Greenhouse Gas Emissions Reduction Potential of the Forest of the Terai Arc Landscape of Nepal

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Rationale and Objective

Global concern over climate change and potential effects of forests has derived both challenges and opportunities in modern forestry over the past decades. Since the forests are source and sink of Greenhouse Gases (GHGs) emissions, accounting carbon budget has received much attention in recent years. The size of global carbon pool in forest has been estimated 359 gegatonnes of carbon (IPCC, 2000), whereas global emissions from deforestation contribute 20 to 25 percent of all GHGs emissions (Sedjo and Sohngen, 2007). Considering the size and potential climate effects of anthropogenic activities on forest, management of forest carbon has been recognized as an important element of international climate agreement. Reducing Emissions from Deforestation and Forest Degradation (REDD$^+$) has been one of the key agenda in the recent conference of parties of United Nations Framework Convention on Climate Change (UNFCC). To materialize REDD$^+$ into tangible financing mechanism to address climate change mitigation, it is essential to have reliable baseline information on carbon stock. The study aimed to quantify emissions reduction potential of the forest across the Terai Arc Landscape of Nepal for the purpose of establishing baseline for future REDD$^+$ project.

Methodology

Two methods; remote sensing and ground-based inventory, were applied for the study. Land sat imageries of the years 1990, 1999, 2002 and 2009 were used to detect land use and land use change, whereas ground-based forest carbon inventory method was used to determine carbon stock in five carbon pools viz; Aboveground tree biomass, belowground biomass, Shrub, Litter and Soil Organic Carbon across the management regimes.

Analysis of Land sat imageries of year 1990, 1999, 2002 and 2009 using Forest Canopy Density Mapper

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Measurement of biomass in 121 sample plots across the 1.1 million ha of tropical forests

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Laboratory analysis of samples and calculation of carbon stocks using different methods and models

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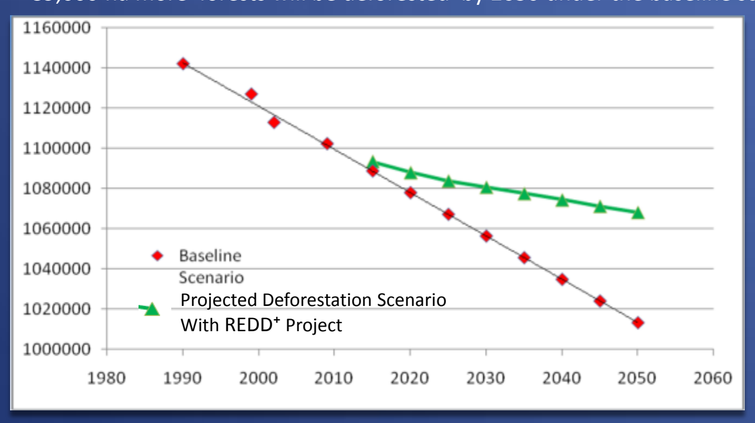
Estimation of emissions reduction potential of the forests

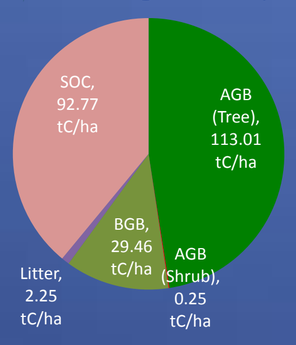
Results and Discussions

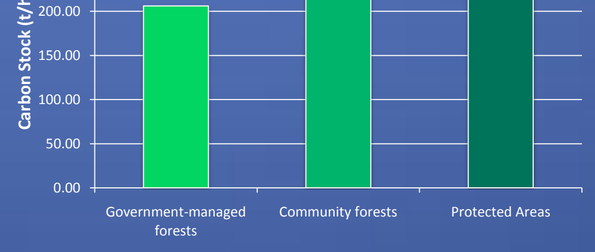
- The deforestation rate (1990-09) in the region is 0.18% per annum
- 89,000 ha more forests will be deforested by 2050 under the baseline scenario



- Rate of deforestation can be reduced to 0.06 % per annum through additional incentives under REDD$^+$ scheme, avoiding deforestation of 54,000 ha.

Aboveground tree biomass is the largest carbon pool





Protected Areas has the highest level of carbon stock with 274 .58 t C/ha followed by community and Government managed forests

Strata	Canopy Class (11-40%)	Canopy Class (41-70%)	Canopy Class (71-100%)	Weighted Average
Mean Carbon Stock (tC/ha)	186.70	244.99	287.43	237.74
Uncertainty at 95% CI	±42.14	±25.41	±47.88	±66.45
Lower Boundary at 95% CI	144.56	219.58	239.54	171.29

Carbon stock varies according to canopy classes, but lower boundary of weighted average carbon stock (171.29 t C/ha) was used to estimate emissions.

Total Avoided Deforestation, Area in ha	54,854
Average C stock per ha	171.29
Residual C stock per ha	109.83
Change in C stock	61.46
Avoided C emission (tC)	3,371,000
Reduced emissions (CO_2e in t) from avoided deforestation	12,373,000

Conclusion

The forest of the region has the potential of reducing 12 million tonnes of CO_2e emissions during the next 41 years, which is sufficient for development of a fairly large scale REDD$^+$ project.

References:
IPCC. 2000. Land use, land-use change, and forestry. Special Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.
Sedjo, R.A. & Sohngen, B. 2007. Carbon Credits for Avoided Deforestation. Discussion Paper 07-47. Washington, DC: *Resources for the Future*.

This study is possible due to generous support from Ministry of Foreign Affairs, Finland through WWF Nepal Program and Lincoln University, New Zealand. We would like to thank Mr Ugan Manandhar of WWF Nepal Program for his support to accomplish the study. The authors would like to thank Mr Manish Kokh, Mr Raju Acharya, Ms Nira Bhatta of Winrock International, Nepal and all inventory crew involved in the study.

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