, the REDD mechanism may not work. Furthermore, by implementing the REDD mechanism with the help of law enforcement authorities, communities may lose the right to use forest resources.

However, REDD shouldn't be seen only from a negative perspective. It offers opportunities for countries like Nepal, where more than 40% of the land is covered under forests and forestry institutions exist at grass roots level. Potential revenues outweigh those from other land uses, and could be a source of green jobs. Table 5 enlists some of the risks and opportunities of the REDD mechanism in Nepal.

WHAT TYPES OF SUPPORT ARE AVAILABLE FOR PARTICIPATING IN REDD FOR DEVELOPING COUNTRIES

From the Forest Carbon Partnership Facility (FCPF) under the World Bank's Readiness Mechanism, select developing countries can get assistance to develop a national REDD strategy, establish a national baseline scenario and put in place a monitoring system. The selected countries or actors within the selected countries which have successfully participated in the readiness mechanism can also be compensated by the World Bank's carbon finance mechanism for the emission reduction verified independently.

In this context, Nepal has made a good start by submitting its Readiness Plan Idea Note (R-PIN) to the World Bank's FCPF. It has already been selected as a beneficiary of the Readiness Mechanism of the FCPF. Successful participation in the mechanism also offers an opportunity to benefit from the carbon finance mechanism, where the FCPF will pilot incentive payments for the REDD policies and measures. The need of the hour is to develop REDD strategies, baseline emission and monitoring mechanism. The issue of benefit-sharing among actors should be addressed in the REDD strategies to be developed with the participation and consensus of all stakeholders. Therefore, participation of all stakeholders, including forest-dependent communities, in all the steps of the process is crucial for the success of such strategies, plans and programmes.

In addition to the FCPF, support is also available from industrialized countries for developing a REDD mechanism and piloting REDD projects. A recent agreement between Indonesia and Australia on a REDD project has boosted such possibilities. The government should play a proactive role and come up with the projects to be piloted and approach the rich countries for partnership.

The UNFCCC is expected to finalize REDD mechanism by CoP 15 in Denmark 2009. It endorsed the concept at the Bali Climate Conference in 2007, and numerous events are taking place to finalize the mechanism. The main methodological issues of the UNFCCC/REDD mechanism still to be considered include: means for estimating and monitoring changes in the forest cover, carbon stocks and emissions; means to establish reference emission level; means to identify and address displacement of emissions; implications of national and sub-national approaches; capacity building; criteria for evaluating effectiveness of action; and other cross-cutting issues.

Table 5: Risks and Opportunities Associated with the REDD Mechanism in Nepal

Risks	Opportunities
Projects might fail due to political and social uncertainties	More than 40% of the country's area under forest coverage of different intensity
Technical knowledge of carbon market mechanism is limited	REDD compensation outweighs revenue from other land uses
Baseline setting and monitoring system is expensive and sometimes unavailable	Forestry institutions exist at grass roots (e.g. CFUG)
Elite dominance prevails in targeted communities	It improves environmental quality
Leakage may occur inside or beyond the project boundary	It is a source of green jobs

CONCLUSION

Nepal has a deforestation rate of 1.7%, which is well above the Asian or global average. The rate of increase in the shrub land cover between the two forest surveys substantiates forest degradation. The major drivers of deforestation and forest degradation in the country include boundary and policy issues, apart from the general drivers such as logging, encroachment, agricultural expansion and urbanization/industrialization. Nepal can benefit from the REDD mechanism by proactively acting to curb the rates of deforestation and forest degradation. Studies indicate high potential for Nepal to benefit from the REDD mechanism by expanding the community forestry programme and bringing the regime under the REDD mechanism. Successful participation can bring ecological and economic benefits to the community as well as the country. Nevertheless, technical complexities in assessing the market, elite domination in contract negotiation and risk of ignoring the voices of forest-dwelling communities pose serious threats to the success of the plan.

REFERENCES

Aune, J.B., Alemu, A.T. & Gautam, K. 2005. Carbon Sequestration in Rural Communities: Is it Worth the Effort? *Journal of Sustainable Forestry,* **20**(4): 73-83.

Baskota, K., Karky, B.S. & Skutsch, M. 2007. *Reducing Carbon Emissions through Community-managed Forests in the Himalaya*. Nepal: International Centre for Integrated Mountain Development.

DFRS 1999. *Forest and Shrub Cover of Nepal 1994 (1989-96)*. Kathmandu, Nepal: Department of Forest Research and Survey, Forest Survey Division.

FAO 2005. Global Forest Resources Assessment. Available at: http://rainforests.mongabay.com/20nepal.htm (Accessed on June 25, 2008)

HMGN 1957. Nationalisation of Private Forest Act 1957. Kathmandu: His Majesty's Government of Nepal.

Hamburg, S.P. 2000. Simple Rules for Measuring Changes in Ecosystem Carbon in Forestry-offset Projects. *Miti Adapt Strat Global Change,* **5**(1): 25–37.

IPCC 2007. Fourth Assessment Report – Summary for Policy Makers. Geneva: IPCC. Available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf (Accessed on July 1, 2007)

Lasco, R.D. & Pulhin, F.B. 2003. Philippine Forest Ecosystems and Climate Change: Carbon Stocks, Rate of Sequestration and the Kyoto Protocol. *Annals of Tropical Research,* **25**(2): 37–51.

Leo, P., Huberman, D., Bowen-Jones, E., Edwards, G. & Brown, J. 2008. Making REDD Work for the Poor. Poverty and Environment Partnership. Available at: http://www.povertyenvironment.net/pep/pep/?q=making_redd_work_for_the_poor_draft_2_0 (Accessed on August 17, 2008)

MEST 2001. State of Environment (2001). Kathmandu, Nepal: Ministry of Environment, Science and Technology.

MFSC 2008. Forest Carbon Partnership Facility Readiness Plan Idea Note (R-PIN) Nepal. Available at: http://carbonfinance.org/Router.cfm?Page=FCPF&FID=34267&ItemID=34267 (Accessed on August 17, 2008)

MFSC 1989. *Master Plan for Forestry Sector, Nepal.* Kathmandu, Nepal: Ministry of Forest and Soil Conservation.

Rana, B.S., Singh, R.P. & Singh, S.P. 1989. Carbon and Energy Dynamics of Seven Central Himalayan Forests. *Tropical Ecology,* **30**: 253-269.

Shrestha, B. & Singh, B.R. 2008. Soil and Vegetation Carbon Pools in a Mountainous Watershed of Nepal. *Nutrient Cycling and Agroecosystem,* **81**: 179–191.

UNFCCC 2007. Reducing Emissions from Deforestation in Developing Countries: Approaches to Stimulate Actions. Decision-/CP.13. Available at: http://unfccc.int/files/meetings/cop_13/application/pdf/cp_redd.pdf (Accessed on 1 July 2008)