Payment for Ecosystem Services: Developing Forest Carbon Projects in Nepal

A case study under the TRANSLINKS program, EnterpriseWorks/VITA

Photo courtesy of ANSAB

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Acknowledgements

Much has been written about forest carbon projects and their potential to contribute to poverty alleviation, provide a sustainable revenue stream for conservation, and introduce more robust payment for ecosystem mechanisms. Yet, country and site level specific cases are still very much lacking to give guidance to groups working to develop projects. EnterpriseWorks/VITA (EWV) and the Asia Network for Sustainable Agriculture and Bioresources (ANSAB) launched in 1992, the “Enterprise-Based Biodiversity Program” within Nepal with USAID support. This program has since grown and expanded within Nepal and around the world with multiple donors and investors.

The program has demonstrated models for payments for ecosystem services using natural products enterprise development, but most importantly built capacity, fostered multi-stakeholder working relationships, and facilitated policy advancement in sustainable forest management that benefits local people. The “Payment for Ecosystem Services: Developing Forest Carbon Projects in Nepal” case study would not have been possible without these efforts and the dedication and support of the multiple stakeholders in Nepal and internationally who have invested so much to advance community forestry, poverty alleviation, and sustainable forest management throughout Nepal and in particular within Dolakha District.

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The future of community forestry in Nepal; photo courtesy of EWV

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On behalf of the entire case study team from Terra Global Capital and ANSAB, EnterpriseWorks/VITA thanks all the stakeholders who will be needed to advance potential forest carbon projects in Nepal and hope this report will help inform the newly constituted National level working group on Reducing Emissions from Deforestation and Degradation, under the MFSC.

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Executive summary

Carbon markets, in particular the ones involving carbon credits from forest-based projects, continue to evolve. While much has been written about the potential for forest-based carbon deals, identification of specific cases compared to current carbon market requirements has yet to be documented in Nepal. Nepal, with its declining forest cover, yet strong history of community forestry, has significant potential to implement forest carbon projects. This case study identifies the potential for forest carbon projects in Nepal; summarizes the eligibility requirements under the various carbon markets and registries - Voluntary Carbon Standard (VCS), Clean Development Mechanism (CDM, and Climate, Community and Biodiversity Alliance (CCBA); and provides a specific case example from Dolakha District in Nepal.

The value and demand of carbon credits is related to the standard under which the project is developed. In a recent survey among potential buyers of credits, the most desirable carbon standards are the Clean Development Mechanism (CDM) and the Voluntary Carbon Standard (VCS) (Conservation International, 2009). Credits generated from projects that are only registered by the Climate, Community and Biodiversity Alliance (CCBA) standard are less desirable. However, a dual certification of CCBA combined with either CDM or VCS can provide carbon buyers more certainty around the co-benefits which make forest carbon projects more interesting for a certain segment of the carbon credit buyers and in the Nepal context could reward communities for the multiple ecosystem services they manage. The choice of a standard should not only be dependent on the price or demand for credits under that standard, but should also be based on the level of effort, costs and timeframe required to have the project validated under the registry. A strong incentive to form national REDD (Reduced Emissions from Deforestation and forest Degradation) programs exists side by side with project-level approaches. In fact, Nepal has recently been selected for the World Bank's Forest Carbon Facilities Program to develop national REDD programs. In the current phase of the forest carbon market, almost no data on project success rates or risks are available, yet information abounds on the promise for or cautions against communities seeking forest carbon credits.

This case study is intended to lay out the basic carbon deal considerations in the Nepalese context, specifically using Community Forest User Groups (CFUGs) in Dolakha as a tangible example of how forest carbon credits and payment for other ecosystem services (biodiversity, water, soil quality, etc.) could be pursued.

Three main forest carbon project types are relevant in the Nepalese context.

- Afforestation and reforestation (A/R and ARR): Planting of trees or silvicultural activities that promote natural regeneration on degraded woodlands through thinning, removal of exotic species, or coppicing. Under the VCS, this is called "afforestation, reforestation, and revegetation (ARR)", and includes the regeneration of degraded forests, and revegetation with non-tree species. Clean Development Mechanism and Climate, Community and Biodiversity Alliance use the term Afforestation/Reforestation (A/R).

- Avoided deforestation or forest degradation (REDD): the avoidance of the conversion of forest land to non-forest land, or the avoidance of the gradual decrease in forest biomass through forest degradation.

- Improved Forest Management (IFM): Altering forest management to increase the standing biomass of a forest (reducing timber harvest, stopping timber harvest, increasing rotation cycles, etc.).

Each of the project types has different requirements, called eligibility criteria, and different methodologies to calculate the volume of carbon credits generated by a project. The requirements and methodologies are developed by carbon standards. The rich biodiversity, existence of specific biodiversity hot-spots, and a strong community forestry program will facilitate the potential for acquiring CCBA certification along with or independent of VSC or CDM registries.

The case study has identified four different categories of land in the Dolakha District related to community forestry, referred to as forest management strata according to the potential for implementing a forest carbon project. These include: 1) stabilized community forests; 2) degraded community forests; 3) severely degraded forests that can be annexed to an existing Community Forest User Group (CFUG); and 4) severely degraded forests that can be integrated into a new CFUG. These four management strata in Dolakha include about 65,000 hectares of land that over a 30 year period could generate net cumulative carbon credits of over 5.4 million metric tons of CO2 equivalent (MTCO2e) if brought under improved management using a variety of activities designed to increase biomass and reduce loss of standing forests. These calculations are based on preliminary data; a more detailed study would be needed to arrive at carbon credit estimates that are sufficiently accurate to be used in a budget analysis for a concrete project. Actual revenue figures and timing of payments are subject to periodical verification. At current trading levels (about four to seven US dollars per MTCO2e), carbon credits could generate significant income each year.

On the cost side, the case study identified a high-level overview of the costs involved in bringing the potential Nepal project to market. Start up costs for carbon development, carbon registries and validation, and up front carbon transaction and monitoring costs have been estimated at $410,000, not including the creation and validation of a new methodology under the VCS and project management costs associated with the target interventions. Ongoing project monitoring and management costs would have to be added to these figures.

An analysis of project risk looked at project specific issues, economic, political and social instability, and natural disturbances risks. This case emphasizes that carbon projects need to be evaluated like any other business opportunity, based on projected revenue, costs, and risks. Carbon credits remain only one out of many mechanisms to increase livelihoods in a sustainable way. One should not overlook the importance of supporting more traditional enterprise activities related to ecosystem services (e.g. non-timber forest products processing businesses) while developing and implementing forest carbon projects to create holistic and robust projects.

Despite the identification of some project-related risks, this case concludes that there is significant potential to implement forest carbon projects in Nepal. The experience of the CFUGs shows that community-based forestry projects can and have succeeded within Nepal, and serve as a valuable source of information and experience that can be drawn upon to implement carbon projects. The case goes on to summarize examples of activities that could be implemented by a carbon project for each of the four land management strata, and gives recommendations for the stakeholders – government, NGOs, CFUG groups, etc. to develop potential forest-based carbon deals.

To pursue any potential forest carbon deals in Dolakha or the rest of Nepal, a number of steps are necessary: (1) the implementing organization and all required partners need to be identified, (2) the project must receive official approval, which requires a determination of who is the legal owner of the carbon credits, (3) a fair and equitable system of revenue sharing needs to be developed, (4) a management stratification map needs to be developed and (5) initial funds for project design and start-up before income from carbon credits flows in must be identified.

List of acronyms

AG	Above ground
A/R	Afforestation/Reforestation
ARR	Afforestation, Reforestation, and Revegetation
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
BG	Below ground
C	Carbon
CCBA	Climate, Community and Biodiversity Alliance
CDM	Clean Development Mechanism
CF	Community Forestry
CFUG	Community Forest User Group
CH_4	Methane
CO_2	Carbon Dioxide
DM	Dry Matter
DNA	Designated National Authority
FAO	Food and Agriculture Organization of the United Nations
FECOFUN	Federation of Community Forestry Users, Nepal
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ICIMOD	International Centre of Integrated Mountain Development
IFM	Improved Forest Matter
LiDAR	Light Detection and Ranging
Mg	Mega gram (also known as metric ton)
MTCO2e	Metric Ton of Carbon Dioxide Equivalent
NTFP	Non-Timber Forest Product
REDD	Reduced Emissions from Deforestation and forest Degradation
SOC	Soil organic carbon
USAID	United States Agency for International Development
VCS	Voluntary Carbon Standard
WHO	World Health Organization

1 Introduction

Forests provide a range of ecosystem services, which today have little direct cash-generating value but do have significant indirect economic value to people's livelihoods. The lack of a cash compensation for the benefits from ecosystem services leads to forest degradation and deforestation, often with disastrous environmental and social effects. Conversely, income from payments for ecosystem services, when appropriately structured, leads to the preservation and regeneration of forest resources. Carbon sequestration in forest systems is rapidly becoming the primary ecosystem service for which a sizeable market is emerging. A forest carbon credit represents either the removal of carbon from the atmosphere and storage in the form of biomass (e.g. wood and long-lived wood products) in quantities larger than would otherwise occur under "business as usual" (baseline) practices, or the reduction of the loss of biomass that would have normally occurred under the "business as usual". By combining carbon credits with poverty reduction and biodiversity conservation, other social co-benefits and non-carbon ecosystem functions are economically rewarded. However, a valid carbon project requires the development of specific project activities that reduce greenhouse gas emissions versus the business-as-usual baseline.

Nepal has a long and successful history of decentralized forest management through community forest user groups (CFUGs). Through the mechanism of community forestry, Nepal has increased its forest cover on previously degraded land. Forests managed under this model regenerate while local communities improve their livelihoods through the sustainable extraction of non-timber forest products. The Government of Nepal has and continues to be a strong supporter of community forestry. The importance of community forestry and empowerment of indigenous people was stressed by Hon. Mr. Kiran Gurung, Minister of Forests and Soil Conservation of Nepal, at the opening session of the plenary of the Eighth Session of the United Nations Forum on Forests, New York, 20 April 2009.

Even after becoming a formal forest user group, many communities still struggle to survive due to the lack of livelihood options and the low productivity of crops and livestock. This threatens the functioning of existing community forests and challenges the formation of new forest user groups. Because community forests are conserved and frequently have lower forest degradation rates or even show forest regeneration, they will reduce the emissions of carbon dioxide to the atmosphere or even sequester atmospheric carbon, compared to areas that are not community forests. This ecosystem service can be monetized as carbon credits, which can form a significant additional income stream. This income could make community forestry more viable in combining forest conservation and biodiversity with poverty reduction and environmental governance. It is this context that the "Payment for Ecosystem Services: Developing Forest Carbon Projects in Nepal" case study have been developed.

The objectives for this case study are:

- Identify the potential for forest carbon projects in Nepal
- Summarize the eligibility and additionality requirements to bring these carbon projects to market
- Document the process steps needed to bring a community forest carbon deal in the Nepal Himalayan context to the carbon markets
- Summarize how other ecosystem services including biodiversity, water, soil quality, etc. can be integrated into potential carbon deals

The scope of work for this case included an overview workshop on land-based carbon - payments for ecosystem services, considering community forest carbon projects in Nepal. This workshop was held in Kathmandu, on February 16th 2009. A copy of the PowerPoint presentation from the workshop can be found on EnterpriseWorks/VITA website – www.enterpriseworks.org

2 Background information

An understanding of the legal and socio-economic framework, as well as broad biophysical, geographical, and meteorological information is necessary to evaluate the feasibility of carbon projects, and payment for ecosystem services in general. Relevant information is presented in this section.

2.1 Socio-economic information

Nepal has a population of 28,563,377 (estimate of July 2009) and a total surface area of 147,181 km^2; the population density is high (194 per km^2). Population growth rate is 1.281% (2009 estimate). Over 40% of the population lives below the poverty line. Subsistence agriculture provides a livelihood for over 80% of the population and accounts for 40% of GDP. Subsistence crops include rice, corn, wheat, millet and root crops. Although some industrial agricultural commodities are produced, including jute, sugarcane, tobacco, and grain, they are very rarely cultivated in the highlands.

Tourism is a key source of foreign exchange, with considerable scope for expanding the potential of tourism. However, the deteriorating world economy in 2009 will challenge tourism and remittance growth, a key source of foreign exchange. Despite the rapid urbanization in the Kathmandu valley, prospects for economic development in the highlands remain poor, because of the remoteness of the area, the landlocked geographic location, and the susceptibility to natural disaster. In forested rural areas, most of the people live in smaller hamlets relatively homogeneously spread over the whole area. Forest-based communities critically depend on forests for a number of non-timber forest products (NTFPs) such as fodder collection, bedding, materials for livestock, fuel, essential oils, paper-making, and bio-briquettes. However, a considerable number of men leave their home and family for periods up to 9 months to find seasonal work abroad.

2.2 Biophysical information

2.2.1 Physical geography

Nepal has extreme differences in elevation which gives it a unique variety in ecosystem biomes and poses at the same time a significant challenge for stratifying the area in homogeneous tracts of land for the purpose of carbon calculations. Figure 1 provides an overview of the five main physiographic regions in Nepal. The high mountain region is mostly snow-covered. The mountain region is only sparsely populated and has relatively good forest cover. The hill region is more densely populated and is characterized by small forested patches in between cropland. The Shiwalik and Terai regions are densely populated, and mostly cropped.

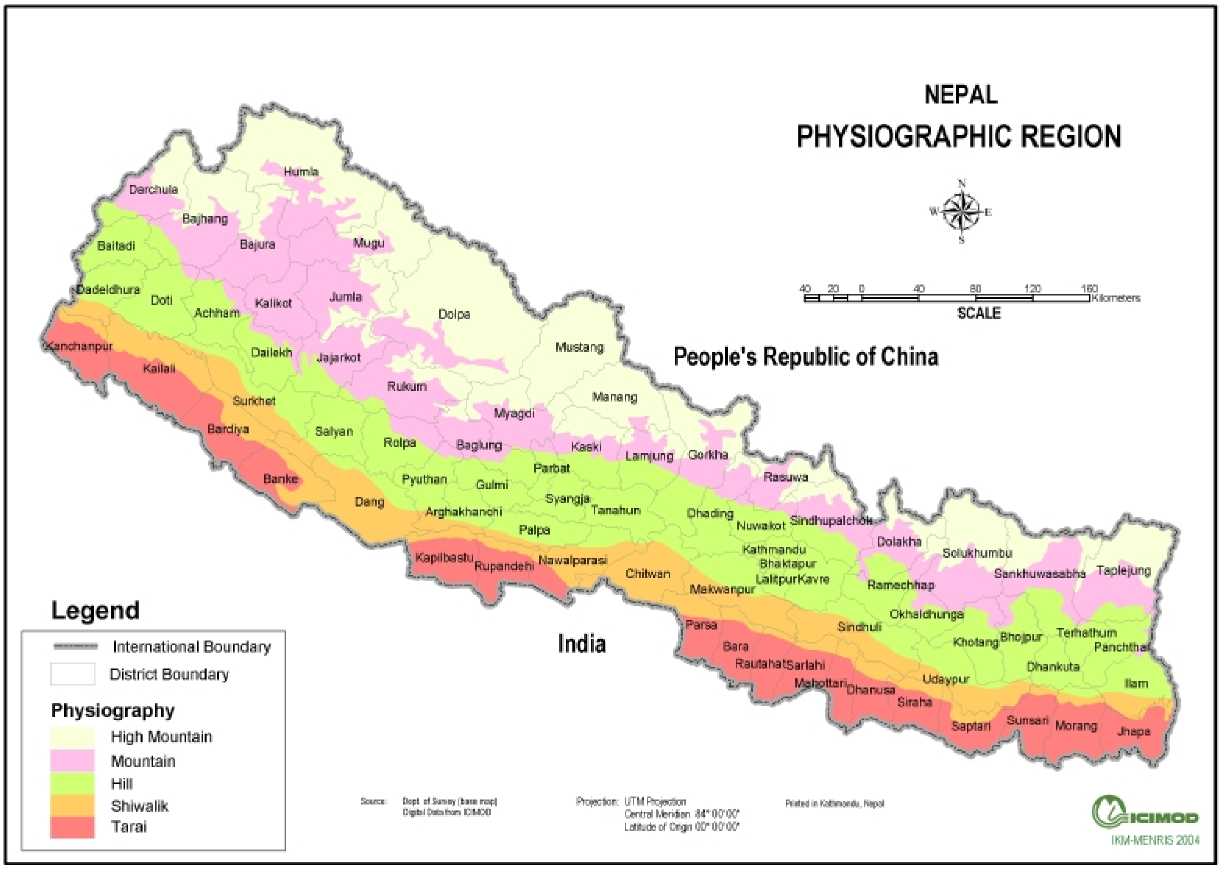


Figure 1. Location of the five physiographic regions in Nepal. Source: ICIMOD, 2004.

2.2.2 Native vegetation and biodiversity

The extreme differences in elevation give rise to a unique variety of vegetation and biodiversity. Without doubt, Nepal contains biodiversity of global significance, as recognized by the presence of biodiversity hot-spots and the designation of areas as having a global priority for biodiversity conservation (Myers 1988, Myers 1990, Mittermeier et al., 1998). The rich biodiversity, existence of hot-spots, and a strong community forestry program (see section 2.3) will facilitate the potential for acquiring Climate, Community, and Biodiversity Alliance (CCBA) certification.

Many herbs and forest understory plants of commercial importance are actively being harvested as non-timber forest products (NTFPs), and form a significant source of income for forest-dependent communities. Sustainable harvesting of NTFPs is a key element that can be incorporated into a forest-carbon project as a way to provide alternative livelihoods that will decrease the pressure on the forest.

Nepal's total forest cover contains about 4.27 million hectares representing about 29% of the total land area. The current deforestation for the whole of Nepal is estimated at 1.7% (National Forest Resource Inventory Report 1999). However, this estimate is not based on a nation-wide forest cover assessment. There is a lack of data to quantify the deforestation rate more accurately.

While national level figures provide a starting point, stratifying specific areas of land according to their forest types and climatic growing conditions, and hence regeneration rates is needed for the purpose of project-specific carbon calculations. Table 1 provides an overview of the forest types in Nepal and their important stock and growth parameters which can be used to stratify an area of land being considered for a carbon project. The climate discussion that follows Table 1 provides the type of illustrative precipitation and temperature data by altitude that can also assist in carbon calculations modeling in the Nepal context.

The diversity of physiographic regions in Nepal; photo courtesy of ANSAB

Table 1. Overview of forest types and their most important stock and growth parameters which can be used in a stratification of the land

Species and management	Dry matter stock density Mg AG+BG DM ha^{-1}	Wood density Mg m^{-3}	MAI m^3 ha^{-1} yr^{-1}	BEF -	R:S -	Annual biomass increment Mg AG+BG DM ha^{-1} yr^{-1}
Shorea robusta	107.5[1] 45.32, 48.14[2] 698, 337[8] 291.5 - 460.4[13] (coppice growth) 303.7 - 716.9[13] (old growth)	0.72[11]	NA	NA	0.16[7] - 0.22[7]	80[1] 59.5[4]
Tropical Mixed Hardwood	41.3[2]	0.88[11] (*Acacia catechu*) 0.76[11] (Tropical *Dalbergia* spp.)	NA	NA	0.22[7]	10.0 - 25.0[13] (Tropical forests with a mean annual temperature of 15°C)
Upper / Lower Mixed Hardwood	43.3[2] 170.9[3] (open) 381.8[3] (dense) 119.0 - 222.9[13]	0.70[9] (Tropical Quercus) 0.51[7] (Tropical *Betula* spp.)	NA	NA	0.17[7] - 0.22[7]	11.0 - 27.4[12] (Himalayan forest)
Pinus roxburghii	31.2[2] 200.8 - 377.1[13]	0.39[7] - 0.50[9] (Tropical *Pinus* spp.)	NA	NA	0.23[7]	18.5 - 24.5[12]
Pinus wallichiana/ Cupressus torulosa and others/ Taxus spp.	57.8, 57.1, 57.1[2] (*Pinus wallichiana*)	0.39[7] - 0.50[9] (Tropical *Pinus* spp.)	NA	NA	0.22[7]	11.0 - 27.4[12] (Himalayan forest)
Abies spp / Tsuga spp. / Picea spp. / Cedrus deodara (Roxb.) G.Don.	94.2[2]	0.42[7] (Tsuga) 0.40[7] (Picea)	218m[3]	NA	0.20[7]	11.0 - 27.4[12] (Himalayan forest)
Shrub	40.0[5]	NA	NA	NA	0.23[7]	NA

[1] Behera and Misra (2006), [2] Manhas et al. (2006) and using C fraction of dry wood of 0.5, [3] Sharma and Rai (2008) and using C fraction of dry wood of 0.5, [4] Koul and Panwar (2008) and using C fraction of dry wood of 0.5, [6] Ravindranath et al. (1997), [7] IPCC(2003), [8] Shrestha and Singh (2008) reported higher tree biomass, [9] USDA Wood Densities of Tropical Species, [10] Velle (1998), [11] Brown (1997), [12] Pandey and Singh (1984), [13] Lieth (1975)

2.2.3 Climate

Precipitation and temperature

Nepal's wet season extends from May to September; the dry season runs from November until March; April and October are transition months. The hottest months are April through September; the temperatures are lowest in January.

Nepal's climate is highly dependent on the elevation. The mean annual temperature is found to decrease by 0.44 degrees C per 100 m increase in elevation in a similar area in the Indian Himalaya (Singh et al., 1994). For example, Kathmandu (elevation 1340 m) has a mean annual temperature of 17 °C, while Dolakha (elevation of 2100 m) has a mean annual temperature of 13.9 °C. This figure shows clearly that communities living in high-elevation areas need a significant amount of fuel-wood for heating, posing a further challenge to already slow growth-rate forests. The following table shows an example of climate information for Kathmandu, though similar trends exist with different magnitude within all regions of Nepal.

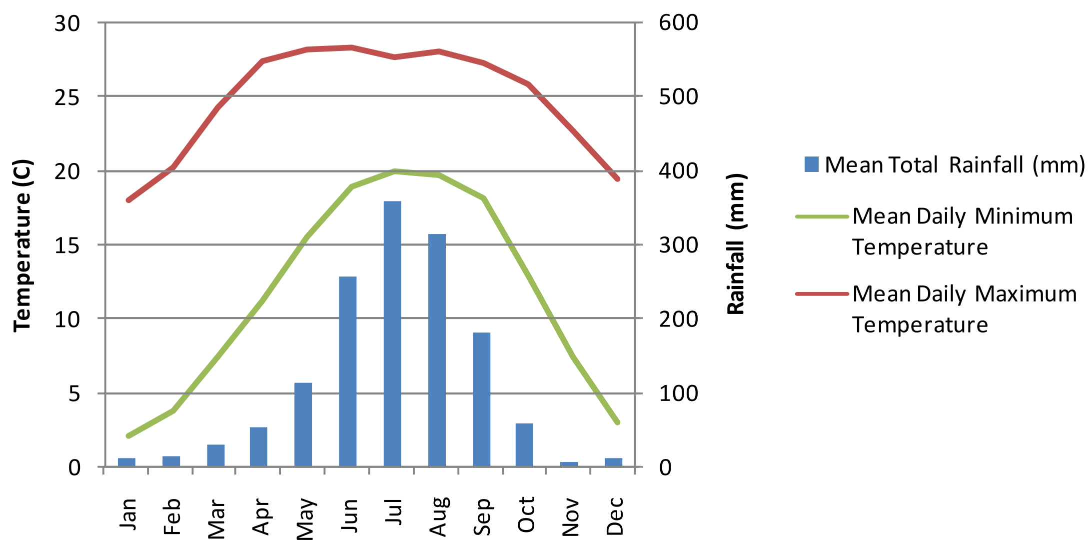


Figure 2. Basic climate data for Kathmandu (elevation, 1340 m). Source: World Meteorological Organization.

Climate change

The Nepalese mountain areas are highly vulnerable to the impacts of global climate change. From 1976-2006, the mean annual temperature increased with 0.8 C, while mean annual precipitation increased 150 mm (Gurung 2009). This rise in temperatures increases the volume of snowmelt water, the size and number of glacial lakes, and the occurrence of floods and land-slides in mountain areas (Gurung 2009). Such floods are referred to as glacial lake outburst flood events. The latter is exacerbated by the concurrent increase in heavy rain storm events. Forest conservation can partially mitigate the increased risks of land-slides by reducing erosion, increasing filtration, and soil stabilization. In addition, a significant forest cover has a profound stabilization effect on the micro-climatic system. Climate change resilience is therefore a significant additional ecosystem service provided by forest systems. This was recognized in the recent statement by Hon. Mr. Kiran Gurung, Minister of Forests and Soil Conservation of Nepal, at the opening session of the plenary of the Eighth Session of the United Nations Forum on Forests, New York, 20 April 2009.

2.3 Land tenure, legal framework, and enforcing capacity

Traditionally, land tenure systems in Nepal have been communal. The communal land-tenure systems were discontinued with the abolition of the Birta system in the mid 1960's, in which individual family land was owned tax-free. This land reform accelerated forest degradation. In the 1990s, new legislation, "Forest Act 2049"[1], supported and provided a framework for traditional communal land-tenure systems, which promote forest conservation and sound forest stewardship. All forestland in Nepal is and remains owned by the government. However, under the Forest Act, a local District Forest Officer may hand over the control of a forest area to local communities upon approval of an operational plan.

The operational plan contains annual allowable harvest levels of timber and NTFPs and provisions to ensure equitable distribution of the forest products at a subsistence and commercial level. The forest area is demarcated and handed over to a CFUG, a community-based organization, which controls the forest's management, utilization, and sale of all community forest resources. The CFUG agreement has a perpetual succession, as long as the operational plan is followed.

Community Forest User Group Meeting; photo courtesy of ANSAB

Understanding Nepal's forest management structures and associated land tenure systems is essential to constructing a potential forest carbon deal. Table 2 provides a typology of forest management types, land tenure, and responsible institutions which at a minimum would need to be consulted and included in forest carbon projects.

[1] An English translation is available from the ministry of forest and soil conservation

Table 2. Typology of forest management types and land-tenure in Nepal (area figures adapted from FAO 2005).

Forest Type	Management Objective	Responsible Institution	area (ha)
Government managed Forest	Production of forest products	District Forest Offices	About 1.1 million
Community Forests	Production of forest products, biodiversity conservation and multiple purpose use	Forest user groups	1,229,669
Leasehold Forests	Rehabilitation of degraded forests, production of forest products, tourism, wildlife farming	Leasehold groups, NGOs, industries	7,011
Religious Forests	Protection of religious sites	Religious institutions	N/A
Protected Forests	Protection of wildlife, conservation of biodiversity and environment	Department of Forest	1,218,060
Private Forests	Production of forest products	Individuals, Industry, NGOs	3,636

Community Forestry (CF) provisions are more detailed in the new Forest Act (1993) and its Regulations (1995). Rights over forest products, management practices and roles and responsibilities of the communities and government agencies are explicitly mentioned in the document. All stakeholders including communities, NGOs and government agencies need to follow the provision of the act and regulation.

Since its establishment in the early 1990s, the Forest Act has been very successful. As of May 2009, a total of 1,229,669 ha of forestland have been handed over to 14,439 Community Forest User Groups (CFUGs) (source: CDF 2009). Between 1990 and 2000, 80,000 ha per year were handed over to CFUGs. The annual area handed over to CFUGs peaked in 1995, when it reached 160,000 ha per year. In recent years, however, the rate decreased significantly to less than 20,000 ha per year. Acharya (2002) reported that policy objectives were redefined in recent years from meeting basic needs to poverty alleviation. The policy focus is now on addressing the following challenges that Nepal's Community Forestry policy is facing:

- Ensuring benefits and access in decision-making for disadvantaged groups
- Ensuring sustainable forestry while maintaining native vegetation
- Moving towards active forest management dominated by a few economic species
- Restructuring of District Forest Offices (DFO) to deliver quality extension services
- Reviewing CF process and practices to maintain people's participation

With over a million ha of government forests not in protected status or CFUG control, there is still significant potential to implement community forestry projects. The main challenges for CFUGs continues to be access to capacity building and technical assistance to institute high-quality operational plans, rehabilitate degraded forests, institute sustainable subsistence use of the forests (fuel, fodder, etc.) and launch enterprises that allow the CFUGs to manage the rich local biodiversity and ecosystem services for the long term health of the environment and their communities.


Lokta Bark Paper Enterprise in Dolakha; photo courtesy of ANSAB

Government-managed forests vary greatly in their condition. Staffing and funding levels are inadequate to undertake active forest management and protection, often resulting in ongoing degradation. Handing over land to communities can reverse the degradation trend, and help to regenerate forest cover while providing alternative livelihoods and ecosystem services to the communities. A significant amount of landless and migratory people exist within Nepal, contributing significantly to largely uncontrolled and unplanned forest encroachment and forest conversion. Given the government resources, there is little capacity to police encroachment by thinly staffed government offices. Instead, some CFUGs have been able to monitor encroachment and work with the landless and migratory people to provide more sustainable access to resources. This model needs to be further developed as the current political situation does not indicate that the government alone will have the budget to provide this function effectively in the near future.

The goal should be for CFUG and government efforts to complement one another. The government has an essential role to play in carbon projects and figure 3 provides an organizational chart overview of the relevant administration levels and authorities that are needed to develop carbon projects in Nepal in a holistic and efficient manner.

2.4 Relevant administrative levels and authorities

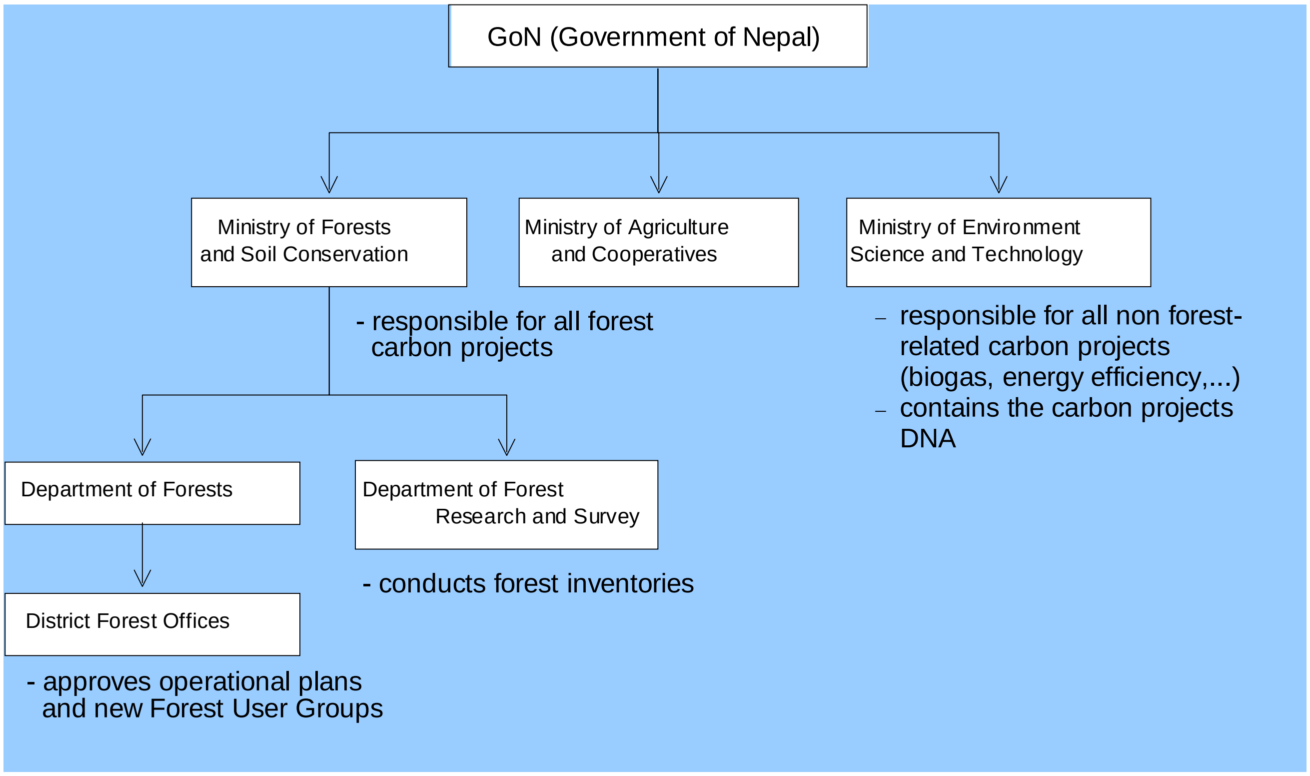


Figure 3. Organizational chart of the relevant Administrative Levels and Authorities

The Ministry of Environment Science and Technology and the Ministry of Forests and Soil Conservation both have roles to play in potential forest carbon projects. The Designated National Authority (DNA), the national administrative body that is responsible for all Clean Development Mechanism (CDM) carbon projects, is located within the Ministry of Environment, Science and Technology. The DNA also has the responsibility for selecting a forest definition, which is crucial to forest carbon projects, as explained further in section 3.4.

Forest carbon projects need to be developed in a holistic manner, in which the demand for fuel wood and timber is integrated in the project design. Forests can regenerate faster if fuel-wood is used more efficiently. Energy efficiency projects would fall under the Ministry of Environment, Science and Technology, while the credits from forest regeneration are part of the Ministry of Forests and Soil Conservation. It is recommended to strengthen the coordination between the Ministry of Environment, Science and Technology and the Ministry of Forests and Soil Conservation to avoid the double counting of carbon credits.

3 What constitutes carbon readiness?

Carbon readiness is a general term that is used to note how close a specific carbon project is to bringing its credits to market. It includes a number of necessary conditions:

1. The project is relatively developed; project proponents have some idea of project activities, and potential standards and registries.

2. Project proponents have secured some funds for project development, certification, and implementation.
3. The legal owner of the carbon credits has been determined.
4. All relevant administrative authorities have been consulted and agree that the project can commence.
5. A trustworthy and experienced organization which is capable of implementing the project has been identified.
6. A fair and equitable system of revenue sharing has been developed.
7. All required data to estimate the volume of credits that will be generated is either available or can be gathered within 6 months.

The following sections outline options and guidance for each of these seven carbon readiness conditions in the Nepal context, with an emphasis on how potential community forestry user group (CFUG) carbon deals could be pursued. Key concepts in forest carbon projects are provided first, in the chart below, to help orientate readers.

Key concepts in forest carbon projects

- **Baseline**. The expectation of what will happen in the future if no carbon project is implemented. This may be a continuing of the current harvesting rates for managed forests, or the currently observed deforestation and forest degradation rates.
- **Additionality**. The question of whether a project would have happened without the carbon project. This may be because the management proposed under the carbon project is financially attractive even without money from carbon credits or there is legislation that imposes the practices that are proposed in the carbon project. A project is additional if certain legal or financial barriers exist to implement it without income from carbon credits.
- **Leakage**. The occurrence of increased emissions outside of the project area that are caused by the project activities. This may be due to the shifting of the harvest of forest products to another place that cancels out the gains of the forest carbon project.
- **Permanence**. The longevity of the carbon stored in biomass for which carbon credits are issued. Forest-based credits that are sold represent carbon that is sequestered in biomass. If there is a high risk that this biomass will be lost due to e.g., fire or floods, the carbon credits will have a low permanence. Projects must take measures to ensure that the carbon remains stored in the forest over time.
- **Validation**. The initial checking of the project proposal developed by the project proponents by an independent third party.
- **Verification**. The on-going checking of the carbon credit calculations done by the project proponents and project conditions by an independent third party after project start.
- **Carbon markets**
    - A carbon project creates and sells carbon in units of **metric ton of carbon dioxide equivalents** (MTCO2e).
    - The MTCO2e is created by **increasing the biomass above a baseline**
    - The **calculation of the MTCO2e** is explained in validated and approved formal protocols.
    - The calculations are verified by **third-party verifiers**
    - The verified MTCO2e is tracked through a **greenhouse gas registry**.

3.1 Project activities and potential standards

The case study work has identified several project types that could generate carbon credits in the forests of Nepal:

- **Afforestation and reforestation (A/R and ARR)**: Planting of trees or silvicultural activities that promote natural regeneration on degraded woodlands through thinning, removal of exotic species, or coppicing. Under the Voluntary Carbon Standard (VCS), this is called "afforestation, reforestation, and revegetation (ARR)", and includes the regeneration of degraded forests, and revegetation with non-tree species. The Clean Development Mechanism (CDM) and Climate, Community and Biodiversity Alliance (CCBA) use the term Afforestation/Reforestation (A/R).
- **Avoided deforestation or forest degradation (REDD)**: the avoidance of the conversion of forest land to non-forest land, or the avoidance of the gradual decrease in forest biomass through forest degradation.
- **Improved Forest Management (IFM):** Altering forest management to increase the standing biomass of a forest (reducing timber harvest, stopping timber harvest, increasing rotation cycles, etc.).

Each of the project types has different requirements, called eligibility criteria, and different methodologies to calculate the volume of carbon credits generated by a project. The requirements and methodologies are developed by carbon standards. Before any credits can be issued, a concrete project must gain the acceptance of the standard. The credits themselves are issued by a carbon registry – formally recognized bodies which register and track carbon. Very often, the carbon standard and the registry are the same entity.

The value and demand of carbon credits is related to the standard under which the project was developed. In a recent survey, the most desirable carbon standards are the Clean Development Mechanism (CDM) and the Voluntary Carbon Standard (VCS)[2] (Conservation International, 2009). Credits generated from projects that are only registered by the Climate, Community and Biodiversity Alliance (CCBA) standard are less desirable by businesses. A dual certification of CCBA combined with either CDM or VCS can provide carbon buyers more certainty around the co-benefits which make forest carbon projects more interesting for a certain segment of the carbon credit buyers, according to the same survey.

The choice of a standard should not be only dependent on the price or demand for credits under that standard, but also be based on the level of effort, costs and timeframe required to have the project validated under the registry. One of the key eligibility criteria for carbon projects is the requirement that they are additional (also referred to as additionality), and they would not have happened without the development of a carbon project due to financial or legal barriers. The CDM has published a formal tool to test the additionality criterion[3]. This tool can also be used to demonstrate additionality for projects that are submitted to the VCS.

[2] http://www.ecosecurities.com/Standalone/Forest_Carbon_Offsetting_Trends_Survey_2009/default.aspx#19721

[3] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-01-v2.pdf

Figure 4 provides a decision tree to help determine which project types may be eligible for a given area in Nepal and under which standard each project might be eligible.

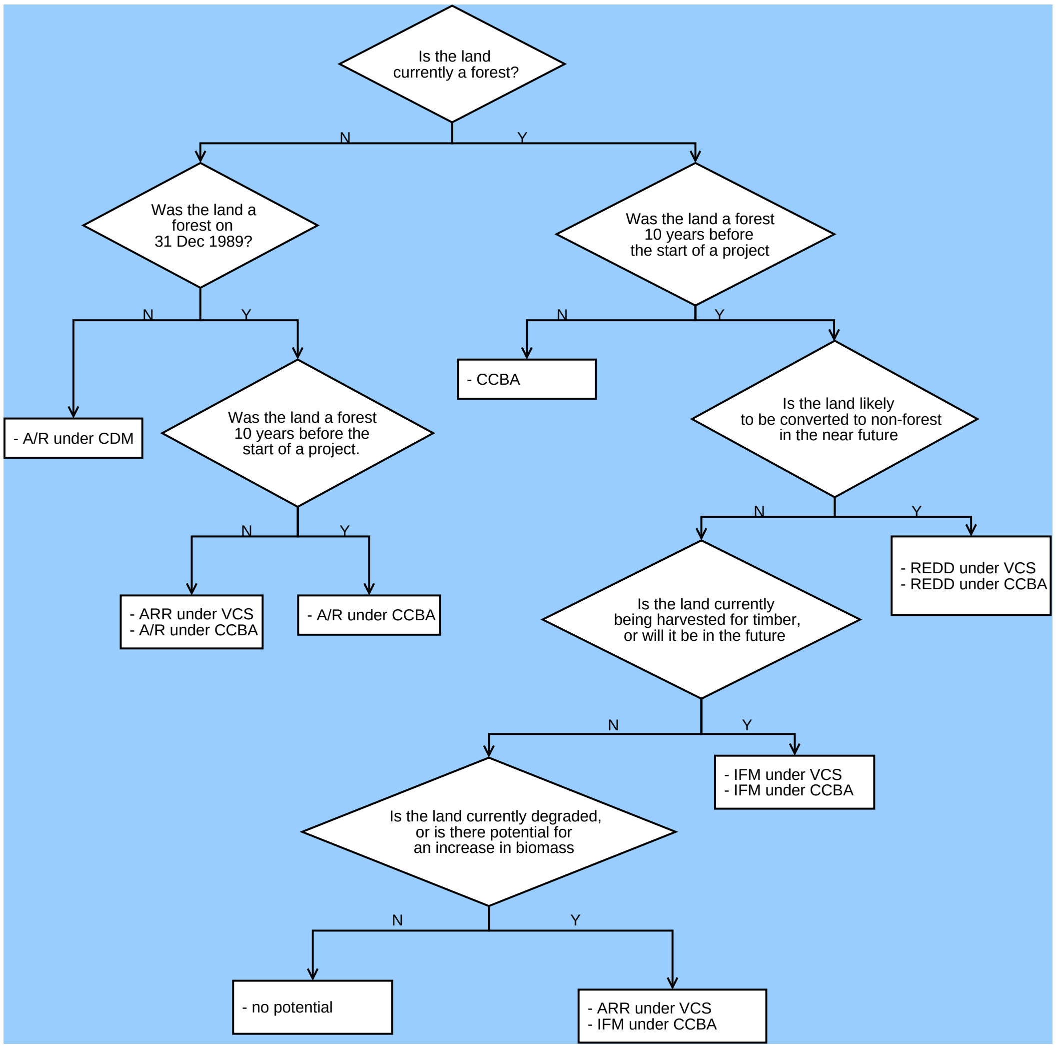


Figure 4. Decision tree for project eligibility and registry.

3.2 Required funds

Forest projects are often subject to a significant funding gap. Funding requirements for forest project activities are typically substantial in the beginning of the project which is an obstacle to project implementation. Funding is required for (1) project development, which includes costs for forest inventory and development of the project methodology and project document; (2) third party certification and validation; and (3) initial project activities such as tree planting, silvicultural activities, or investing in alternative livelihoods. However, income from carbon credits is typically received only upon delivery (sale) of carbon credits, which occurs after project activities have successfully reduced emissions or sequestered carbon in carbon sinks. This can easily be 5 to 10 years after the project start date for A/R and IFM projects or 2 to 5 years for REDD projects. However, some form of pre-payment is negotiable with potential buyers. The price paid in pre-payment arrangements is to a large extent dependent on the risks the buyer is willing to take.

In the current stage of the forest carbon market, almost no data on project success rates or risks are available. Therefore, most projects overcome the project gap with donor funding or funds from philanthropic investors who are less risk averse.

3.3 Ownership of the credits

When carbon credits are generated, one entity will have the property right of the credits. The owner of the credits may be the legal owner of the land, the leaseholder of the land, or land-tenure holder. The legal owner may transfer some or all of the rights to the credits to a different party. No precedent exists in Nepal to determine the legal owner of carbon credits from forest projects. If the credits are legally owned by the CFUGs, ownership may still be transferred to the government, and vice versa. Credits could also be transferred to a non-governmental organization or stakeholder group. It is important to note that while there needs to be clear ownership, distribution of carbon payments can be structured in many different ways, with multiple beneficiaries. Agreements can be structured to allow payments from carbon to go to entities that are not the legal owners of the credits.

3.4 Consultation of relevant administrative Levels

Similar to the credit ownership issue is the issue of administrative clearance. All carbon credit projects must have the approval of the appropriate administration that has jurisdiction over forests and carbon. The Ministry of Environment, Science, and Technology focuses on all non-forest carbon projects, whereas the Ministry of Forests and Soil Conservation handles all forest carbon credits. However, a number of issues are cross-project type, and will require synchronization among ministries.

- A formal definition of a forest is important in determining the project action that may be implemented in a given area. However, this definition must be set by the CDM- assigned Designated National Authority (DNA), which is overseen by the Ministry of Environment, Science, and Technology in Nepal. Avoided deforestation and improved forest management can only be implemented on land that is formally defined as forest. Afforestation and reforestation are formally defined as bringing non-forest land back to a forest, and can only be implemented on land that is formally defined as non-forest. Therefore, whether the land is forest or not is very important when assessing potential carbon project actions. The formal definition of whether land is forest or not is based on a number of criteria such as the minimal tree crown cover percentage on the land, the minimal size of the area, and the minimal height of the trees on the land. Although only A/R projects are accepted as an eligible land-use project under the CDM, the CDM-defined forest

Rhododendron forest in Dolakha; photo courtesy of ANSAB definition has generally been adopted by all carbon standards for all project types, including IFM and REDD. Forest definition is defined as a minimal allowable tree crown cover percentage, minimum land area (ha) and minimum average tree height. This definition changes depending on the biophysical constraints of different countries. For example, a country may set the minimal tree crown cover percentage anywhere in the range of 10% to 30%. Countries that assign a smaller value for the minimal tree cover within this range will contain more land that is considered forests. Therefore, there will be a larger potential for REDD projects. Conversely, countries that set the minimal tree crown cover at the higher end of the allowed range will contain less land defined as forest. These countries have more potential for A/R projects. In cases where the DNA has not selected valid minimal values for forests, a country cannot participate under the CDM. The VCS recommends using the CDM forest definition when determining land eligibility. Where no CDM definition is available, as is the case in Nepal, Terra Global Capital suggests using the forest definition set forward by the FAO[4]:

> *Forest includes natural forests and forest plantations. It is used to refer to land with a tree canopy cover of more than 10 percent and area of more than 0.5 ha. Forests are determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 m.*

A dialogue between the Ministry of Environment, Science and Technology, which hosts the DNA, and the Ministry of Forests and Soil Conservation, will be required to select an appropriate forest definition.

- Fuel wood is the main energy source for many rural communities in Nepal. Therefore, reducing forest degradation will require an increase in energy efficiency of stoves and essential oil distillation units (a common NTFP enterprise found in Dolakha). Therefore, most forest carbon projects will have an energy-related component, which falls under the jurisdiction of the Ministry of Environment, Science, and Technology.
- Similarly, the intensification of agriculture by the introduction of sustainable integrated soil fertility measures, or enhanced livestock keeping practices will require the integration of different ministries.

In general, the holistic nature of many forest carbon projects will require the collaboration of different ministries and administrative levels, which could more easily be facilitated with the creation of a main carbon and payment for ecosystems project committee with representatives from each ministry.

3.5 Potential project implementing organizations

Nepal contains an active civil society with many well-functioning NGOs. These organizations usually have a proven track record of stakeholder consultation and participation. Therefore, each of these can participate in implementing and supporting forest carbon projects, according to the individual strengths

[4] http://www.fao.org/DOCREP/004/Y1997E/y1997e1m.htm#bm58

and expertise. However, it is advised that the separate roles and tasks of each of the organizations are examined up-front to identify the most appropriate organization for project implementation.

Table 3. Examples of relevant organizations of the civil society which could implement forest carbon projects in Nepal. This list is illustrative and non-exhaustive, a more complete list of forestry resource groups in Nepal can be found at www.forestrynepal.org

Organization Name	Description
ICIMOD	International Centre for Integrated Mountain Development. This NGO is headquartered in Kathmandu. http://www.icimod.org/
ANSAB	Asia Network for Sustainable Agriculture and Bioresources. This NGO is headquartered in Kathmandu and focuses on biodiversity conservation and economic development through community-based enterprise oriented solutions. http://www.ansab.org/
FECOCUN	District Level Community Forestry User Group Federation http://www.fecofun.org/
WWF	International conservation NGO with a strong presence in Nepal http://www.wwf.org/

3.6 Revenue sharing

An equitable and transparent system of revenue sharing among local stakeholders and government authorities must be established. It is essential that all stakeholders agree to this system of revenue sharing before the start of the project and that a clear legal foundation is established to define the criteria for payment. Nepal stakeholders need more learning opportunities to better understand the potential size of carbon revenue streams, project management costs, and risks associated with the carbon projects they develop. This is as an essential component to develop an equitable and transparent revenue sharing system.

3.7 Data requirements

3.7.1 Available data

Previous government and bilateral programs have generated a series of land-cover maps:

- Land Reform Mapping Project (LRMP) mapping in 1987
- Land cover map from 1998
- New forest cover and forest biomass density dataset will be collected in collaboration with the Finnish government by 2012.

Development and Aid organizations have collected a wealth of environmental and social data which can be used directly for the development of forest carbon projects

- Australian AID: Community Resource Management and Livelihood projects
  http://www.nacrmlp.org.np/

- DFID: Livelihood and Forestry Program http://www.lfp.org.np/
- USAID: USAID/Nepal, TRANSLINKS program, including Katoomba Group
- Development Resource Management Forestry Team at USAID: http://rmportal.net/groups/forest/usaid_ft_resources/

Other organizations provide valuable information relevant to forest carbon projects.

- http://www.digitalhimalaya.com
- http://www.forestrynepal.com
- http://www.nepjol.info/index.php/BANKO
- http://www.forestaction.org/
- U.S. Forest Service (USFS) - USFS has developed research-based adaptation strategies, carbon sequestration models and a body of collaborative resource management practices applied in more than fifty countries around the world. http://www.fs.fed.us/global/topic/climate_change/welcome.htm

3.7.2 Data to be gathered

Many CFUGs have experience conducting forest inventories through the development of their operational plans, which are in part based on an inventory of timber and non-timber forest products (NTFPs). Each operational plan of a CFUG contains an inventory of the forest, or different forest blocks. Only when the original plot-level data is available, can this be directly used to quantify forest carbon density. The guidelines for Inventory of community forests are largely compatible with the requirements to measure forest carbon, forest types, condition, and distribution of diameter and height of trees in the standards and protocols for forest carbon projects. However, since measurements of forest carbon for carbon offsets usually require an accurate measurement of the change in biomass stock, it is advised to use permanent sampling plots instead of temporary sampling plots. Markers can be used to locate the corners of each plot. The location of the permanent sampling plots should be selected using a stratified random sampling design.

The generation of credits from avoiding forest degradation is challenging due to the complexity of measuring forest biomass densities using satellite images. Only high-resolution satellite imagery and LiDAR measurements are capable of truly quantifying carbon stock densities remotely. However, given the experience of local communities with forest inventories, a quantification of forest degradation could be entirely based on ground measurements, provided that the sampling design is based on a sound stratification. In addition, a strong Quality Assurance and Quality Control system must be set-up to ensure an accurate and unbiased quantification of the forest carbon stocks.

Table 4 provides an overview of the data requirements for forest carbon projects in Nepal and data that was found to be available based on the brief case study work. Note that given the short time frame of the case study work, other secondary data may also exist in addition to the available sources noted. Table 4 can therefore be used as a guideline for organizing new data found and collected in relationship to the available sources noted.

3.7.3 Overview of data requirements and availability

Table 4. Overview of data requirements and availability for forest carbon projects in Nepal.

Data Category	Available	To be acquired
Historical Land Cover Maps	1987, 1998	2010-2012
Historical Remote Sensing Images	1990, 2000, 2005, and other scenes from Landsat 5 and Landsat 7	Some scenes could be acquired from the IRS constellation of satellites e.g., LISS-III
Vectorized Road ,Tracks, and Settlements Maps	Only a very coarse road and tracks map is available	A more detailed road, tracks and settlement inventory will be needed
Forest Biomass Stock Assessments	Some available within operational plans	More are required
Forest Regeneration Rate Estimates	Some broad-level data is available from the Community Forestry Inventory Manual	More fine-level and regional data is required for a detailed forecast of the potential of carbon credits that can be generated
Accurate elevation model	SRTM 90-m elevation map	It is expected that a ASTER-based DEM will become available for free in the first half of 2009
Forest type map	1998	
Forest Management Stratification	Some coordinates of CFUGs are available from ANSAB, FECOFUN, and other NGOs	All coordinates of CFUG boundaries are needed, together with the state of the CFUG

4 Example: forest carbon projects in the CFUGs or potential CFUG areas of the Dolakha District

4.1 Overview of projects, activities and potential registries

This section focuses on how the community forestry mechanism can be used to develop forest carbon projects, either by optimizing management in existing CFUGs, or by bringing new forest land under CFUG control. The case study has identified four different categories of land in the Dolakha District, which are referred to as management strata according to the potential for implementing a forest carbon project (Table 5). In addition, Table 5 summarizes examples of activities that could be implemented by a carbon project for each of the four management strata, and the potential project types. Table 6 provides an overview of the surface area of each management stratum that could potentially be included in carbon projects in Dolakha, the biomass density for each stratum, the potential biomass density that could be attained within 30 years and an estimate of the regeneration speed.

Table 5. Management stratification for the Dolakha District.

Stratum Name	Current status of the land	Potential activities to reduce degradation and deforestation	Potential activities to increase biomass	Potential project type
1. Stabilized community forests	• Lightly degraded forest • Little sign of continuing degradation • Under control by well-managed CFUGs with a reliable operational plan • NTFPs are harvested and processed using small enterprises • Some CFUGs have already acquired FSC certification	• Bio-gas projects • Fuel-efficient stoves	• Enrichment planting • Fencing • Removal of invasive species • Thinning • Coppicing	• IFM
2. Degraded community forests	• Moderately degraded forest • Some signs of continuing degradation • Under control of CFUGs that can further optimize their management • Poorly defined operational plan • No NTFP enterprises exist	• Bio-gas projects • Fuel-efficient stoves • Reducing of grazing pressure • Social fencing and forest patrolling • Optimizing of NTFP enterprises	• Capacity building • Optimization of existing operational plan • Enrichment planting • Fencing • Removal of invasive species • Thinning • Coppicing	• REDD • IFM
3. Severely degraded forests that can be annexed to an existing CFUG	• Forest biomass is severely degraded • Clear signs of continuing degradation • Forest is under Government management • No operational plans exist • The land neighbors an existing CFUG	• Agricultural intensification • Fuel-efficient stoves • Reducing of grazing pressure • Social fencing and forest patrolling • Alternative livelihood support through NTFP development	• Capacity building • Optimizing of existing operational plan and expanded CF areas with new revised plan • Enrichment planting • Fencing • Removal of invasive species • Thinning • Coppicing	• REDD • IFM • ARR[5]
4. Severely degraded forests that can be integrated into a new CFUG	• Forest biomass is severely degraded • Clear signs of continuing degradation • Forest is under Government management • No operational plans exist • The land cannot be brought under control of an existing CFUG	• Agricultural intensification • Fuel-efficient stoves • Reducing of grazing pressure • Social fencing and forest patrolling • Alternative livelihood support through NTFP development	• Formation of a new CFUG • Development of new Operational Plan • Reforestation • Fencing • Silvicultural activities	• REDD • IFM • ARR

[5] Under the VCS, Afforestation and Reforestation (A/R) is categorized as Afforestation, Reforestation, and Revegetation (ARR).

Table 6. Area and biomass characteristics for the four management strata.

Stratum Name	Potential area [ha]	Average current biomass density [Mg AG+BG DM ha^{-1}]	Potential biomass density [Mg AG+BG DM ha^{-1}]	Regeneration Speed [Mg AG+BG DM ha^{-1} yr^{-1}]
1. Stabilized community forests	24500[a]	105[b]	150[c]	5.2[d]
2. Degraded community forests	10500[a]	80[b]	150[c]	4.0[d]
3. Severely degraded forests that can be annexed to an existing CFUG	15000[a]	40[b]	150[c]	4.0[d]
4. Severely degraded forests that can be integrated into a new CFUG	15000[a]	40[b]	120[c]	4.0[d]

[a] Of the total 35000 ha in community forest land, it is estimated that 70% is in category 1. About the same area (30000 ha) is under government control. It is assumed that half of the area can be annexed to existing CFUGs, and for the other half, a new CFUG must be developed.
[b] Stratum 1: average of Balamdamji (104 Mg AG DM ha^{-1}) and Dhande (57 Mg AG DM ha^{-1}) community forests, multiplied by 1.3 to account for roots. Stratum 2: biomass of Dhande, multiplied by 1.3 to account for roots. Stratum 3 and 4: biomass of Manang forest (Singh and Tiwari, unpublished, reported in Subedi, 2006) (31 Mg AG DM ha^{-1}) multiplied by 1.3 to account for roots.
[c] Conservative estimate based on Singh and Tiwari (unpublished) reported in Subedi (2006). This is in line with a value of 123 Mg AG DM ha^{-1} from HMG/ADB/FINIDA (1988) as reported in Upadyay et al. (2005), with a root expansion factor of 1.3, this is 160 Mg AG+BG DM ha^{-1}.
[d] Stratum 1: sequestration rate from Dense mixed banj oak forest in Singh and Tiwari (unpublished) reported in Subedi (2006) (4 Mg AG DM ha^{-1} yr^{-1}) multiplied with 1.3 to account for roots. Strata 2-4: sequestration rate from Ilam in Singh and Tiwari (unpublished) reported in Subedi (2006) (3.2 AG DM ha^{-1} yr^{-1}) multiplied with 1.3 to account for roots. This is in line with an average increase in biomass of 3.61 reported by HMG/ADB/FINIDA (1988) as reported in Upadyay et al. (2005).

4.2 Overview of agents and drivers of deforestation and degradation

Most of the deforestation and forest degradation within Nepal is strongly correlated to poverty and population density. Many communities rely only upon the forest and forest resources for their livelihoods. Agents of deforestation are the concrete actors or groups that are directly contributing to deforestation or degradation within a forest. Drivers of deforestation are the reasons or motivations behind why deforestation or degradation is occurring.

Table 5 provided an overview of the broad activities that could reduce deforestation and forest degradation, and therefore generate carbon credits for each of the management strata. A more detailed project plan must be based on an analysis of who is deforesting or degrading the land and for which reason. A carbon project should address the different agents and drivers of deforestation and degradation. The following section briefly describes agents and drivers of deforestation that are present in the Dolakha district, and could form the base of a detailed site-specific analysis of the drivers of deforestation.

- **Uncontrolled cutting of trees for timber:** For land that is not under CFUG control, logging is often non-sanctioned and occurs at un-sustainable rates. Forests that are under CFUG control may be logged at higher rates than what is allowed according to the operational plans when no proper monitoring mechanisms are in place. This is especially the case when logging is carried out by external entities commissioned by the CFUG.

- **Unsustainable collection of fuel-wood.** Wood remains the main energy source for cooking and heating in most rural communities. The average consumption of wood per person is 387 kg DM yr^{-1} (HMG/ADB/FINIDA, 1988 as reported in Upadyay et al., 2005). Wood consumption increases with higher altitudes, due to colder temperatures.
- **Unsustainable collection of NTFPs.** The collection of medicinal and aromatic plants collected from the forest understory can lead to forest degradation if the harvesting occurs unsustainably.
- **Encroachment and degradation by landless or migratory people.** Migratory shepherds often cause over-grazing or degradation in forest areas. Some incidents have been reported when migratory shepherds use land from CFUGs.
- **Forest Fires.** Forest fires are a significant cause of forest degradation, although no official statistics were found on the occurrence of forest fires at the time of this report, it is estimated that in 2009, 70,000 ha of forest area will be lost to fire. The Central Bureau of Statistics in Nepal (1998) estimated that 64% of fires in Nepal are set intentionally by local people, often due to the lack of knowledge of local people, personal interests from poachers clearing land, charcoal traders, encroacher, or the burning for new areas to graze cattle.
- **Livestock grazing within forests.** When livestock are allowed to graze uncontrolled in forest land, forests are degraded and the ability of the forest to regenerate naturally is severely reduced. In addition, the forest litter layer or understory plants are often collected for livestock bedding and fertilizer, which can further inhibit regeneration and increase degradation.

While most areas in Dolakha will encounter the drivers listed above to some extent, the relative contribution of each of these drivers will depend on local conditions. For example, for one of the Dolakha CFUGs visited during the case study work, the grazing of livestock within the forest area was recognized as the main driver of deforestation when no forest agreement was in place, followed by forest degradation by landless or migratory people. The relative importance of each of the drivers must be determined for each of the project sites based on field surveys and social appraisals.

4.3 Actions to slow deforestation and forest degradation

Once the agents and drivers of deforestation are identified, specific project activities can be designed to directly address them. The following is an illustrative list of project activities that could address some or more of the drivers identified in the previous section.

- **Introduction of fuel-efficient stoves.** Traditional wood-stoves burn wood very inefficiently and produce copious amounts of smoke in often poorly ventilated indoor environments. Traditional Nepali hearths are 15 times more polluted than the World Health Organization (WHO) standard. This causes eye infections and severe respiratory illnesses. According to the WHO (2007), a total of 7,500 deaths each year are estimated to be caused by

Clean burning briquette enterprise in Dolakha; photo courtesy of ANSAB indoor pollution in Nepal. Introduction of improved stoves and fuels can decrease the amount of fuel-wood needed while significantly reducing the output of harmful smoke. In addition, the black carbon in the smoke of the woodstoves is a major contributor to global warming. Black soot deposits on the Himalayan glaciers are theorized to be contributing to the rapid melts being experienced in recent years (Ramanathan and Carmichael, 2008). Although not yet recognized by international offset programs, replacing inefficient cooking stoves and fuels with improved versions that emit far less soot could provide a cost-effective and technically simple way to reduce Greenhouse Gas (GHG) emissions (New York Times, 2009).

- **Introduction of bio-gas digester plants.** A household biogas digester system can provide biogas for the thermal energy needs of multiple households. In practice, at least 2 heads of cattle (cow or buffalo) are required to provide enough gas for a digester system. The use of these digesters can displace fossil fuel and/or non-renewable biomass products (e.g.; unsustainable firewood). One biogas carbon project has already been submitted to the CDM. It should be noted that because a bio-gas project is also accounting for the reduction in fuel-wood consumption, there is a potential for double counting of credits in areas where both bio-gas projects and REDD projects are implemented. This potential for double counting demonstrates the need for (1) holistic projects that combine forest regeneration and conservation with alternative energy needs of households, and (2) the necessity of a strengthening of the coordination among the Ministry of Environment Science and Technology and the Ministry of Forests and Soil Conservation to avoid the double counting of credits.
- **Fire-Control measures**. Examples of activities that can reduce the incidence and severity of forest fires include: installation of fire breaks, capacity building and education on fire prevention techniques, forest patrolling and the organization of voluntary fire brigades. It is advised to coordinate with the Ministry of Forests and Soil Conservation to support the development of specific fire control rules and regulations. Local communities must be engaged in the implementation of fire control efforts. A multi-stakeholder discussion on the risks of potentially fire-inducing practices among local communities, hunters, beekeepers, shepherds, landless and migratory people will be essential.
- **Education, support, and capacity building.** An impressive body of experience exists within the well-organized CFUGs in Nepal. By organizing an exchange of this experience among CFUGs, the management of many other CFUGs can be optimized. In addition, support should be provided to resolve conflicts with migratory shepherds. In many cases, these conflicts can be resolved by assigning tasks and responsibilities to the shepherds in return for the sustainable use of the forest.
- **Stall feeding.** A shift from free-ranging livestock systems towards stall-fed livestock systems can drastically reduce the negative impact of livestock on forest regeneration. In such a system, specific NTFPs can still be harvested and used sustainably for animal feed. Some CFUGs have demonstrated systems in which forests are closed off from grazing for extended periods of time (5-10 years), then opened to controlled grazing, to successfully combine the need for grazing land with forest conservation.

4.4 Actions to increase biomass

- **Planting of fast-growing woodlots for fuel-wood and timber.** The use of fast-growing species in small woodlots that are harvested in short rotation (7-15 years) can drastically reduce the pressure on forests for fuel-wood and timber. Credits can be generated for the extra above ground biomass that is present in these woodlots, averaged over the rotation cycle.

- **Fencing of forest areas.** Closing of forest areas is a cost-effective way to increase biomass on degraded lands, especially when the forest lands were previously grazed. It must be ensured that grazing is not merely displaced to a different forest area to avoid leakage. A conversion of a free-grazing system to a stall-fed livestock system will be necessary.
- **Thinning.** Thinning of smaller diameter trees within dense forests can open the forest canopy for light, providing remaining trees with more nutrients to stimulate radial and vertical growth. It was noted that in several *Pinus patula* L. plantations in the Dolakha region, stocking densities were too high, reducing the growth potential of the forest system.
- **Coppice management.** Coppicing consists of repeatedly cutting down smaller stems to near ground level to stimulate the growth of new shoots and increase the number of future stems. This management technique increases the amount of small diameter stems that can be use for fuel-wood or poles.
- **Removal of invasive species.** Very often, degraded forest land still contains a sufficient amount of root stock which can re-sprout if early colonizing species are removed at regular intervals.
- **Enrichment planting.** When no root-stock of valuable species is available, replanting with native species can help to restore the plant biodiversity of degraded forests. A high-biodiversity system attracts wildlife, and may create unique habitats that will attract plant species with potential economic and biodiversity value. Additionally, it has been shown repeatedly that high-biodiversity forest systems are more pest resistant than plantations with only a limited number of species.

4.5 Preliminary calculation of carbon offset potential

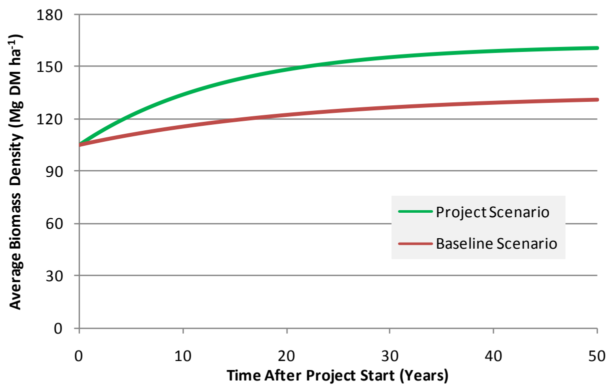
Carbon trading is expressed in units that reflect the standard under which the project was verified. For example, projects that are verified under the Clean Development Mechanism (CDM), generate certified emission reductions (CERs), while projects registered under the Voluntary Carbon Standard (VCS) generate voluntary carbon units (VCUs). One CER or VCU always represents one metric ton of CO_2 emission equivalents (abbreviated as MTCO2e).

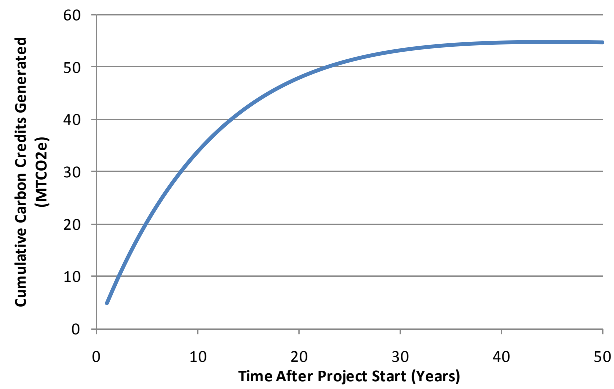
As an example, broad-level calculations of the potential volume of carbon credits that could be generated across the four management strata are included below. These numbers are based on literature data and general assumptions on current biomass, maximally attainable biomass (see Table 6), and regeneration speeds, and are intended only to provide an order of magnitude. More reliable estimates of the volume of carbon credits that can be generated will require more detailed data collection and analysis. Note that the estimated carbon credits represent an average degree of intensity of project activities, not all activities suggested in Table 7 have to be effectively implemented.

4.5.1 Biomass under future baseline for the project strata scenarios

1. Stabilized community forests

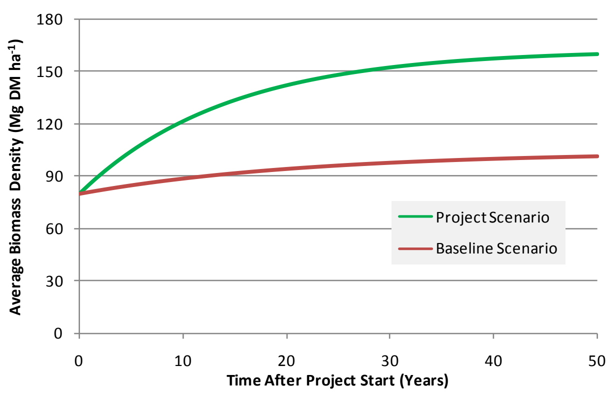
In stabile and mature community forests that are under control of well-functioning CFUGs, it is assumed that the biomass still increases under the baseline scenario, but at a relative slow rate. The calculations below are based on an average biomass increase rate of 0.9 Mg AG+BG DM ha^{-1} yr^{-1} under the baseline scenario. These CFUGs have demonstrated an ability and willingness to invest in forest management practices, and therefore would be able to increase the forest biomass even further by using the income from carbon for specific project activities. An average baseline biomass increase of 2.2 Mg AG+BG DM ha^{-1} yr^{-1} was assumed under the project scenario.

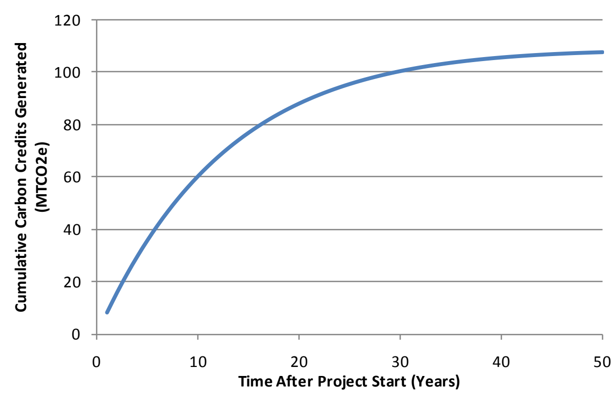




2. Degraded community forests

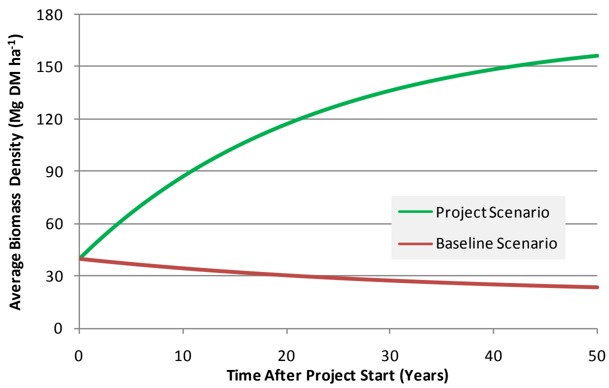
The degraded community forests start with a lower standing biomass density than the previous category, therefore there is more potential for increasing the biomass in these areas. A smaller average increase in carbon content than the previous category was assumed for the baseline scenario, 0.7 Mg AG+BG DM ha^{-1} yr^{-1}. While this category has the potential to generate more credits, more capacity building, up-front investment, and training would be needed so that communities could rehabilitate the degraded areas. It is assumed that the CFUGs could regenerate the forest biomass to similar levels over time as the previous category.

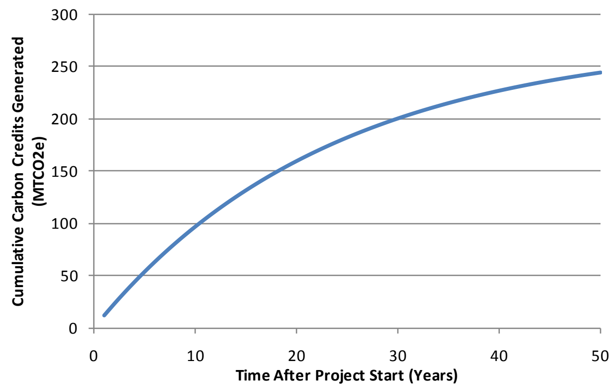




3. Severely degraded forests that can be annexed to an existing CFUG

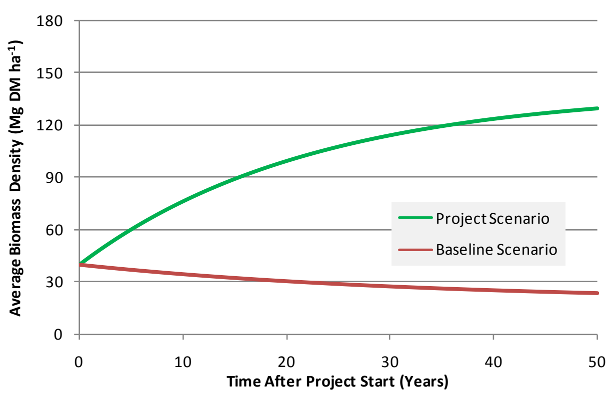
This category represents severely degraded areas that are not under the control of a CFUG. These areas are characterized by a small biomass density, and without any intervention, they will degrade into open woodlands, with sparse shrubs. A slow decrease in biomass density of 0.5 Mg AG+BG DM ha^{-1} yr^{-1} was assumed under the baseline scenario. There is great potential to increase the biomass in these areas. However, significant resources are needed to implement a carbon project. Depending on if the area is adjacent to a well-functioning CFUG, or one that requires increased capacity building this option could need resources either closer to the level of the first or second scenario. However, it is assumed that within 50 years, a biomass density similar to the previous categories could be reached.

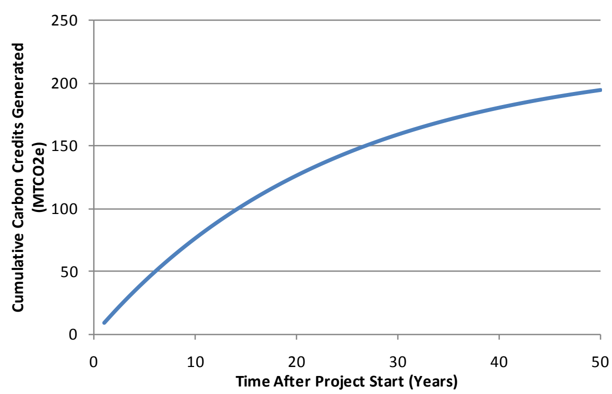




4. Severely degraded forests that can be integrated into a new CFUG

Similarly to the previous category, the forest land is severely degraded in this case. A similar slow decrease in carbon content of -0.5 Mg AG+BG DM ha^{-1} yr^{-1} is assumed in the baseline scenario. Forests under this category cannot be annexed by CFUGs adjacent to this land. Therefore, this scenario requires up front land tenure work to become carbon ready and while it can potentially generate a substantial amount of carbon credits, it requires the greatest investment of all four categories. In the calculations, it was assumed that under the project scenario, a biomass density of 80% of the maximal density of the previous categories could be reached.





4.5.2 Secondary emissions - emission sources and leakage

Forest carbon projects may increase greenhouse gas (GHG) emissions in or near the project area due to the implementation of project activities (emission sources) or shift activities that were previously occurring in the project area to areas beyond the control of the project proponents (leakage). These emissions are referred to as secondary emissions which must be subtracted from the GHG removals to calculate the volume of net carbon credits generated by the project.

Emission Sources

The implementation of some project activities may directly lead to the emissions of additional greenhouse gases. These are referred to as emission sources and must be subtracted from the volume of credits being claimed by a carbon project. Examples of these emission sources include:

- **Reducing of fuel loads through controlled burning.** When fire is used to reduce the fuel-load in forests or to construct firebreaks, the loss of C and the fire-related emissions of CH_4 and N_2O must be taken into account.
- **Project-related fuel-use.** The CO_2 generated from the fuel used to transport products or goods required for the project must be subtracted from the carbon credits generated by the project. Examples are transport of seedlings to and from nurseries or transport of people to and from the forest for assisting regeneration.
- **Nitrous oxide emissions related to increases in fertilizer.** If additional fertilizer is used as a way to intensify agriculture and decrease the pressure on forests, the increase in nitrous oxide emissions must be subtracted from the project's emission reductions.
- **Changes in livestock management.** When project activities include increasing livestock stocking rates or altering manure management, all subsequent increases in emissions of nitrous oxide and methane must be taken into account.

For the purpose of the preliminary calculations, a conservative emission source discounting rate of 10% of the generated GHG benefits is assumed in Table 7.

Leakage

Leakage is defined as the increase in emissions outside of the project area. This can occur through shifting of activities that lead to deforestation and forest degradation to nearby areas. Similar to emission sources, the calculation of project-related emission reductions must take these additional emissions into account. Examples of leakage include:

- **Collection of forest products in nearby areas.** Due to stricter forest management plans and reduced harvesting rates of timber, fuel wood and NTFPs, individuals may start collecting forest products beyond the community forest. This uncontrolled harvesting of forest products may accelerate degradation of forests near the carbon project.
- ***Farm expansion in less protected areas***. Farmers that seek to expand their slash and burn farming area and who are expelled from forest project areas may move into government forests that have few patrols. For the purpose of the preliminary calculations, a conservative leakage cancellation

Villagers depend on forests products; photo courtesy of ANSAB rate of 20% of the generated GHG benefits is assumed in Table 7.

4.5.3 Summary of preliminary calculations

Table 7 summarizes the potential credits that can be generated from each of the four management strata from Table 5, over a period of 30 years, adjusted for emission sources and leakage. Note that these estimates are preliminary. A more reliable estimation of the carbon credit volume related to concrete project actions requires the collection of local data and more in-depth analysis.

Carbon credits can be sold privately based on negotiated prices and payment terms between the buyer and seller or in the international exchanges that trade in carbon allowances. Climate exchanges have been established to provide a spot market in allowances as well as futures and options markets to help discover a market price. Carbon prices are typically quoted per metric ton of carbon dioxide equivalents (MTCO2e). Given the newness of carbon markets and the still speculative nature of where carbon markets are going, prices fluctuate based on the global demand for carbon credits and the project type from which credits are generated. At the time of writing, it is expected that 1 VCU, which is 1 MTCO2e registered from a project validated under the VCS will trade for 4-7 US dollars.

Table 7. Summary of the potential carbon credits generated by four proposed project strata (scenarios) types.

Stratum Name	Potential area [ha]	Gross 30-yr Cumulative Credits per area* [MTCO2e ha^{-1}]	Net 30-yr Cumulative Credits per area* [MTCO2e ha^{-1}]	Net 30-yr Cumulative Credits [MTCO2e]
1. Stabilized community forests	24,500	53	37.1	908,950
2. Degraded community forests	10,500	101	70.7	742,350
3. Severely degraded forests that can be annexed to an existing CFUG	15,000	200	140	2,100,000
4. Severely degraded forests that can be integrated into a new CFUG	15,000	159	111.3	1,669,500
SUM	65,000			5,420,800

*Gross credits are not discounted for leakage or emission sources, while net credits are discounted for leakage and emission source. A total leakage cancellation rate of 20% and an emission rate of 10% are assumed, see section 4.5.2.

4.6 High-level overview of costs

While high-level discussions on forest carbon projects usually focus on how much money can be generated from carbon credits, less attention is given to the costs associated with developing and implementing a forest carbon project. A carbon project needs to be evaluated like any other business opportunity, based on projected revenue, costs, and risks. Carbon credits remain only one out of many mechanisms to increase livelihoods in a sustainable way. One should not overlook the importance of supporting more traditional enterprise activities related to ecosystem services (e.g. NTFP processing businesses) while developing and implementing forest carbon projects to create holistic and robust projects.

Table 8 outlines the costs involved in bringing the potential Nepal projects to market at a high level. Carbon development costs refer to the costs for organizing the stakeholders' consultation, designing the project activities, secondary data consolidation, detailed primary data collection (biological, social and legal) for the proposed areas, and assembling all this information into a project document. Carbon development often requires outside consultants to be hired who are qualified to do the technical verification and guide the registration process with the chosen carbon registry and its associated carbon standards (i.e. VCS, CDM, CCBA). In addition, every project must undergo an official auditing by an independent third party whom does the initial checking of the carbon project proposal developed by the project proponents combined with an on-site field visit; this is referred to as "validation". Carbon development costs and carbon registration and validation costs are incurred at project start-up and are not on-going over the life the carbon deal.

Carbon transaction and monitoring costs are incurred once the project has been verified and project activities are being implemented. Carbon deals require an independent third party to conduct the on-going checking of the carbon calculations done by the project proponents in order to confirm the carbon credits periodically; this is referred to as "verification". Project implementation costs are also incurred at start-up and on an on-going basis. These costs can vary greatly depending on the planned activities to obtain the carbon credits. These costs are typically similar to traditional development projects doing comparable development activities (e.g. tree planting programs, enterprise development, community natural resource management capacity building, etc.).

The creation and validation of a new methodology, the documents that justify credit creation on specific projects, under the VCS is NOT part of this cost overview and would have to be added to the figures below. The cost of creating a new methodology can run well over $US 100,000. At the time of writing, the project types considered are covered in part by other methodologies that have been submitted to the VCS and are undergoing review for approval. Nepal should review these methodologies first and adjust as necessary to meet Nepal specific conditions. The lack of approved VCS methodologies is an issue for all projects around the world as of this writing, not just Nepal. It can be expected that new and more comprehensive methodologies will become available over time giving Nepal even more options to bring down the costs.

Table 8. High-level overview of costs involved in bringing a 65,000 ha project to market.

Category	Start-up	On-going
Carbon Development Costs	$200,000	Non recurring
Carbon Registration and Validation Costs	$160,000	Non recurring
Carbon Transaction and Monitoring Costs	$50,000	To be determined
Project management costs	TBD	To be determined

5 Broad risk assessment

5.1 Project Risk

The project risk generally relates to (1) the risk that the project will not deliver the carbon credits as anticipated due to incorrect assumptions, or some unforeseen circumstances or (2) the risk that some of the already generated carbon credits are lost due to biomass loss. The latter is sometimes referred to as *non-permanence risk* or *reversal risk*. Each of the following individual risk factors can cause non-delivery of anticipated (ex-ante) credits or reversal of already generated credits. The VCS standard has a buffer pool mechanism in which 10-30% of the carbon offsets from a forest carbon project must be deposited. Upon reversal of credits, i.e. loss of already-issued credits, credits within the buffer pool can be used for compensation. The buffer is pooled over all forest carbon projects.

The risk that project activities lead to a displacement of deforestation, and not a net decrease in deforestation is referred to as leakage. A carbon project must monitor leakage, and all loss of forest-land through leakage due to project activities must be subtracted from the carbon credits generated by the project. For example, the increased forest degradation from grazing by livestock of landless or migratory people which were excluded from a protected forest within a non-protected forest adjacent to the project area must be subtracted from all carbon increases within the protected forest. A sound forest carbon project must implement measures that will minimize leakage. Such measures typically focus on increasing the efficiency of existing land use through sustainable agricultural intensification, decreasing the dependence of the livelihood of communities on unsustainable harvest of timber and non-timber forest products, and providing alternative livelihoods such as eco-tourism.


CFUG in Dolakha harvest wintergreen; photo courtesy of ANSAB

5.1.1 Risk of loss of land-tenure or ownership

Though CFUGs do not legally own the land, they legally have the forest product usage rights and conserve the forests under their control adequately. Given the relatively long tradition of communal land tenure and community forestry, the risk of losing land-tenure by the CFUGs is considered low.

5.1.2 Technical capability and experience of implementer

Within the framework of community forestry, many CFUGs are very familiar with harvest quota and management plans. Every CFUG is implementing an approved operational plan, which contains all the specific details of the allowed management practices on the land. In addition, there is a substantial amount of capacity within civil society organizations, consisting of NGOs such as ANSAB, ICIMOD, or WWF, and research institutes to implement forestry projects in Nepal.

5.1.3 Net revenue to all stakeholders

An equitable revenue sharing mechanism among all stakeholders must be developed. It must be ensured that local communities are significantly benefiting both directly (carbon payments) and indirectly (employment and capacity building).

5.1.4 Future development of infrastructure

Most of the mountainous regions are very remote and probably will remain relatively inaccessible for some time. No significant expansion of the road infrastructure is foreseen.

5.1.5 Population surrounding the project area

A population increase equal to the national average can be assumed for the areas surrounding the project.

5.1.6 Incidence of crop failure

No data on the incidence of crop failure is available. But local farmers reflect that they are facing problems with irregular rainfall, drought, flooding etc.

5.1.7 Credibility of long-term financial viability

The long-term financial viability must be evaluated on a per-project basis by taking into account increasing pressures on the forest land due to population increases.

5.2 Economic risk

5.2.1 Risk of rising land opportunity costs causing reversal

The conservation and regeneration of forests is high on the political agenda. Given the political situation, it is considered unlikely that forest land under control of CFUGs will be developed. Mineral resources in Nepal's mountain regions are limited and are not likely to be developed, except for some smaller-scale quarry operations in these areas. The risk of community forest land conversion to mines or quarries is considered minimal. However, Nepal has considerable scope for exploiting its potential in hydropower, an area of recent foreign investment interest. Therefore, some risks exist for conversion of forestland bordering watercourses in mountain areas for hydropower projects.

Trees within agricultural production; photo courtesy of ANSAB

5.3 Risk of political and social instability

After a period of civil strife and unrest in which the country transitioned from a monarchy to a federal republic, the political situation is stabilizing. However, the stability is not consolidated, and some risks for political and social insurgency remain.

5.4 Natural disturbance risks

5.4.1 Fire

Every year forest fires occur in many places of the country and cause heavy loss of property as well as loss of many species of wildlife. Most of the forest fires, 64 percent, are set intentionally; the share of accidental cause of forest fire is only 36 percent. About half of the intentionally set fires are motivated by the need for new pasture land for grazing cattle (CBS, 1998).

5.4.2 Pests and Disease

Pests and diseases pose little threat to the community forests in Nepal as long as a minimal level of tree species diversity is maintained. The natural capacity of forests to control pests and diseases increases with increases in forest plant diversity. To avoid increasing the risk on biomass loss through pests and diseases, enrichment planting should be done only with a proper tree mixture, and the planting of large areas with one or a small number of species should be avoided.

5.4.3 Weather

Windstorms and hailstorms and thunderbolts occur frequently in Nepal and affect many areas of the country on a regular basis. Although these events can cause considerable damage to standing crops in fields and to buildings, they are usually not a real threat to forest resources. Indirect effects from global climate change on snow-melt and floods are considered in the next section.

5.4.4 Geological

Floods and landslides are by far the most serious risks to humans, infrastructure and natural resources in Nepal. About three decades ago, at least 75 percent of all landslides in Nepal were interpreted as natural (Laban, 1979). Areas at higher elevation are increasingly susceptible to land degradation caused by glacial lake outburst floods. Large glaciers of the high mountains have been experiencing rapid melting, attributed to global warming, resulting in the formation of a large number of glacial lakes. Glacial lakes of the Himalayas are usually not geologically consolidated enough such that a slight disturbance can break the balance of the structure, resulting in an abrupt release of a great amount of water and generating floods. Many potentially dangerous glacial lakes have been identified by ICIMOD and UNEP (UNEP and ICIMOD, 2001).

6 Next steps to pursue forest carbon deals

1. Develop the project plan further and determine eligibility for a number of potential carbon projects according to the decision tree (Figure 4) in this document. To investigate the exact potential of implementing carbon credit projects within Dolakha, a map must be created which shows the area and extent of each of the four identified management strata. The creation of this map will require the combination of existing GIS resources and participatory social appraisals. Determine the minimal size of a carbon project to become financial attractive.
2. Find initial funding capital to design the project and implement the first project activities.
3. Elucidate which entity will become the owner of the carbon credits. Because no forest carbon projects have been registered yet in Nepal, there is no precedent. A CDM biogas project has been created and submitted to the CDM, and could be used as an example of non-forest carbon credit ownership.

4. Consult all relevant administrative authorities for approvals and clearance. It must be determined which approvals are required in order to sell carbon credits from forest projects.
5. Determine which existing or to be founded organization will be the main project aggregator, managing the relatively large number of small forest parcels that will be part of the project. The full design and development of a forest carbon project will require a broad set of experience and capacities. Only a concerted effort from existing organizations such as FECOFUN, ICIMOD, ANSAB, or other NGO and technical analysts and consultants can enable the design of such a project.
6. Develop a fair and equitable system of revenue sharing in a multi-stakeholder consultation process.
7. Develop maps of forest resources, indicating the biomass density, location of NTFPs, and critical biodiversity habitats.

7 Conclusions

CFUG member in Dolakha; photo courtesy of ANSAB

Despite the identification of some project-related risks, this report concludes that there is significant potential to implement forest carbon projects in Nepal. The experience of the CFUGs shows that community-based forestry projects can and have succeeded within Nepal, and serve as a valuable source of information and experience that can be drawn upon to implement carbon projects. Nepal has a sound technical, organizational and administrative capacity to develop forest-based carbon offset projects. Some barriers to project implementation will need to be overcome, namely the identification of a reliable project partners, official approval from the government of Nepal and its relevant administrative organizations to carry out a project, and the identification of project funding for start-up costs. Additionally, an equitable system of revenue sharing between all project participants must be developed and all stakeholders must agree upon a community forestry management plan.

The CFUG process is a valuable paradigm when organizing forest carbon projects. It is recommended that an implementing organization is identified which has sufficient experience and capacity to carry out community-based carbon forestry projects. The main implementing organization can be assisted by one or more of the many civil society organizations in Nepal. All relevant government agencies should be consulted to resolve any issues surrounding carbon credit ownership and revenue sharing. There is no precedent for carbon forestry projects in Nepal, so there may be unanticipated methodological issues regarding carbon readiness and project implementation that are encountered.

A project or group of projects in Nepal would be a strong step forward for forestry carbon projects and for the preservation Nepal’s forest resources and the livelihood of the people of Nepal. The writers of this case study hope this material will be timely in helping to advise the newly constituted National level working group on REDD, under the Nepal Ministry of Forests and Soil Conservation.

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