The Economics of Reducing Emissions from Community Managed Forests in Nepal Himalaya

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Bhaskar Singh Karky
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Acronyms

ACAP	Annapurna Conservation Area Project
AR	afforestation and reforestation
CAMC	Conservation Area Management Committee
CDM	Clean Development Mechanism
CER	certified emission reduction
CFM	community forest management
CFUG	community forest user group
C	carbon pool
COP	Conference of Parties
CO_2	carbon dioxide
CO_2e	expressed as carbon dioxide equivalent
dbh	diameter at breast height
DDC	District Development Committee
DFO	District Forest Office
DNA	Designated National Authority
FAO	Food and Agriculture Organisation of the United Nations
FECOFUN	Federation of Community Forestry Users-Nepal
FRA	Forest Resources Assessment
FUC	forest user committee
GATT	General Agreement on Tariffs and Trade
Gt C	gigaton carbon or billion tonnes carbon or petagram carbon (1 Gt = 1 billion tonnes = 1 Petagram = 1×10^{15} g)
GHG	greenhouse gas
ICIMOD	International Centre for Integrated Mountain Development
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LULUCF	land use, land use change and forestry
masl	metres above sea level
MOFSC	Ministry of Forest and Soil Conservation
MOEST	Ministry of Environment, Science and Technology
MOPE	Ministry of Population and Environment (renamed MOEST in 2005/2006)
NRs.	Nepali Rupees (1 U$ ≅ NRs. 69)

NTFP	Non-forest timber product
PgC	petagram carbon or one billion metric tones carbon or gigaton carbon
ppm	parts per million
PES	Payment for environmental services
PPP	Polluter Pays Principle
RED	reduced emission from deforestation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SOC	soil organic carbon
$tCha^{-1}yr^{-1}$	ton carbon per hectare per year
$tCO_2ha^{-1}yr^{-1}$	ton carbon dioxide per hectare per year
UNFCCC	United Nations Framework Convention on Climate Change
UPP	User Pays Principle
VDC	Village Development Committee
WTO	World Trade Organization

Chapter 1

Introduction and Problem Statement

1.0 Introduction

The publication of the summary of the Fourth Assessment Report of Working Group 1 of the Intergovernmental Panel on Climate Change (IPCC) in February 2007 marked an important step forward as regards thinking on climate change (IPCC, 2007). It makes clear that the vast majority of scientists believe not only that climate change is occurring at an alarming rate but that one of the major causes of this change are anthropogenic greenhouse gas (GHG) emissions. The threat of climate change had already been recognized by governments around the world, who had in 1992 unanimously agreed, through the United Nations Framework Convention on Climate Change (UNFCCC), that there is an urgent need for globally concerted action to curb emissions so that damage inflicted by climate change is reduced to manageable proportions. The debate continues, however, on how; that is, what actions need to be taken and by whom, since by its nature, climate is a global public good requiring international management of this commons (Stern, 2007).

Human activity systems lie at the centre of the debate since they bear the responsibility for the changes that are observed today and which are predicted for the future. The Fourth Assessment Report of Working Group 1 (Trenberth *et al.*, 2007: 237) notes that eleven of the last twelve years (1995 to 2006) rank among the warmest years recorded since 1850. It further notes that for most of the observed increase in temperatures since the mid-20th Century, the cause was very likely (more than 90 percent probability) due to human activity (Hegerl *et al.*, 2007: 671). This is an advance in certainty over the Third Assessment Report (IPCC, 2001) which had stated this as "likely" (more than 66 percent probability).

It is thus now almost without doubt that climate change results from human induced emission of GHGs, of which CO_2 is the most important. The two main human induced activities that have led to the increased concentration of CO_2 into the atmosphere are: 1) burning fossil fuel, which has increased many folds since the start of the industrial revolution and 2) loss of forested area. The concentration of GHGs including CO_2 have already reached levels well above any observed in the last million years. Even if all GHG emitting activity such as burning fossil fuel or deforestation were stopped tomorrow, the earth's surface temperature would still continue to increase for another 50 years because of the time lag between emission and the earth's response (Stern, 2007). According to the Stern Review (2007), the full warming effects of emissions that have taken place so far have yet to be realized.

GHG emissions and land conversion (deforestation) are linked with economic development. Countries at different stages of development emit GHGs from these two activities in different proportions. Much emphasis has been placed in other research on reduction of emissions from fossil fuel use in developed and industrializing countries. This thesis looks at Nepal, a country which is at an early stage of economic development, with very little industry and per capita consumption of fossil fuel and a very low per capita emission[1]. In this type of country, where the national deforestation rates are high it is clear that emissions from deforestation are the greatest concern. Based on the FAO Country Report (2005: 10) data, Nepal has an annual deforestation rate of -1.63% from 1990 to 2005 which is higher than for most other countries. Between the same period, shrubland also increased by 4.05% annually indicating a conversion of forested land into degraded forests. According to another study, (FRISP, 1999: 14), between 1978/79 to 1994, the annual deforestation rate in the hills of Nepal Himalaya was -2.3% and that in Terai, the low lying plains, it was -1.3%. Diagram 1.1 shows map of Nepal with the three research sites in Nepal Himalaya.

1.1 The Role Forests Play in Climate Change

Forests play a unique role in balancing the global carbon cycle as they can sequester carbon from the atmosphere playing the role of ***sink*** and they can also emit carbon from loss of biomass playing the role of ***source***. Forests store more CO_2 (4500 Gt CO_2) than the atmosphere (3000 Gt CO_2) (Prentice *et al.,* 2000:1554-1555). They play a critical role in stabilizing atmospheric concentration of CO_2 as they can switch between being sinks and sources depending on their succession stage, and on specific disturbances or management-interventions (Masera *et al.,* 2003). On average 50% of the dry weight of tree biomass is carbon, regardless of the species (MacDicken, 1997; IPCC, 2003). Forests act as sinks when they expand in area and when the density of trees in any given forest area increases, since there is an increase in biomass and a corresponding reduction of carbon in the atmosphere. Moreover, such processes are usually accompanied by an increased level of soil organic carbon (SOC).

When forested lands are cleared, or converted into other land uses such as agriculture or urban landscapes, carbon stored in above ground biomass, below ground biomass (roots) and in the soil is released back into the atmosphere.

[1] The per capita CO_2 emission for Nepal is one of the lowest in the world standing at 0.11 tCO_2 where as this figure for China is 3.84 and for India 1.20 and the average for the world is 5.4 (Dhakal and Raut, 2008: 3).

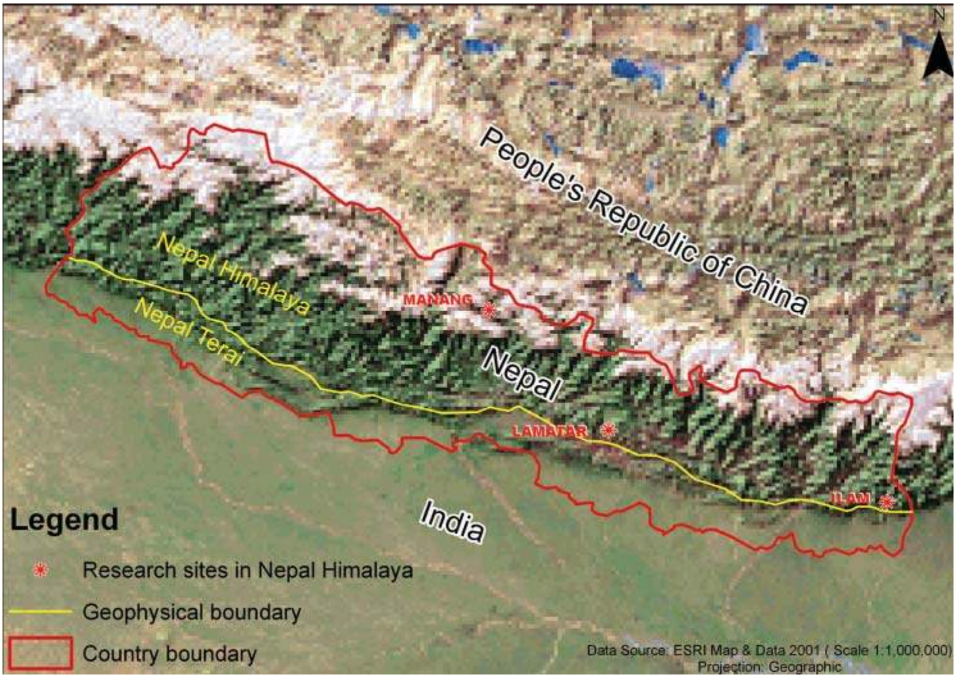

Diagram 1.1 Map of Nepal showing the three research sites in Nepal Himalaya.

Estimates of emissions from global deforestation range from more than 18% of global GHG emissions (Stern, 2007), to about 25% (IPCC, 2000), and the vast majority of these emissions are coming from developing countries in the tropics. The total amount of CO_2 released from the tropical deforestation alone was estimated to be 5.5 Gt CO_2 per annum throughout the 1990's accounting to about 20% of anthropogenic GHG emissions (Gullison *et al.*, 2007: 985; Achard *et al.*, 2004). The Stern Review (Stern, 2007) further put the emission from deforestation into perspective by comparing it with the other sources; it stated, deforestation contributes to more emission than the global transport sector for example.

Forestry has significance in reducing emission as well. The Fourth Assessment Report of Working Group 3 (Nabuurs *et al.*, 2007: 562) states that 65% of the total mitigation potential is located in the tropics and about 50% of this could be achieved by reducing emissions from deforestation. The Stern Review (Stern, 2007) views intervention in the forestry sector as the globally least cost solution in reducing emissions. It is regarded therefore that the role of forests in climate change as a sink and as a source is important and the carbon dynamics of forest need to be taken into account in all attempts to mitigate this process.

Under the Clean Development Mechanism (CDM) of the Kyoto Protocol (KP) certain forestry-related activities in developing countries may be credited for carbon sequestered and these credits may be sold through market mechanisms, as will be explained in Chapter 2. But there are very limited options under this mechanism, only in the area of afforestation and reforestation (i.e. planting of new trees in areas that are not at present forest). Forest management and forest conservation (i.e. of existing forest) are not included. A detailed account of the types of forestry activities allowed under the KP is made in Chapter 3, where the shortcomings of the CDM in this regard are also analyzed. Chapter 3 also analyses the forestry-related aspects of the new international climate agreement for the post 2012 period, in as far as this had been agreed at the time of finalising this thesis in mid-2008. In particular it analyses developments towards a policy known as Reduced Emissions from Deforestation (RED)[2], under which there are likely to be much wider possibilities for forest management and conservation.

The central theme of this thesis stems from this analysis. The thesis deals with the question whether community managed forests such as those found in hills of Nepal referred to as Nepal Himalaya, can contribute to reducing emission through the kinds of global market mechanisms that are offered under the KP and which may be offered under RED. In order to contextualize this, first a brief overview will be given concerning the history and significance of community forest management (CFM) in Nepal.

1.2 Development of Community Forest in Nepal

In Nepal, the concept of CFM emerged in response to the deteriorating condition of the state controlled forests in the late 1970's. Nepal's forestry sector has under gone a paradigm shift that reflects devolution of forest resources from state control to community control (Gilmour and Fisher, 1991; Hobley, 1996). Hobley (1996: 65-92) refers to the phases in this shifting paradigm as Privatisation, Nationalisation and Populism. The development of CFM policy and its implementation were shaped by internal and external developments with support from the international donor community as will be discussed in Chapter 4.

Within Nepal, the political developments and administrative changes of the period paved way for various policies that subsequently refined the policies enabling the implementation of community forestry as we find today. The loss of forested land between 1950s to the 1970s reflected the failure on part of the state to control deforestation and consequently, the perceived Himalayan environmental degradation emerged as a major concern by the mid 70s. For example, Ives (2006) shows how deforestation in the 1970's led to perceive the theory of Himalayan Environmental Degradation, and the belief that there would not be trees left in the Himalaya by the year 2000. Policies promoting community forestry were promulgated in the 1976 National Forestry Plan, 1978 Panchayat

[2] RED stands for reduced emission from deforestation in developing countries; this is also interchanged frequently with REDD which stands for reduced emission from deforestation and degradation in developing countries.

Forest regulation and Panchayat Protected Forest Regulation, 1993 Forest Act and the 1995 Forest Regulation. Additional administrative policy like the 1992 Decentralisation Act further facilitated in implementing community forest at village levels. These policy shifts that increasingly relied on people's participation in the management and conservation of forests were possible with the restoration of parliamentary democracy in 1990 which removed the bottle neck for such participative policies that were people-centred.

At the international level, in the 1960's development started to embrace a new "bottom up" approach (Chambers, 1983) since the effectiveness of top-down approach was in question as it failed to address the concerns of the poor people. This new development concept was characterized by giving more importance to enhancing rural livelihood and rural environment over monetary income (Gilmour and Fisher, 1991). In parallel to this changing development perspective, another type of global thinking was emerging: the neo-liberal economic ideals of the 80's forming the over arching economic development paradigm of that period.

The expansion of CFM in Nepal Himalaya by the mid 90's reflects attempt to correct market failure by delegating usufruct rights to local communities and it also fits rather well with the neo-liberal school of thought in terms of operationalizing the "User Pays Principle" (UPP) (in Pearson 2000: 285). Community forestry is about giving usufruct rights of state owned commons to the locals who subsequently derive benefits from the commons by managing them and protecting the forest. Under state management, CF was prone to 'the tragedy of the open access' (Ostrom, 1990); anyone and everyone had unlimited access any time because the state owned the resource. This was turned around by implementing CFM. Usufruct rights were spelled out on the commons (Gilmour and Fisher, 1991; Hobley, 1996) and deforestation rates were considerably reduced, particularly in the hills (Acharya & Sharma 2004; Banskota, 2000). At present 1.1 million ha, or about one quarter of the country's forest (Kanel, 2004), is being managed by communities with 93% of this is in the hills and 7% in the Terai (plain areas) (Springate-Baginski *et al.,* 2007: 47).

Handing over forests to communities for management has over time improved the forest condition (Malla, 1997) with positive impact on biodiversity conservation (Jackson and Ingles, 1994) and increased production of firewood, timber, fodder, forest litter and grass to assist in improving the subsistence livelihood (Kanel, 2004; Acharya and Sharma, 2004). The same has also been acknowledged by Banskota (2000) who states numerous degrading ecosystems have improved due to decentralized and participatory development strategies. The impact of this policy in the forestry sector has undoubtedly been positive in reducing deforestation and forest degradation in Nepal Himalaya. Although, as noted, community forestry is carried out in only about a quarter of the country's forests, the national deforestation trend has been reduced from -1.90% per annum between 1990 to 2000 to -1.35% between 2000 to 2005 according to the FAO (2005) data which coincides with the rapid expansion of CFM. In Chapter 4, the development of CFM sector in Nepal is discussed in more detail. This research involved forest inventory sampling plots from one community forest each in the high mountain, middle mountain and Churiya/Siwalik hills of Nepal Himalaya, where 89% of the forest land and 86% shrub lands (degraded forests) of the country lie and also 93% of the total area under community forest as described in detail in Chapter 5.

1.3 Problem Statement

The theoretical basis of the Kyoto Protocol (KP) is founded within the realms of the meta theory of neo-liberal economics as will be shown in Chapter 2. This Protocol was agreed under the auspices of the United Nations, and created a market for emission reduction via a cap-and-trade mechanism. For the non-industrialized countries like Nepal, the CDM has been created as a market mechanism that permits participation in carbon market on a voluntary basis. The market is however heavily regulated and controlled. In the forestry sector, avoiding deforestation is not recognized under the regulations of the CDM. This means that countries like Nepal that promote CFM and contribute to reducing global emission by biological sequestration of carbon through forest management cannot claim carbon credits under the CDM.

This issue was raised at COP 11 in Montreal (2005), by the Coalition of Rainforest Nations led by Costa Rica and Papua New Guinea that presented a new proposal for recognizing reducing emission from avoiding deforestation. There is now discussion going on in the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the UNFCCC for formulating a new policy under the new treaty that will replace the KP in 2012. The proposed policy is expected to permit avoided deforestation and forest management activities for carbon trading under the new climate treaty which will be analyzed in detail in Chapter 3. This new policy will also be market-based in the long run as there are commitments to make the post Kyoto climate treaty market driven (Sovacool and Carroll, 2008; The Times of India, 31st March, 2008).

It would appear probable that CFM as practiced in Nepal Himalaya, can in principle effectively and efficiently reduce global emission, but the restrictive CDM policy does not recognize forests as sources of emission in developing countries and CFM does not meet the additionality criteria of the CDM as communities are already managing existing forests. The problem that this thesis addresses is whether CFM can be integrated into the market-based mechanism under the new climate change treaty as a viable option for reducing global emission. And if the CFM can be integrated with the UNFCCC, then what are the conditions necessary for CFM and the global climate treaty to work together? This is what this thesis analyses.

1.4 Hypotheses, Research Questions and Objective

The ***first*** hypothesis is that CFM as practiced in Nepal Himalaya region can play an important role in contributing to reducing global emissions. This leads to the ***second*** hypothesis: CFM will only be able to participate in carbon trading under the UNFCCC if the global treaty has policy instruments that recognize forests as sinks and sources, and when changes are also made at the local and national management levels. To test the hypotheses, the thesis has outlined three broad questions with subset of questions each as stated below. The order of the questions is listed below following a logical sequence, but in the thesis while answering them, it follows different order due to the presentation format of arguments with data in the chapters, which starts from the review of climate treaty and then analyses the field data. The questions are listed as follows:

1 Does CFM in Nepal Himalaya have the potential to participate in global carbon trading?

1.1 Does community forest in Nepal Himalaya sequester carbon?
1.2 Is the current CFM policy in Nepal favourable for supporting carbon trade?
1.3 Can the current management system undertake carbon trading?

2 Can CFM meet the challenges of carbon trading?

2.1 Will carbon trading have an impact on the livelihood?
2.2 Does carbon trading provide an attractive incentive?
2.3 What needs to be changed at management level to support carbon trade?

3 What kind of an international treaty would be needed to allow CFM to participate in global carbon market?

1.1 What are the conditions necessary at global level to bring CFM under climate regime?
1.2 What needs to be changed in the climate treaties if CFM is to be eligible and able to participate?

The objective of this research is to contribute to the global debate on formulating the post Kyoto climate treaty with specific reference to the forestry sector policy under RED, based on the experience of CFM from Nepal Himalaya. This study is useful in that it may provide recommendations to the ongoing discussion on RED which will be decided in December 2009 at the climate conference in Copenhagen when a decision will be made on whether this RED policy will be accepted by the UNFCCC for the post KP treaty or not.

1.5 Methodology of Study

Since climate change and action to mitigate climate change through the global protocol are both considered to be based on the neo-liberal economic approach, the conceptual framework of this research will be derived on the same, as explained in Chapter 2. In order to test the hypotheses, the research has to rely on data from numerous disciplines. To understand the global climate accords, policy analysis from literature review is conducted in Chapter 3. For biomass estimation, IPCC guidelines (IPCC, 2003) were used for calculating carbon stocks in forested lands, based on standard forestry inventory techniques as will be described in Chapter 5.

Of the 1.1 million ha under CFM in Nepal, 97% of this area lies in the mountain and hilly region called Nepal Himalaya in this thesis which accounts for about 90% of the population engaged in CFM (Springate-Baginski *et al.*, 2007: 47). Initially various sites were selected in Himalaya region across the country at varying altitudes. However, since the objective of this research is to obtain valid in-depth insight into CFM and emission reduction values, of the first selected sites, only three were decided for becoming case study sites. This is due to accessibility, and the political unrest in the country. These were selected in regions where the research could be conducted over the initially anticipated period of three years. Also, the willingness on part of the CFUGs to participate in the research further reduced the number of CFUGs for case studies at different altitudes. Finally, with the limited means for field work was another reason limiting the number of case study sites.

Consequently the community forests selected for the case study lie on the physiographic zones of high mountain (Manang), middle mountain (Lamatar) and Churiya/Siwalik hills (Ilam) as shown in further detail in Chapter 5; this Nepal Himalaya region covers 89% of the forest land and 86% shrub lands (degraded forests) in the country. This altitudinal variation is depicted in the diagram below (diagram 1.2) in a cross sectional map of Nepal.

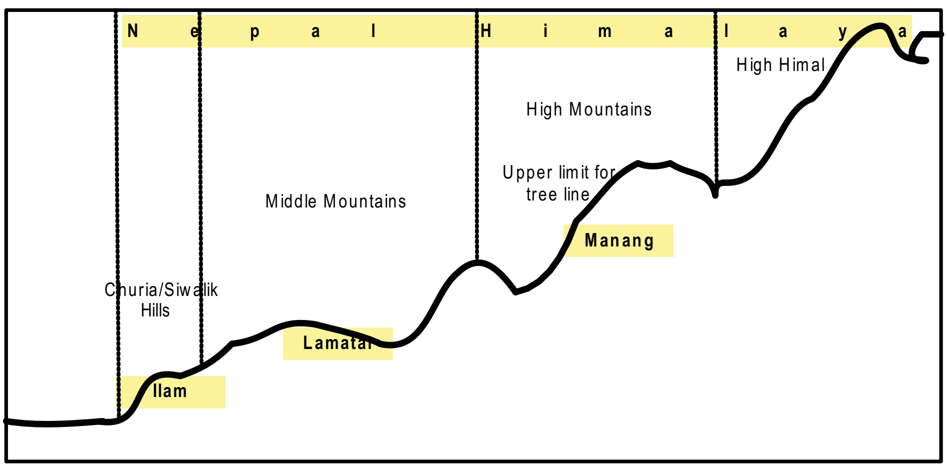

Diagram 1.2: Cross section view of Nepal from the plains to the mountains showing the distribution of research sites in Nepal Himalaya

The three case studies presented in this thesis can be typically indicative of how forest are managed by local communities in Nepal Himalaya, and it can be said that most of the community forests in the region is managed in the same way and for the same purpose with similar motives. It would help if more such case studies were taken to draw a more accurate generalisation for Nepal Himalaya region as there are many other additional attributes that have to be accounted for such as forest typology, aspect of land, rainfall, soil structure, area of forest, population pressure to name a few parameters if we want a generalised sample for the region. But taking three case studies was part of the research design to enable in-depth analysis of the case studies which would not have been possible with more sites selected.

The three case studies were specifically not selected in the low land Terai region because CFM implementation has not been very successful in the lowlands (Bhatia, 1999: 30; Blaikie and Springate-Baginski, 2007: 80) as also will be mentioned in Chapter 4. The biomass and carbon data presented in Chapter 5 from the three case study sites follows the standard methodology recommended by the IPCC (2003) for LULUCF sector.

In Chapter 6, the three case studies are analysed looking at their management regimes to understand their managerial capacity. The unit of observation is a community forest user group (CFUG) and its forest. For determining the livelihood condition of CFUG members and their reliance on forest, a detailed socio-economic survey was carried out in each site as is elaborated in Chapter 7. This survey was based on the Livelihood Approach as it deals with livelihood issues to illustrate the relationship between forests and people. The socio-economic survey was conducted in the three sites and targeted at CFUG members from Ilam, Lamatar and Manang with the household as basic sampling unit. A sample of ±35 households was taken from each village using the random walk technique, as a sample larger than this would not increase the confidence level of the results as the households represented a normal population (Damodar, 1999: 66-72). The household-level data from livelihood survey were validated through focus group discussion with CFUG members in the villages to triangulate the quantitative data. Chapter 8 conducts a gross margin analysis under different scenarios for carbon management based on the data from Chapters 5 and 7.

The unit of analysis used for the carbon economics in this research is tonnes of CO_2. Each CFUG is an autonomous body managing its forest. Any income derived from the forest is under the control of the CFUG as the members decide what to do with such incomes. The research examines the rate at which carbon is sequestered in community managed forests in CO_2 terms.

The research collects both quantitative and qualitative data. Forests inventory and socio-economic data are quantitative. Qualitative data include literature review for policy analysis in climate treaty and information from literature review on Nepal's shifting development paradigms and forest polices. Qualitative data on forest management were collected by holding focus group discussions in the villages with CFUG members who also helped to triangulate the quantitative data.

Forestry data was analysed in Excel spread sheets using allometric equations as described in Chapter 5. Socio-economic data were analysed using SPSS 11.1 as described in Chapter 7. Gross margin analysis was conducted using both biomass (from Chapter 5) and socio-economic data (from Chapter 7) as illustrated in Chapter 8 for different scenarios.

1.6 Structure of Thesis

Table 1.1 shown below illustrates the structure of the thesis with the questions to be answered by the respective chapters together with the methodology used.

Table 1.1: Structure of thesis

	Chapters	Questions answered	Methodology
Chap 1	Problem statement and rationale of study	What is the problem?	Review of contemporary literature
Chap 2	Concepts used:		Review literature
	1) Climate change as a market failure	What is the theory underpinning climate change?	
	2) Neo-liberal economic approach to dealing with climate change	What is the theory underpinning the global effort to mitigate climate change?	
Chap 3	Examining the nexus between forests, climate change, Kyoto Protocol and emerging RED policy	3.1 What are the conditions necessary at global level to bring CFM under climate regime?	Review climate policy related documents and other secondary data
		3.2 What needs to be changed in the climate treaties if CFM is to be eligible and able to participate?	
Chap 4	History of community forest development	1.2 Is the current CFM policy in Nepal favourable for supporting carbon trade?	Review literature on the CFM policy in Nepal
Chap 5	Community forest as carbon mitigation activity	1.1 Does community forest in Nepal Himalaya sequester carbon?	Carbon estimation methodology

Table 1.1 (continued)			
Chap 6	Community forest management regime	1.3 Can the current management system undertake carbon trading?	Focus group discussion
		2.3 What needs to be changed at management level to support carbon trade?	
Chap 7	Livelihood and community forest	2.1 Will carbon trading have an impact on the livelihood?	Household survey based on livelihood approach
Chap 8	Economic analysis	2.2 Does carbon trading provide an attractive incentive?	Gross margin analysis
Chap 9	Conclusion	1.0 Does CFM in Nepal Himalaya have the potential to participate in global carbon trading?	Summary of chapters 2 to 8
		2.0 Can CFM meet the challenges of carbon trading?	
		3.0 What kind of an international treaty would be needed to allow CFM to participate in global carbon market?	

Chapter 2

Concepts Used

2.0 Introduction

This chapter provides answers to the question which theory underpins climate change and the efforts to mitigate it. The chapter starts by introducing the concept behind KP, showing how it relies on neo-liberal theory of using market mechanisms for regulating global emission. It tries to illustrate that attempts to deal with climate change as a market failure, have led to devising market mechanisms such as the KP. This raises questions, from a theoretical point of view about whether carbon markets and using market-based mechanisms to trade in carbon credits are a good solution for combating climate change. The chapter concludes by providing a theoretical rationale for the research questions presented in Chapter 1.

Though there are few cases[3] where marketing of carbon credits in the voluntary sector have benefited the farmers elsewhere, we want to find out whether the people managing community forests in Nepal Himalaya could benefit under the global climate treaty by receiving payments for the carbon emissions they reduce annually. We want to see whether market-based mechanisms such as carbon trading will provide additional benefit for forest management and conservation and work in favour of CFM sector if permitted in carbon trading in the second commitment period post 2012.

2.1 Climate Change as Market Failure

According to Stern (2007:3), climate change is essentially a case of market failure that is linked with numerous other market imperfections globally. Climate is a global public good that requires international management of this common. CO_2 emission is different in nature from other polluting substances which inflict

[3] The Scolel Te project in Mexico is one example where small-scale indigenous farmers who manage community forests can participate in carbon trading through private agroforestry activity or through forestry activity in the communal lands for which they receive payment from the voluntary market (Tipper, 2002: 223-233). This started as a pilot project in 1996, by 2002 it had expanded to over 400 individual participants and over 30 communities with expected revenue from sale of carbon to be around US$ 180,000 for 2002. This project has been able to benefit the local people through increased income as well as by increased forest cover from carbon revenue.

local damage and which are often controlled by the local society (Wheeler, 2001). CO_2 pollution has no direct impact in the emitting society and hence has this market failure trait. 'Market failure' or 'imperfect market' refers to a market in which some ingredients of a free and competitive market are missing. As a result, such a market does not efficiently allocate goods and services. There are three characteristics of market failure as described by Ellis (1996: 10), which are: 1) open access resource, 2) externalities and 3) failure of provision. All of these characteristics pertain to climate change.

An open access resource, such as global climate, is a resource for which the private cost of using more or polluting more is lower than the social cost incurred by the community as a whole. Externalities are costs that are not incurred by the polluter (of atmosphere in this case) but represent disbenefits to the whole society from the pollution. Failure of provision occurs when goods or services with the nature of public good traits once made available, is not possible to exclude others from making use or benefiting and so the private sector is reluctant to provide good and services of this kind e.g. reducing emission. Even as we know the crisis of climate change is occurring and there is a need to act urgently, not enough is done because of this prevalent market failure in climate which makes taking a concerted action difficult as costs and benefits of any action are shared disproportionally between the polluters and those that act to reduce pollution.

Besides climate, forest is also a resource which possesses the same three characteristics of market failure traits as climate. Just as GHGs emissions are caused due to market failure traits of the climate, deforestation is caused by market failures.

2.2 Policy Instruments for Environment Protection

When dealing with environment protection, governments are usually left with two types of policy instruments excluding voluntary action which are 1) regulatory instruments and 2) market instruments (Pearson, 2000: 144). Sometimes governments can also use a combination of these two instruments together.

Regulatory instruments (also known as command-and-control approach) rely on policies that include bans and prohibitions and setting product standards (inflexible ones) that are directed by the government. This leaves the polluters room to only comply or to be punished.

Market instruments (also known as incentive-based approach or market-based approach) rely on policies that include taxes, tradable permit schemes, deposit-refund schemes, tax rebates and fines which are based on economic incentives or market stimuli that are directed not by the government but by the market. This leaves the polluters to choose their own abatement strategy and may achieve the same environmental protection goal at a lower cost than regulatory instruments.

Traditional economists see regulatory instruments as a cost effective way of pollution abatement while neo-liberal economists views market instruments as the most efficient means to meet the same objective. However, in many instances where markets are absent or where the government does not have the structure to support markets, regulatory instruments are also used. The Pigouvian tax (Pigou, 1920), Coase theorem (Coase, 1960) and emission permits (Baumol and Oates, 1971) are economic theories that support the notion that market instruments are more efficient and work better than regulatory instruments. Today many environmental issues are addressed using market instruments; community forestry in Nepal is one example, another example is the bicycle policy[4] in the Netherlands. The KP also belongs to this category relying on market instruments by using the 'cap-and-trade' mechanism.

Cap-and-trade mechanism limits the emission levels an area or an industry can emit and then allows individual firms to buy and sell credits which permit them to release certain specified amounts of gas. Thus cap-and-trade policy, based on neo-liberal market economy replaces the inefficient "end of the pipe limits" and mandatory "compliance to technology" (regulatory measures) that are expensive and provid no incentive for firms to look for efficient ways for reducing emission. This cap-and-trade mechanism is an alternative to strict government mandates and relies on the market dynamics to mitigate pollution levels.

In order to tackle the problem of market failure in climate change, countries have jointly developed an accord to combat the issue of climate change by regulating emission by setting a cap and then forming a carbon market. The idea of setting a cap on emission and permitting trade for reducing the concentration of GHGs to mitigate global warming led to the KP. This Protocol in essence is a binding commitment established by the Parties to the UNFCCC in December 1997. The commitment regulates emission by setting legally binding emission targets for the industrialized countries (Annex 1 countries) which allowed a market for carbons (discussed in Chapter 3). Creating markets for carbon and trading carbon credits is one way of correcting market failure in climate change based on the neo-liberal economic approach.

Market mechanisms are at the centre of policy addressing the issue of climate change. The UN Secretary-General Ban Ki Moon in a video address to the Bangkok Climate Change Talks (31st March to 4th April, 2008) (The Time of India, 31st March, 2008) reiterated "The world is waiting for a solution that is long-term and economically viable," to the 1000 delegates from 190 countries. This talk was intended as a follow up of the agreement on a road map towards strengthening international action reached at Bali three months before. The UNFCCC Director remarked that "effective carbon market mechanisms" would be the "key component" of any post 2012 climate change regime (Sovacool and Carroll, 2008). It is clear that market approach is at the centre stage in the

[4] Since 1995 the Dutch Government has a Bicycle Policy, first of its kind in the world where usage of bicycle is encouraged by claiming mileage for tax reduction purposes.

international policy for dealing with climate change not only now (under KP) but also in the future (successor of the KP).

2.3 Neo-liberal Economic Theory

The neo-liberal economic theory is based on the notion of gains from market economy and trade that is based on free market and unregulated trade; together these two principles are the corner stone for today's market-based neo-liberal economic models worldwide. Neo-liberalism is a political philosophy or world view of free markets and less government which has also shaped environment management policy over the past 25 years (Liverman and Vilas, 2006: 329).

The philosophy behind this neo-liberal theory is the efficiency of the market as opposed to government interventions that entail high transaction costs. This theory states that economic growth occurs faster through free markets, international trade, property rights, and privatization of public enterprises. It became popular as an international economic policy since the beginning of the 70's. This approach is based on *laissez faire*[5] doctrine, where the market assigns efficient allocation of resources and the government intervention is left to the minimum essentials only. Neo-liberal ideology was first embraced by world leaders like Reagan and Margaret Thatcher in the early 80's and was later caught up by Manmohan Singh in India in the early 90's to liberalise the Indian economy. In Nepal, a neo-liberal economic policy was adopted around the mid 90's following the First People's Movement that reinstated parliamentary democracy in 1990. Study of neo-liberalism in Latin America by Liverman and Vilas (2006:333) show that adopting neo-liberal economic theory coincided with moving from authoritarian to democratic rule in 15 out of 18 countries by 1999, which also adopted a decentralized administration systems.

Clearly the world has been moving towards free market economy since the 70's with different countries embracing this development theory at different timings. Neo-liberal principle can also be seen as a harbinger for political liberalism and decentralisation of the state powers; it cannot flourish under autocratic rule. That is the reason this thesis will show in Chapter 4, how CFM policy developed in Nepal as a result of a changing political and administrative system within the country.

According to the neo-liberal theory, opening markets and trading brings economic gains. Trading and open markets have benefited the world; today we cannot imagine a scenario without trade and open markets. Taking a closer look at the international trade, the volume of world trade merchandise increased by sixteen times between 1950 to 1997 and the value of world output increased by a factor of 5.5 (OECD, 1998). Another example illustrating benefits of market economy is from a research exploring benefits of free trade between two countries differing

[5] Laissez faire is an economic doctrine that opposes government interference in business beyond the minimal necessary letting free market system to function.

only in their area, concluded by confirming that even as the global welfare is increased when compared to trade under autarky, small countries gain more from free trade (Tharakan and Thisse, 2002). Moving to free trade lowered the equilibrium prices in the small country as a result of pro-competitive effect of free trade. Evidently market-based approaches can deliver economic benefits to developing countries even if they are small nations.

The interesting point is that neo-liberal economic theory was originally intended for trade and commerce; only later was it applied to the environment management and protection, it was not part of the initial neo-liberal theory of the 1960's. In the environment sector, neo-liberal economic theory is linked with privatization or usufruct right spelt on state owned resources such as forests, water and biodiversity. It also includes payment for environmental services; deregulation and cuts in public sector expenditures for environment management and protection; opening trade and investment; and transfer of environmental management to local bodies/non-governmental organisation from the state (Liverman and Vilas, 2006:328).

Nepal embraced the notion of neo-liberalism in the forestry sector back in the 80's. It was beginning to be seen that market-based mechanisms were best at working with reducing deforestation and forest degradation which led to the CFM policy that finally was implemented in Nepal by the 90's that rapidly expanded in the next few years. Also globally for environment protection policy, the cap-and-trade concept that relies on market dynamics to reduce emission was being considered as an alternative to strict government regulatory instruments at around the same time. Emissions that were free in the past irrespective of their environmental and social cost were now priced by the market under the cap-and-trade mechanism. An example of this is the 1990 Clean Air Act in the USA which was one of the pioneering legislation to implement this mechanism. National emissions trading programme for acid rain was set up that authorised states to make their own emission trading programme to reduce smog in cities (Beder, 2006: 163).

2.4 Influence of Neo-liberal Economic Approach in the Kyoto Protocol

Neo-liberalism in environment sector is grounded on the assumption that cost of pollution and environmental pollution should be allocated by the market and that property rights must be allocated to environmental resources for its efficient protection and management. And it is this argument which forms the economic rationale for the KP to be formulated on a cap-and-trade basis.

The KP is formulated on the basis of economic principles as it relies on developing markets for carbon, and it also relies on international trade as it uses market-based mechanisms for payment in order for the protocol to be functional, so that emission may be regulated at globally least-cost solution. KP sets out to create a market for carbon trading by creating three market segments, namely Joint Implementation (JI), Emissions Trading (ET) and the Clean Development Mechanism (CDM). The CDM is the only market segment that enables trading of emission credits between industrialized and non-industrialised nations. According to the economic theory of trade, carbon trading should be profitable for both importing and exporting countries of emission credits (Sijm *et al.,* 2000) as it enhances economic efficiency in achieving GHG emission reduction (Austin and Faeth, 1999).

To understand the neo-liberal economic principles embraced by KP, we have to place the UNFCCC and the KP in the context of the broader global development paradigm emerging at that period. In 1992 at the Rio Earth Summit, UNFCCC was signed as an international treaty to mark the beginning of a process to reduce global warming. Five years later in 1997, governments agreed upon the KP. The UNFCCC and the KP were signed in the backdrop of a newly emerging school of thought on development based on a neo-liberal ideology that relied on open markets and trade.

By the 1970's, the prevailing wisdom of the 1950s and 1960s that favoured import substitution was being replaced by export promotion. Notably two of the renowned economists of the mid-twentieth century, Friedrich August von Hayek[6] and Milton Friedman[7], were starting to influence the global development paradigm by promoting market-led development together with the University of Chicago. Their promotion for neo-liberal economic approach for development was further complimented by the new theory on property rights by Coase[8] (1960). Neo-liberalism was embraced by governments of Thatcher in United Kingdom and Regan in the United States in the early 1980's and further promoted in developing countries by the World Bank by adopting the Structural Adjustment Loan[9] (SAL) programme throughout the 80's, which intended to open up markets

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[6] Friedrich August von Hayek was a renowned economist and political philosopher known for his defence of economic liberalisation, democracy and free market capitalism (von Hayek, 1960) against socialist and collectivist thought of the mid-20th century. During the 1980s, he very much influenced Margaret Thatcher's economic approach and that of Ronald Reagan's. Many agree that his theory on socialists as well as on non-socialists were proven by the break up of communist regimes in Eastern Europe.

[7] Milton Friedman advocated minimizing the role of government in a free market economy as a means of creating political and social freedom and was a strong advocate of the laissez-faire capitalism (Friedman, 1962). Friedman firmly believed that if capitalism or economic freedom is introduced into countries governed by totalitarian regimes, it would result in political freedom.

[8] Coase theorem (Coase, 1960) provides a revolutionary rethinking on the issue of externalities and suggested a new approach to the problem of externality by defining property rights. Later Coase theorem was refined to 'the tragedy of the open access' which was widely referred to the case of community forest.

[9] During the decade of the 80's, the World Bank launched a new instrument for development- the structural adjustment loan (SAL) that aimed at moving the developing countries towards market-based economy. The Bank provided finance over a period of several years for reforming trade protection and price incentives for efficient resource use (Kapur et al., 1997: 509). The SAL had dual objectives of maintaining growth and to facilitate balance of payment for developing countries. Countries had to agree to undergo a structural adjustment program (SAP) that would expand the role of market forces and constrain the role of the state. By 1990 policies inspired by SAL reigned through Latin America, East Central Europe and much of the remaining developing world.

in developing countries. While markets were being opened at a global scale especially in developing countries, a treaty was being developed simultaneously for promoting market liberalisation.

The ground work for the Uruguay Round General Agreement on Tariffs and Trade (GATT) started in 1982 and in 1986, GATT was signed. This moved the world closer towards the neo-liberal economic model. The World Trade Organization (WTO), established in 1995 was founded on the Uruguay Round GATT negotiations which took place between 1986 till 1994. This important international trade treaty opened markets for trade at around the same time the UNFCCC and the KP were beginning to be formulated, and they share a similar ideology.

Both the GATT and KP are based on neo-liberal ideologies. The KP relies on market through cap-and-trade mechanism and limits emissions between nations ratifying this global protocol. For the UNFCCC to reflect the GATT principles, it also tries to prevent restrictive trade sanctions by stating that abatement measures "should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction of international trade," language taken directly from GATT (Pearson, 2000. pp 426). Again, "Article 3.3 states that climate policies should be cost-effective so as to ensure global benefits at the lowest possible costs", also a view advocated by GATT (Gupta, 1997: 99). The UNFCCC acknowledges that abatement policies should be market oriented and cost-efficient, and implemented cooperatively by interested parties, phrases that are used within the neo-liberal school of thought.

Such market-based approaches in the UNFCCC relating to open market and international trade paved way for carbon trading under the KP based on the three market-based flexible mechanisms mentioned earlier. These three flexible mechanisms created three market segments for carbon trading in which carbon has a fungible nature. Each mechanism's commodities are traded on separate markets, that is to say they are differentiated institutionally on the basis of governance, monitoring, validation and sector. Though each of the three mechanisms have different markets for trading, the basic commodity traded is the same: additions or subtractions of the amount of GHG emissions assigned to Annex 1 countries for the period 2008 to 2012 expressed as tonnes of carbon dioxide equivalent (CO_2e) (Sijm *et al.,* 2000). Clearly the KP had strong neo-liberal elements based on trading right from its inception.

2.5 Development of Market Mechanisms in the Environment Sector

In order for a market economy to thrive, market failures must be corrected. For carbon trading to take place, market failures needed to be corrected, but the process was complex and uncertain, it took a long time to create a market for carbon and to design a carbon trading mechanism that was market-based.

Carbon trading and other market-based payment mechanisms originated from the concept of payment for environmental services. Payment for environmental services is a corollary of the Polluter Pays Principle (PPP)[10]. This PPP supports the notion that environment protection costs incurred in the private sector should not be offset by government subsidies. This is in line with the emerging neo-liberal school of thought of the 1980's. The idea was to press market prices closer towards the full social costs of production and at the same time eliminate trade distortion arising from differences between countries in funding environmental protection (Pearson, 2000: 284).

However, the PPP was contradictory in itself as explained by Pearson (2000: 284) for two reasons. The polluter was only paying for the pollution abatement cost and not actually paying for the pollution or the residual environmental damage caused by it. The second point is that when polluters pay for the abatement cost, they simply transferred the cost to the consumers, consistent with "Consumer-Pays-Principle" (CPP) (Pearson, 2000: 284). These were some of the limitations PPP encountered in the initial stages. That is the reason why in the 1992 Rio Declaration on Environment and Development treaty, Principle 16 of the Declaration advocates "internalization of environment costs, taking into account the approach that the polluter should, in principle bear the cost of pollution…" (Pearson, 2000: 284). This made clear a distinction between internalizing the abatement cost and internalizing the damage cost.

PPP also had another deficit: what amount should the polluter pay and who should determine the cost? By 1991, OECD (1991) further developed this definition to incorporate "internalization of pollution prevention, control and damage costs" (Pearson, 2000: 285). This was followed by the OECD endorsing "User-Pays-Principle" (UPP) as an analogue of the PPP, in which governments would determine the social cost and calculate the fee for natural resource users accordingly. However, there were no serious efforts in operationalizing UPP at the OECD level (Pearson, 2000: 286). Although the theory seemed fine, one problem continued to persist: how reliably would the calculated costs reflect the true value of pollution prevention, control and damage?

Never-the-less, by the turn of the century, UPP was regarded as the best approach to addressing environmental issues. The Katoomba Group in 2000 viewed market-based mechanisms under UPP as the most appropriate way to calculate pollution prevention, control and damage costs (Pagiola *et al.,* 2002). Market-based mechanism was becoming an increasing popular development approach with *laissez faire* approach where the government intervention was minimized. For instance, micro-finance in rural areas of non-industrialised countries was one

[10] The PPP concept dates back to the 1970s when it was first proposed by the U.S. Commission on International Trade and Investment Policy in 1971 (Pearson and Takacs, 1971). At the global level, PPP was first adopted by the OECD in 1972 in "Recommendations of the Council on Guiding Principles Concerning International Economics Aspects of Environment Policy" which was based on a simple cost-allocation principle to improve efficiency (OECD, 1975 quoted in Pearson, 2000: 283).

example where market mechanisms were increasingly relied upon to reduce poverty which was considered to be working quite well (Hulme and Mosley, 1996). So it was quite natural for the environment sector to also copy this paradigm and let the market take control to regulate emission.

In terms of reducing air pollution from industries, a cap-and-trade approach was developed in the 80's and adopted for the first time in 1990. The 1990 Clean Air Act Amendment of the U.S. Acid Rain Programme was the first large scale long term US environmental programme to rely on tradable emission permit because the cap-and-trade programmes promoted innovation while maintaining strict environment integrity at least cost compared to rate based standard (Ellerman *et al.,* 2000). Interestingly even though the US is not a party to the KP, it has developed its own carbon trading regime which like the KP, is also based on cap-and-trade mechanism but predates the KP.

The cap-and-trade mechanism promoted innovation in technology and market-based systems which replace rate levels on individual firms with flexible approaches. The market approach imposes a single industry-wide limit rather than imposing installation of a specific technology, and the firms are free to use the most cost effective strategy to achieve their cap limitations. Reductions below their allocated levels enables firms to sell the remaining allowance to other firms that find abating costs more expensive, thus creating continuous incentives for finding cheaper cleaner technologies (Swift and Mazurek, 2001). The main benefits of the cap-and-trade mechanism are lower compliance costs, while it creates continuous driver for improvement and innovation, and lower administrative costs (Swift, 2001).

Market mechanisms are also attractive to governments because it enables a government to transfer costs for environmental protection to the private actor that pollute or use the environment resources. Instead of government support as incentive and subsidy for forest protection, the private sector pays the cost. The community forest in Nepal is one example where corrections were made to market failure by redefining property and usufruct rights and allowing the locals to manage the resources instead of government depleting its funds for managing the forest resources. This proved successful in Nepal in the devolution of natural resource management as will be explained in greater detail in Chapter 4.

When market mechanisms work, the price is determined by equating demand and supply, which gives important efficiency gains. This is one reason, why increasingly number of policies in environment protection is looking towards market mechanisms including the KP. Opening up a market for carbon trading under the KP was regarded as a novel way to mitigate GHG emissions in a globally concerted manner without government spending. And taking the Nepali community forestry sector, if usufruct rights already worked for in forest management and conservation without relying on the state funds, then there is ample rationale to further link forestry with markets by adding value through carbon sequestration. In theory it looks plausible, however it needs to be seen if it is practical as well with reference to CFUGs.

2.6 Development of Carbon Market and Mechanisms

Market-based mechanisms are designed to reduce the negative characteristic of public goods and to set compensation mechanisms for externalities through market. According to Richards (2000) there are 3 types of payment mechanisms for the forestry sector namely: 1) transfer payment approach, 2) property rights approach and 3) markets approaches based on public good benefits. Amongst the three types of payment system, the market-based approach is considered the most efficient instrument in the neo-liberal theory and the Clean Development Mechanism (CDM) of the KP falls in this category as shown below in Table 2.1. CFM on the other hand is a property rights approach as it is about spelling out usufruct rights to local communities of forest resources in government owned common lands. Transfer payment approach is the least efficient approach which relies on regulatory instruments such as direct funding assistance through subsidies, taxes or grants.

Table 2.1: Types of payment mechanism for tropical forestry

Types of mechanism	Domestic	International
A. Transfer payment approach	Fiscal MBIs and subsidies: 'polluter and beneficiary pays' in taxes differential land-use taxes Innovative forest pricing: concession bidding, performance bonds tax-exempt bonds	International transfer payments: debt-for-nature swaps Global Environmental Fund conservation trust funds international timber trade taxes area-based payments to forest managers other international taxes
B. Property rights approach	Community usufruct rights partial privatisation e.g. community forestry	Tradable development rights intellectual property rights.
C. Market approaches based on public good benefits	Water commoditisation protection rights ecotourism charges e.g. Payment for Environmental Services.	Carbon offset trading e.g. CDM certification of forest products bio prospecting deals fair-trade.

Source: Richards, 2000: 1002.

By creating carbon markets in the form of Certified Emission Reduction (CER) credits under the CDM, private sector investment from Annex I parties can be directed towards climate friendly projects that may not have taken place otherwise (Yamin and Depledge, 2004) or that would have been accorded low priority in developing country's development agenda. Market-based CDM can be used to promote economic incentives for conservation related activities in developing countries. Given the fact that public sector spending on conservation is experiencing global cut backs, CDM could be viewed as a strong promotional agent for conservation activities, especially in the resource-scarce, non-industrialised world.

Due to this unique market linkage, the UNFCCC has more weight and a higher profile globally than the Convention on Biological Diversity (CBD) which has not garnered the same level of interest in political and private sectors (Koziell and Swingland 2003). CDM under the KP is particularly important amongst the three mechanisms, as it can be regarded as bridge between industrialised and non industrialised countries for transfer of clean technology and is receiving unprecedented attention from policy makers due to its cost savings and efficiency gains (Baumert *et al.,* 2000; Landell-Mills and Porras, 2002: 10). In addition to deriving payments from CER credits, developing countries also gain from the technology transferred, including knowledge and experience transferred from the industrialized to developing countries from carbon trading (Sijm *et al.,* 2000).

According to neo-liberal economic theory, developing market-based mechanisms to trade carbon would accrue benefit to the parties participating in trade. Thus market developments can improve the livelihood of the poor who are dependent on forest in many ways. Carbon offsets can be a source of additional income which contributes in raising the welfare by increasing purchasing power and reducing vulnerability by diversifying income for the poor and at the same time also bear positive spin-offs for assets which the poor community rely on (Landell-Mills and Porras, 2002:100). An example is the protection of arable land and agricultural productivity enhancement from investment in forest protection and management.

Research conducted by Halsnaes (2002) reviewing empirical case studies across the globe revealed that numerous CDM projects had significant co-benefits on the local environment and on development. Case studies illustrated that benefits can be significant in many developing countries characterized by high local pollution levels and unemployed labour. These benefits however were strictly subject to the project context and were site specific.

In a separate research undertaken by Brown and Corbera (2003), it is revealed that the emerging carbon market economy was being viewed by market advocates "as being economically efficient and as providing market incentives for a wide range of resources managers" under the KP. Based on a case study in Mexico, it was found that middle-income rural communities were favoured in setting up forest carbon projects. Another case study from Mexico (Tipper, 2002: 223-233) referring to the Scolel Te project illustrates that carbon trading from a voluntary market resulted, not only increased forest cover on communal and private lands, but farmers are receiving additional income from carbon as well. Thus there is a priori indication that, rural communities in Nepal Himalaya that manage forest could also benefit from the global climate treaty by receiving payments for emissions they help to reduce.

2.7 Critique on Market-based Approach to Environmental Management

However, though in theory the neo-liberal approach sounds very positive as regards development and environment protection, in practice there are many critiques to this approach which claim the opposite and say benefits may not accrue as intended.

There are arguments that neo-liberal economic principles often work against the marginalized and in favour of the more powerful and rich, and thus that poor nations could benefit less. Under the neo-liberal market approach, there is always the danger that cut back of public sector funding may constrain environmental enforcement and also shift the management of resources from the state to a profit making private party; both these actions could increase the vulnerability of marginalised communities that are dependent on forest resources. There is also still a belief that environment is best regulated by the government as markets do not place a high enough value for the environment nor the ecosystem services (Liverman and Vilas, 2006: 330). In a subsistence economy, community managed forests have a high social value for the local communities, and consequently the monetary value from the carbon market may not reflect the true value of the forest resources as it will be discussed in Chapter 8. It is therefore important to come up with a policy that safe guards the local and indigenous people's rights in managing and utilizing forest resources while at the same time contribute to reducing global carbon emission.

Additionally, it is also common (rhetoric) to hear from the left theorists that neo-liberal market-based approach is in reality another form of imperial control whereby resources are allocated property rights, then commodified and finally exported to support capital accumulation by powerful nations (Harvey, 2005 cited in Liverman and Vilas, 2006: 333). This criticism may be very relevant in the carbon trading sector where the polluting nations may have vested interest in acquiring cheap polluting permits from non-industrialised countries.

Yet another critic of this theory relevant to the KP is that markets may not be really free in the emission sector. The market for carbon in essence was created through negotiations based on cap-and-trade mechanism and is regulated by quotas and thus not a free market but a regulated one (Pearson, 2000). This raises the question as to what extent principles of market and trade may work in the emerging global carbon market for the communities of Nepal Himalayan. As will be discussed in Chapter 3, Nepal has so far only marginally benefited from the CDM market compared to the larger economies like China and India.

In theory, opening rural products to the global markets may look promising especially in carbon trading where potential opportunities could be exploited for seeking funding forest conservation activities. But there is a growing concern that developing such markets in practice in the environment sector can actually be counter productive or have unintended negative results.

A study on neo-liberalism and environment in Latin America by Liverman and Vilas (2006:356) highlight the impacts of neo-liberalism policies in water, forest, agriculture and fishery sectors. It concludes that though neo-liberalism has a profound impact on the state's environment policies, there was very little evidence based on this study to state that environment is better managed and protected under the neo-liberalism policy. There were both positive and negative impacts across the different sectors and across the different countries because the impact of neo-liberal policies in the environment sector is very context specific and varies greatly as a result of differences in political, institutional, economic, environmental and social conditions.

The most severe critique on the assumptions of neo-liberal market-based mechanisms in the environment sector comes from the New Institutional Economics[11] in five main points as described by Landell-Mills and Porras (2002: 13). It states that markets are expensive, market development is intimately linked with power relations, markets are multi-faceted, markets cannot be evaluated in a void, and markets are dynamic.

The points raised by the New Institutional Economics are very much valid critique to the carbon market in the context of the CFM sector. CFM operates in a subsistence economy and consequently the carbon market may come at an expense which will be analyzed in Chapter 8. This is due to the fact that market (carbon market) use is expensive and entails transaction costs which could be expensive for CFUGs. Also markets are developed by economic agents who have their own objectives and the more powerful the agents, the greater influence they have in developing this carbon market under the UNFCCC. So poor nations with little bargaining power may end up with little as terms of trade could be in favour of the powerful nations and this is also applicable to the carbon markets under the KP just as in any market. This point is also elaborated by Gupta (1997) that raises the concern that the potential long term-term effectiveness of the KP may be constrained by horizontal negotiation deadlock between larger developed nations. Therefore in the first commitment period, small nations like Nepal have benefited less from the CDM as will be illustrated in Chapter 3.

An argument by Sovacool and Carrol (2008) suggests that relying on markets to fight climate change could create disastrous consequences for the world's poor

[11] The International Society for New Institutional Economics (ISNIE) webpage (ISNIE, 2007) describes the New Institutional Economics (NIE) as "an interdisciplinary enterprise combining economics, law, organization theory, political science, sociology and anthropology to understand the institutions of social, political and commercial life. It borrows liberally from various social-science disciplines, but its primary language is economics. Its goal is to explain what institutions are, how they arise, what purposes they serve, how they change and how - if at all – they should be reformed." The NIE is an economic perspective that focuses on social, legal and institutional norms that underlie economic activity in terms of neoclassical economic theory.

and the global environment for three reasons. Firstly because nature, unlike market, has finite limits; and therefore after certain threshold, changes cannot be reversed. But the market mechanisms presume carbon offset follows a pro-growth, economic expansionist model of development with improvement in the environment. Secondly, global carbon trade will exacerbate the developing world's dependency on the industrialized nations as the industrialized nations will be in a position to buy cheap emission reductions in poor countries and bank them for the future such that when the time comes for the non-industrialized nations to cut their own emission, the least cost options will already have been licensed by the firms from industrialized nations. Thirdly, market mechanisms view one-to-one relationship between pollution and abatement. In reality carbon offsets and credits do not follow this one-to-one relationship as different intensity of energy are required for different offset methods like carbon capture and sequestration. Sovacool and Carrol (2008) explain that in many cases, two or three tones of CO_2 must be sequestered to offset one tonne CO_2.

In a study by Landell-Mills and Porras (2002) that reviewed 287 cases of market-based mechanisms for carbon trading and environmental services, several issues were raised when markets were developed for numerous forest products. Firstly, they point to the fact that neo-liberal economics does not address how markets are created but rather focuses on the end result of a functional market. The process is important for the poor nations and poor communities so that trade does not make them worse off or abstain them from fair trade.

Though Landell-Mills and Porras (2002) see the benefits of markets by opening avenues for income, diversifying asset bases and developing skills, at the same time they warn that in poor communities, livelihoods may be marginalized by increased exclusion, lower income and weaker asset base from the development of the market. The authors also warn that poor communities may be forced to leave traditional entitlements with long term supply contracts for carbon offset that could constrain flexibility in resource use. They add that, transaction cost for carbon offsets may be so high for small suppliers that participation in the market could out weigh any potential gains. These are important potential dangers raised, but Landell-Mills and Porras (2002) conclude that they are not sufficient to conclude that carbon trade and market will retard development in non-industrialised countries.

The issues raised here on neo-liberal approach to tackle climate change indicate the need to develop sound policies that take into account and respect the principles of human rights and safeguard land and customary rights of indigenous peoples (Mehata and Kill, 2007:1) while reducing emission. By reviewing the current carbon market under the KP, this study intends to shed light on how and what is needed to make the market mechanisms support CFM. This will lead to recommendations for the proposed new treaty that is being drafted to replace the KP after 2012.

2.8 Summary

Climate change is considered a market failure and measures to combat this change have taken a neo-liberal approach to correcting it because in theory, permitting markets to take control of regulating emissions looks innovative and beneficial. The cap-and-trade policy of the KP allows markets to regulate emission levels globally instead of the governments. The KP having neo-liberal ideals similar to that of the GATT, relies on market-based mechanisms to control emission in a cost-effective way that ensures global benefits at the lowest possible cost.

The neo-liberal approach became a wide spread development paradigm from the 80's onwards and it gained popularity amongst governments even in the environment sector as it enabled states to transfer cost for environmental protection to the private sector. The CFM sector in Nepal is an example of this approach where the cost of forest protection and management was transferred to the local communities reducing the state's intervention after the state handed over forested lands to the local communities. As CFM has worked in Nepal Himalaya region, the idea emerged to see whether markets could bring further benefit from carbon to the communities managing and conserving forests.

It is evident from this chapter that in theory, the world views climate change as a market failure and consequently, the global concerted efforts to mitigate this change is also based on market mechanisms; and it is certainly expected that the new treaty which will replace the KP to be also market oriented. In theory, permitting markets to take control of regulating emission looks innovative and beneficial for both parties that buy and sell credits. However, there are several important issues raised in this chapter which must be dealt with when working with markets so that the interests of marginal groups are safeguarded. In the next chapter, the thesis will analyze the role forests play in climate change and how the climate change treaty of the KP views the forestry sector and what needs to be addressed in the new treaty to make the market mechanisms conducive to marginal farmers engaged in CFM such that some of the concerns raised in this chapter pertaining to markets can be addressed in the new global climate treaty.

Chapter 3

Role of Forest in the Climate Change and Climate Change Policies on Forest

3.0 Introduction

It has been learnt from the previous chapter that governments of the world view climate change as a market failure and consequently, the global concerted efforts to mitigate this change is also based on market mechanisms. Permitting markets to take control of regulating emissions looks in theory, innovative and beneficial for both parties that buy and sell credits. However, as pointed out in the previous chapter, market mechanisms also have numerous draw backs requiring cautiousness when developing carbon markets, hence this chapter identifies policies required in the post Kyoto period that remove these obstacles for CFM to function under the UNFCCC carbon market.

First this chapter shows how forestry plays an important role in emission reduction and yet how it has been largely excluded from the global climate treaty to reduce emissions. This chapter also highlights the details of the KP pertaining to the forestry sector and identifies gaps that make this protocol ineffective in meeting its intended goal at least as regards with CFM. This shortcoming is also acknowledged by the IPCC and consequently now the Parties and the SBSTA are working on developing a new policy called Reduced Emission from Deforestation (RED) in developing countries. Such a policy should be more effective at curtailing emissions from the forestry sector. Therefore, this chapter also indicates what the future direction of this global policy may take if it is to recognize CFM.

This chapter has four sections, the first explains the role forests play in mitigating emission, the second section analyzes the shortcomings of the Kyoto Protocol when dealing with forestry sector in non industrialized countries. The third section analyzes voluntary carbon market available to CFM and finally the fourth section analyses the proposed RED policy and how CFM and RED could be synchronized. By analyzing these aspects, this chapter will answer what the necessary conditions are at global level to bring CFM under climate regime and what are the required changes in the climate treaty for CFM to participate under the UNFCCC.

3.1 Role of Forest in Altering Atmospheric CO_2 Concentration

Forests play a significant role in maintaining the global carbon cycle because of its unique role in being able to sequester carbon as a ***sink*** and also in being able to emit carbon as a ***source***. These two roles are discussed below and analysed how the climate policy views these different roles.

3.1.1 Forest as Sink

Depending upon the ecological state, specific disturbance or management / intervention, forest can act as a sink and as a source (Masera *et al.,* 2003). Forests act as sinks by increasing above ground biomass through increased forest cover and by increased level of soil organic carbon (SOC) content. By conversion of shrub/pasture lands and agriculture fields or degraded forests into forests, the rate of respiration from plants, soil and dead organic matter is exceeded by Net Primary Production (NPP). This leads to sequestration of CO_2 from the atmosphere to the terrestrial ecosystem. On average 50% of the biomass is estimated as the carbon content for all species of trees (MacDicken, 1997).

According to Upadhyay, revitalizing the degraded forest land and their soils in the global terrestrial ecosystem can sequestrate 50-70% of the historic losses. Such degraded forests have emitted their carbon pool and now have the potential capacity to sequester greater volumes. Managed forests sequester more carbon than unmanaged forests nearing their climax stage as decay, burning, die-back are balanced by the growth of plants (Upadhyay *et al.,* 2005).

Forests play a profound role in reducing ambient CO_2 levels as they sequestrate 20 to 100 times more carbon per unit area as croplands (Brown and Pearce, 1994). Trees absorb atmospheric CO_2 for the growth of woody biomass and increase the SOC content in the soil as well. Tropical forest and tropical savannas store over 31% of the total carbon in 27% of surface land area as depicted in Table 3.1. This table is important because it shows that any loss in biomass from existing forests of developing countries lying in the tropical region, means losing more carbon stock than from any other vegetation area.

Another research study states that, of the total global terrestrial carbon, about $2/3^{rds}$, excluding those sequestered in rocks and sediments, are stored in forested area in the form of standing biomass, under-storey biomass, leaf and forest debris, and soil (Sedjo *et al.,* 1998 cited in Upadhyay *et al*., 2005). The FAO estimates the total carbon content in forest ecosystem to be 638 Gt for 2005, half coming from biomass and dead wood and half from soil and litter, which together amounts to more carbon than that is in the atmosphere (FAO, 2006: 34-35).

Table 3.1: Summary of global carbon stocks in plants and soil				
Biome	**Area (109 ha)**	**Global carbon stocks (Pg C)**		
		Plants	**Soil**	**Total**
Tropical forests	1.76	212	216	428
Temperate forests	1.04	59	100	159
Boreal forests	1.37	88	471	559
Tropical savannas and grasslands	2.25	66	264	330
Temperate grasslands and shrub lands	1.25	9	295	304
Deserts and semi-deserts	4.55	8	191	199
Tundra	0.95	6	121	127
Croplands	1.60	3	128	131
Wetlands	0.35	15	225	240
Total	15.12	466	2011	2477
Source: Janzen (2004: 401)				

Under the existing climate treaty, CDM only recognizes forest in developing countries as sinks and consequently only afforestation and reforestation are permitted activities.

3.1.2 Forest as Source

According to FAO, the definition of deforestation is the removal of forests and its replacement by other land uses class or the long-term reduction in canopy cover to less than 10%. The global forestry data shown below in the Table 3.2, reveals that of the 16.1 million ha of natural forests being lost every year, 15.2 million ha were lost in the tropical areas alone through deforestation. The net forest change in the tropical region was -12.3 million ha per year while in the non-tropic we find a net forest expansion at the rate of 2.9 million ha per year from 1990 to 2000. Forests in Asia are sources or net emitters of CO_2 (Dixon *et al.,* 1994 cited in Upadhyay *et al.,* 2005). The biomass increment in the non-tropics mainly comes from boreal forests in temperate regions of North America and Europe (Kauppi and Sedjo 2001: 303), and therefore leaves the problem of emission from deforestation to be tackled in the tropical regions of developing countries. Globally, CO_2 emission from land use change have greatly increased over the last century approaching to 7.3 Gt and is mainly attributed to tropical deforestation (Janzen, 2004: 403).

Table 3.3 shows carbon stocks in the different regions and this also shows largest carbon loss occurring in South and South East Asia which consists of tropical forests. Between 1990 to 2005, tropical forests in South and South East Asia region were loosing 1.67 $tCha^{-1}$ every year as a result of deforestation and forest degradation taking place.

Table 3.2: The world's annual change in forest cover area between 1990 to 2000 (million ha)								
Domain	**Natural forest**				**Forest plantation**			**Total forest**
	Loss			**Gain**	**Net change**	**Gain**		**Net change**	**Net change**
	Deforestation	Conversion to forest plantations	Total loss	Natural expansion of forest		Conversion from natural forest	Afforestation		
Tropical areas	-14.2	-1.0	-15.2	1.0	-14.2	1.0	0.9	1.9	-12.3
Non-Tropical areas	-0.4	-0.5	-0.9	2.6	1.7	0.5	0.7	1.2	2.9
World	-14.6	-1.5	-16.1	3.6	-12.5	1.5	1.6	3.1	-9.4
Source: FAO, 2001:44									

Table 3.3: Global estimates of total carbon in forest						
	Total carbon in forest			**Total carbon in forest**		
	million t			**tons per ha**		
Region	**1990**	**2000**	**2005**	**1990**	**2000**	**2005**
Africa	108,284	102,069	99,511	154.8	155.7	156.6
South and South East Asia	59,093	49,726	44,471	182.9	167.2	157.1
Asia	85,805	79,124	75,845	149.4	139.7	132.7
Europe	173,945	175,840	177,134	175.8	176.2	176.9
North and Central America	83,316	84,387	84,710	117.2	119.3	120.0
South America	172,686	165,126	160,192	193.9	193.6	192.6
Ocenia	36,654	35,997	35,713	172.5	173.0	173.1
World	660,688	642,544	633,105	162.0	161.1	160.2
Source: Marklund and Schoene, 2006: 28						

This loss is after taking into account the large scale reforestation taking place in China. China witnessed a forest area growth of 2.2% annually between 2000 and 2005 making it the country with the largest annual gain in forest area of about 1.4 million ha. per annum according to the Forest Resources Assessment (FRA) (FAO, 2006: 239). China also ranks 5th and India 10th in the world with largest forest area in 2005 and both reported significant total carbon stock increases between this period mainly from afforestation programmes raising the carbon figures for Asia. However, though the forested area in these countries is increasing through afforestation, huge biomass loss (in Asia biomass reduced from 149.4 to 137.7 $tCha^{-1}$ between 1990 to 2005) is occurring at regional level through deforestation and degradation in old forests. Forest degradation from a climatic perspective is the loss of carbon through removal of woody biomass but without reducing the area below 10-30% canopy cover (Skutsch *et al.,* 2007: 327) and which is not easily picked up by satellite images.

It must be noted that the reliability of the data that were shown above (Marklund and Schoene, 2006) is also a concern in itself. The data presented in this chapter is retrieved from a UN report produced by the Food and Agriculture Organization (FAO) that regularly publishes Forest Resources Assessment (FRA) which is widely used by numerous researchers in the forestry and climate change sectors. The FRA report is a compilation of data submitted by the national forest authorities from each country and is widely used around the world. But critics claim that such global data based on national aggregations from countries has large errors (Grainger, 2008); many of the developing countries do not have the resources nor the priority in conducting a detailed forest change survey on a regular basis, hence the FRA 2005 figures reliability may vary. A similar concern is raised by Skutsch *et al.,* (in press 2008), i.e. the FRA reports contain very little data on areas affected by degradation.

Irrespective of the reliability of these FRA data, what we know is that deforestation and loss of biomass through forest degradation in tropical countries are the main concerns for CO_2 emission from terrestrial ecosystem. Estimates show a quarter of all CO_2 emission according to IPCC, or to 18% according to Stern, being emitted from deforestation in tropical regions (IPCC, 2000; Stern, 2007). Hence, the tropical regions in Asia are responsible for unabated emission from terrestrial ecosystem, and this is where the concerted effort to combat climate change must focus. For this reason, the proposed RED policy if and when implemented, will now account for forest as sources as well. When this research began four years ago, it was highly uncertain how the post Kyoto treaty would take shape, but now since the global debate has progressed on, it is very probable that forestry will be recognized as a source and will be dealt with under the proposed RED policy.

Hence it has been learnt that forests play an important role as they are sinks and sources of GHG emissions. Under the KP, it only recognizes the sink role and under the proposed RED, only the sources part may be recognized. In essence, both the roles must be recognized for effective and efficient management of carbon cycle from the forestry sector.

3.2 Forestry Activities for Carbon Management

As forests play a critical role for both reducing and releasing CO_2 depending on its management, forest management is a key strategy for managing atmospheric concentration of CO_2. Bass *et al.,* (2000) have classified various forest management activities into three carbon management strategies namely carbon sequestration, carbon conservation and carbon substitution, as illustrated in Table 3.4.

Table 3.4: Carbon management strategies by undertaking different forest management activities

Strategy	Land use type and forestry activity	Forestry/rural development project type
Carbon sequestration	• Silviculture in increased growth rates • Agroforestry • Afforestation, reforestation and restoration of degraded lands • Soil carbon enhancement (e.g. alternative tillage practices)	• Community/farm/outgrower plantations • Forest rehabilitation or restoration • Agroforestry
Carbon conservation	• Conservation of biomass and soil carbon in protected areas • Change forest management practices (e.g., reduced impact logging) • Fire protection and more effective use of prescribed burning in both forest and agricultural systems	• 'People and Protected Areas' projects • Agriculture intensification • Rotational shifting cultivation • Community fire control schemes • Home gardens • NTFP production • Eco-tourism
Carbon substitution	• Increased movement of forest biomass into durable wood products, used in place of energy-intensive materials • Increased use of biofuels (e.g., introduction of bioenergy plantations) • Enhanced utilization of harvesting waste as a biofuel feedstock (e.g., sawdust)	• Community fuelwood • Community farm fuelwood
Source: Bass et al., 2000 :6 and 17.		

This table is important in that it shows the different activities in forest management that lead to reductions in emissions. Initially under the CDM, only the strategy of carbon sequestration was regarded for recognition and consequently it limited forestry related activities to afforestation and reforestation (AR) in developing countries. However, now this deficiency has been recognized and the proposed RED will include the strategy of carbon conservation by recognizing carbon saved from avoiding deforestation and conservation of existing forests.

CFM as practiced in Nepal Himalaya in essence also includes the strategy described by Bass *et al.*, (2000) as carbon substitution. Fuelwood is a major source of renewable energy when derived from a sustainable managed forest. Sustainable forest management in the context of subsistence livelihood as aimed under CFM is when the rate of forest resources extraction is less than the rate of forest regeneration. This makes CFM unique compared to other forest activities because the management activities of CFM result in carbon sequestration, carbon conservation and carbon substitution. This thesis does not account for carbon substitution because that would technically be under the energy project of the KP.

In this thesis, fuelwood is accounted for in economic value as well as in carbon terms for sensitivity analysis in Chapter 8, but its substitution effect is not considered.

The important role played by forest in balancing the carbon cycle in different ways and the livelihood and environment benefits accruing to the local communities enable CFM to meet sustainable development and emissions reduction simultaneously. Hence, there is growing interest in linking community managed forests to climate change instruments.

In addition, lately it is even being debated whether the forestry sector is more efficient than the rapidly expanding biofuel sector. Forestry is considered more carbon efficient than agriculturally derived biofuel (Righelato and Spracklen, 2008: 902). From a similar area, forested land can sequester two to nine times more carbon over a 30-year period than the emission avoided from the use of biofuel grown on the same area. Conserving existing forest is an efficient strategy for mitigation of carbon emissions. This forms another reason why there is a growing interest in the forestry sector for the second commitment period under RED.

3.3 The Kyoto Protocol

Global climate has always been changing naturally. But the changes witnessed in the last 50 years have been very dramatic and scientists attribute the change mainly to human induced factors that are linked directly to increased levels of CO_2 and other GHGs emitted into the atmosphere. Most of these emissions occurred after the industrial revolution from burning of fossil fuel, deforestation and other human activities resulting from economic and population growth.

Concerns over climate change due to anthropogenic interference first emerged in 1979 at the First World Climate Conference held in Geneva. Following this in 1988, IPCC was established as a body to assess climate change scientifically. The IPCC in its First Assessment Report published in 1990 confirmed that threat from climate change was real and in its Second World Climate Conference held later that year, the IPCC concluded that a global treaty was necessary to mitigate the dangers resulting from climate change. This conclusion thus paved the way for the establishment of the UNFCCC.

The text of the UNFCCC was adopted at the United Nations Conference on Environment and Development (or Earth Summit) in 1992 in Rio de Janeiro. The objective of the Framework Convention was to stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system through the adoption of a global protocol called the Kyoto Protocol (KP) in 1997 in Kyoto, Japan. The KP is a binding commitment relying on market based mechanism of cap-and-trade that would assist in implementing the UNFCCC goals.

The text of the KP to the UNFCCC was adopted at the third session of the Conference of the Parties (COP 3) to the UNFCCC in Kyoto, Japan, in 1997. Since Russia ratified the KP in November 2004, this global protocol came into force in February 2005. For this, it was necessary that at least 55 countries that encompass at least 55% of global emission from Annex 1 countries (industrialised countries) ratify it. By December 2006, 169 countries responsible for 61.6% of global emission had ratified this protocol. Nepal became a signatory of the UNFCCC on 12th June 1992 and ratified the KP on 16th September 2005. Nepal's interest in the ratification is solely with the objective of trying to secure CDM funds[12] and adaptation funds and to a lesser extent also in showing international solidarity for the global climate crisis. Nepal being a non-Annex 1 country does not have emission reduction commitments.

The KP's rules focus on:

- Commitments to legally binding emission targets
- Implementing the three market mechanisms
- Reducing adverse impacts in non-industrialised countries, including the use of Adaptation Fund
- Complying with the commitments

The UNFCCC and the KP have become globally high profile policies with political importance as GHGs are embedded in every economic and development activities of a country. The enforcement of the KP from 2005 has paved the way for the following:

- Industrialised nations (Annex 1) that ratified the KP have to comply in meeting emission reduction targets of six GHGs during the first commitment period, 2008 to 2012.
- Established a global carbon market which earlier was a voluntary market[13] before the Kyoto.
- Non-industrialised nations (non-Annex 1) can participate in emission reduction by hosting Clean Development Mechanism (CDM) projects.
- Adaptation Fund established in 2001 under the KP can be accessed by non-industrialised nations to cope with adverse effects of climate change.

As noted above, according to the KP all industrialised countries (Annex 1 countries) that are Parties to the UNFCCC are legally committed to reduce their emission of GHGs by on average of 5.2% from the 1990 levels by 2008 to 2012. This can be done by domestic action and also by international action under the KP. As stated in Chapter 2, the Protocol has devised three market

[12] The researcher was a founding member of the Climate Change Network Nepal (CCNN) established in 2003 as an informal civil society for lobbing and raising awareness. This group consists of WWF, NTNC, Winrock International, ICIMOD, and CEN and played a key role in lobbing the Government of Nepal to ratify the KP in September 2005. This group consisting mainly of INGOs (four out of six) had an interest in Nepal ratifying the KP in order for these INGOs to be eligible to secure climate change funds (CDM and adaptation) through their organizations.

[13] It must not be confused that voluntary market still exists today along side the KP. Projects that cannot comply with the KP rely on the voluntary market (see for further detail Section 3.6).

mechanisms to enable compliance with the commitment, namely, the Joint Implementation (JI), Clean Development Mechanism (CDM) and Emission Trading (ET). CDM is the only carbon market in which developing countries like Nepal can participate in the action for emission reduction. Hosting of CDM projects is limited to non-Annex I countries and Certified Emission Reduction (CER) credits are purchased by the Annex 1 countries to fulfil their commitment targets. Non-Annex 1 members cannot participate in JI and ET mechanisms.

3.3.1 The Clean Development Mechanism

The Clean Development Mechanism (CDM) is set out in Article 12 of the KP on CDM and has twin objectives of:

- Assisting non-Annex I (non industrialized and developing) countries in achieving sustainable development, and
- Assisting Annex I (industrialized and developed) countries in achieving compliance with their quantified emission limitation and reduction commitments (UN, 1997; Aukland *et al.,* 2002).

It is intended that through the CDM, institutional capacity building and technology transfer are the means of encouraging sustainable development in non-Annex I countries. Abatement projects in non-Annex I countries are the means of enabling Annex I countries to meet part of their commitment in a cost-effective way for fulfilling the second objective. Because developing countries like Nepal have no commitment under the KP to reduce their GHG emissions, it may implement CDM to voluntarily reduce GHGs. CDM projects are hosted in two main sectors: 1) energy and 2) land use, land use change and forestry (LULUCF). For countries like Nepal, such agreement in theory provides an opportunity for them to voluntarily seek ways to reduce emission by hosting CDM and selling credits to the Annex I countries.

CDM has in principle, several benefits due to its market approach, innovativeness and inclusion of developing countries to collectively mitigate GHG emissions as explained in Chapter 2 (Section 2.6) as reported by Yamin and Depledge (2004) and by Sijm *et al.,* (2000). Another innovative aspect of the CDM is that it sets aside a portion (2%) of the proceeds from CER trading which is deposited in the CDM registry. This fund is to be utilized to assist adaptation projects in non-industrialised countries vulnerable to adverse climate change effects and to cover CDM associated administrative expenses. In principle, there is much to gain from the CDM for non-industrialized countries like Nepal. However, in reality, this fund has not as yet been mobilized for adaptation purposes in developing countries.

Between theory and in practice, the CDM picture is quite different. CDM has been less favourable for the Least Developed Nations like Nepal. Bulk of the CDM projects are implemented in larger economies like China, India, Brazil and Korea that host nearly 80% of all CDM projects as shown in Table 3.5. Nepal has only two approved CDM projects in the energy sector with its emission reduction credit share in the global CDM market at only 0.06%.

Table 3.5: Number of CDM project distributed by country and share of CERs as of 13th October 2007				
Country	**Number of project**	**% share of project**	**Average Annual Reductions**	**% share of CER**
China	121	14.88%	75,835,735	44.88%
India	283	34.81%	27,440,390	16.24%
Brazil	108	13.28%	17,137,261	10.14%
Republic of Korea	15	1.85%	14,323,306	8.48%
Mexico	97	11.93%	6,463,625	3.82%
Argentina	10	1.23%	3,851,143	2.28%
Chile	20	2.46%	3,127,087	1.85%
South Africa	10	1.23%	2,088,041	1.24%
Malaysia	17	2.09%	1,904,500	1.13%
Philippines	14	1.72%	359,718	0.21%
Honduras	12	1.48%	229,032	0.14%
Nepal	2	0.25%	93,883	0.06%
Others	104	12.79%	16,136,466	9.55%
Total	813		168,990,187	
Source: CDM webpage (2007)				

When we look at the forestry sector, CDM is even less attractive. In the LULUCF sector in 2007, there was only one CDM project approved for the forestry sector which was hosted in China. It involves reforestation of degraded land in Guangxi Watershed by establishing 2000 ha of forest.

Lately the CDM of the KP is undergoing severe criticism as argued by Vidal (2008) who reports that billions of dollars are being wasted under the UNFCCC for paying emission reduction projects in developing countries that should not be qualifying in the first place. Vidal (2008) argues that of the 3,000 projects applying or already granted up to $ 10 billion of credits from the CDM over the first commitment period, would have been built anyway without the CDM fund, and claims that no genuine emission cuts are made which undermines the KP and the UNFCCC. Such concerns have raised doubt on the effectiveness of the CDM and on its intent. Such concerns are expected to be better addressed in the post Kyoto treaty which will also address the role of forestry in the climate treaty.

3.4 Forestry under the Kyoto Protocol

Initially carbon trading only existed in the energy sector and it was only later that the forestry sector was included. The forestry sector plays a profound role in climate stabilization as biological sequestration of CO_2 by forest is considered to:

- be more cost effective than other carbon sequestration methods (Righelato, R. and Spracklen, D. V. 2008, Schlamadinger *et al.,* 2007; Stern, 2007, van Kooten *et al.,* 2004, and Kauppi & Sedjo, 2001).
- reduce carbon emission as it is estimated that global deforestation accounts more than 18% of the global GHGs emissions (Stern, 2007) to about 25% (IPCC, 2000).
- bear the potential to store large volumes of carbon as huge historic losses have occurred from terrestrial ecosystems (Upadhya *et al.,* 2005; Kauppi & Sedjo, 2001).
- open up a 'virtual' market for carbon as a non-timber forest product (NTFP) where previously forest carbon had no linkages with markets (Skutsch, 2005). Thereby assisting in the development of Payment System for Environmental Services (PES).
- replenish carbon in terrestrial ecosystems with multitude of benefits in improving soil fertility, ecosystems and biodiversity which in turn have series of other benefits attached (Janzen, 2004).
- enhance livelihood options for the poor communities that are dependent on forest resources.
- be an adaptive strategy to cope with adverse effects of climate change.

In spite of the significant role forests play in both removing CO_2 from atmosphere and also in emitting CO_2 depending on its management, the KP has only two narrow windows for forestry activities to be credited for developing countries. The two activities that qualify under the CDM are afforestation and reforestation (AR).

According to the CDM definition, afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years through planting, seeding and/or the human-induced promotion of natural seed sources. Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding or human-induced promotion of natural seed sources, on land that was forested but has been converted to non-forested land. For the first commitment period (2008–2012), AR activities have been limited to planting trees on those lands that did not contain forest on 31st December 1989.

AR activities qualify for sink projects on lands that did not have forest before 1990. But much of the CFM that we see in Nepal Himalaya is on land that did have forest before 1990 as they were common lands with some form of degraded forest (Chapter 4). CFM is about avoiding deforestation and forest degradation and enhancement of forest biomass. Hence, community managed forest such as those found in Nepal Himalaya cannot qualify for carbon sink projects for AR.

There is also a discrepancy in the recognition of a permitted forestry activity between Annex 1 and non-Annex 1 countries. Article 3.3 of the KP requires the industrialised countries to take into account in their national inventory of GHGs human induced afforestation, reforestation and deforestation activities and adds under Article 3.4 additional measures in the land-use sector that add to the national accounts. This includes management of existing forests that were there before 1990. This allows the industrialised countries to generate carbon credits and meet part of the KP commitment. Consequently for many Annex 1 industrialized countries where forest biomass is increasing like for example the boreal forests, inclusion of forest management in the national GHG accounting enables them to gain carbon credits in a relatively low cost manner. This is the reason, countries like Switzerland have included forest management in their national GHG inventories where as Nepal cannot account for its existing management of forest to be accredited under the CDM. For non-industrialised countries, only afforestation and reforestation activities are permitted.

CDM policy has numerous potential benefits, but there are also strict criteria for the CER credits to ensure that they are real and additional. If CER credits are exaggerated, there will be a transfer of exaggerated CER credits to Annex 1 countries, which would increase the global GHG emission levels to above the KP threshold, rendering the whole mechanism counter-productive. Projects are scrutinized very closely and stringent criteria are set by the CDM board for projects to qualify, including a timeframe for emission reduction activities within the budget period of 2008 to 2012, known as the first commitment period, so that emission reduction credits are authentic and credible; this is what differentiates CDM from the voluntary carbon market which do not have to comply with any specific standard. The GHG emission reduction achieved can also be banked from the beginning of 2000 till the budgeted period for CDM activities. Box 3.1 highlights the conditions to be fulfilled for qualifying as an AR CDM activity.

Many of the requirements as shown above for CDM AR projects can also be met by CFM as has been practiced in the Nepal Himalaya. For instance, points 2, 4 and 5 are easily met by existing CFM; points 7 to 10 are the same for CFM and CDM. CFM only does not meet the dates of the project period (points 1 and 6) as forests already existed and were managed before 1990. The other two conditions which are the major constraints that CFM does not meet are additionality test mentioned in point 3 and leakage in point 11. CFM is already a national policy that is implemented and cannot therefore be additional; leakage is discussed in Section 3.5.

By comparing CFM to the conditions required for CDM, we can conclude the following. CFM can be integrated into this climate policy, it is not incompatible outright, which can be a valuable lesson for the UNFCCC while it discusses on drafting the proposed RED policy. Under the RED approach, it is expected both the obstructions posed by additionality and leakage within a country will be removed and this will make the new climate treaty potentially more conducive for CFM.

Box 3.1: Conditions for Afforestation/Reforestation CDM

1. Only areas that were not forest on 31st December 1989 will meet the CDM definitions of afforestation or reforestation.
2. Projects must result in real, measurable and long-term emission reductions, as certified by a third-party agency ('operational entities' in the language of the convention). The carbon stocks generated by the project need to be secured over the long term (a point referred to as 'permanence'), and any future emissions that might arise from these stocks need to be accounted for.
3. Emission reductions or sequestration must be additional to any that would occur without the project. They must result in a net storage of carbon and therefore a net removal of carbon dioxide from the atmosphere. This is called 'additionality' and is assessed by comparing the carbon stocks and flows of the project activities with those that would have occurred without the project (its 'baseline'). For example, the project may be proposing to afforest farmland with native tree species, increasing its stocks of carbon. By comparing the carbon stored in the 'project' plantations (high carbon) with the carbon that would have been stored in the 'baseline' abandoned farmland (low carbon) it is possible to calculate the net carbon benefit. There are still a number of technical discussions regarding the interpretation of the 'additionality' requirement for specific contexts.
4. Projects must be in line with sustainable development objectives, as defined by the government that is hosting them.
5. Projects must contribute to biodiversity conservation and sustainable use of natural resources.
6. Only projects starting from the year 2000 onwards will be eligible.
7. Two percent of the carbon credits awarded to a CDM project will be allocated to a fund to help cover the costs of adaptation in countries severely affected by climate change (the 'adaptation levy'). This adaptation fund may provide support for land use activities that are not presently eligible under the CDM, for example conservation of existing forest resources.
8. Some of the proceeds from carbon credit sales from all CDM projects will be used to cover administrative expenses of the CDM (about 2%).
9. Projects need to select a crediting period for activities, either a maximum of seven years that can be renewed at most two times, or a maximum of ten years with no renewal option.
10. The funding for CDM projects must not come from a diversion of official development assistance (ODA) funds.
11. Each CDM project's management plan must address and account for potential leakage. Leakage is the unplanned, indirect emissions of CO_2, resulting from the project activities. For example, if the project involves the establishment of plantations on agricultural land, then leakage could occur if people who were farming on this land migrated to clear forest elsewhere.

Source: Auckland et al., 2002: 5-6.

3.5 Reasons for CFM not included under the CDM of the Kyoto Protocol

CFM is about avoiding deforestation by encouraging the local communities to undertake sustainable forest management and conserve existing forests in the common lands. Avoiding deforestation in non-industrialised countries was never included in the CDM because leakage from avoided deforestation was considered to be a significant hazard and difficult to estimate and monitor (Schlamadinger *et al.,* 2007). Leakage is the endogenous increase in carbon emissions as a result of the emission reduction elsewhere. Each CDM project has to address and account for potential leakage and there are no clear ways to address leakage from avoided deforestation. An example could be taken from Nepal where the national deforestation rates are alarming as shown in Chapter 1, and it can easily raise the argument that CFM may be protecting forest in some place at the cost of degrading forests in other sites.

Another reason for its exclusion as stated by Skutsch *et al.,* (2007) was that at the time of policy negotiations in 2001 at Marrakesh, there was a strong opposition from many toward including large scale land use change management because this would reduce the efforts in the energy sector. In other words it was thought that by permitting avoided deforestation, there could be a market glut of carbon credits (excess supply of carbon) forcing the price so low, that eventually CDM would be counter productive (Trexler, 2003). Hence for the first commitment period, LULUCF options have been restricted to AR activities under the CDM.

This is very unfortunate since in practice the present CDM criteria permit large-scale monoculture plantations and ignore biodiversity abundant and sustainable management practices despite one of the twin objective of CDM being to assist non-Annex 1 (non-industrialised) countries in achieving sustainable development. Sustainable development goals are better addressed in small-scale community managed sustainable forests than in large-scale commercial monoculture plantations. Recognizing the deficiency of the CDM, it has been decided in 2007 at COP 13 in Bali, under the decision on RED (2/CP13), that a new policy called RED will be formulated under the new treaty that will include forest management activities which will also recognize the social welfare dimension and respect the right of indigenous peoples for the post 2012 period. Till now, CFM can only participate in the voluntary carbon market which is discussed below in detail in Section 3.6

3.6 Alternative Voluntary Carbon Market for CFM

In the first commitment period, CFM as a carbon offset project can only qualify under the Voluntary Carbon Market outside the treaty of the KP, i.e. an alternative market. It is better to analyse the voluntary market by comparing it with the existing CDM market to understand the voluntary market and its differences with the CDM market.

There are two types of global carbon markets for non Annex 1 countries (like Nepal): 1) regulated market under the KP and 2) unregulated voluntary market. Under the regulated one of the KP, there is the CDM, and under the voluntary market, there are the voluntary activities that do not comply with the global treaty of the KP. But it must be noted that even under the CDM, there could be a voluntary non-compliance project which follows the CDM modality but the credits do not go towards fulfilling the KP commitment and thus remain voluntary credit.

As shown in Diagram 3.1, buyers can purchase CDM credits called CERs to fulfil the Kyoto commitment; or they could also buy the same on a voluntary basis for non-compliance project but that maintains the same standard as the CDM where the CERs are voluntary and not intended to meet emission reduction targets. The voluntary market on the other hand deals with the non-Kyoto compliance credits called Voluntary Emission Reductions (VERs) only. CDM credits are registered with the CDM Executive Board whereas voluntary credits are available through independent retailers. In the first commitment period (2008 to 2012) CFM is left to operate only under the voluntary market as it is not permitted under the CDM.

The voluntary market refers to entities (companies, governments, individuals) that buy credits for the purpose other than meeting the Kyoto targets (Taiyab, 2006). Voluntary markets are independent of the KP and mainly driven by the corporate social responsibility (CSR) nature of the private sector (Peskett *et al.,* 2006). In the last couple of years, climate and carbon has gained more prominence within the

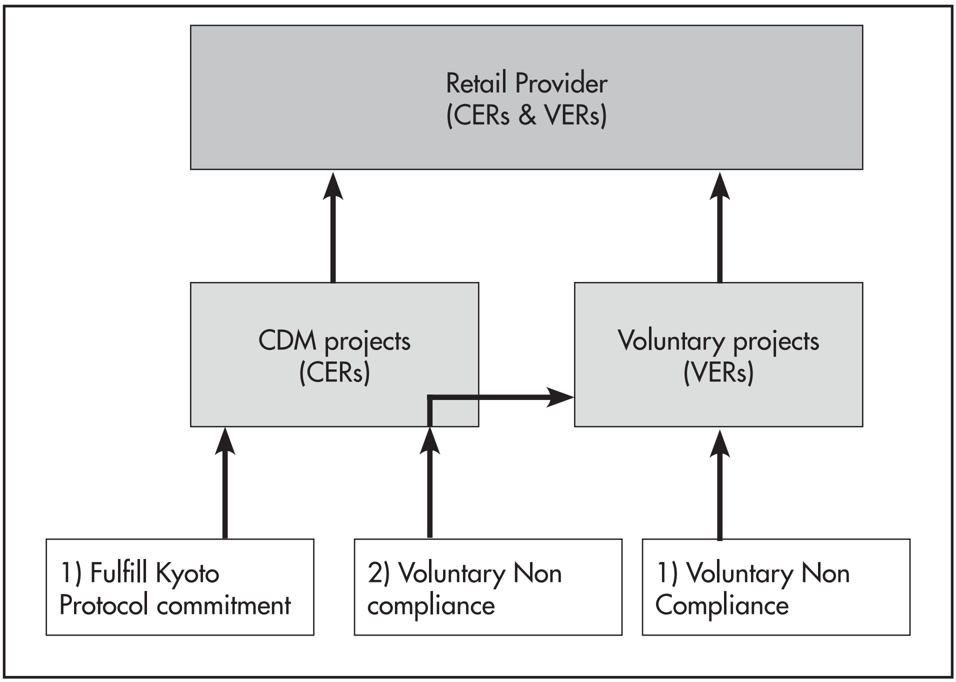

Diagram 3.1: Overview of the global carbon market

overall CSR agenda of the private sector and this is expected to continue to grow in the future. The voluntary market has expanded most rapidly in the last three years. Such growth in voluntary market is a result of increasing CSR which is now targeting the climate agenda more than ever before. Improved environmental media coverage and the enforcement of the KP have also raised the level of awareness on climate change globally (Taiyab, 2006) and thus contributed to the expansion of the voluntary market.

The bureaucratic CDM process entails high transaction cost and restriction. The voluntary market is more favourable in the forestry sector where wide range of activities can participate under the Voluntary Carbon Markets. As the current CDM market of the KP has failed to make progress in the forestry sector especially in the non-industrialized countries, the bulk of finance flowing into the forestry-based mitigation projects are from the voluntary market. Reducing carbon emission via the voluntary market has enabled companies to add value to their brand by showing their environmental commitment. The forestry sector is more attractive to the private sector as investing in trees is more tangible than offsets in energy projects and also sells more easily to the public (Taiyab, 2006). Most of this taking place through the voluntary market as there is only one CDM so far in the forestry sector.

Comparing the value of both the markets will enable to analyse the relative market sizes. According to Ranganathan (2007:14), the emerging global CDM market is worth \$ 50-60 billion at prevailing prices of \$12-15 per tonne CO_2. In the beginning of 2007, at the prevailing market prices of \$ 12-15 per tonne of CO_2, the report adds, CDM was worth about \$ 40 billion for CO_2 and another \$ 10-20 billion for the remaining five other anthropogenic GHGs. In the first half of 2006, according to the report, approximately \$15 billion worth of CO_2 emission credits were traded – five times more than in 2005. However, of the 1000 CDM projects which have been approved or are in the process of being approved, almost all are in the energy sector. Just as the CDM saw a rise in market size, the voluntary market is also growing. It has seen an eight fold rise between 2004 to 2005 rising from five million to \$ 43 million (Capoor and Ambrosi, 2006). The Chicago Climate Exchange (CCX) is an example of a voluntary carbon market that started since December 2003 where US based companies purchase offset credits to meet their voluntary targets to reduce GHGs.

There are merits of a voluntary market as well as demerits. At the merit side, it can channel funds to small-scale projects that promote sustainable development in non-industrialised countries which would not be feasible under the CDM due to the high transaction cost or lengthily approval processes. The drawback of voluntary market is that different retailers adhere to different standards for verification and monitoring which gives inconsistency in VERs. One way to see this is by visiting the web page of numerous retailers. Many of them have an emission calculator and it turned out that their emissions calculations are done differently between the different retailers.

There are around 40 retail providers for carbon credits, most of them in Europe, US and Australia. Taiyab (2006) claims that there were none to be found in developing countries though some could exist. The retailers have different mark-up added on the VERs to cover their costs and also they were found to have varying percentage of revenue expended on marketing, administration and the project. According to Taiyab (2006) one voluntary market retailer was found to spend 25% each on 1) project cost, 2) marketing and advertisement, 3) verification and 4) overhead and salaries.

From a list of 27 companies both profit and non-profit detected on the internet in August 2007 that mainly provide retail services in the voluntary carbon market, 14 were found to provide credits from energy projects, 9 from forestry projects and four from both sectors with the average selling price for tCO_2 in the forestry sector being $ 16 as shown in Table 3.6. At what rates they purchased credits from the project developers is not known. As of August 2007, of the 27 retailing firms found on the internet offering their services, 13 were based in Europe, 11 in the USA and three in Australia.

Table 3.6: A survey of voluntary retailers detected on the internet (20th August 2007)

Project type	No of firms	Average price (US$) per ton CO_2
Energy	14	19
Forestry	9	16
Energy & Forestry	4	11

The objective of this thesis is to analyze the viability of CFM under the global climate treaty and not under a voluntary market because the proposed RED policy will fall under the UNFCCC treaty. What this section illustrates is the distinction of the carbon credit market under the UNFCCC climate treaty and one that is not bounded by a treaty. Credits in the voluntary market could be dubious, inflated and unreal as these do not undergo a rigorous scrutiny process like that of the CDM and can conform to the standard set by any agency. It is specifically for this reason, that this thesis only focuses on the carbon market that is under the UNFCCC treaty and not the voluntary market.

For the remaining part of this thesis, carbon accounting methodology will adhere to the methodology accepted under KP. In the voluntary sector, there is no standard methodology for accounting carbon; different retailers have their own accounting processes. This thesis follows the IPCC guidelines (IPCC, 2003) to account carbon based on CDM projects so that carbon data and calculations are in compliance with an accepted methodology even though the forestry activity such as CFM is not yet permitted under the KP.

3.7 The Proposed Reduced Emission from Deforestation (RED) Policy

Avoided deforestation, sustainable forest management and conservation activities are excluded from the current global treaty. But now there is a growing interest to integrate forest management activities that encapsulate all of these into the cap-and-trade mechanisms for reducing emissions and at the same time to tackle the problem of deforestation taking place in developing countries. There is a strong move now to find ways to reduce CO_2 emission from terrestrial ecosystems by reducing deforestation rates in tropics that is being considered in the UNFCCC for discussion (Gullisom *et al.*, 2007: 985-986) under a proposed policy called Reduced Emission from Deforestation (RED) in developing countries.

It is assumed that CERs from RED will be traded the same way as CERs from CDM projects. The proposed RED policy for developing countries will recognize and provide payment for forest activities reducing emissions from deforestation and forest degradation by permitting sustainable management and forest conservation activities. It has not yet explicitly decided whether credits will also be given for enhancement of forest carbon stocks in developing countries.

It is highly probable that these points will be included in the post Kyoto treaty that will be declared at Copenhagen in December 2009. The proposed RED policy is quite different from the existing CDM approach as it recognizes a whole range of forest management activities thereby giving legitimacy to CFM under the climate agreement. CDM operates at project-level whereas this new proposed approach under RED is country wide and uses past deforestation rates as the baseline so that leakage is also accounted for.

Under RED, how CFM will be recognized for accreditation is not yet known at this stage, discussions are still ongoing at the UNFCCC and the SBSTA as there are hosts of other more technical issues that are attached with RED. In this chapter which analyzes the shortcomings of the KP, it is useful to consider the possibilities under RED so that real and practical proposals can be made to include CFM in carbon trading in the new climate treaty.

3.7.1 Development of RED Policy from Marrakech to Bali

The current rules under the KP on LULUCF were agreed at COP 7 in Marrakech (2001). COP 7 ended with the Marrakesh Accord which was a negotiated solution that contained agreement on key elements relating to implementation of the provisions of the KP and the UNFCCC. The main outcome of the Marrakech Accord included finalizing the detailed rules and modalities of the Clean Development Mechanism (CDM). Under the framework of the KP and the Marrakesh Accord, for the first commitment period for non-industrialized countries, only AR activities were permitted in the forestry sector as forests were only recognized as sinks.

This narrow definition to view forestry led to a move to consider the inclusion of avoided deforestation as a strategy to reduce emission as an important climate change mitigation option in addition to AR activities. The concept behind RED policy as an alternative to CDM progressed slowly with successive COP meetings. In 2003, at a side event at COP 9 in Milan, "compensated reduction" was first introduced by Brazilian researchers from Instituto de Pesquisa Ambiental da Amazonia as one potential new way to take into account deforestation in non-industrialised countries. The idea behind this was that addressing emission from deforestation was distinct from sequestrating it by a sink project (AR projects). Under this mechanism, non-Annex 1 (non-industrialised) countries could reduce national deforestation rate under historical baseline and be allowed to acquire carbon offset credits by demonstrating reduced deforestation (Santilli *et al.,* 2005).

At COP 11 in Montreal (2005), the Coalition of Rainforest Nations led by Costa Rica and Papua New Guinea presented a formal proposal for reducing emission from deforestation. This concept of compensated reduction was further refined by the Institute for Environment and Sustainability for the European Commission Joint Research Centre (Skutsch *et al.,* 2007). It uses the same baseline approach of taking the historical deforestation rate as compensated reduction except it starts from the global average rate of deforestation. A nation having baseline deforestation rate above half the global average deforestation rate, would be able to receive credits for the commitment period. By COP 11, the term "avoided deforestation" was being replaced by the term "reduced emission from deforestation" (RED) which included a wider range of forest management activities in addition to conservation activities under avoided deforestation.

The reason RED was being considered for discussions were because under this approach, it provides four important advantages as described by Skutsch *et al.,* (2007). Firstly, if accepted, the RED approach will account for major source of emission from deforestation in tropical regions and enable market mechanisms to be used for mitigation measures. Secondly, it will address leakages since baselines at national level would mean detecting and accounting for losses as well as gains. Thirdly, transaction costs would be reduced significantly compared to individual projects. And finally, RED gives much more authority and responsibility to the country itself in selecting the means to reduce their emissions from deforestation, compared to CDM.

At COP 11, a two years process was launched to explore this new option of RED. Three years later, the discussions are still on going to find the most effective and practical way to operationalize RED for the second commitment period. Since then the SBSTA has invited Parties to make submission on its views on RED twice already, once on February 2007 at its 26th session and the second on March 2008 at its 28th session. Nepal has made submission at both the times[14] (see **Appendix 1** for Nepal's views on RED submissions). There were 19 submissions in 2007 and 14 in 2008.

[14] The researcher drafted the submission submitted by Nepal on its views on RED to the SBSTA on February 2007 and March 2008 as attached in Appendix 1. The February 2007 SBSTA submission from Nepal as a Party was the country's first ever submission, and consequently first real participation in the climate debate. These submissions on the country's view are approved by Nepal's Designated National Authority (DNA) of the UNFCCC.

At the COP 13 in Bali (December, 2007), discussions on the forestry sector became the dominant theme of the conference. The Bali "road map" that is paving the way for the new treaty which will succeed the Kyoto Protocol in 2012, is dependent more on the forestry sector than KP. At COP 13, the Parties have agreed to address emissions from deforestation and degradation with COP 13 (2/CP13) decision on RED which states the following:

- acknowledges the contribution of the emissions from deforestation to global anthropogenic greenhouse gas emissions;
- recognizes the potential role of further actions to reduce emissions from deforestation and forest degradation in developing countries in helping to meet the ultimate objective of the Convention;
- affirms urgent need to take further meaningful action to reduce emissions from deforestation and forest degradation in developing countries;
- recognizes also that the needs of local and indigenous communities should be addressed when action is taken to reduce emissions from deforestation and forest degradation in developing countries;
- invites Parties to further strengthen and support ongoing efforts to reduce emissions from deforestation and forest degradation on a voluntary basis;
- encourages all Parties, in a position to do so, to support capacity-building, provide technical assistance, facilitate the transfer of technology to improve, inter alia, data collection, estimation of emissions from deforestation and forest degradation, monitoring and reporting, and address the institutional needs of developing countries to estimate and reduce emissions from deforestation and forest degradation;
- this all with a view to reducing emissions from deforestation and forest degradation and thus enhancing forest carbon stocks due to sustainable management of forests.

The Bali outcome on RED was important in that the Parties agreed to strengthen and support RED policy for reducing emission which also is appealing to CFM because it recognizes forest as sources, recognizes management of existing forest as well as the rights of the indigenous people that are dependent on forest resources for meeting their sustenance needs. These were not included in the KP. The discussions on RED have progressed much while this research was being undertaken. The latest Bali decisions show the way which course RED may take, however, the final policy will only be known when the policy is agreed in December 2009 in Copenhagen.

This decision for non-Annex 1 countries to participate in RED remains voluntary. The price of CER and the methodology for accounting carbon credits will play a decisive role in whether the carbon market under RED will attract the CFM sector in Nepal and other countries.

When the RED policy is formulated for implementation in the post Kyoto period, the baseline methodology will also be very critical. The rules on baselines will determine whether community managed forests such as those found in Nepal Himalaya region may benefit from carbon financing or not. For this reason, the baseline for accounting credits as that will be applied in Chapter 5 and Chapter 8, will only account for real biomass increment as it is not yet known what sort of a baseline methodology will be accepted in the future for CFM.

3.7.2 Uncertainties in Technicalities of RED

RED as mentioned above can be a novel way in addressing climate change and deforestation in developing countries. At the macro policy level, RED looks promising, but it could run into the same problem as the CDM- being good in theory but not working out in practice. There needs to be rules and regulations under RED that cater to the specific needs of the CFM if it is to be attracted to the carbon market and contribute to the goal of the UNFCCC. At the moment there are still uncertainties surrounding the specific technical nitty-gritty of RED.

It may be easier for CFM to get recognition from the UNFCCC when the RED policy simply recognizes forests as both sinks and sources which includes avoided deforestation, reduced degradation and forest enhancement. If this is the case, there will not be any perverse incentive for the CFUGs to maintain their forest below the natural carbon storage potential when forest enhancement is recognized and paid for the incremental carbon.

However, the recognition as sink and source will not suffice in attracting CFM to participate in carbon trade. As we shall see in the following chapters, CFM has unique characteristics and consequently there has to be suitable technical processes that create a conducive environment in the carbon market. The RED policy needs to address the areas of a) carbon accounting criteria, b) baseline construction and c) indigenous people's right as discussed below. These are three allegedly technical issues as mentioned in the COP 13 decision on RED (2/CP13), however, the indigenous people's rights is actually more of a political and cultural issue.

<u>a) Carbon accounting criteria:</u> Under RED, the criteria on how carbon is accounted will be one key issue. The COP 13 decision on RED (2/CP13) has explicitly mentioned of addressing emission from deforestation and degradation, but it is not clear if forest enhancement will also be rewarded.

CFM contributes to carbon saving from activities taken to avoid deforestation, and avoided degradation (reduce removal of woody biomass) and enhancement of biomass by implementing protective measures. Avoiding deforestation is easy to account for as it can be measured in area terms. Forest biomass enhancement is accounted by recording the incremental biomass change based on the IPCC Good Practice Guideline (IPCC, 2003). But measuring degradation is more complicated as by nature, forest degradation takes place by unsustainable removal of woody biomass by local communities for meeting their sustenance needs from the forest without necessarily decreasing the forest area. So to claim what is saved by reducing degradation requires a special carbon accounting method that considers the off take rates as well.

b) Baseline construction: In addition to the issue of carbon accounting method, the issue of baseline is uncertain under RED. How reference point will be selected is going to be one critical factor that determines whether RED will support CFM. The RED policy proposes a national baseline which may likely have other smaller nested baselines, which sum up to the national level baseline. How baselines are determined for deforestation and degradation and how these will be combined are major concerns for CFM as what credits they receive will be judged by the baseline construction.

Deforestation and forest degradation reference scenarios would have to be established using two quite different methodologies because of the inherent differences in the data required and available. A deforestation reference scenario can be based on remotely sensed imagery over a historical period which shows changes in area covered by forest, using statistical (secondary) data on carbon stock in different types of forest to calculate the change in terms of tons of carbon. The reference scenario may be projected into the future either by using very simple assumptions (linear continuation of past patterns) or more sophisticated approaches (relating the past changes to particular drivers, and using predictions of these drivers to forecast forest areas likely to be lost in the future under 'business-as-usual' conditions). The technical problems involved in establishing deforestation reference scenarios can be solved relatively easily, as the methodology for accounting for deforestation can follow Chapter 3 of the IPCC Good Practice Guideline (IPCC, 2003).

A forest degradation reference scenario, on the other hand, is much more difficult to establish because most degradation cannot be detected from remotely sensed imagery. There is no historical record of the spatial pattern of forest degradation (which areas are being degraded and the level of degradation), and because of lack of forest inventory data in most developing countries, there is no detailed information on the rate at which carbon stock is being lost in the areas that are subject to degradation. The Good Practice Guideline 2003 provides no clear recommendations for methodology for assessing and quantifying forest degradation rates.

c) Indigenous people's rights: The global climate treaty to follow the Kyoto Protocol will have implications for livelihoods dependent on forest resources. The local communities that manage and conserve forest resources will be affected by how climate policies are formulated and whether and how their existing efforts to reduce emissions are recognized for payments. According to Mehata and Kill (2007:1), RED needs to take into account and respect the principles of human rights, customary rights and land rights of indigenous peoples, as in a subsistence economy, CFM plays an integral part in rural mountain livelihoods as described by Gilmour and Fisher (1991) and Hobley (1996) for Nepal Himalaya. Realizing this, the COP 13 decision on RED (2/CP13) explicitly states the policy must recognize the needs of local and indigenous communities when action is taken to reduce emissions from deforestation and forest degradation in developing countries. This is one important policy in the interest of CFM because CFUG members are local indigenous people who rely on forest resources for meeting their sustenance needs. This point is mentioned in this chapter because it is still not exactly known how the RED policy will address this issue when dealing with CFM.

This has always been a concern for indigenous peoples that rely on biomass-based subsistence economy. Chapter 7 will analyse the relation between subsistence livelihood and CFM. There is always the danger that credit buyers with a tendency to reduce the risk from deforestation and degradation would prefer to keep forests only for carbon purposes and restrict all other uses. This will centralize forest management and alienate the people from their local resources. Such action could end up following the path of deforestation and forest degradation, the forests underwent when they were nationalized in Nepal between 1957 up to 1987 before eventually being handed back to the locals in the 1990s. It has already been learnt that without the local people's involvement, forests cannot be managed and conserved.

These are three allegedly technical issues raised by this chapter on the RED pertaining specifically to the CFM as we find in Nepal Himalaya although the issue of indigenous people's rights is more political and a cultural one. How RED will solve these issues is critical because they will eventually determine whether the new treaty will support CFM.

3.7.3 Post Bali Developments on RED

In Bali, RED was the dominating theme being discussed at the side events. Though Bali provided a new impetus for RED to be acknowledged by the COP 13 decision on RED (2/CP13) titled "Reducing emissions from deforestation in developing countries: approaches to stimulate action", for CFM there is a long way to go. At one level this decision is important and relevant to CFM in that it explicitly recognizes reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. But the negotiations ahead for RED could be rocky as the European Commission has quite a different approach to viewing forestry for the post Kyoto period.

The views of the European Commission on forestry could be a major concern for CFM in the future. The European Commission, a month after the Bali agreement, has released a new proposal that would potentially ban any kind of forestry credit till 2020 from the European carbon market which is the world's largest (Tollefson, 2008: 8). It seeks to address the problem of deforestation separately by funding government programmes. As Europe leads the way in global carbon policy, the whole issue of market mechanisms in the forestry sector is standing on shaky grounds. One argument for this is because global deforestation accounts for 5-6 $GtCO_2$ annually, while the entire European carbon trading scheme only accounts for 2 $GtCO_2$; there is a danger of forestry sector flooding the market with carbon credits (Tollefson, 2008: 9). Brazil is also pushing for an international fund, rather than a carbon market, and one that will assist tropical countries in reducing deforestation rates.

But there is also some hope for RED. Despite the numerous unresolved methodological issues surrounding RED, the World Bank has moved a head by committing to implement the RED policy. In 2007, the Bank established the new Global Forest Alliance (GBA) with conservation agencies like Nature Conservancy, Conservation International and WWF for creating funds to intervene in the forestry sector. For this the Bank has established Forest Carbon Partnership Facility (FCPF) with a financial plan of US$ 165 million to jump start the RED in developing countries and at preserving forest by linking economic incentive with forest management and conservation. The FCPF may be regarded as a precursor to the RED in the same way Activities Implemented Jointly (AIJ) which operated prior to the first commitment period was on an experimental phase before the market mechanisms took full control.

The debate continues on how RED should be developed under the UNFCCC, whether it should remain confined to recognizing the role of forest as sources only or should it also include the role of sinks. In any case, RED is expected to take a market approach based on a national level baseline- similar to the way Annex-1 countries certify industrial emission (Tollefson, 2008:8). This would rely on using remote sensing technology for monitoring. It is expected this approach may add value to standing forests thereby providing an incentive for sustainable management and conservation, because philanthropy and governments cannot control deforestation and forest degradation. These are some of the issues that may be taken for discussion. For the final decision we just have to wait for the climate conference in Copenhagen in 2009 where it is expected the rules to the climate treaty will eventually be declared. To get a picture on how RED could be operationalized to suite CFM, Nepal's 2008 RED submission can serve as an example as it is the only submission with CFM perspective on RED. This submission is attached as Appendix 1 of this thesis.

3.8 Conclusion

Forests play a significant role in stabilizing the concentration of atmospheric CO_2 as they switch between becoming a sink and source. Permanent loss of CO_2 from the terrestrial ecosystem by conversion of land use and loss of biomass can be reduced by avoiding deforestation and is more important in tropical regions of Asia where there is more carbon loss from forest.

The KP is a commitment to reduce human induced emission of GHGs to the atmosphere and is created with the objective to implement the UNFCCC after it had been scientifically proven that climate change was occurring. However deforestation in tropical countries is a major source of CO_2 emissions, but still remains outside the KP. Though there are various forest management strategies that are important from a climatic point of view, the KP has a very narrow approach in allowing only AR activities as it only views forests as sinks.

As the scientific community has gained new insights into more effective ways to reduce global emission, there is now a growing interest in finding ways to include reducing deforestation in non-industrialised countries in the post 2012 era. The recent policy developments are concerned with innovative ways to tackle reduction of emission from deforestation in non-industrialised countries. Mechanisms like the RED could have a global benefit in reducing emission from deforestation and at the same time rewarding those in the non-industrialised world that clean up the pollution, and this will be welcomed by many. Till now, RED proposes to view forests as sources only, but for RED to be more effective and conducive to CFM, it should view forests as both sinks and sources.

As mentioned earlier, if and when the role of forests as sinks and sources are recognized under RED, the role of CFM under the climate treaty would be clear. But this recognition at the global level would not be sufficient to attract CFM to the carbon market. There are numerous smaller and more CFM specific technicalities that need to be changed in the current climate treaty and addressed by RED policy if the future treaty is to include CFM. The proposed RED must come up with CFM conducive policies in carbon accounting criteria, baseline construction and recognize the rights of indigenous peoples. These conditions at global level and the subsequent changes in the climate treaty to suite CFM are necessary to bring CFM under the climate regime.

Therefore it is important for authorities in countries like Nepal that implement CFM, to take early cognizance of the potentials and possibilities that CFM can offer and be able to lobby for a mechanism that brings benefits to the locals that manage and conserve forest locally while extending benefits globally. Hence the purpose of this thesis is to draw on the lessons from the KP, to be able to find out a way to synchronize the successor of the KP with the CFM policy such that the issue of climate change is addressed while at the same time locals that contribute to reducing emission are rewarded.

Having seen the benefits and constraints of the global climate treaty and what has been proposed for the second commitment period, the next chapter will present the CFM policy in Nepal and analyse whether this policy at national level is favourable for supporting the global carbon trade and what changes are required at policy level in order for the CFM policy to synchronize with the global climate treaty.

Chapter 4

Development of Community Forestry

4.0 Introduction

Nepal is the oldest nation in South Asia; it has existed since 1768 AD as a sovereign state in its present boundaries. But the country's formal modern governance started much later with its first written constitution promulgated on 26th January 1948. This marked the beginning of the formal development processes within Nepal based principally on democratic ideology as the nation started to set up administrative apparatus to function as a modern state. Since the mid-20th century, forestry policy began to be shaped by numerous internal and external factors that affected the development process of Nepal in the forestry sector which is discussed in this chapter. While completing this thesis, Nepal became the newest republic in the world by declaring itself a Federal Democratic Republic on 28th May 2008. This will, inevitably shape the nation's future policies including the policies in the forestry sector related to community forestry and carbon trading.

In Chapter 3, the role of forest in climate stabilisation and policy developments in climate change treaty pertaining to the forestry sector were analyzed so that in this chapter, the national CFM policies can be analyzed in the context of the global climate treaty. The objective of this chapter is to answer the research question whether the current CFM policy in Nepal is favourable for supporting carbon trade. The chapter analyzes how CFM in Nepal evolved as a formal devolution in resource management shaped by changing contexts both in Nepal and outside Nepal. It also illustrates how CFM has been institutionalized within Nepal and how CFUGs have become legal entities, all these occurring in the backdrop of support from international donor community. It then analyses where CFM policy stands in the international arena with regard to the global climate treaty of the UNFCCC. The chapter starts of by discussing the internal and external factors that influenced the development of CFM in Nepal. It then analyses the befits of CFM policy at local levels and goes on to analyse the current CFM policy with regard to the global climate treaty and recommends policy changes at national level for CFM and global carbon market to work together.

4.1 Factors Influencing the Development of Community Forest in Nepal

Community managed forests in the Nepal Himalaya region have always existed and are as old as the settlements themselves because communities have always interacted with their local environment. According to Gilmour and Fisher (1991: 2) community forestry is not a modern term but a very old one. What is new is the formalizing of CFM by mainstreaming it into the national forest policy. The process of formalizing CFM was shaped by internal (within Nepal) and external (outside Nepal) factors as discussed below.

4.1.1 Internal Factors

In the last half century, the internal factors such as: 1) changes in the political and administrative system and 2) developments in national forestry policy, influenced and shaped the way management of forest resources was carried out as analyzed in the next section. These factors first shifted the management paradigm of forest from a traditional village affair satisfying local needs to a nationalized system controlled by the state, which resulted in huge deforestation and forest degradation. Ultimately this led to the development of formal policies to hand over forest management back to the locals again.

4.1.1.1 Changes in the Political and Administrative System

Since formal development processes began in the mid-20th century, the country has seen six constitutions, and the seventh is in the pipeline. The past 60 years reflect the political process of democratization of the country and as part of this process, polices that were developed in this later era show increasing elements of decentralization and devolution of authority from the state to the local communities, empowering ordinary people (Whelpton, 2005).

The first constitution promulgated in 1948 was drafted at a time when the country was under the autocratic Rana regime for 104 years (1846 till 1950) with the country isolated from the outside world. This constitution implicitly embraced the notions of decentralization and democracy although the constitution was never implemented by the Rana regime. The 1948 constitution was followed by a number of experiments with various forms of governance as pressure was mounting on the Rana regime for the establishment of a democratic form of governance and political system.

In 1951, the first constitution was replaced by the 1951 Interim Constitution (second constitution) at a time when CFM was first developed as a policy in 1952 but not implemented. This was the decade of experiments in governance. In 1959, a multi-party constitution (third constitution) replaced the Interim Constitution which was implemented for a short span of 8 years. Soon this was replaced by the party-less Panchayat Constitution in 1962 (fourth constitution). It was only under the Panchayat system in 1978 that CFM was first implemented, but it couldn't gather momentum.

This Panchayat system was mainly leaning more towards the social ideologies of the time where Village Panchayats were put at the centre of development processes. During this era when political parties were banned, a village boundary with all its inhabitants was allocated a Panchayat Forest within their village boundary. At the time, the administration did not realize that distribution of forest resources didn't follow the Village Panchayat administrative boundaries.

The reinstatement of parliamentary democracy in 1990 which led to the 1991 multi-party constitution (fifth constitution) was an important change for the development of community forestry to its present form because it set conducive environment to recognize Community Forest User Group (CFUG) as a unit for implementing community forest. This further refined the Panchayat Forest by replacing the village boundary with CFUGs as a unit. The formation of autonomous and democratic grass roots groups as legal entities called CFUGs to manage forest is the hall mark of the Nepali forest policy today. The implementation of CFM took over 25 years from its inception to its actual implementation in the field as CFM could be promoted only as fast as the democratization and decentralization process of the country and not before.

Post 1990, the forestry sector received generous financial aid from the international donor community that included numerous capacity building programme targeted at reorienting forestry officials from armed policing to letting communities manage themselves, putting CFM into practice. With greater levels of democracy at the grass roots level, CFUGs expanded rapidly post 1990 and this was further facilitated by policies strengthening local empowerment such as the 1992 Decentralization Act.

The 2006 Interim Constitution (sixth constitution) was a caretaker arrangement for holding the Constituent Assembly Election that was held in April 2008. Following this election, the declaration of Nepal into a Federal Democratic Republic state in 28th May 2008 will certainly pave the way for more decentralized policies giving more regional autonomy as the nation embarks on the process of writing its seventh constitution on federal democratic republican lines.

It is yet to be seen how the CFM policy for the Terai will develop under the new federal structure because forest management is ultimately about political ecology and CFM was developed in the context of the Himalaya regions. Now with the people of Terai engaging in a much broader political debate demanding federal autonomy for the Terai region as their major agenda in the new constitution, the deadlocks in forest management will ultimately be resolved when the bigger political agendas are resolved first. It is likely that the community forestry issues pertaining to the Terai region will be better addressed in the upcoming legislation and so will new policies related to carbon trading as well. It is easier to address new policies on carbon trading when the country is writing a new constitution under a Constituent Assembly.

4.1.1.2 Developments in National Forestry Policy

The development of forestry policy within Nepal over the century has also contributed to the formulation of the current CFM policy which saw the shift in viewing forestry from a commercial commodity to viewing it as a communal resource and accepting the rights of local communities. The changes in political and administrative system over the past 60 years as described above provided the context in which the national forestry policies were able to develop.

During the Rana regime, the forests in Nepal were providing raw material to Britain for free as Nepal's contribution to the war effort (1914-1918). In the 1920s British forest experts from Indian Forest Service were employed in Nepal to supervise felling of trees and timber export to India for the construction of the Indian railway (Hobley, 1996: 67). The Forest Service started very late in Nepal compared to India and it was not until 1942 that the forest service was created on the advice of a British forester who had worked in India (Hobley, 1996: 68). It was based on the Indian Forest Service model with officers being trained at the Imperial Forestry School of Dhera Dun in India.

In 1952 the first forest policy was drafted by Emerald S.J.B. Rana with assistance from E. Robbe, an FAO expert. This policy recognized community forest making it the first time CFM was ever formally defined in a forest policy. The policy clearly categorized Nepal's forest into 3 categories namely 1) Protection Forest, 2) National Forest, 3) Community Forest. Community Forest was described as "Forest which has to be created or set aside to provide firewood, small timbers, for agriculture implements, building timbers, other forest produce and grazing for cattle, for the rural community" (Hobley, 1996: 69). This was the first mention of CFM and it predated any attempt to implement CFM policy by 25 years (Gilmour and Fisher, 1991: 11).

It was remarkably far sighted, but probably the system of governance was a bottle neck and consequently CFM did not get implemented at that time. The level of democracy for grass roots level groups was lacking as the nation was still experimenting with electoral democracy. Instead forests were nationalized by the government under the 1957 Private Forest Nationalisation Act and CFM implementation took a back seat.

Around the 1950's, about a third of the total forest and cultivated lands were under *birta*[15] tenure, of which about 70% belonging to the Rana family according to Gilmour and Fisher (1991: 11). To remove this feudal system where the land was granted by the state to the aristocrats, private forests were nationalized in 1957 and fell under the state control. However, much of the forest and shrub land

[15] '*Birta*' = land or forest grants from the State.

in the hills (50% of the total land area according to Gilmour and Fisher (1991: 11) that was supporting subsistence livelihood of hill farmers also fell under the state control. Nationalization of forest was followed by rapid deforestation as farmers saw their forest being taken over by the state. But the state was severely under-resourced and was unable to effectively manage all the forest in the country.

Gilmour and Fisher (1991:12) have noted a very important point. Most documents record that deforestation became rampant after the nationalizing of the forest in 1957 (Hobley, 1996), but Gilmour and Fisher by contrast point to this era of 1960s when a large number of indigenous forest management systems emerged. With the end of the autocratic regime, numerous communal initiatives started to safeguard local forest. Such developments at local level were emerging in the decade of experiment with democracy, when feudalism was ending and the rural communities were asserting their communal influence at a time when governance was weak due to political instability. In 1960, however the experiment with multi-party democracy ended and in 1962, was replaced by a Panchayat system of governance.

In 1961, the Forest Act was promulgated making provision for small patches of state owned forest land to be transferred to Village Panchayats for their use and maintenance. By 1962 multiparty democracy was fully replaced by the Panchayat system of governance till 1990. The Panchayat system had limited democracy in that political parties were banned, but it carried out many social reforms and was very village oriented, as it was influenced by the Chinese socialism in the north.

By the 70s it was realized that since development began, growing state control had led to alienation of local rights and people's distrust for government motives began to grow. CFM actually became more pragmatic in 1974 in the Ninth Forestry Conference held in Kathmandu when forest officers convened and identified CFM as the real line to pursue; until then it had only been rhetoric. This was remarkable because the planned three-day meeting ended up extending to 23 days which clearly showed the government's interest and commitment to reducing deforestation by adopting CFM.

This paved way for the 1976 National Forestry Plan which re-emphasized the 1961 Forest Act in allocating forest lands to the local Village Panchayats. Under this forestry plan, District Forest Offices were given more authority to formalize the transfer of national forest to Panchayat Forest. In 1978, the Panchayat Forest and Panchayat Protected Forest policies were promulgated for the state to hand over the forest to the Village Panchayats based on the 1961 Forest Act which provided a framework for donor projects to hand over forest management to the Village Panchayats. This enabled the externally funded international donor projects in community forestry to operate to 'save the environment' from further degradation (Hobley, 1996: 75). However, very little forest had actually been transferred to the village panchayat during this period. The successive policy developments aiding CFM implementation are summarized in Box 4.1.

By the 80's a framework had been developed in the country to launch community

Box 4.1: Chronology of policy developments in Community Forestry in Nepal

- **1952 Forest Policy** community managed forest first defined but not implemented.
- **1974 Ninth Forestry Conference** held in which community forestry first discussed.
- **1976 National Forestry Plan** recognized deterioration due to neglecting the hill forest by the Forest Department and the need to develop Panchayat Forests to reduce deforestation. It adopted set of norms for handing over forest to the village panchayat.
- **1978 Panchayat Forest Regulation** and **1978 Panchayat Protected Forest Regulation** provided support and framework for externally funded donor projects in community forestry to operate to 'save the environment' from further degradation.
- **1982 Decentralisation Act** formalized the duties and responsibility of village panchayat and ward committees and empowered them to form people's consumer committees for forest management, conservation and utilization.
- **1984 Decentralisation Regulation** further empowered the village panchayat. A 1988 amendment of the Panchayat Forest and Panchayat Protected Forest of 1978 subsequently adopted the concept of user groups based on reference to Decentralisation Act.
- **1987 First National Community Forestry Workshop** led to the recognition of real user in the concept of user group which was also included in the 20-year 1988 Master Plan for the Forestry Sector (MPFS).
- **1993 Forest Act** acknowledged the right of the Community Forest User Groups and regulatory function of DOF reduced.
- **1995 Forest Regulation** provided procedural guidelines for implementation of the 1993 Forest Act and also made provisions for CFUGs to commercialise.
- **1998 Forest Act 1st Amendment** intended to control financial irregularities in CFUGs through the District Forest Office.
- **2000 revised Forest Sector Policy** recommends CFM for the hills and Collaborative Forest management (CollFM) for Terai with greater government control.
- **2004 Fiscal Ordinance for fiscal year 2004/2005** lowered the tax on CFUG revenue.

forest while in the international setting, donors were committed to help develop community forest in Nepal to halt the perceived environment degradation in the Himalaya region. The government launched the CFM programme in the early 1980s on the assumption that farmers were responsible for the deforestation by illicit logging. As the experiment continued, more insights were gained and by late 80s it was realized that farmers were not destroying forest but they could play the main role in planting trees and preserving them in their lands (Messerschmidt, 1986, Gilmour and Fisher, 1991).

Nepal's first forest sector policy was declared in the 6th Five Year Plan (1981-85) which was based on community participation in forest management, conservation and utilization of forest resources. In 1987 the 20-year Master Plan for the Forestry Sector (MPFS) which later formed the basis for community forest policy, placed greater emphasis on CFM by directing 47% of investment in the forestry sector to CFM.

By 1987, despite commitment from government and donors, only about 2% of the available forest area had been handed over for community management (Hobley, 1996: 82). However forest handed over to local administrative units such as the Village Panchayats did not generate participation and interest as real users were not identified (Bhatia, 1999: 11). Even when implemented, in many cases people still saw themselves as labourers in government forest, as they were unaware of CFM policies (Baral, 1993). By the 1990s, this led to the shift from Panchayat or village based forest management as a unit to the user group concept (Hobley, 1996: 82). The recognition of CFUG as a unit to implement the CFM policy provided greater devolution as it dealt with real users.

In this decade of experiment, it was clear that the focus on user groups was more practical than on the Village Panchayat or the Village Development Committee because distribution of forest resources didn't follow the administrative boundaries, it was not practical to allocate a Panchayat Forest to all the inhabitants of a village. The user group concept was formalized in the post 1990 legislation with a policy that recognized its rights.

The 1993 Forest Act acknowledged the right of the CFUGs for the first time and gave them usufruct rights while the state maintained the ownership of the forested land. A further improvement in 1995 was the 1995 Forest Regulation which stated CFUGs could have their own wood-based industry once they crossed the sustained yield threshold permitting them to sell surplus. The production of timber is much regulated and needs approval from the District Forest Office for harvesting timber so that commercializing of CFUG activity does not become counter productive for forest protection.

The 1993 Forest Act guarantees non-interference from the government forest office in the operation of the CFUG and in the management of the community forest as long as the CFUG complies with the Forest Act and the Regulation and follows the CFUG's Operational Plan (Bhatia, 1999: 12).

Under the 1995 Forest Regulation, the right to have their own wood-based industry for the CFUGs was important as till then CFM was only regarded as fulfilling subsistence needs, but this regulation allowed them to commercialize by making provision for linking markets with CFM. This created incentives for forest conservation as the people saw an opportunity to benefit from better forest management. Today local incentives have drawn the rural population to manage and conserve the bulk of the nation's forest without government intervention; this will be further analyzed in Chapter 8 as regards what incentives are there for the locals in managing and conserving their forest.

This Act and Regulation illustrated the government's recognition of CFUGs capacity of not only managing community forest to fulfil their sustenance needs and agricultural requirements but also as a commercial enterprise. Such shift in government thinking set the stage for CFM to 'graduate' in undertaking more market-oriented activities through establishment of forest-based enterprise. CFUGs are able to fix prices and market products obtained from the forest and use the funds generated from these activities towards forest protection and rural development. This gives the local communities an economic incentive for forest management and conservation. Forest conservation as referred to in this thesis means implementing management intervention to protect the forest by local communities while they are allowed to harvest forest products on a sustained yield basis (rate of extraction < natural regeneration rate).

The concept of CFM policy is well institutionalized not only in terms of handing over government managed forest to locals under the jurisdiction of Department of Forest (DOF) but also by this being adopted in special protected areas such as Conservation Areas and Buffer Zones (outside National Parks) that are under the jurisdiction of Department of National Parks and Wildlife Conservation (DNPWC). In both Conservation Areas and Buffer Zones, the local communities play a key role in forest management, utilization and protection where revenue from tourism sector is ploughed back into conservation measures through the local CFUG communities. Forest management in Manang, as explained in Chapter 6, illustrates how communities have been working in forest management inside Conservation Area as this village lies inside the Annapurna Conservation Area.

All this progress in policy was based on the experiences from the hills and the mountainous regions (Nepal Himalaya), but for the Terai region[16], community forest was not working well (Bhatia, 1999: 29-30). In Terai, the forest user groups are much more difficult to identify as users can be from distant settlements far away from the forest due to access from road networks. Consequently even today problems do exist with community forest in the Terai region, therefore the same level of success has not been achieved in the Terai region as in the hills.

[16] Though the Forest Act 1993 does not distinguish the mountains from the Terai with respect to implementation of community forestry, community forestry programme has been more feasible for the hills/ mountains and its suitability for the Terai still remains questioned by many (Bhatia, 1999: 29). There are numerous conflicts with community forestry in the Terai region and it is now increasingly argued that the community forestry model in the Terai needs to be different from the hills. In the hills, the focus is on people living in the proximity of forest while in the Terai stakeholders access forest from far greater distances (Baral, 2002) making the process more complicated. Realising the failure of CFM in the Terai, in 2000 the Revised Forest Sector Policy has recommended a new policy for the community forestry called Collaborative Forest Management (CollFM) in the Terai region which is opposed and pending to be implemented.

The Terai forest has been prone to more issues in implementing CFM as stated by Blaikie and Springate-Baginski (2007: 80): 'The main reason is that there is very valuable standing timber there, and participatory forestry threatens to increase transparency, open up contractual arrangements for more democratic scrutiny and share proceeds from timber sales with a wider public." And further they add that many donor projects up till 2000 were reluctant to start working in the Terai region because they felt that there was lack of clear policy for CFM in Terai, strong vested interests and hidden motives to continue illegal logging, reluctance in government to facilitate any real initiative that might actually make CFM operational in the Terai and due to political protection for illegal settlers in forest. But now donors like United States Agency for International Development (USAID), German Agency for Technical Cooperation (GTZ), UK Overseas Development Administration (ODA/DFID), and CARE, have started supporting the CFUGs and the government in the Terai for making meaningful progress in CFM policy by putting forward a new Collaborative Forest Management (CollFM) policy specifically only targeted at Terai forest. But this new policy is already under strong opposition from the Federation of Community Forestry Users-Nepal (FECOFUN)[17] (FECOFUN, 2008) and civil societies and had run into stalemate by 2006. It is expected that the discussion about whether the Terai plains need a separate CFM policy will be taken up for discussion in the Constitution Assembly.

In the fiscal year 2005-2006 the government had made plans to include the forestry sector under the local government (at District Development Committee level) together with agriculture and livestock starting from selected districts. But due to the political and constitutional changes and the subsequent restructuring of the state on federal system, these decentralization processes have not been implemented and awaiting further discussion in the parliament. With a new constitution in process of being drafted, the future policies on forest could further devolve giving the locals more authority while it could also simultaneously support carbon trading.

The government has also taken interest in adding value to CFM by exploring carbon market. Under the current Three-Year Interim Plan (2008-2011) in the Environment, Science and Technology sector, the government intends to promote carbon trade. In the forestry sector, it recognizes carbon trade as an opportunity to reduce poverty and promote conservation of the forest (NPC, 2008). The Forest Department is new in this area and learning by doing. The first meeting called by the Ministry of Forests and Soil Conservation under the Foreign Aid Coordination Division took place 27th March 2008; the consultation with various INGOs,

[17] FECOFUN is a national federation of forest users which advocates for community forestry user group rights, locally, nationally, and regionally. FECOFUN's membership stands at about 5 million people. This comprises rural-based farmers – men, women, old, and young – from almost all of Nepal's 75 districts. Since its establishment in 1995, FECOFUN has been instrumental in representing concerns of community forestry user groups in deliberations about policy formulations and forest futures. FECOFUN is an autonomous, non-partisan, socially inclusive, non-profit organization. It is Nepal's largest civil society organization. Among more than 14 thousands community forest user groups in the country, more than 10 thousands user groups are the members of FECOFUN (2008).

NGOs, FECOFUN and civil society provided feedback to the government on what should be done so that there will be conducive policies in place to support CFM under the new treaty. Now the government is in the process of developing a policy that will give guidelines for carbon trading in the forestry sector in the future, this may also have to wait till the new federal constitution (7th constitution) is implemented first.

4.1.2 External Factors

In addition to the changes within Nepal, there are also external factors from outside the country that have influenced the development of CFM in the country. The perceived ecological change in the Himalayan environment by the donor community and the global economic development paradigm have had an influence on the formulation and implementation of CFM in Nepal. This has made Nepal a pioneer in adopting CFM as an official policy formalizing devolution in forest management. The external factors influencing the development of CFM are discussed below.

4.1.2.1 The Perceived Ecological Change

The perceived ecological transformation in the Himalayan region during the decades after its formal development processes began was an important driving force to influence the development of community forest. In the 1970's the international community considered Nepal to be facing an ecological, social and institutional crisis of enormous proportions making Nepal enter the 'eco-doom era' (Hobley, 1996: 77) which caught the interest of the international donor community.

The 1970s energy crisis with rising oil prices and world population growth was interpreted by some in Malthusian[18] perspective in which conflation of poverty, population growth in developing countries and pressure on natural resource base against the rising energy prices could lead to economic and environmental collapse. After the 1973 OPEC oil shock, Erik Eckholm (Eckholm , 1976) painted a vivid picture of developing countries being caught in the vicious cycle of deforestation, soil erosion, declining agriculture productivity, burning dung instead of using it as fertilizer, all exacerbated by increase in fossil fuel prices thereby reducing productivity of natural resources and compounding poverty. This cycle in the Himalayan context was termed the Theory of Himalayan Environmental Degradation which as Eckholm described has eight steps as summarized below in Box 4.2.

[18] In the first half of the 19th century classical economists were primarily concerned with the availability and cost of primary products. Thomas Malthus, a Christian minister, wrote a political economic essay in 1798 in which he stressed that the world would face shortage of food and starvation as population growth continue with limited availability of agricultural land. The debate over how many people the Earth can sustain effectively started from Malthus' essay.

Box 4.2: The perceived eight steps of the Theory of Himalayan Environmental Degradation of the 1970s

1. After 1950 with eradication of malaria, Nepal's population started to grow very rapidly.
2. More than 90% of the population was rural and subsistence farming based, therefore forests were exploited for forest products as well as for agricultural land expansion.
3. There was excessive pressure on the forest and it was predicted that all accessible forest in Nepal would disappear by 2000.
4. Deforestation occurring on steep slopes caused massive soil erosion and landslides.
5. Erosion from the mountain slopes caused siltation and flooding in the plains.
6. The increase sediments from the mountains significantly increased the Ganges-Brahmaputra Delta and created new islands in the Bay of Bengal.
7. Continued soil erosion degraded agricultural land leading to expansion of agricultural terraces by further deforesting the mountain slopes. This increased shortage of fuelwood, increased drudgery especially for women for collecting fuelwood, and increased burning of dung.
8. Shortage of manure reduced agriculture productivity and weakened the soil structure to cause further soil erosion and landslides. More forest in steeper slopes had to be cleared for agriculture expansion to feed the growing population.

Adapted from Hobley, 1996: 77 and Ives, 2006: 6-7.

This perspective pointed to poverty as being a cause for environmental degradation with the need for sustainable development to address it, as was later emphasized in the *Brundtland Report* (in 1987) (WCED, 1987). This perspective also pointed out that abuse of national resource base by poverty and population pressure leads not only to limiting economic growth, but also causes a decline in overall economic welfare. And this protection of natural resource base was not an option but a prerequisite for sustainable development.

Although this perception brought the agenda of sustainable development in developing countries to the forefront, in other areas it also inflated the perception of the 'crisis'. The 1978 World Bank review of Nepal forestry sector mentioned "All the accessible forests in the hills would disappear by 1993 and in the low lands of Terai by 2003 unless large scale compensating action was undertaken" (Hobley, 1996: 78). This alarming report formed the basis for all major funding of forestry projects for the next decade and beyond and had a very long lasting impact in the international donor community. In particularly it created a strong case for pledging support for Nepal and consequently organizations like the International Centre for Integrated Mountain Development (ICIMOD) were established in the country in 1983 with full donor support to promote sustainable development in the Himalaya region. Even today many of the assumptions of this alarming perspective still remain in the mind of the international donors because it is difficult to provide empirical evidence to contradict them. However by the late 80's, some of the myths of the 8 points were also been challenged and discredited e.g., by Ives and Messerli (1989)[19].

It was a result of this perceived scenario of environment doom that the CFM was launched exclusively donor funded with the sole objective to reduce environmental catastrophe in the Nepal Himalaya region. It was also helped by the Forest Department acknowledging that it was unable to control deforestation and forest degradation nor manage the forests as the department was severely under resourced. Hence the decade of the 1980's became the period of experimentation with different forms of CFM with unprecedented donor support.

The main donors to promote CFM in the Nepal Himalaya and the year of involvement in community forestry sector were: Australian Agency for International Development (Aus Aid) started since 1966, United States Agency for International Development (USAID) started since 1978; World Bank (1979-1997), German Agency for Technical Cooperation (GTZ) since 1992, UK Overseas Development Administration (ODA/DFID) since 1993, Danish International Development Agency (DANIDA) since 1997 to 2005, and Netherlands Development Organization (SNV) since 2002. Other additional donors working in the same sector but whose years of involvement are not known are: Japan International Cooperation Agency (JICA), Swiss Agency for Development and Cooperation (SDC), United Nations Development Programme (UNDP) and World Wide Fund for Nature (WWF). Clearly the CFM sector was one of the most preferred sector by donors, and there were many more projects that used the institution of CFUGs as the point of entry.

The motive of stopping the perceived environmental crisis in the hills was not the only reason for donor interventions. The weak capacity due to lack of means resulted in high dependency of the Government of Nepal on donors in delivering environmental protection services. The Ministry of Forest and Soil Conservation (MOFSC) was always under budgetary constraint and did not have effective

[19] The 8 steps theory of Himalayan Environmental Degradation has been challenged and discredited by Ives and Messerli (1989). They termed the eight steps as the Himalayan Dilemma because the conviction of the 70's and 80's that blamed the poor Himalayan farmers as the culprits for flooding in Gangetic plains was not true. Numerous studies undertaken in Nepal Himalaya in the mid 80's did show that farmers were not wantonly destroying forests but were actually planting trees and taking care of them (Fisher, 1989; Carter and Gilmour, 1989; Messerschmidt, 1986; Bajracharya, 1983). According to Ives (2006), the simplistic environmental alarm that blamed the farmers was simply diverting attention from more dominant and complex issues of the Himalayan region such as socio-economic, administrative and political issues.

control of all the 39% of the country's land under its jurisdiction. This provided the donors with an opportunity to 'assist' the government in implementing CFM without restrictions that has resulted in giving shape to the current CFM policy. For this reason, "the power to enact legislation, write manuals and shape the practice of forest management on the ground is more diffuse and less concentrated in Nepal's forest administration than it is in India." (Blaikie and Springate-Baginski, 2007:8).

Thus Nepal's forest policy came to be characterized by accommodating ideas from a wide range of civil society organizations and international donors while the perceived ecological crisis created a lobby for experimenting and embarking on a new paradigm with full donor assistance.

4.1.2.2 Forestry in the Economic Development Paradigm

As mentioned above, the international donor community had a direct involvement in the development process of CFM policy as well as in its implementation. Due to this dependency on international donor community, the global economic development paradigm had an impact on the developments in the forestry sector in the country as discussed in this section.

Between 1945 to the 1970s, forestry planners saw forestry as a catalytic agent for industrialization and economic growth. In the post war period, development for developing countries was modelled entirely on economic terms based in a pro-industrialisation top-down approach (Gilmour and Fisher, 1991: 2). Till the 60s, the government continued to follow the global model of forestry management for industrialisation. During 1950s to the 1970s the forestry sector was viewed as an enterprise for generating revenue for the state in line with the Dhera Dun school of thought in India. Consequently in 1960, the Timber Cooperation of Nepal (TCN) was established for the state to exploit commercialisation of forest resources to supply the industries.

By 1960s, the top-down development model of the post-war period was beginning to be questioned in some quarters by development thinkers as it failed to address the concerns of the poor people. Subsequently a new development concept using bottom-up approach was emerging (Chambers, 1983). This new development concept was characterized by giving more importance to enhancing rural livelihood and rural environment. Under the new concept, additional development indicators were used, such as life expectancy, literacy rate, freedom and participation in government processes, and access to public services to name a few (Gilmour and Fisher, 1991: 4). Around the 1970s the bottom up approach received much popularity following the development strategy as described by Schumacher in *Small Is Beautiful: Economics as if People Mattered* (1973). This formed a good starting base for grassroots community involvement in development works and it facilitated in promoting community forestry in developing countries as an alternative strategy to the previous forestry model. But at the global level, in the 70s and the 80s the dominant overarching development model was set by the East Asian trade led growth[20] (Pearson, 2000: 470) which was a different path than Schumacher's *Small is Beautiful* or the *Brundtland's* sustainable development approach (WCED, 1987).

The neo-liberal case for free trade on the basis that it confers benefit to all trading partners provides arguments in favour of market solutions generated by competitive markets. Neo-liberal economic theory emphasizes economic growth occurring through free markets, international trade, property rights and privatization of inefficient public enterprises, and became a popular international economic policy beginning of the 70s as explained in Chapter 2 (Section 2.3).

In the 1980s there was a renewed debate over the role of the state as an agent for economic growth (Cypher and Dietz, 2004: 191). Unrestrained laissez faire was considered the best way to advance the wealth of nations during the English Revolution and the same debate was on again. Margaret Thatcher (1979-1990) and Ronald Reagan (1980-1988) called for a greater reliance on free market as vehicle for promoting economic development. The development policy of the neo-liberal market was based on the view that "the best way to achieve growth was by getting prices right, promoting financial discipline, removing distortions created by state intervention, promoting free trade, and encouraging foreign investment" (Trubek and Santos, 2006: 5) including strengthening of rights of property and ensuring the contracts were enforced. These ideas were very much in line with the emerging policy of CFM in Nepal that relied on demarcating the commons to assign usufruct right and management right, from the state to local communities to gain efficiency in management.

Although at the global level the dominant development paradigm following the 80s remained the neo-liberal market approach, donor funds still poured into the CFM sector in Nepal to assist with sustainable development in subsistence economy. This paradox can be explained as follows: though the neo-liberals have a dislike for government intervention, they regard: "foreign aid and technical assistance as extremely important instruments of influence which can be utilised to impose their policies on less-developed nations…" (Cypher and Dietz, 2004: 199). This is another reason for the high level of donor intervention that we find in the community forestry sector in Nepal; apparently, it could be a part of the neo-liberal model to retain influence over a smaller nation.

[20] Neoliberalism became the dominant development model at the macro level with examples from East Asia. In 1975, 60% of the Asians lived in poverty of less < 1 US$ a day; which was reduced to 2% by 1997 excluding those of South Asia as a consequences of opening up their economies to trade and investment (OECD, 1998). The stark differences in trade-led growth is evident by comparing African countries of Nigeria, Ivory Coast and Tanzania with South-East Asian economies of Malaysia, Thailand and Indonesia. These two groups of countries started out with similar economic structure and income distribution levels in the 1960s (OECD, 1998). The South-East Asian countries achieved remarkable economic growth and a rise in living standard mainly by adopting the path of open market economy before these African countries.

Though Nepal's economy liberalised in the mid 1990's following the reinstatement of parliamentary democracy in 1990 when state owned industries were being privatised, the forestry sector relied on the neo-liberal approach to manage its forest before the industrial sector. The CFM policy is about giving ownership of commons to the local people who derive benefits from the commons by managing them and protecting the forest. Under state management, community forest was prone to 'the tragedy of the open access'; anyone and everyone had unlimited access any time because the state owned the resource. This was turned around with implementing CFM as a result of usufruct right spelled out on the commons.

The expansion of CFM in the mid 90's went further to fit with the neo-liberal school of thought in terms of operationalizing the "User Pays Principle" (UPP) (Pearson 2000: 285). This somehow stuck the two development paradigms together, using Schumarcher's approach as well as sustainable development concept, but at the same time relying on market mechanisms to correct market failures. In essence it was taking a neo-liberal approach of market and combining it with elements of local empowerment and sustainable development which made it a practical development approach without state intervention.

The multi-party system of 1990 reinstated parliamentary democracy, liberalized trade and adopted open market polices followed by privatization of state owned industries. In the forestry sector, national forest and common forested lands were demarcated and clearly defined usufruct rights given to the local CFUGs. This corrected market failure of the common lands and also limited government intervention which was in line with the neo-liberal thinking. As stated earlier in Chapter 2 (Section 2.3), the global economic development paradigm and political liberalism and decentralisation of state powers are interlinked and compliment each other. Because the multi-party political system of the 1990 supported the global economic development paradigm, rapid promotion of CFM policies and its implementation in the post 1990 era was possible.

4.2 Benefits at Local Level from CFM Policy

CFM policy has numerous local level benefits. Managing community forest brings about economic benefit, environmental benefit and community mobilization which are benefits in non-monetary terms. Due to these benefits, the locals see an incentive in implementing the CFM policy by managing and conserving their forest in a sustainable manner. The benefits from CFM policy are analyzed below.

4.2.1 Economic Benefit

Community managed forest plays a prominent role throughout the Himalaya region where agriculture, livestock rearing and forest are strongly interlinked. Under state management in Nepal, unregulated livestock grazing and fodder collection were the major cause for forest degradation which prevented natural regeneration, while unrestricted fuelwood and timber collection were the major cause of deforestation. But this trend stopped with community involvement, and when the community members started realizing benefits of CFM and the incentive, management of forest became more accountable, effective and a serious task.

The livelihood impact of CFM policy in Nepal is that most groups have become better off in legitimatising their access for sustaining their livelihoods with improved off take of forest products and improved water security. The rural poor in Nepal have been able to better position themselves in harnessing the benefits compared to the Indian scenario (Blaikie and Springate-Baginski, 2007:15). As of 2004 about 25% of the total national forests covering around 1.1 million ha are being managed by 13,000 CFUGs distributed across 1.4 million households (i.e. 35% of population) (Kanel 2004). The bulk of this population is living in the hilly region as reported by Springate-Baginski, *et al.,* (2007: 47), only 7% of the community forest area lies in the Terai region and this account for only 10% of the CFUG population.

While members of the CFUGs pay a nominal fee for the various forest products they consume, these products fetch a much higher price when marketed by the CFUGs. The estimated monetary value of timber extracted (NRs. 1.27 billion ≅ US$ 17 million) by the communities is higher than the value of fuelwood (NRs. 0.39 billion ≅ US$ 5.6 million), although in terms of the volume, fuelwood extracted is about three times more than the harvested timber according to Kanel (2004). The same study on CFM found that revenues collected by the CFUG were invested in social infrastructure that was demanded by the community members such as school maintenance, drinking water facility construction, etc. Part of the revenue (about 28%) is also used for forest protection and management.

Community forests are a major source of energy to the rural population. Fuelwood by far is the major source of energy, accounting for 76.30% of the total consumption of energy in Nepal in 2002 (MOPE, 2003), decreasing from 80.60% in 1995-1996 (Amatya and Shrestha 1998). Hence community forest has been contributing to the livelihood of the bulk of the rural population of Nepal and forming a backbone of subsistence economy.

A study by Dev and Adhikari (2007: 154) on 14 CFUGs found that current balance in CFUGs account ranged from $ 915 to $ 44 with $ 335 being the average balance amongst the 14 CFUGs. The same study also revealed the contribution made by income generated from CFM in helping build village infrastructure ranged between $ 7638 to $ 942 as depicted by Table 4.1 shown below. The table below also shows development work conducted by 14 CFUGs over a decade in their village and the total percentage of cost supported by CFUG is quite high for building a temple and village trail, which is benefited by all the village people. Similarly, 30% of the cost for building water supply was also borne by five CFUGs which extend benefit to all village residents including those that were non-members.

Table 4.1: Contributions of CFUG in village infrastructure building					
Infrastructure	**Number of study CFUGs**	**Quantity**	**Contribution of CFUGs**		**Main beneficiaries**
			$	**% of cost**	
Village trail	8	45 km	3275	50	All
Temple	1	One	942	85	All
School support	9	Nine schools	7638	30	Wealthy and some poor
Electricity	1	One village	4348	30	Wealthy
Water supply	5	Five projects	3101	35	All
Irrigation channel	5	20 km	2899	35	Wealthy
Source: Dev and Adhikari, 2007: 162.					

Hence CFM policy does extend significant contribution to the village economy in numerous ways which touches the lives of all the rural residents. In addition to forest products like fuelwood, fodder and timber, forest management also plays a vital role in contributing to the overall development of the village by contributing towards village development budget from the revenue generated from CFM.

4.2.2 Environmental Benefit

CFM policy plays a prominent role in the hills of Nepal where agriculture and livestock rearing and forest are strongly interlinked (Gilmour & Fisher 1991). To mitigate the growing deforestation and deteriorating state of the forest all over the country, the government of Nepal adopted a policy to involve local communities in forest management. The impact of this policy in the forestry sector has been positive for the Himalayan environment. Where communities are managing their forests, the degradation trend in the hills has been checked. Forest conditions have improved in most places with positive impacts on biodiversity conservation (Mikkola, 2002; Springate-Baginski *et al.,* 1998 cited in Acharya and Sharma, 2004). Numerous degraded forest ecosystems have improved due to decentralized and participatory development strategies (Banskota, 2000). Communities have easier access to firewood, timber, fodder, forest litter and grass (Kanel 2004; Acharya 2003 cited in Acharya & Sharma 2004). Soil erosion has been mitigated and water sources have been conserved in areas where communities have been able to regenerate forest cover in previously degraded forest lands.

4.2.3 Community Mobilization as Social Capital

The FECOFUN is the largest civil society organization in the country (Timsina, 2003: 67) that represents over 13,000 user groups. CFUGs have federated themselves at district and regional levels to form FECOFUN at national level which covers over 70% of the CFUGs across the country as its members and this sets the country's CFM programme unmatched by any other country. The main objective of FECOFUN (see footnote 17 for more details) is to raise awareness amongst forest users about their rights regarding access to and responsibilities for management of forests as outlined by the forest policies (Timsina, 2003: 67). Simultaneously, it plays a lobbying and advocacy role in the interest of forest users to ensure that community forestry policies are implemented in a participatory and inclusive manner.

FECOFUN came into existence after growing dissatisfaction amongst local forest users and field projects with the speed and effectiveness of implementation of CFM by the Department of Forest (Timsina, 2003: 68) which often took a top down approach at handing over forests to the users in a lengthily time frame. Responding to this, in 1995 FECOFUN was established with support of numerous bilateral and multilateral donors. According to Timsina (2003: 68), the areas FECOFUN is working in, are:

- Advocacy and campaigns to put pressure on government for policy implementation.
- Lobbying with political leaders and NGOs to protest against anti-CFM activities.
- Building alliances with donor-funded forestry projects for funds and other support.
- Networking of CFUGs.

Today, the FECOFUN has become a legal entity and has already contested the government in numerous cases in court. This federation of forest users as a social capital is extremely valuable to the development of CFM as it monitors the government's dealing with CFUGs. This federation could become more valuable asset when implementing the RED policy for redistributing the national baselines to regional levels.

Having gained experience from the CFM sector, recently the government is trying to devolve other sectors like water resource management, agriculture, education and health so that local communities can take ownership in management leaving the government with both reduced spending and efficiency gains. User groups are already being formed in some areas to try this approach in other sectors. Due to such a strong grassroots movement in community forest in Nepal, the devolution in forest management is well institutionalised within the population. And it is this participatory grassroots-level local institution that could potentially be the link between CFM and the global carbon market by bundling their credits together at a national level to lower transaction costs.

Community based organisations (CBOs) as a social capital in the socio-economic livelihood framework is analyzed in Chapter 7 (Section 7.5). It analyses the household perception towards CBOs in general which also includes the CFUGs.

4.3 CFM Policy in Relation to Global Climate Treaty

So far in this chapter, it has been revealed that CFM policy in Nepal Himalaya is well formulated and successfully implemented and one that is open to accommodating more refinements with new challenges. It has received a good deal of support from the international donor community and now it needs to be seen how well CFM policy can be synchronized with the emerging global climate policy which was analyzed in Chapter 3 (Section 3.7) with specific reference to RED policy.

At the national level, Nepal has a very robust CFM policy that is working successfully in the Nepal Himalaya region with the support of grassroots level institutions of CFUGs and at the national level with FECOFUN. The government has taken interest in adding value to this success of CFM by trying to link up with the global carbon market. In this regard, the current Three-Year Interim Plan (2008-2011) under the 2007 Interim Constitution mentions in the Environment Science and Technology sector the promotion of carbon trade. The Three-Year Interim Plan further adds under the Forestry Sector for the need to recognize carbon trading as an opportunity to enhance poverty reduction and promote conservation (NPC, 2008).

In March 2008, the Foreign Aid Coordination Division under the Ministry of Forests and Soil Conservation (MOFSC) for the first time called a consultative meeting with various INGOs, NGOs, FECOFUN and various civil societies to provide feedback to the government on what should be done in the future and what policies are required to have a conducive environment for Nepal to be able to benefit from RED in the future. This is certainly a move in the right direction, although much more needs to be done to prepare for the challenges of carbon trading in the CFM sector. One of the major obstacles is the lack of an appropriate institution to coordinate CFM and carbon trading.

In order to coordinate with the CDM market, the government of Nepal has made the Ministry of Environment, Science and Technology (MOEST) responsible to function as the Designated National Authority to the UNFCCC since December 2005. All CDM projects and matters related to the global climate treaty are coordinated by the DNA through the MOEST. The DNA has an 11-member steering committee to ensure inter-sectoral coordination and to provide guidance on CDM matters. There is one member from the MOFSC represented in the steering committee of the DNA which clearly is not sufficient to establish sound coordination.

A fundamental problem with this is: the DNA in Nepal was formed with the sole objective to coordinate CDM projects with the UNFCCC. With RED this is more complicated because DNA in Nepal was mandated by the government for coordinating the CDM activities only, and RED is outside this mandate. Further more, in Nepal CFM falls under the MOFSC while expertise on climate treaty and

GHG inventory lie with the MOEST and the DNA. Forestry related expertise and specifically CFM related data and regulations are monitored by the Community Forest Department of the MOFSC. This ministry does not have expertise and is not aware of the developments in the climate debate, even about those taking place in the forestry sector under the UNFCCC. Only the DNA officials attend the UNFCCC related SBSTA and COP meetings. Consequently, when Nepal made two submissions on RED to the SBSTA in February 2007 and March 2008 relating to Nepal's views on community forest and climate policy (see Appendix 1), neither the Community Forest Department nor MOFSC were aware nor consulted or informed about these submissions. In future, when RED deals with national level baselines and national level payment system, there is bound to be a tussle between the MOEST and MOFSC on who controls and monitors the carbon trading in the forestry sector.

In order to avoid this tussle, there needs to be a conducive policy and an institution in place at the national level to support carbon trading in the forestry sector, because ever since Nepal ratified the KP in September 2005, the government has been interested in participating in carbon trade. This intent is also evident from the current Three-Year Interim Plan where it is explicitly stated. This is one area where the government needs to work on by formulating a conducive policy which will synchronize the CFM policy and the global climate treaty that will create an environment for implementing RED. It would need to develop new policies that will help establish a national level institution for guiding carbon trading.

This institution at the national level must be able to use the strengths of grassroots level institutions like CFUGs and be able to consolidate there at national level by having an institution that represents FECOFUN, DNA, MOFSC, Department of Community Forest, MOEST and the Ministry of Finance. It will also need to coordinate with line ministries like and MOEST, MOFSC and the Ministry of Finance.

The role of such an institution would be to monitor and implement RED because under RED, baselines will be negotiated at national level and payments from the national level will have to be dispersed to the CFUG level. How this payment is shared across the country needs to be monitored as much as transparency and accountability must be maintained when dealing between national level to local level. This also calls for a national level payment mechanism which pays the CFUGs for conducting forest inventory and carbon assessment on a yearly basis and for maintaining a data base at the national level.

At the international level, this institution will need to act as a link between domestic actions and the global protocol and be in a position to negotiate with the Parties to the UNFCCC. It will be a clearing desk for the RED CERs for the country.

At the global level, RED is market based for achieving efficiency gains in abatement as explained in Chapter 3 (Section 3.7), however, how this policy is implemented within Nepal is in principle a matter of national sovereignty. The redistribution policy within Nepal of this globally efficient abatement strategy rests intimately with the policy and institution in Nepal and whether it opts for a market based system or a command-and-control measure one (regulatory instrument). If it chooses the latter approach, some of the efficiency gains in carbon trading would be lost.

For these reason, it is crucial that a new institution is formed so that the country can deal with RED mechanism effectively and efficiently without conflict between the stakeholders. Although the recent move from the MOFSC have started the process on addressing this issue through a consultative process, the time is also right as the country is going through political and legislation change (as explained in Section 4.1) including drafting of a new federal constitution, and this could be the best time to have new policies.

4.4 Conclusion

The development of the CFM policy has shown that market failures can be corrected by assigning the local communities usufruct right and by demarcating of the common lands. Community forestry in Nepal developed as a process over few decades of experimentation that was shaped by internal and external factors. This process was shaped by political history of the country, by the perceived ecological changes in the Himalaya region and by the global development paradigms in the backdrop of support from the international donor community.

Clearly, the greatest lesson learnt by analyzing the development process of CFM policy in Nepal is that in order for forest protection to be effective, local people must be at the centre of the initiative and in control of the management of their resources. For this local participatory initiative to succeed, democratic and decentralized policies were a prerequisite in the country. CFM has evolved and institutionalized at the grassroots level democratic and autonomous groups called CFUGs to manage their forest founded on the principles of democracy and decentralization. Today, the CFUG members have organized themselves to form a federation called FECOFUN which has become a legal entity and also the largest civil society in the country which distinguishes Nepal's progress made in the CFM sector. This shows that the CFM policy in the country is resilient yet adaptive as it is strongly founded on democracy and neoliberal ideals but at the same time embraces elements of local empowerment and sustainable development.

The time has now come to analyze CFM in the broader context of the global climate treaty. Following the ratification of the KP by Nepal in 2005, the government has been showing interest to participate in the global carbon market and has recently initiated a consultative process to prepare policies in line with the global climate treaty in the forestry sector. This indicates the government's interest to develop policies that will facilitate carbon trading in the country. With restructuring of the state in federal republican lines, policies in the forestry sector could devolve further and as the country is in the process of writing a new constitution, the time is favourable to have new legislations for guiding carbon trading. To move ahead for the CFM policy and the global climate treaty to work together, there needs to be a policy and an institution that supports the redistribution of global RED policy within the country based on market mechanisms.

From this chapter it can be concluded that CFM policies are by no means a hindrance for the global climate treaty. In fact due to all these factors, CFUGs of the Nepal Himalaya are the best sites to analyze whether communities managing and conserving forest can actually benefit from carbon trading under the global climate agreements. On knowing that CFM policies are favourable for carbon trading and in fact new policies are also in the pipeline, the next chapter (Chapter 5) will show whether CFM actually sequesters carbon and if so at what rate.

Chapter 5

Community Forest as Carbon Mitigation Activity

5.0 Introduction

In Chapter 4 it was revealed that CFM policies in Nepal were progressive and were favourable for supporting carbon trading under the RED policy as described in Chapter 3. The objective of this chapter is to answer the research question whether community forest in Nepal Himalaya sequester carbon. This chapter introduces the research sites and quantifies the level of biomass and carbon sequestered in each forest managed by communities. The data was collected over a three year period in three sites of Nepal namely Ilam, Lamatar and Manang. In Manang second year data could not be collected due to early snowfall in Sept 2005. This chapter shows how community managed forests like those found in Nepal Himalaya play a significant role in stabilizing atmospheric CO_2 concentration by biological sequestrating CO_2 and storing it in terrestrial biomass and soil. The data from the research findings are presented and also compared to other findings.

5.1 Selection of Sites

Nepal is categorized into five physiographic zones as shown below in Table 5.1 (HMG/ADB/FINIDA, 1988) which in brief can be said to constitute the mountains, hills and the Terai (plains). Based on this classification, around 6.31 million ha or 43% of the total land falls in the hilly terrain (middle mountains and Churiya/Siwalik hills) and an equal area constitutes the mountain terrain (high himal and high mountains). This research involved forest inventory sampling plots from the high mountain, middle mountain and Churiya/Siwalik hills of Nepal Himalaya as shown in Table 5.1, where 89% of the forest land and 86% shrub lands (degraded forests) of the country lie.

Table 5.1: Nepal's physiographic zones					
	High Himal	**High Mountains**	**Middle Mountains**	**Churiya/ Siwalik Hills**	**Terai**
Climate zone	Artic	Sub-alpine/ alpine	Cool temperate	Warm temperate	Tropical/ subtropical
Natural vegetation	Tundra	Birch (*Betula*) Fir (*Abies*) forest: open meadow above 4000m	Oak (*Quercus*) forest	Pine (*Pinus*) forest	Sal (*Shorea robusta*) mixed hardwood forest
Area in %	22.71	20.07	30.12	12.79	14.31
Agriculture area in %	0.26	7.99	40.07	8.81	42.86
Forestry area in %	2.18	29.70	32.82	26.06	8.61
Shrubland area in %	9.49	24.93	57.22	4.11	4.25
Research sites		Manang	Lamatar	Ilam	
Source: HMG/ADB/FINIDA, 1988.					

The community forest selected from Nepal Himalayan region that lie in the physiographic zones of high mountains (Manang), middle mountains (Lamatar) and Churiya/Siwalik hills (Ilam) as shown above are also more generally speaking called high mountains, middle hills and Churiya hills respectively. In this thesis, the three sites are collectively called Nepal Himalaya as they fall in the Himalayan range at differing altitudes as illustrated by Diagram 1.1 in Chapter 1 and also explained in Section 1.5 of the same chapter.

5.2 Identifying and Selection Process for Case Study Sites

The objective of this research was to obtain valid in-depth insight into CFM and emission reduction values by taking only three case studies as outlined in Chapter 1 (Section 1.5). There were three criteria in the selection of sites as discussed below.

1) The sites had to be in Nepal Himalaya.
2) The sites had to be accessible with relative ease.
3) The CFUG had to be willing to collaborate in research.

Of the 1.1 million ha under CFM in Nepal, 97% of this area lies in the mountain and hilly region called Nepal Himalaya in this thesis which accounts for about 90% of the population engaged in CFM (Springate-Baginski *et al.*, 2007: 47). So the sites were selected for the Himalaya region. Initially various sites were selected from Nepal Himalaya region spread across the country in varying altitudes. When accessibility factor was taken into account, only a handful of CFUGs remained and when willingness of the CFUG members to participate was considered, it left three CFUGs for this research at varying altitudes.

After the selection of the physiographic zone of Nepal Himalaya, the case study identifying process started to look for CF in the hills and mountains and those that could be reached with relative ease. As illustrated in Chapter 4 (Section 4.6.1), Nepal has over 13,000 CFUGs covering 1.1 million ha area with an outreach to nearly 1.4 million households, bulk of this in the Nepal Himalaya region. Accessibility becomes a crucial aspect in determining the research sites especially when working during politically unstable period, because not all areas were as accessible as they would under normal circumstances. Accessibility also becomes important because remotes areas require several days of walking, field expenses and logistics become more expensive. So the research sites were shortlisted on the basis of accessibility which gave a handful of accessible community forest in Nepal Himalaya.

The criteria for the selection of CFUG's from among the several shortlisted community forests was also based on the willingness of the community members to participate and collaborate in the field work for carbon estimation. A workshop with CFUG members and members of the FUC (Forest User Committee) were conducted at several places before the field research work began. The locals were briefed on the aim of the research, the duration of engagement, and their role in the research and asked whether they were willing to become partners in field research. Only those CFUGs willing to participate over the entire research duration were considered for the case study, and this left only a few CFUGs that were available for collaborative research, and when the varying altitudes were considered, the sample was left with Ilam, Lamatar and Manang which also met the objective of selecting three case studies for in depth analysis on managerial aspects and carbon sequestration rates.

The three sites were selected at different altitudes within this region: Ilam being the lowest, Lamatar being in the middle and Manang being at the highest altitude. Community forest in Nepal started in the Himalaya region and ever since it has gained enormous promotion and success in the in the Himalaya terrain than in the low land Terai region as explained in Chapter 4. The three sites specifically selected as they are in different altitudes, the low lands in Ilam (southern part of the district adjoining Jhapa district) are located in the low hills or the Churia/ Siwalik range which marks the starting point of the rise of the Himalayas from the Gagentic plains. Lamatar is located in the middle hills also known as middle mountains, this terrain forms the bulk of the country. And Manang is located in the high mountains; above this altitude there are no trees. These three areas in Nepal Himalaya cover 89% of the forest land and 86% shrub lands in the country.

This chapter presents quantitative data which inevitably have limitations. The sample of three villages, one from each of the three altitudinal variation in the hills of Nepal, is small, and despite the fact that they were selected so as to be as typical as possible, in statistical terms they cannot be said to be representative of the villages in the Himalaya region of the whole country. Though the three sites are situated in different altitudes, they cannot be generalized to represent Nepal

Himalaya as there are many additional attributes that would have to be accounted for such as forest typology, aspect of land, rainfall, soil structure, area of forest, population pressure on forest to name a few parameters. Hence the three sites do not represent the whole Himalayan region but illustrate three specific case studies on the way community forest is managed in Nepal Himalaya. It can be said that most of the community forest in the region is managed in the same way and for the same purpose with similar motive as these three case studies.

In the three sites, the lowest altitude is Ilam, located in the lower ranges of the Himalayas in the foothills called Churiya of the Siwalik hills which form a belt adjoining the subtropical Terai (southern part of Ilam district). It is characterized as a warm temperate climatic zone and is humid during the monsoon, lying adjacent to the plains. The second site, Lamatar, falls in the middle hills with cooler, more temperate climate than the Churiya range, being higher in altitude. The third site is located in the upper reaches of the hill region which forms the transition between temperate forest and alpine grassland, and is in the physiographic zone of high mountains with sub alpine climate. This region is also the border between hill and mountain in the agro ecological classification. The Table 5.2 below describes the forest sites and forest type for each research site.

Table 5.2: Description of research site in Nepal Himalaya

Location	Ilam district	Lalitpur district	Manang district
VDC	Kalbung and Erautar	Lamatar	Manang
Name of CFUG	Namuna CF	Kafle CF	Manang CF
Management practice	Community managed	Community managed	Community managed
Area (ha)	383	96	240
Year established	1998	1994	Mid 90's
No. member household	450	60	164
Rainfall	200 cm	160 cm	40 cm
Temperature	Min 60C- 300C Max	Min 30C- 300C Max	Min -50C- 200C Max
Altitude	400-800 masl	1830-1930 masl	3500-4200 masl
Vegetation/forest type	Subtropical broad-leaved	Lower temperate broad-leaved	Temperate conifer
Dominant species	Various species of bamboos, Lannea grandis and Schima wallichii	Castanopsis tribuloides and Schima wallichii	Pinus wallichiana
Size of permanent plots	$100m^2$	$100m^2$	$250m^2$
No. of permanent plots	14	8	9

Ilam at an altitude of 400-800 masl has subtropical broad-leaved forest dominated by bamboos and *Lannea grandis* and *Schima wallichii*. Forest in Lamatar lies at an elevation between 1830-1930 masl and is dominated by lower temperate broad-leaved species, particularly *Schima-Castanopsis*. In Manang, the forest lies at elevation 3500-4200 masl with a temperate conifer forest dominated by *Pinus wallichiana*. This is the upper limit of forest vegetation as it is a transition between temperate forest and alpine grassland.

In these three sites, the forest is composed of mainly young trees. This is because effective forest protection started only after the forest was handed over to the local communities for its protection and management in the 90's. Many barren patches of forest were regenerated as is demonstrated by the dominance of young stands found in Ilam and Lamatar. A more detailed summary of data findings are presented in the following sections.

5.3 Methodology for Forest Inventory

This section describes the methodology used for estimating biomass and carbon in forest in accordance to the standard set by the IPCC (2003) for LULUCF sector. The steps applied in the estimation process are derived from the protocol developed by MacDicken (1997) which uses standard forest inventory principles and techniques. Hence the carbon estimation methodology for this research is based on the standard forest inventory principles and techniques, with minor differences to suit differing field conditions, forest types, local forest management and available technical resources.

The forest inventory methodology used is a simple stepwise procedure for carbon estimation in a given piece of community managed forest with local people's collaboration in data collection. The methodology pertains to data collection and analysis of carbon accumulating in biomass and soil carbon of forests using modern verifiable methods.

The permanent plots surveyed for three years were marked using GPS. The local members of the CFUG were partners in the fieldwork, they were given regular training on conducting forest inventory. Their involvement included activities like demarcation, finding permanent plots with GPS, identifying the local name of species, measuring diameter at breast height (dbh) of trees and recording the data on hard copy forms. In the three sites, education level played a decisive role in the capacity of the locals to conduct the survey. In Lamatar, college educated CFUG members could use hand held GPS set with ease whereas in more remote area of Manang, the entire team of local research partners were illiterate. After attending Adult Literacy Class and training, they learnt to read the measuring tape.

Forest inventory methodology was based on MacDicken (1997) that included the following steps after forest was identified: 1) boundary mapping, 2) pilot survey for variance estimation and sample plot size, 3) calculating of optimal sampling intensity, 4) laying out of permanent plots and data recording. These steps for forest inventory are explained below.

5.3.1 Boundary Mapping

Boundary mapping was done using hand held GPS sets by marking coordinates with the assistance of the locals as they were familiar with their boundaries. Forest were not stratified because the area of forest were relatively small and having uniform forest cover within each community forest.

5.3.2 Pilot Survey for Variance Estimation and Sample Plot Size

Carbon inventory is more intricate than traditional forest survey as each carbon pool could have different variance. Pilot inventory was carried out for estimating the variance in carbon stock of the main pool (in this case trees) by laying out at least 15 circular plots per strata in a random way. The plot size of the pilot survey plots were determined by the area per tree as described by MacDicken (1997: 54) as depicted in the Table 5.3. Diameter at Breast Height (dbh) (cm) and height (m) of all trees greater than 5 cm dbh were measured to calculate variance.

Table 5.3: Plot radii for carbon inventory plots

Plot size in square meters	Plot radius in meters	Typical area per tree (square meters)	This size of plot is usual for:
100	5.64	0 to 15	Very dense vegetation, stands with large numbers of small diameter stems, uniform distribution of larger stems
250	8.92	15 to 40	Moderately dense woody vegetation
500	12.62	40 to 70	Moderately sparse woody vegetation
666.7	14.56	70 to 100	Sparse woody vegetation
1000	17.84	> 100	Very sparse vegetation

Source: MacDicken, 1997: 54.

The area of the circular permanent plots varied as shown in Table 5.2 in different sites as the radii of the plots were determined by the area per tree as described by MacDicken (1997: 54).

5.3.3 Calculating Optimal Sampling Intensity

The following statistical formula was used to calculate the number of permanent sample plots (n) required for the inventory.

$$N = \frac{CV^2 t^2}{E^2}$$

CV = Coefficient of variation of basal area.

t = Value of t obtained from the student's t-distribution Table at n-1degree of freedom of the pilot study at 10% probability.

E = Sampling error at 10%

Sampling intensity for different sites is illustrated above on Table 5.2 that shows the number of permanent plots.

5.3.4 Laying Out of Permanent Plots and Data Recording

The 'sample design' extension for Arc pad was used to systematically locate the permanent sample plots in the map. The plots were then marked in the field using a mobile GPS system.

While placing the circular permanent plots care was taken to do a correction for slope. Instead of using the mathematical process for slope correction, stepping method of surveying on gradient ground was used which avoids the need for slope calculation. Simply holding the measuring tape horizontally corrected the slope.

Trees measuring >5 cm dbh were measured and recorded in the circular permanent plots using dbh tape. The plot radius for Ilam and Lamatar was 5.64 m whereas for Manang it was 8.92 m as it had fewer trees as described by Table 5.3.

Data on each measurement was recorded in data collection form and later on entered into a computer in Excel spread sheet. The data was recorded along with species name by two persons and in cases of discrepancy the measurements were redone. Simplified standard national allometric equations having only dbh as an input variable were used for calculating volumes in Excel spread sheet. Data were recorded at intervals of 12 months in each plot for 3 years, except for Manang where data was only available for two years due to early snow fall.

5.4 Methodology for Carbon and CO_2 Estimation

For the estimation of carbon pool in forest, above ground biomass for plants >5 cm diameter at breast height (dbh) and below ground biomass for the same were only included. Other carbon pools such as carbon in herbs/grass and litter and for those plants <5 cm dbh were not included in the carbon estimation.

5.4.1 Above Ground Biomass

For estimating biomass of trees and saplings occurring in permanent plots, the national allometry tables developed by Department of Forest Research and Survey were used which had simplified equations that required only dbh as single input variable to calculate volume described in Sharma and Pukkala, 1990a; Sharma and Pukkala, 1990b and Tamrakar, 2000. The net change in biomass ($\Delta Yr = Yr_2 - Yr_1$) between Yr_2 and Yr_1 was taken as annual biomass accumulation. Half of this change in biomass was taken as carbon sequestration rate (MacDicken, 1997) expressed in t/ha. To convert carbon to carbon dioxide (CO_2), carbon was multiplied by 44/12 (the ratio of the molecular weight of carbon dioxide to carbon).

5.4.2 Below Ground Biomass

Below ground biomass estimation is much more difficult than above ground. To simplify the process for estimating below ground biomass, MacDicken (1997) recommends we use the root:shoot ratio value of 0.10 or 0.15 which is based on tropical forests. The IPCC (2003) also recommends the use of such default ratio based on root:shoot ratio for different types of forests, so we took a mean value of these two to come up with a value of 0.125.

5.4.3 Soil Carbon Estimation

Two methods are most commonly used for soil carbon analysis: the dry combustion method and the wet combustion method. The IPCC (2003) recommends the dry combustion method for carbon projects as this method separates organic and inorganic carbon, the latter being removed by acidification. But due to lack of lab facilities, dry combustion method was not available for this research and hence soil carbon estimation data was referred from literature (Bajracharya *et al.,* 2004) which summarizes over ten other studies carried out in Nepal for estimating soil carbon from the middle hill region which is comparable to the research sites of this thesis.

5.5 Leakage

Leakage in CDM terminology is defined as unplanned and indirect emission of GHG resulting from the project activity. All CDM projects must account for direct and indirect leakage and credit is given only after deducting this amount.

Leakage could not be found only by biomass survey and it required household level surveys on forest resource consumption pattern. The best approach to accounting leakage is by getting information from the project sites. To account for leakage, a livelihood approach survey was designed to collect data at the household level. This database was then used for estimating leakage which is presented in Chapter 7. For this purpose, a random household survey amongst CFUG members was conducted in each site. Data from this survey were verified through focus group discussion. A forest resources use survey was also conducted to triangulate data for estimating leakage.

5.6 Constraints in Measurement

In the first year, centres of the permanent plots were not marked. However, in the second year, locating the exact centre of the circular plots was difficult as GPS readings could easily error by 20m. So from second year onwards, centre of the plot was market with white paint.

5.7 Results

5.7.1 Vegetational Parameter for Three Sites

Referring to Table 5.4, in the three sites, the tree density of Ilam (536 stems/ha) and Manang (489 stems/ha) were on the low side compared to Lamatar (2000 stems/ha). However, it is evident that both Ilam and Lamatar forest are young as the basal area is below 20 m^2 ha^{-1} (Table 5.4). The temperate conifer forest of Manang has a high basal area indicating that the forest has older trees. The subtropical and lower temperate broad leaved forests of Ilam and Lamatar are rich in species diversity compared to Manang where only one species was found in the permanent plots due to the altitude.

Table 5.4: Vegetational data of 3 CFUG's of Nepal Himalaya

CFUG's	Density (stems ha^{-1})	Basal area (m^2 ha^{-1})	No of species in CF
Ilam	536	13.4	24
Lamatar	2000	19.5	21
Manang	489	33.85	1

The distribution of dbh also gives a clear picture of the state of forest in the three sites. Table 5.5 shows that around 94% of the trees in Lamatar have dbh between 5 to 20 cm while the same for Ilam was 87%. Manang only had 32% for the same range. Looking for older trees above 51 cm dbh, we find 5% of the trees belonging to this range in Manang and only 2% for Ilam and none for Lamatar. Manang also had 24% of trees within the range of 21 to 40 cm indicating the forest was relatively older than in Ilam which had 10% of trees in this category and Lamatar had only 6%.

The distribution of dbh class clearly shows that the bulk of the trees have small dbh and especially in the case of Lamatar where nearly $3/4^{th}$ have dbh between 5 to < 10cm. This clearly reflects how severely degraded forests were handed over to the local communities that have since deployed strict protective measures and allowed natural regeneration in all the three sites. Preventing livestock grazing in Ilam and Lamatar was particularly significant to promote natural regeneration. So the bulk of the forests consist of juvenile forest which started to regenerate after the degraded forests were handed over to the local community around the mid 90s. As stated by the local people, Lamatar was almost a barren hill slope at the time degraded forest was handed over to the local community for management and protection.

Table 5.5: Distribution of dbh class								
	dbh class							
	5 to < 10	10 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	> 70
Ilam yr 1	47%	35%	15%	0%	2%	0%	0%	2%
Ilam yr 2	62%	29%	5%	0%	1%	1%	0%	1%
Ilam yr 3	56%	31%	5%	4%	1%	1%	0%	1%
Lamatar yr 1	72%	22%	4%	1%	1%	0%	0%	0%
Lamatar yr 2	73%	21%	5%	1%	1%	0%	0%	0%
Lamatar yr 3	70%	23%	6%	1%	1%	0%	0%	0%
Manang yr 1	26%	29%	14%	17%	9%	3%	1%	2%
Manang yr 2	NA	NA	NA	NA	NA	NA	NA	NA
Manang yr 3	22%	34%	15%	16%	5%	3%	1%	4%

5.7.2 Biomass for Three Sites

In the three sites, the tree biomass (above ground and below ground) for Ilam and Lamatar was >100 t ha^{-1} whereas for Manang, it was nearly half of this (Table 5.6). This data is important by illustrating the fact that management in community forest leads to increased biomass growth. As these forests are harvested regularly, there is room to believe that management practices may maintain this range of increment in the long run (30 years) as well because older trees are harvested on a regular basis and the forest is highly unlikely to reach a biological maximum.

5.7.3 Carbon and CO_2 Sequestration Rates

From biomass data presented in Table 5.6, we can compute carbon and CO_2 pool size for each site as shown in Table 5.7. Ilam was found to have the highest level of carbon per ha (mean value 61 $tCha^{-1}$) followed by Lamatar (52 $tCha^{-1}$) while for Manang carbon per ha was almost half (32 $tCha^{-1}$). This shows the lower altitude regions of subtropical and lower temperate broad leaved forests have more biomass per ha than temperate conifer and thus a larger pool. Lamatar has nearly four times more trees than Ilam and Manang, yet the biomass per hectare in Ilam is higher because as mentioned earlier (Table 5.5), the bulk of the stands in Lamatar are young with > 50% falling between 5 to 10 cm dbh.

Table 5.6: Annual variation in tree biomass in the 3 CFUG's of Nepal Himalaya							
	Year	**N**	**Basal area**	**Volume**	**Above ground biomass**	**Below ground biomass**	**Total biomass**
		trees ha^{-1}	**G (m^2ha^{-1})**	**V (m^3ha^{-1})**	**tha^{-1}**	**tha^{-1}**	**tha^{-1}**
Ilam	1	393	10.22	64.58	102.64	12.83	115.47
(383 ha)	2	585	11.84	81.41	108.16	13.52	121.68
	3	536	13.43	98.64	114.05	14.26	128.31
Mean		505	11.83	81.54	108.28	13.54	121.82
Lamatar	1	1900	18.71	58.30	90.46	11.31	101.77
(96 ha)	2	1988	19.29	57.68	93.05	11.63	104.69
	3	2000	19.53	62.28	95.72	11.97	107.69
Mean		1963	19.18	59.42	93.08	11.63	104.71
Manang	1	497	30.46	80.53	55.01	6.88	61.89
(240 ha)	2	NA	NA	NA	NA	NA	NA
	3	488	33.74	87.53	58.88	7.36	66.24
Mean		493	32.10	84.03	56.95	7.12	64.06

Table 5.7: Biomass, carbon and CO_2 sequestration data from three sites				
	Year	**Total biomass tha^{-1}**	**Carbon per ha $tCha^{-1}$**	**CO_2 per ha tCO_2ha^{-1}**
Ilam	1	115.47	57.74	211.70
(383 ha)	2	121.68	60.84	223.08
	3	128.31	64.15	235.23
Mean		121.82	60.91	223.33
Lamatar	1	101.77	50.88	186.57
(96 ha)	2	104.69	52.34	191.93
	3	107.69	53.84	197.43
Mean		104.71	52.36	191.97
Manang	1	61.89	30.94	113.46
(240 ha)	2	NA	NA	NA
	3	66.24	33.12	121.44
Mean		64.06	32.03	117.45

From biomass stock measured on a yearly basis as presented in Table 5.7, we can compute carbon and CO_2 sequestration rates per hectare on an annual basis by taking the mean of the differences for each site as shown in Table 5.8.

Referring to Table 5.8, over the three years, the mean biomass growth was highest in Ilam (6.42 $tha^{-1}yr^{-1}$) and the lowest in alpine Manang (2.18 $tha^{-1}yr^{-1}$). From the three sites, the mean carbon sequestration rate on an annual basis was 1.93 $tha^{-1}yr^{-1}$ and for CO_2 the mean rate was 7.06 $tCO_2ha^{-1}yr^{-1}$.

Table 5.8: Annual variation in carbon stock in 3 community managed forests of Nepal Himalaya and their mean C sequestration rates

	Year	Total biomass tha^{-1}	Δ biomass $tha^{-1}yr^{-1}$	Δ carbon $tCha^{-1}yr^{-1}$	Δ CO_2 $tCO_2ha^{-1}yr^{-1}$
Ilam	1	115.47			
(383 ha)	2	121.68	6.21		
	3	128.31	6.63		
Mean		121.82	6.42	3.21	11.77
Lamatar	1	101.77			
(96 ha)	2	104.69	2.92		
	3	107.69	3.00		
Mean		104.71	2.96	1.48	5.43
Manang	1	61.89			
(240 ha)	2	NA	NA	NA	NA
	3	66.24	2.18		
Mean		64.06	2.18	1.09	3.99
Mean per year for 3 sites			3.85	1.93	7.06

These figures presented in Table 5.8 are in the lower side when compared to other researchers that measure biomass and carbon as shown on Table 5.9, except for the 16 tha^{-1} (Chhetri, 1999: 77) biomass found in a severely disturbed forest in the mid hills. It must be noted that the figures presented in Table 5.7 and 5.8 only account for above ground biomass of trees >5 cm dbh and excludes, biomass in herbs/grass and litter and those <5 cm dbh. Below ground biomass is calculated by taking a default value of 12.5% of the above ground biomass.

Table 5.9: Biomass and carbon data from other studies conducted in the Himalayan region						
	Study	**Biomass tha^{-1}**	**Soil organic carbon tha^{-1}**	**Quantity carbon $tCha^{-1} yr^{-1}$**	**Includes**	**Location**
1	Aune et al., 2005: 72	45.70	53.20	2.60	Above ground biomass Under storey biomass Soil organic carbon up to 0.2m (2 tCha-1yr-1 only from biomass)	Inner Terai (lowlands)
2	Chhetri, 1999: 77	16.00	....	....	Above ground biomass	Severely degraded, Kathmandu valley
		469.00	....	....	Above ground biomass	National Park, Kathmandu valley
3	Tiwari and Karky, 2007	304.50 198.01 168.40	208.90 253.75 218.26	 3.25 3.78 4.10	 Above ground biomass Below ground biomass Herbs and shrubs Soil organic carbon up to 1.5m but not included in yearly carbon calculation	Uttarkhand, India
Source: Aune et al., 2005; Chhetri, 1999 and Tiwari and Karky, 2007.						

The mean figure from this research shows 1.93 $tCha^{-1}yr^{1}$ which is closer to the figure of 2.6 $tCha^{-1}yr^{1}$ shown by Aune *et al.,* (2005: 72). This data from Aune *et al.,* (2005: 72) includes SOC up to 0.2m which is not accounted for in this thesis. Also Aune's data are from forest in the lower altitude than this thesis presents, from the inner Terai region. These two factors explain the higher results for Aune *et al.,* (2005) than found in this thesis (Table 5.8).

Chhetri (1999) conducts only biomass survey, 16 tha^{-1} biomass is from a severely disturbed forest by human activity while the 469 tha^{-1} of biomass is found in an undisturbed protected forest where access is restricted. This protected forest is identical to the one found in Lamatar with same vegetation and they are very closely located within the boundary of the Kathmandu valley. So we can imagine the protected forest containing 469 tha^{-1} of biomass could be the biological maximum for biomass pool in Lamatar which would be around more than four times its current biomass. But because Lamatar forest is under CFM, it is highly unlikely it will reach this stage as they practice sustainable resource extraction to meet subsistence needs.

The third study by Tiwari and Karky (2007)[21] shows data from three community managed forest in India Central Himalaya located in Uttarkhand. The biomass in India is more than twice of that found in this thesis (Table 5.8). The Indian data includes herbs and shrubs which were excluded in data from this thesis. The figures for biomass and carbon sequestration rates were found to be smaller in the data presented in this thesis (Table 5.8), because maybe the locals in Ilam, Lamatar and Manang depend more on fuelwood than in Uttarkhand where liquid petroleum gas (LPG) is available to the villagers on government subsidy. The extent of reliance in forest resources by CFUG households in Nepal is discussed in Chapter 7.

5.7.4 Soil Carbon Estimation

Carbon in the deeper layers of the soil remains sequestered for years unless the aboveground forest is disturbed. Soil carbon is distributed in deeper layer of soil due to (1) decrease in soil carbon turnover with soil depth resulting in higher soil carbon accumulation per unit of carbon input in deeper layer; (2) additional soil carbon leaches from shallower to deeper layers of soil; and (3) carbon moves down vertically through soil organisms (Jobbagy and Jackson, 2003).

Soil carbon pools were not quantified in the three research sites due to lack of laboratory resources and so data were used from a study by Bajracharya *et al.,* (2004) who showed that in the middle hills, the mean SOC pool to a depth of 1m is estimated for forest to be 89.1 $tCha^{-1}$ (327 tCO_2ha^{-1}) as shown in Table 5.10. The SOC values in Nepal Himalaya are less than those of Uttarakhand where the mean C pool is 154 $tCha^{-1}$ (565 tCO_2ha^{-1}) up to a soil depth of 90 cm. This may be because forest biomass could be higher in the research sites of Uttarakhand, India (Tiwari and Karky, 2007), than those of the Nepal research sites, and even for these sites where the soil tests were conducted by Bajracharya *et al.,*(2004), the forest cover could be less than those for those sites studied in Uttarakhand India.

Table 5.10: Mean SOC pools and the total stocks forest land uses in the Nepal Himalaya

Soil Depth (m)	SOC (%)	Bulk Density (mg m^{-3})	Mean C pool ($tCha^{-1}$)
Forest (0-0.30m)	2.31	0.7	48.5
Forest (0.3-1m)	0.58	1	40.6
Total (up to 1m)			89.10
Source: Bajracharya et al., 2004: 35.			

[21] A similar study was undertaken in Uttarkhand in India by CHEA (a non government organisation) as part of the Kyoto Think Global Act Local research project where carbon in biomass and soil were estimated in community managed forest. Carbon was estimated using similar methodology as mentioned in this thesis. The data from Uttarkhand is presented in Banskota et al., 2007.

5.7.5 Total Carbon Pool Size in Community Forest

From the data mentioned above, we can calculate the total carbon and CO_2 stored in the forested terrestrial system from mean of the three sites. The Table 5.11 illustrates the mean pool size as well as the annual increment per hectare from the three sites, giving above ground and below ground figures.

Table 5.11: Carbon and CO_2 pool size and yearly incremental rates in a forested land

		Mean Carbon pool size	Annual mean increment
		$tCha^{-1}$	$tCha^{-1}yr^{-1}$
Above ground	tree biomass	43.06	1.70
	herbs, shrubs, grass	Na	Na
	litter	Na	Na
Below ground	tree biomass (root system)	5.38	0.22
	soil organic carbon (to 1m)	89.10	Na
	Total $tCha^{-1}$	137.54	1.93
	Total tCO_2ha^{-1}	504.31	7.06

This data is important for three reasons.

1) Firstly, it shows the carbon pool size of a community managed forest (excluding litter and herbs, shrubs) which is found to be 138 $tCha^{-1}$ or 504 tCO_2ha^{-1} including SOC up to 1m depth in the three sites of Nepal Himalaya.
2) Secondly, it shows the annual increment rate for carbon sequestration in forest under CFM was found to be between 1.92 $tCha^{-1}yr^{-1}$ and 7.04 $tCO_2ha^{-1}yr^{-1}$ excluding SOC.
3) Thirdly, should such community forests be converted to other land uses, this pool (above ground carbon and below ground carbon) will be lost and released back into the atmosphere.

The carbon pool quantified in this chapter raises several questions. Should crediting be given on the yearly incremental value or also for the maintenance of the pool? The soil in forested land is a huge reservoir and should this also be credited although we cannot measure its stock change on an annual basis. In Table 5.11, the increment of SOC on an annual basis is not included as a much longer time frame is needed to see SOC changes in the soil. These issues are important as regards structuring a baseline for carbon offset forestry projects; for practical purpose and for simplicity, this thesis only estimates the value of incremental carbon sequestration for calculating the gross margins as presented in Chapter 8.

5.8 Conclusion

The forests we found in the three sites were ecologically diverse and rich in floral diversity as shown by the number of species. Even though Manang only had a single species of tree, the forest vegetation at that altitude is of significant importance and supports biological sequestration of carbon.

In terms of carbon sequestration in these forests, although the annual increment in biomass was found to be small, it is nevertheless important as it indicates that these forests managed by the community are not degrading but providing environmental additionality by becoming a large carbon reservoir. Even the small increment is significant, because this is happening despite the fact that the forests are harvested for fuelwood, timber, fodder and NTFPs by the local people to meet their subsistence needs as we find out in Chapter 7. Such forests are supplying renewable energy by carefully practicing sustainable management. The small amounts of incremental carbon sequestered per hectare through CFM also indicate reduced emissions from deforestation. Therefore, from the data presented, community forests are shown scientifically to mitigate carbon and it can therefore be argued that they could become viable projects for carbon offsetting.

Now, since it is proven that community managed forests are an important measure against climate change, the next chapter (Chapter 6) will analyse the management regime in the three sites and see similarities and differences between them to know what could work better for developing a carbon offset project. The data presented in this chapter will also be used in Chapter 7 to show how community managed forests are being used to support subsistence livelihood.

Chapter 6

Management Regime for Sustainable Community Forest Management

6.0 Introduction

Community managed forest does sequester carbon and therefore is an important activity from a climatic perspective as shown in Chapter 5. However the locals who manage forests do not see it from a climatic perspective. As illustrated in this chapter, communities manage forests in different ways, leading to the same end result, of forest protection while providing a subsistence livelihood to the rural population based on sustainable forest management. This chapter looks at the management regime in the three sites.

The chapter sheds light on how each of the forests is managed in terms of its past history, how the management system evolved, how administration is conducted, the day-to-day management practices and how forest protection operation works are implemented. It also shows how the harvesting activity is conducted and shows how the income and expenditure pertaining to forest management is used from the data gathered through focus group discussion with CFUG members and members of the Forest User Committee (FUC) which is the executive committee of CFUG.

This chapter tries to answer to what extent current management regime is capable of adding carbon management for trading of credits by analyzing the various aspects of management undertaken in the three sites. It identifies some areas where improvements and changes are required. For community managed forests to engage in carbon trade, CFUGs must develop a sound capacity for forest management that complies with the carbon trading norms and standards (Minang *et al.,* 2007). This chapter will try to find out whether the existing CFUGs in the three sites have the managerial capacity to undertake this challenge and if so what changes or improvements are required at management level.

6.1 Case Study 1: Ilam

The case study households of the CFUG in Ilam district belonging to Namuna Community Forest are situated in the eastern region of Nepal. The case study households are located in the hills as well as in the plains with the community forest lying in the hills. In this thesis, Ilam refers to the case study community forest called Namuna Community Forest and the area where its member households live belonging to the districts of Ilam and Jhapa.

This is the region where the Terai plains meet the hills of the Himalayan range. The community forest consists of subtropical broad-leaved forest with warm climate and high humidity. The area is in the eastern part of Nepal bordering on India. The settlements in this region have some of the most fertile agricultural lands in the country and the population is highly dependent on agriculture and livestock rearing.

6.1.1 CFUG as a Unit of Observation

The forest in Ilam is a good example of a CFUG that does not follow ecological boundary or an administrative boundary. In this case the community forest extends in both hills and parts of plains across the two districts and over several VDCs while the CFUG members are from settlements scattered across the area with the majority of the population being from Brahmin and Chetri castes. The CFUG in Ilam has an 11 member (including 3 woman) Forest User Committee (FUC) that is elected for a two-year tenure for managing the CFUG. The elections take place in the Annual General Meeting of the CFUG and any member can contest for the Forest User Committee member.

This Namuna Community Forest is located in the Siwalik Hills of southern Ilam district (in villages Ward 9 of Kalbung, Ward 2 of Erautar) and reaches the low lands of Terai in Jhapa district (in villages Ward 6 of Santinagar). The members of the CFUG are mainly from Jhapa district (95%) which is situated in the low lands and a small minority from the hills of Ilam district (5%). Members from the low lands are from Wards 6 and 1 of Santinagar VDC, while members from the hills are from Ward 2 of Erautar VDC in Ilam district. Altogether there are 450 households in Namuna Community Forest.

As shown in Diagram 6.1, though the forest also lies in Ward 9 of Kalbung VDC, there are no CFUG members from this ward. Similarly, the forest does not lie in Ward 1 of Shantinagar VDC where most of the CFUG members of this forest live. This shows how CFUG functions as a group and does not follow administrative boundaries.

There are over 3,300 households in the whole of Shantinagar VDC of Jhapa, but only 12% of the households (around 397) are members of this CFUG (Namuna Community Forest), the remaining household are members of different CFUGs. There are five additional community managed forests lying in the VDC of Shantinagar.

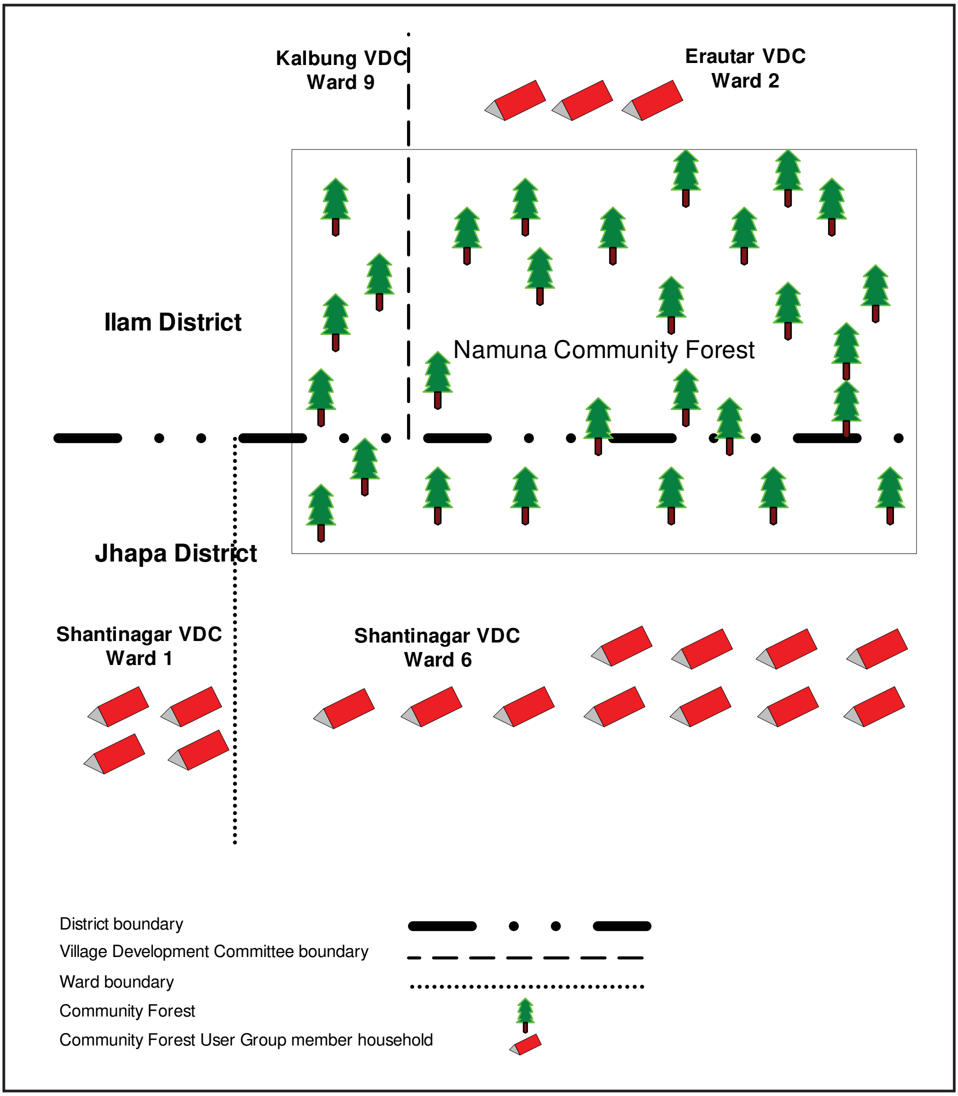

Diagram 6.1: CFUG as a unit of observation in Ilam. The scattered households within different districts make up the CFUG.

Ilam and Jhapa are tea growing districts of Nepal. Tea was first introduced by Colonel Gajraj Singh Thapa in 1863 in Ilam, brought from China when tea was beginning to expand in Darjeeling district of India. Ilam shares identical climate and topography as the renowned tea growing Darjeeling district, the two also share a common border. In 1982 the government declared Ilam and Jhapa together with three other eastern districts as 'tea zone'. Since then tea has been promoted extensively in these two districts, and after seeing the benefits of tea plantation over subsistence agriculture by small scale farmers, agricultural lands are rapidly being converted into tea plantations by small and large farmers. This has resulted in a changing land use pattern in the area. In future, this could be the greatest threat to community forest as tea bushes can grow well in marginal land and compete with community forest which is not suitable for other agricultural crops. Currently India has prohibited import of Nepali tea leaves and consequently the price in Nepal for tea leaf is suppressed as it is dependent on the domestic processing plants only. If this restriction is lifted, more land could come under tea cultivation.

6.1.2 Brief History of Namuna Community Forest

The forest in the southern flank of the hills of Ilam district that borders with the Terai of Jhapa district has always been a forest. The road to Ilam from Jhapa was constructed in 1975, and since then villages like Shantinagar expanded. The plains of Shantinagar are fertile agricultural fields with forests mainly remaining in the hills. The *sal* forests *(Shorea robusta)* in the plains were deforested for agricultural expansion; and road construction linked it with markets in the Indian state of West Bengal that is only 30 minutes away by road. Settlement grew and there was immense pressure on forests in the hills. The road that went to Ilam quickly saw new settlements emerging along the road side. However, due to steep slopes where the Siwalik range drops to join the Terai plains, settlements and agriculture expansion couldn't take place on the slopes and they remain forested areas. Consequently, crowded settlements with agricultural plots expanded in the lowlands with forest degrading in the hills due to the pressure from the plains.

According to the elder locals, before the road was built 30 years ago, settlements were very few and so were agriculture plots in the region. This left vast tracts of primary forests in the hills and the plains compared to what we can find today. The trend of people migrating from the hills to the plains in search of jobs and farming land and better access to modern facilities have increased the population in and around Shantinagar many fold since then.

In the decade of the 90s, forests were being handed over for CFM as explained in Chapter 4. In Ilam, Namuna Community Forest was handed over to the locals in 1996. The locals claim that before the forest was handed over to the communities, it was severely deforested as there was no management regime and anyone could extract forest resources. By the mid 90s community forestry was a priority sector with the number of community managed forests growing very rapidly and this is how Namuna Community Forest came to be established; similarly the adjacent forests were also handed over to the locals. When established in 1996, there were 322 member households. Now the number of member household has increased by an average of 4% per annum for a decade (till 2006) resulting in 450 households as members.

To halt the deforestation trend, the locals say they had to work hard as there were many timber smugglers involved in logging trees from this area and selling them in urban centres in the south. The local's claim that political parties never helped in taking strong action against smugglers or those that entered the forest illegally to collect firewood and fodder, they feared it would make them unpopular and so protection responsibility remained solely with CFUG members.

6.1.3 Administrative Work

Namuna Community Forest has an 11-member Forest User Committee (FUC) elected for a two-year duration by the Annual General Meeting where 2/3^{rds} of the members participated. The CFUG in Ilam have their own office building together with a saw mill for sawing timber. They haven't yet started sawing timber for commercial purpose but are working in that direction; it is only for the CFUG members. The CFUG office remains open from 10 am to 4 pm from November to May which is the working season in the forest. Between June to October the office is not opened on a daily basis and the forest is also closed except for collection of fodder, litter and grass.

All the administrative expenses have to be covered by the CFUG, and sometimes, where certain tasks have to be undertaken such as forest supervision and forest conservation works as required by the district forest office, funds are collected from the members that range from NRs. 51 [sic] to NRs. 101 [sic] depending on the task required. In Lamatar and Manang, they do not collect this fund but manage it within the CFUG budget.

In Ilam, money is also raised from members to undertake other additional and special work. This could be because, at the end of the year, if there are any financial profits made by the CFUG, it is shared equally between the member households in a manner similar to a business company issuing dividends. And because these incomes are from rural enterprises, when they distribute profits, 15% value added tax (VAT) is not levied because these transactions pass as being in the informal sector. However, all profits are not always distributed, the CFUG also finances local development works as illustrated by the decisions taken by the Forest User Committee depicted below in Box 6.1. Shown below are the last five decisions taken by the FUC in Ilam.

These decisions were taken by the FUC and implemented by the CFUG with the main objective of using the resources from the forest in a systematic and formal way with the consensus of the general members of the CFUG. This shows a systematic management is in place to utilize the resources in a sustainable manner. The CFUG also has an Internal Audit Committee selected at the Annual General Meeting. Its task is to audit the CFUG account which has to be approved by an authorized auditor. After approval from external audit, this committee presents the audit report to the members at the Annual General Meeting.

Box 6.1: The last five decisions taken by the Forest User Committee in Ilam as noted from their meeting minute record in Nepali calendar dates.

Decision 1 - 2063/11/28 (March 2007)
It was decided by the Forest User Committee to grant NRs. 25,000 plus volunteers for the construction of road (Goranwarwat-Chanauta-Shantinagar). This road is being constructed jointly by Shantinagar VDC, Erautar VDC ward no 2 and 3, the local people and the GCA of Ilam.

Decision 2 - 2063/10/05 (Jan 2007)
Decision was made on surveying the forest for selecting timber for harvest. This is aimed at fulfilling the domestic requirements of the locals which would have to be approved by the District Forest Office and also supervised by the DFO.

Decision 3 - 2063/09/07 (Dec 2006)
Decision was taken to mobilize 450 households by forming them into 34 groups for cleaning sections of the forest (Deurali, Kalktay and Kadiya) for better conservation of the forest.

Decision 4 - 2063/07/05 (Oct 2006)
As about 50% the member households of Namuna CFUG did not have electricity connection in their house, 76 poles (cement) and 2 km of wire were purchased for electrification of these houses.

Decision 5 - 2063/02/02 (May 2006)
Decision was taken to impart skill development programme in the village. A training on tailoring was given to 51 women for six months while 25 men were provided with three months training on electric wiring for homes. These trainings were imparted to the members of the CFUG in order for them to be able to generate income and also to fulfill the human resource requirements of the village.

6.1.4 Forest Management Practice

Every community forest has to have a Five-Year Operational Plan that has to be approved by the government. The management of this forest is based on the Operation Plan that was revised in 2003 which provides a broad outline for the way this forest has to be managed. The CFUG had hired a consultant to assist them in surveying and making up this plan which was approved by the District Forest Office. The Operation Plan was developed jointly by the Forest User Committee of the CFUG, consultant and the District Forest Office which also provided the technical support.

The FUC meets on the first Saturday of every month and if there is a need to meet urgently, a notice letter is sent at least 3 days prior to the meeting. The chairperson of the FUC presides over the meeting and presents the agenda for discussions. Decisions are made in a transparent manner by the FUC where discussions, debates and voting take place to resolve issues. When there is an important decision to be made, CFUG members are invited, and if the issue is of significant importance, it will be discussed at the Annual General Meeting. The decisions taken by the FUC are implemented in the field as soon as they can.

Every household that is a member pays a membership renewal fee of NRs. 5 per year and an additional NRs. 10 per month which is used for covering the wages for forest guards. For a household to become a new member of this CFUG, there is an additional membership fee of NRs. 2001 [sic]. New members are usually families that split household or the new comers that migrate from the northern hills and settle in this village. Additionally, each household is to contribute 5 man-days of free labour per year. But when there are other tasks at hand, more voluntary labour can easily be demanded by the FUC. If a member cannot do the 5 man-days voluntary work, a penalty of NRs. 101 [sic] is fined. This revenue collected goes into the account of the CFUG.

6.1.5 Forest Protection Operation

The forest protection work is planned by the FUC and they have hired forest guards to keep a watch. There are four forest guards that are paid from the NRs. 10 collected from each household, i.e. NRs. 1125 is paid to each guard per month. The protection responsibility lies entirely with the CFUG members, they make sure the protective measures are complied by the CFUG members, and any illegal activity by an outsider is reported to the range post located near by that enforces the protection measures when the CFUG report cases and exert pressure for action. The CFUG members still see a very high degree of threat from illegal logging and feel there is a need to constantly be alert and in the lookout. Livestock grazing is not permitted in the forest other than in a designated area. Grazing is one of the main causes for forest degradation. Controlling livestock alone plays a vital role for forest protection through natural regeneration as we find this rule implemented in Lamatar and Manang as well.

This CFUG has maintained a nursery so that regular reforestation can be conducted. In addition, there is another benefit. Trees in agriculture plots can be grown from the samplings made available from this nursery, which is the only one in the area. CFUG members get them at subsidized rates, the private buyers are charged more. Keeping a nursery has assisted forest protection tremendously.

6.1.6 Harvesting

CFUG members can always collect grass and fodder but firewood can only be collected twice a week. For fuelwood, dried, fallen and dead wood can be collected as specified in the Operational Plan which also applies for Lamatar and Manang; green trees cannot be felled. Large dead trees have to be inspected by the FUC and by a Ranger from the Range Post who is authorized to issue a formal permission for cutting of dead trees.

This process is the same for selective logging, where the CFUG identifies trees for logging; permission has to be granted from the Range Post. This is how demand for fuelwood and timber is met from community forest, any excess after meeting their demand is auctioned to people outside the CFUG. Demands of the locals for timber for household furniture, timber for repair and renovation or reconstruction and bamboos for other household purposes are carefully analyzed by the FUC and given special permission on a case by case basis. In this manner, the management regime of the common forest has enabled the community's subsistence needs to be fulfilled from the forest. This action actually also reduces their carbon emission levels significantly as they rely largely on resources from a sustainably managed forest making fuelwood similar to biofuel. More on this will be discussed in Chapter 7 where we present the resources use data at household level.

6.1.7 Income and Expenditure

CFUG are to maintain a financial record. The CFUG gave the following income-expenditure statement for the past five years as shown below in Table 6.1.

Table 6.1: Ilam CFUG cash flow in NRs.

Year	Income	Expenditure	Savings
2005/06	717,267	704,322	12,944
2004/05	557,122	554,046	3,097
2003/04	877,995	881,705	(-3,710)
2002/03	920,829	914,478	6,351
2001/02	1,385,337	1,384,851	486

The complete break down of the budget was not available, only the titles for income and expenditure were given as shown below in Table 6.2. This is where financial record keeping needs to improve for Ilam.

The products sold for income are timber, fuelwood, herbs grown in nursery, bamboo and broom grass. Fuelwood and bamboo are the two most common products used by the locals. The selling of timber is done through a public auction amongst the members and also for the surplus sold to non-members. The main cash income of this CFUG is from selling of timber. The selling of timber has two types of prices, subsidized rate for members and market rate for outsiders. What amount was sold last year was not made available, but it could be estimated that nearly all the income amount as shown on Table 6.2 comes from selling of timber as membership renewal fees are nominal.

Table 6.2: Income and expenditure headings of CFUG in Ilam	
Income headings	**Expenditure headings**
Balance of previous year Internal source Application charge Renew charge New household Wages for forest guard Penalty charge Selling of forest product in & out of community Shaku (timber) Kukhat (low grade timber) Bakal (bark) Firewood Deposit+ Penalty Mobilization of user	Administrative Transportation Printing and photocopy Miscellaneous Stationery Electricity charge Telephone charge Technical exp. Oil Wages for forest guard Collection of estimation exp. Plantation, fire line construction Cleaning of forest Technical training and prize Nursery building Forest fire fighting

Also it is strange that though the income is substantial, expenditure is also huge. The locals had said that they received some dividends from the profits, but this is not shown in the expenses heading. Also the budget heading does not show expenditure made on rural development such as road construction or the salary of school teacher or the maintenance of school building nor does it show income from shops leased by the CFUG at the view point. Nor are the income and expenditure from the nursery shown. These aspects play an important role when we want to find out how capable they will be in maintaining accountability and transparency if funds from carbon trading are made available. Clearly even the basics as maintaining an account is lacking in Ilam, though the procedures are there, implementing accountability is lacking.

The CFUG is also paying the salary of one school teacher in the local school in addition to the teacher from the government. This is a government school that provides free education, and just like the rest of the government schools in the country, it is severely under resourced. Noticing this, the CFUG have added one teacher from which everyone benefits even those households that are not members. Similarly, financial assistance is also extended for the school's maintenance and upkeep from time to time by the CFUG. This expense was also found to be missing in the balance sheet.

The FUC also gives additional extra forest products to the members of the low income group who participate actively and on a regular basis in CFUG works. In addition, the CFUG also supports development work in the village such as road construction, electrification and impart income generation training to the villagers to name a few.

6.1.8 Environmental Services

The locals claim that three decades ago when the settlement in the plain was very sparse, the area was rich in biodiversity with a variety of birds, deer, wild boars, bear, foxes, porcupine, etc. This forest was linked with large tracts of forest in the plains which are now largely agricultural plots. However, this forest is still significantly important for biodiversity conservation because it links patches of forest together forming a corridor from the hills to the plains and is a habitat for number of wildlife species which have smaller populations than before. Such patches of community forest that link together are becoming an important wildlife habitat outside protected areas. The area in the plains south of this community forest lies in the migratory path of wild elephants from Assam (India) in the east. Even today wild elephants pass this migratory route every year during the winter season.

Similar to Lamatar, there are numerous water sources inside the community forest. Locals claim that due to forest protection, these spring sources have been conserved. These water springs are tapped and the water supplied to the villages in vicinity; most of the water is used by the CFUG member households. A small percentage of households that are not members also receive this water. For the maintenance of this water supply, funds are raised as and when needed from the users and the FUC also plays an important role in mobilizing labour when required for the maintenance of water flow. Water is not sold from this forest.

This community forest in addition to being an important wildlife and floral habitat outside of the protected areas (like in Lamatar), also has a scenic view point for visitors in the forest. Mechi highway travelling north passes through this forest and as the high way begins to climb the hills, there is a view point overlooking the plains. The CFUG have built a welcome-gate in the highway, this point is called Deurali where the CFUGs have fenced off an area and made a view point with tea shops for travellers. From this point one can see the plains of Terai and in the east the plains of India, during the evening the view of the lights in the plains is spectacular.

There is no agricultural land within the forest, but some of the CFUG members have bamboo, broom grass and some herbs *(khar)* cultivation which they can harvest themselves, as long as it does not disturb the trees.

6.2 Case Study 2: Lamatar

The case study households of the CFUG in Lamatar village belonging to Kafle Community Forest are located in the southern part of Kathmandu valley. In this thesis, Lamatar refers to the case study community forest called Kafle Community Forest and the area where its member households live belongs to the district of Lalitpur.

Lamatar is a village situated in the south-eastern part of the Kathmandu valley only 10 km away from the city. The study households are situated in the fertile plains of the valley with the community forest in the adjacent hills. This is also the largest valley in the Himalayan region. The community forest consists of lower temperate broad-leaved forest with warm climate. Residents of this village are more educated than in the other case study villages and the population is also less dependent on agriculture as employment opportunities are available in Kathmandu. Of the three case studies, this CFUG also has the most formal management regime in place.

6.2.1 Brief History of Kafle Community Forest

Lalitpur district has 15,253 ha of forest of which 9,993 ha are managed by 162 CFUGs. Within Lamatar Village Development Committee (VDC) there are nine community managed forests covering 525 ha and involving 670 households. Kafle Community Forest is one such CFUG. The Kafle Community Forest manages a block of 96 ha involving 60 households of the VDC. This forest lies at an elevation of between 1830 and 1930 masl and is dominated by lower temperate broad-leaved species, particularly *Schima-Castanopsis (katus-chilaune)*.

The tradition of community managed forest here is not new, what is new is the formalization of the traditional management practice in modern terms. Villagers recalling the history of their forest management explain that this forested area historically belonged to the Ghimere family, who were Brahmins living to the south of the main valley. They had agricultural lands in the fertile valley below the hills; the hills themselves were unsuitable for agriculture and were covered with forest. They were granted this forest as *Birta* by the State for services rendered. It is told that the forest was rich in biodiversity at that time, as it was well managed and population pressure on the forest was far less than in current period. In 1957, however, this forest, like all forests in Nepal, was nationalized. After that, as narrated by the locals, the forest gradually decreased, both by outright deforestation (loss of forest area) and in terms of degradation (loss of biomass within the forest). Noticing this change, the Department of Forestry carried out a reforestation programme in 1978 by developing a *sallo* plantation *(Pinus roxburghii)* and putting forest guards in place to protect it. But deforestation and forest degradation continued unabated, converting this entire hill to almost barren land by the early 1980's. Unregulated livestock grazing and fodder collection were the major causes of forest degradation as they prevented natural regeneration, while unrestricted fuelwood and timber collection were the major cause of deforestation. This was a classic case of 'the tragedy of the open access'; anyone and everyone had unlimited access any time because the state owned the resource and it was managed by their staff, to whom the local people did not feel answerable.

This scenario at Lamatar was occurring all over the country which meant that Nepal was losing forests at a rapid rate especially in areas adjacent to settlements.

In the late 1970's a paradigm shift occurred, when foresters realized that forest protection and management was not possible without involvement of the local people. Between 1975 to 1993, the community forestry policy that is being widely practiced in Nepal today brought about a series of milestone decisions as highlighted in Chapter 4 (in Box 4.1). Handing over large tracts of forests to the local communities took place in the 1990s. In Lamatar this happened in 1994, a year after the formation of the Kafle Community Forest User Group. Since then, forest has been managed effectively with strict restrictions and user guidelines and norms. Deforestation and forest degradation have been checked and forest regeneration (which is mainly natural regeneration) is taking place after stringent protective measures were enforced by the local people through the CFUG. Today the forest is recuperating ecologically and already has a rich diversity in tree species. One of the most important resources used from this forest is water. This forest has several springs which are carefully protected and used by the villagers for drinking purposes, at no charge to the users. It has been reported that the flow of water has remarkably increased with the rejuvenating forest biomass.

6.2.2 Administrative Work

Community forestry also entails numerous administrative tasks such as calling and organizing meetings, conducting elections, recording meeting decisions, maintaining accounts, getting accounts audited and as well as those directly connected with forest activities such as setting dates for extracting resources and circulating the information, and developing the management plan and Five-Year Operational Plan with the assistance from the Range Post. The CFUG of Lamatar are doing this administrative exercise professionally, but such professionalism cannot be expected among all CFUGs in Nepal. Lamatar being adjacent to the capital city is bestowed with better access to human resources.

The FUC consists of 11 members with a two-year tenure. They are elected by members of the CFUG during the Annual General Meeting. The voting system consists of two votes per household, one for each gender. The FUC can be dissolved by the general assembly of the CFUG.

Illustrated below in Box 6.2 are the latest decisions recorded in the meeting file made by the Forest User Committee of Lamatar. The meeting minutes reflect their administration system in terms of managing their forest resources.

6.2.3 Forest Management Practice

To ensure their fulfilment of forest products, generally all households become members of the user group (except those that do not want to use fuelwood and can afford to use gas and kerosene). The Kafle CFUG has a constitution and a Five-Year Operation Plan that indicates how and for what purpose the forest will be managed which is a requirement of the District Forest Office. The Operational Plan that was formulated by the members of the CFUG has to be approved by the

Box 6.2 The last five decisions taken by the Forest User Committee in Lamatar as noted from their meeting minute record in Nepali calendar dates

Decision 1 - 2063/06/04 (Sept 2006)

It was decided to form new groups for forest patrolling and prepare a new roster for these groups to patrol the forest on a daily basis. These groups will be responsible for forest patrolling till the new groups are formed by the CFUG. This decision illustrates work division between the CFUG members for protecting their forest. As forest protection work is a major task and often the most expensive as well, instead of paid forest guards, the CFUG members themselves carry out this task. Both women and men take up the responsibility to do the patrolling.

Decision 2 -2063/06/04 (Sept 2006)

A committee to monitor forest protection consisting of 5 members have been formed that would also monitor the work of the forest guards. The CFUG and the forest patrolling groups were unable to control illegal activities that continued in their forest and hence the members formed a committee to monitor forest protection and curb the high rate of deforestation that was taking place.

Decision 3 - 2063/05/19 (Aug 2006)

As per the decision of the general meeting of the CFUG, this decision was taken to make available books and pencils free of cost to school children till grade three.

Decision 4 - 2063/05/19 (Aug 2006)

As the position of Range Post Coordinator became vacant in the Forest User Committee, a new female member was nominated for the position. The responsibility is to coordinate between the CFUG and the Range Post of the District Forest Office (DFO) which is located in Lamatar.

Decision 5 - 2063/04/14 (Jul 2006)

As suggested by the Operational Plan, dried trees are to be sold through auction. However, after securing the tender, a party changed its mind and did not claim the timber. So a decision was taken by the FUC to not refund the bond deposit amounting to 10% of the total value of timber and to call a re-tender.

District Forest Office which is also the same for Ilam. The process for formulating an Operational Plan is highlighted below:

- CFUG meeting is called
- Division into smaller groups (by *tole*- small settlements)
- Small group meeting and selection of one representative
- Discussion on drafting the Operational Plan
- Drafting the plan in small groups
- Meeting and discussion of each small group representatives
- Synthesizing and compilation of small group's recommendations
- Presenting the drafted Operational Plan to the CFUG members and seeking approval of the general assembly.

The members of the CFUG also form a FUC consisting of 11 elected executive committee members (6 women and 5 men) which makes day to day decisions based on the Operational Plan. The primary objective of the Kafle CFUG is to increase the harvesting capacity of fuelwood, timber and fodder through better management of forest resources for the benefit of the CFUG members and to make the CFUG a self-sustaining organization. The Operational Plan guides the committee in moving towards this achievement. In addition, the CFUG also aims to conserve water sources, biodiversity, check soil erosion and promote environmental stability in their village area. It is also in the interest of the CFUG to assist in raising livelihood conditions from the use and access of forest resources and to generate income as well, and to try to develop this area for recreation and tourism uses.

6.2.4 Forest Protection Operation

Protection work is a major task and often the most expensive as well. In Lamatar, the community has divided itself into several groups to patrol their forests on a rotational basis. Illegal logging poses the greatest threat and requires careful protective measures. While working at home or in the field all members are vigilant and watch their forest for irregular movements, such as illegal logging, animal grazing or forest fire. This approach, in the past has helped the community to control fire outbreaks. It is mandatory for all members of the CFUG to participate in putting out fires. Failing to participate is penalized. Penalties are also levied on members who are found to adopt any kind of unsustainable forest resource extraction practice. The FUC meeting decides when community members can harvest different types of resources and their quantities. Members that do not comply are penalized based on monetary fines which are decided by the FUC. The penalty rates vary for illegal fodder and litter collection; illegal sand, gravel and stone collection; timber and fuelwood extraction; and bamboo collection. Hunting, grazing livestock and charcoal are all permanently banned. Fencing as a protective measure is not practiced in this forest; putting up a fence is very expensive. The implementation and compliance of rules and regulation has been the main instrument for avoiding forest degradation and deforestation in this forest patch.

The willingness of the community to implement the forest protection measures they have decided is dependent on the pay-back they perceive and actually derive. It is explicitly stated by the people in Lamatar that without strict conservation measures, natural regeneration is not possible, nor is it possible to harvest greater quantities of forest resources. In other words the incentive for conservation is being tangibly realized by the community by using forest resources. Across Nepal many such examples abound. In 2006 First Quarter when the prices of crude oil increased, and people of Lamatar who used to consume an energy mix of LPG and kerosene with fueldwood, were seen switching back to fuelwood use for cooking.

6.2.5 Harvesting

Harvesting is done by all the members. The main products extracted are timber, fuelwood (dried and green), fodder, litter, *nigalo*, (small bamboos: *Drepanostachyum intermedium*, *Drepanostachyum falcatum*, and *Sinarundinaria falcata*) and NTFPs. Of these, timber is the most heavily regulated; a decision to harvest is taken by the FUC together with the Range Post via an official process, and the timber is sold through a bidding process to anyone, including people from outside the village.

Fuelwood, fodder, litter, *nigalo* (small bamboo) and NTFP on the other hand can be collected by CFUG members when the forest opens; the Forest User Committee decides on the days and dates on which harvesting of these products is allowed in the different seasons and accordingly informs all CFUG members. Members pay a small fee for firewood and bamboo, but fodder and litter collection are free. From records[22] held by the CFUG, it reveals that each household derives about 1000 kg of green fuelwood, 500 kg of dry fuelwood, 500 kg of grass fodder, 1000 kg of leaf litter and 500 kg of *nigalo* every year. On special occasions such as marriage, religious ceremony and funeral, 350 kg of fuelwood can be harvested by any CFUG member for a subsidized price. Products extracted collectively after an operation such as thinning or clear cutting are distributed equally among the users. Members of the CFUG may sell any of their personal surplus products to non-members within the village, but they may not be sold commercially outside of the village i.e. Lamatar VDC. The financial returns from the sale of timber is the largest source of income for this CFUG, however, volume-wise fuelwood is the main resource extracted. With the increase in global oil prices, CFUG members rely more on fuelwood from their forest to meet cooking energy requirements.

[22] The record from the CFUG document shows half the amount of fuelwood being consumed at household level when compared to the data from household survey that states households consume 3.2 tons per year. There could be two reasons for this. Firstly, either the record in the CFUG office is not updated and does not take into account the increased off take after fuel prices started rising. Secondly, the FUC simply keeps records that make them look good but that do not necessarily reflect ground realities.

Weeding, cleaning, pruning/branch cutting, singling, thinning, clear cutting and regeneration management are other activities the CFUGs conduct on a regular basis which is similar to as also done in Ilam. The CFUG has maintained demonstration plots using modern techniques to propagate a number of species such as *Chilaune (Schima wallichii)* and *Jhingane (Eurya acuminate)* as well as several additional varieties of NTFPs (e.g. cardamom, fodder grass imported from Ilam district). In future, Kafle CFUG intends to develop a forest nursery and also to increase the number of medicinal plants in the forest. Most of the people in Lamatar understand silviculture practices and are able to identify most of the tree species in their forests.

6.2.6 Income and Expenditure

The Kafle CFUG maintains a very clear and transparent financial record as reflected in Table 6.3 that shows cash flow between 2001 to 2005 which reveals a gradual increment trend in income.

Table 6.3: Kafle CFUG cash flow in NRs.

Year	Income	Expenditure	Savings
2004/05	41,854	18,694	22,699
2003/04	40,537	33,627	6,910
2002/03	27,521	8,190	19,285
2001/02	9,896	6,975	3,081

Looking at their detailed breakdown of the expenditure as shown in their account books, we found that this CFUG invested 13% of the cash income from 2004/05 on school and Red Cross activities in the village, while in the year before that 16% was spent on college and school building repairs. Such an investment benefits not only the immediate members of the CFUGs but also others who live in the vicinity of this community forest. The account system and record keeping in Lamatar is much more transparent than in Ilam.

6.2.7 Environmental Services

Forests provide numerous environmental services often many of which go unpaid for. In Lamatar, Kafle CFUG has realized an increased flow of numerous environmental services as a result of improved forest management, one of the most significant being water supply as told by the locals. Not only have the users benefitted directly from the increased flow but also adjacent communities and downstream people have benefited. Increased water supply to the villages and the downstream population has been the most visible outcome of improved forest management.

According to the locals, there has been a constant flow of good quality water throughout the year as a result of improved forest management and increased forest cover. The forest cover and the steep terrain have protected the streams from pollution as people cannot have easy access to the springs. Currently in the dry months, around 6 inch deep stream flows continuously which is a source for drinking and irrigation water for Lamatar VDC and Lubhoo VDC and other settlements in the vicinity. About a half of the water is used for drinking by about 150 households and additional 200 households derive their irrigation needs from this discharge. The other half of this water could be sold to tankers to supply in Kathmandu which has an acute shortage of water. It is estimated that 20 tanks per day at the rate of NRs. 150 per tank could be sold earning NRs. 3,000 per day to the CFUG as is being done in a nearby community forest. But it is prohibited to sell water due to a strong opposition from people using the water for irrigation further down in Lubhoo VDC.

Lakuri Bhanjyang at an altitude of 1930 masl is located at the top of Kafle Community Forest. This hill top provides a spectacular view of the entire Kathmandu valley and of the Himalayan range in the north. It is also popular to view the sunrise during winter months when the valley below is covered by thick fog. Tourism activities include over night stay at a private resort adjoining another community forest, day picnicking, hiking in the forest and mountain biking. Few years ago, some monks tried to build a monastery by taking a small patch of forest on lease but the Kafle CFUG members strictly declined the offer.

Despite being rich in stone quarry and sand, for which there is a high demand for as construction material, the local community has declined the offers made by private parties to develop quarrying enterprises. As claimed by the locals, though the potential income from quarrying is attractive, the possible adverse impacts of quarrying such as landslides, drying of water sources, deforestation and pollution outweigh the benefits. Consequently, they have declined the attractive offers made by the private parties for quarrying.

6.3 Case Study 3: Manang

The case study households of the CFUG in Manang district belonging to Manang Conservation Area Management Committee (CAMC) (referred to as CFUG in this thesis) is located in the northern part of the country surrounded by mountains and located in the south of the Tibetan plateau. In this thesis, Manang refers to the case study community forest called Manang CAMC and area where its member households live in the district of Manang.

The village of Manang where the CFUGs of the case study community forest is located is a three-day walk from the nearest motorable road head. Being in the rain shadow of the Himalayan range, Manang has a semi-arid cold desert-like condition that is similar to the Tibetan plateau. There is very little arable land at this altitude. Livestock rearing in the high altitude range land provides for subsistence needs as agriculture can be carried out for only one season in only a limited area. This village lies inside the Conservation Area and is en-route to the Annapurna trekking circuit. The locals of Manang also depend on business from the tourism sector. Forest management in this village is conducted in an informal and traditional manner.

6.3.1 Conservation Area Management Regime

Manang lies within Nepal's largest protected area (7629 sq. km.) called the Annapurna Conservation Area. Conservation Area means that people are allowed to live in the area, which is less restrictive than a National Park; local people can continue to manage community forest in Conservation Areas in Nepal. This area was declared a Conservation Area covering 55 VDCs through Conservation Area Management Regulation (CAMR) notified in the gazette in 1996 (Karky, 2003: 14). At the village level, instead of CFUGs as found in Ilam and Lamatar, CAMCs are formed at Village Development Committee (VDC) level to look after the conservation and development programmes and activities within its boundaries (Gurung, 2003: 24). Under the Conservation Area Management Regulation, CAMCs have the authority and responsibility for managing, utilizing and conserving their natural resources including forests in their respective VDCs. There are 55 CAMCs in the ACA, one in each VDC. CAMCs may also form different sub committees to monitor different projects.

However there is a conflict at the policy level. The Conservation Area Management Regulation 1996 states that local resources are under the authority and management of the CAMC, which directly contradicts with the Local Self-Governance Act 1999[23]. The Local Self-Governance Act 1999 explicitly states the devolution of authority to the District Development Committee (DDC) and VDC for the management of the entire local resources including forest. In this case the act prevails over the regulation, but the Annapurna Conservation Area Project (ACAP) continues to mainly coordinate with CAMC for forest management. However, this conflict of policies is not looked at seriously at the field level because in the case of remote villages of Manang, traditional culture and authority system are more important than government policies. Outside of Protected Areas and Conservation Areas, Forest Act 1993 would be applied that would recognize CFUGs as the local body to manage the forests. Unlike CFUGs that acts as a unit, the CAMCs follow the VDC administrative boundary.

[23] The Local Self Governance Act 1999 has mandated District Development Committee (DDC) to establish their own line agencies to replace those of the government (Shrestha, 2000: 47) making the DDC the apex of the local government. At the lower level, there are Municipalities and Village Development Committees (VDCs). Nepal has 75 DDCs and each of them is divided into Village Development Committees (VDCs) that are further sub divided into nine wards (municipalities are divided into nine to thirty six wards). There are 3913 Village Development Committees and 58 municipalities in the country. Each local body of District Development Committee, Municipality and Village Development Committee has its executive and legislative body. The Local Self Governance Act 1999 delegates function and responsibility to the local bodies in areas of education, natural resources, agriculture, transport, social welfare, etc. Under this Act, local bodies can tax and raise fees to strengthen local resource base and they are also given authority to resolve minor disputes at the local level (Rijal, 2003)

6.3.2 Traditional Administrative Style of Manang

Through focus group discussion and intensive field visits to the region, many traditional practices of administration still prevalent in area were noticed that show how CFM is still implemented in a traditional manner. The inhabitants of Manang are called the Mangis and are of Tibetan origin that follows the Bon-po Buddhism strictly. This village consists of 164 households bordering the Tibetan plateau in the north at an altitude of 3540 masl. Before we look at the forest management style in Manang, we have to understand how things work in this village and for this we need to understand some characteristics of this village.

The April 2008 election to the Constituent Assembly was the first time ever that election took place in Manang where three candidates contested. In earlier elections, there has never been voting as only one candidate used to be nominated by the village. The single candidate would then win the election unopposed after the deadline for nomination ended. Similarly, there were no real local elections either for the posts within DDC and VDCs. Representatives were nominated through their traditional system and there was no contest.

Similarly there has never been a case filed in a court in the district headquarters of Manang that is a day's walk from Manang village. All disputes are settled within the community through their traditional legal system.

The village of Manang is officially divided into two VDCs namely Manang and Tanki Manang, but the people see it as one and there is a single joint VDC management committee. The two chairmen take turns every alternate year to become the chairman of both the villages informally. This means they also have two different CAMCs, but managed by the same VDC chairperson. This shows how official administrative processes are moulded to suit traditional practices.

Manang VDC also lies in another area further east, that is under this VDC there are two separate land areas which is divided by another VDC in the middle. The VDC of Manang adjoins Bhraka VDC in the east and the further east of Bhraka VDC is Manang VDC again. Since the lands are fertile and as there is an airport, the influential Manang village used their strength to retain this land and forest under Manang VDC which is also recognized by the government, even though this area is separated by another VDC in the middle. This is a unique case and also the only VDC to be separated by another VDC. It takes three hours to reach the part of the VDC that is in the east. In these two locations, there are two forested areas and people can use resources from any forest as they are from the same VDC.

There is one more point to be made here. The VDC committee also happens to be the CAMC. The members to the VDC committee are nominated, none of the members are elected. The elder men in the village take turns to be in the VDC, there are no woman representatives. This is not to say that women are marginalized in Manang, in fact women are more empowered here than in the lower hills (Bhadra and Karky, 2002); the roles of administration are, however, taken my men. The VDC members are actually selected by *Khamba-Nerba*[24] system.

The locals have their own traditional administration and legal system based on the *Khamba-Nerba* culture that is still deeply rooted in Manang society. During the Panchayat era, the people of Manang opposed to the formal governance system from Kathmandu and it was only in 1973 that they accepted the formal governance system. However, even today the village administration is deeply rooted in the traditional system. The government divided Manang district into two VDCs thinking this division would weaken their traditional administration, but the two chairmen take alternate years to administer the two VDCs as one larger village as had always been the case.

6.3.3 Brief history of Manang Community Forest

Manang's CFM is very different from Ilam and Lamatar, although the purpose of management is the same. The difference in management regime is mainly due to two factors 1) this forest is within a Conservation Area and 2) traditional administration and legal practices are still prevalent in Manang.

Manang is on a world famous trekking circuit called the Annapurna Circuit where more than half of the tourists visiting Nepal go to. In the year 2000, over 70,000 tourists visited this Conservation Area (Gurung, 2003: 27) making it the most popular trekking trail in Nepal. After Nepal opened up to tourism in the mid 20th

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[24] *Khamba-Nerba* system: The village of Manang which is one of the 12 VDCs in the district is the most dominant and influential village of the district. As reported by the locals, this village consists of four clans namely 1) Kungdindu Phobe 2) Ngimachhiring Phobe 3) Tenden Phobe and 4) Samden Phobe. The traditional Khamba Ngerba system is equivalent to the VDC except that these are nominated from the four clans annually. This committee could form other sub committees or task force as and when needed. The main source of revenue for running the *Khamba-Nerba* system is from penalties, and in the past this was followed by revenue based on land holding size, livestock population, and family size. Revenues are not collected anymore but fines and penalties are still collected. Although formally abolished, the *Khamba-Nerba* can still be seen in practice today. The elder men from the four clans in the village are nominated to make up the *Khamba-Nerba* council. In the past, this committee was also responsible for selection of their parliamentarian so elections were never held including for DDC and VDC members as well. If there was a close competition between the people with seniority and experience, then there will be a lucky draw instead of voting. This committee is also responsible for making decisions on regulations related to conserving and managing the forest.

There are more examples of the presence of the *Khamba-Nerba* culture even today. For instance, other villages cannot harvest their one-season crop before the harvest begins in Manang village, otherwise strict penalties are imposed. The *Khamba-Nerba* of Manang village gives the other villages the 'permission' to harvest their crops. An example of another rule enforced today by the *Khamba-Nerba* is on marriage. A girl cannot marry a non-Manangi and live in the village. Recently too many Manangi men migrated for work and woman ended marrying men from southern villages that were poorer and ended living in Manang village. After the population of such 'outsiders' started to grow, this new rule was imposed with a huge fine to deter men moving into this relatively prosperous village.

century, tourists started arriving in Manang since the late 1950's. Since then Manang has seen a flux of tourist trekkers and with it, adverse impacts on the environment also increased. Deforestation and the subsequent loss of wildlife habitat as well as pollution from garbage and sewage were visible throughout the trekking trail. The locals claim that Humde area underwent massive deforestation with the influx of tourists, before being declared a Conservation Area.

As a response to this environmental degradation, a project based on Integrated Conservation and Development Project (ICDP) was launched in 1986 called the Annapurna Conservation Area Project (ACAP) as an experiment (Rowell, 1989). It was based on the revolutionary idea that fees paid by trekkers would be reinvested for conservation and development of the local environment to benefit the local community (Karky, 2003: 14). This became a case for payment for environmental services with ACAP, a NGO, acting as an intermediary. ACAP as a payment for environmental services is also mentioned in the list of global PES programmes found in Landell-Mills and Porras, (2002: 253). This case of Manang illustrates how the local people can organize themselves to compete for tourists in the international tourism market by conserving their environment and culture to reap the economic benefits from the global tourism industry. This also illustrates how economic incentives can work for biodiversity conservation. This project started in Manang in 1992. With ACAP's ICDP approach in the Conservation Area, a holistic package was designed so that region's carrying capacity of tourists would increase but without increase in environmental externalities.

Besides blaming the tourist for deforestation in Manang, the climatic condition of the region also required the use of extensive fuelwood. Winters are cold requiring heating of homes. The other reason for deforestation is from the local construction sector. Traditional houses in Manang require extensive use of timber, which is used in the most inefficient manner. The inner walls are also panelled by wood to insulate. So construction especially of huge lodges for tourists consumes a lot of trees. Now all new buildings are required to purchase timber from other villages to stop deforestation in Manang. To reduce fuelwood consumption, all hotels for tourists have to use cooking gas (LPG) and kerosene subsidized by ACAP. Water is heated by solar panels again subsidized by ACAP or by using back boiler system from kitchen. These are some efforts in Manang to reduce the pressure off forests from the tourism industry.

6.3.4 Administrative Work

Since 2000, felling of tree for timber for construction from Manang community forest was prohibited for ten years as declared by the VDC. During this period exception will be made for village infrastructure repairs such as bridges and poles and for religious sites such as monastery and also for the new construction of a local museum. Timber for private construction can only be purchased from outside of this village that takes several days of walking.

VDC meeting is held about 7 times a year when forest related matters are also discussed. Forest protection is very strict in Manang and there are frequent house-to-house checks and regular monitoring is carried out. Forest patrolling is carried out by villagers and the VDC, to look for signs of logging and poaching of wildlife in houses. Wildlife traps are removed and if caught, fines imposed.

There are specific responsibilities delegated by the VDC to a number of people for conducting house-to-house check for illegal timber and firewood. They particularly look for green timber because green timber should not be found at home and a fine will be imposed as it infers that a tree has been cut. Similarly house-to-house checks are also carried out on livestock. Livestock can only be let out from the stable to the agricultural fields after the harvest, and there is a specific date when livestock can be let into the forest. Livestock found wandering in the forest or agricultural field when they are not supposed to, get locked up and only returned after fines are paid.

When a person requires timber for repairing his house or for partition when one of the sons have to separate from the family (but can be living in the same house), the person takes home brewed alcohol in a bottle together with a white prayer scarf called *khada* to the chairman of the VDC. The chairman then calls a VDC meeting and the person has to put their case and explain the urgency to the VDC members for sanctioning some timber. But for now, this has also been suspended as harvesting is not allowed at all.

6.3.5 Forest Management Practice

Forest in Manang is managed in a traditional way not conforming to the government regulations and norms strictly. Like CFUGs are expected to have five-year Operational Plan approved by District Forest Office, the CAMC is supposed to have a five-year Operational Plan approved by ACAP. However, such Operational Plan for managing forest does not exist and nor does ACAP have a Management Plan in place after the first management plan expired in 2002 for managing this Conservation Area. At the field level, most of the things are running informally and in the traditional manner in spite of the gaps at the policy level which clearly show that at field level, government policies matter little in Manang.

The forest was always managed by the *Khamba-Nerba* in the past. With pressure to adopt the formal governance system from Kathmandu, Manang has tactically managed to blend the decentralized bodies of VDC and DDC within their traditional system. Although there is a disagreement between the policy in forest management between the Forest Act and the Conservation Ares Management Regulation, the management of the forest at ground level is taken care of by the VDC which also is the CAMC and which is based in the traditional system of *Khamba-Nerba*.

Unlike in Ilam and Lamatar where the CFUG has a written constitution, the VDC/ CAMC does not have one, in fact they do not have written records for forest management at all. Forest management follows a strict calendar (Tibetan calendar) for operations and is based on practices.

6.3.6 Forest Protection Operation

Due to the altitude and the arid conditions, raising tree plantation is not possible. The only way to conserve forest is by having strict protective measures in existing forested areas that will allow natural regeneration. Growth takes much longer here due to the altitude and the low level of soil nutrients present. The ten-year ban on logging has greatly assisted in protecting the forest. The subsidy from ACAP on LPG and kerosene has also greatly assisted in reducing the pressure on fuelwood, especially from hoteliers. Manang has the strongest protection measures even though they are no written rules or formal forest administration system. Though this could be a good management system for increasing the carbon pool, the traditional management system is likely to be recognized for payment under the RED policy and a more formal system will be required. To implement more formal management, education is a prerequisite that will be analyzed in Chapter 7.

6.3.7 Harvesting

Forest litter can be collected throughout the year and there is no fee but the litter cannot be sold. There are specific times when the forest is open for collecting dry wood. Timber cannot be cut, but only for special reason as mentioned earlier. Dead trees are auctioned by the VDC. Dried fuelwood can be collected. There are specific times when the forest is opened for the collection of fuelwood. Hoteliers cannot use fuelwood to cook for tourists, they have to use gas and kerosene subsidized by ACAP. The community forest also has animal shed in the middle of the forest. People can keep their livestock in the communal shed for certain times of the year only. For most of time livestock is grazed in the high altitude rangelands.

6.3.8 Income and Expenditure

In Manang, it is quite difficult to account for income and expenditure for forest management alone as the VDC which is also the CAMC maintain the account and they have numerous other activities going on.

The VDC allows the collection of rare fungus found only in parts of Nepal, Bhutan and China called cordyceps which is all sold in China for medicinal purposes. This is a parasite that grows on a caterpillar and kills the larva.

Table 6.4 shown below illustrates the income since the past five years from forest lands and rangelands (which lie above the forested lands) that were made available from the VDC office, but a detailed break down of this was not available. Income from fines is three times more than income from timber and fuelwood and income from cordyceps is more than eight times higher than from timber and fuelwood. Cordyceps are not collected from forest but from the communal rangelands. VDC also receives income from the government which we have not included as it is more for rural development than forest protection. According to the BBC news (Dummett, 2007) a kilogram of cordyceps is sold for more than $ 3,000.

Table 6.4: Income from forest and rangeland in NRs.

Year	Income from timber and fuelwood	Income from cordyceps	Penalty	Total
2005-06	30,000	700,000	125,000	855,000
2004-05	30,000			30,000
2003-04	30,000	500,000		530,000
2002-03	30,000		350,000	380,000
2001-02	20,000			20,000

Consequently this has become the most significant income for the VDC. As this harvest and trading takes place in remote range lands, the government only receives nominal tax from cordyceps trading with the trading mainly taking place informally but under the VDC control.

Table 6.5 shows the expenditure of the VDC. It is quite difficult to segregate the expenses on forest. We find that forest patrolling is given a priority by the larger share in the expenditure. Maintenance of religious sites also constitutes a major share of expenditure. These figures only show the VDC contribution, activities like monastery repair receive large additional funds from outside the village and country (from philanthropists), which is not shown here.

Table 6.5: Expenditure in NRs.

Year	Expenditure		
2005-06	Bonus for VDC members	9 members*NRs. 700*12 months	756,00
	Tiffin for meetings		28,000
	Forest patrolling and plantation		72,600
	Religious sites restoration and construction		186,800
	Total expenditure		363,000

In addition to the income from forest and range lands and the VDC budget from the government, ACAP also allocates some budget towards forest conservation from the fees collected by trekkers. The financial subsidy made available from ACAP towards the forest management in Manang for the last three years is shown below in Table 6.6. This figure excludes the other support extended by ACAP such as in sectors of renewable energy, poverty reduction, rural infrastructure development, etc.

Table 6.6: ACAP subsidy in NRs. for forest conservation only

Year	Subsidy from ACAP
2005-06	112,000
2004-05	34,000
2003-04	72,000

ACAP subsidy for forest conservation is only expended on forest patrolling and forest plantation. So Manang is a relative rich VDC where community forest management does receive substantial income from selling of its resources and from the tourism revenue that is ploughed back into forest conservation. The fluctuation in subsidy is mainly due to ACAP's internal programme budget and how it allocates the budget, which depends on the revenue generated from tourism.

Table 6.7 below shows the balance of the CAMC account which is managed by the VDC. It shows that the CAMC has around 250,000 as fixed deposits and savings account deposit. The account balance also shows how CAMC have formed other sub committees for the conservation of snow leopard and musk deer and have allocated them their own endowment fund to conduct more effective conservation of wildlife. Overall, the savings figure reveals that this community forest has more funds in reserve than Ilam and Lamatar CFUGs jointly have.

For the locals of Manang to be attracted by carbon trading, they need to see a bigger financial gain than what is currently generated, otherwise they might not be interested.

Table 6.7: Balance of CAMC account in NRs.

Year	Balance of CAMC	
2005-06	Fixed deposits in Bank	105,000
	Saving account	147,684
	Snow leopard sub committee savings	188,984
	Musk deer sub committee savings	189,334
	Total	631,002

6.3.9 Environmental Services

This area is rich in biodiversity and scenic landscapes which attract tourists. The forest provides habitat for rare and endangered animals like musk deer and blue sheep that are prey base for the snow leopard, another highly endangered animal. During the survey, musk deer and blue sheep were sighted frequently.

Similar to Ilam and Lamatar, in the middle of the forest there is also a tourist view point where the VDC has constructed a tea shop that is rented out. This point has spectacular view of the north face of Annapurna peak and the Gangapurna glacier.

This area is the first case of payment mechanism for environmental services based on tourism industry in Nepal (Landell-Mills and Porras, 2002: 253). The locals have learnt this very well and are eager to conserve their culture, heritage and their natural resources such as forests for attracting more tourists. The locals apply very strong penalties for illegal hunting and logging.

6.4 Comparing the Three Regimes

The three case studies on the management of community forest show that different communities have different regimes, some are more formal while others take a more informal but never the less very effective approach. However, what is common between the three case studies is that management foremost takes into account of providing the basic necessity of fodder and fuelwood at nominal prices for households. Forest management for this objective has led to numerous additional environmental benefits from contributing to village development, providing drinking water, attracting tourists and maintaining a rich biodiversity.

Table 6.8 shown below highlights the similarities and differences in their management styles. All three sites have a commonality of being severely deforested before they were formally handed over to the present local bodies for management. And now all three forests have become important habitats for wildlife by letting the forest regenerate naturally. In terms of administration and finance, Lamatar and Ilam are more transparent and have a more formal system in place, in Manang administrative works are conducted in a traditional manner.

It is interesting to note that forest protection is more successful in Manang under traditional management than in Ilam and Lamatar where there is the problem of illegal logging by people from outside the CFUG. This is also because Manang does not have adjacent settlements as Ilam and Lamatar have. It is also interesting to note that income from CFM is contributing to village development in all the sites. In terms of scaling up the CFM to become commercialized, Ilam is in the process of operating its own mill while the objective of Lamatar and Manang is still limited to meeting subsistence needs and some sales of surplus. All the three community forests have environmental services which they enjoy.

Table 6.8: Management styles in the three sites			
	Ilam	**Lamatar**	**Manang**
Historic deforestation before handover	Yes. After road construction, there was migration from the hills; settlements and agriculture land expanded.	Yes. This forest was almost converted to barren land.	Yes. Demand for construction of houses and heavy reliance on fuelwood caused much of the deforestation before the introduction of kerosene after Conservation Area was declared.
Administration	Medium level transparency, participatory and formal with most records maintained.	Transparent, participatory and formal with records maintained.	Run in a traditional manner. Not transparent and written records not maintained.
Forest protection	Forest protection implemented but illegal felling from people outside of the CFUG is always a big threat.	Forest protection implemented but illegal felling from people outside of the CFUG is always a big threat.	Very strict forest protection measures complied by the locals. High number of fines and penalties imposed.
Financial record keeping	Has maintained a record of income but few records on expenditure.	Very transparent and well maintained record keeping.	Lacks transparency. CAMC and VDC have joint income and expenditure.
Contribution to rural development	Income from forest contributes to rural development.	Income from forest contributes to rural development.	Income from forest contributes to rural development.
Community forest as a business	In the process of commercializing by operating a saw mill.	Mainly catering for subsistence livelihood.	Catering only to subsistence livelihood.
Environmental services	Wildlife habitat, view point for visitor, water	Wildlife habitat, tourism, water.	Wildlife habitat for endangered species, tourist attraction.

The case study of three CFUGs illustrates how the locals have developed a management regime to manage forests for their own benefit and not intended from a climatic perspective. As evident from Chapter 5, these CFUGs are already defacto managing carbon. It is important to understand their managerial capacity to draw conclusions on how these groups would be able to manage carbon in the emerging global carbon market in the future, and to gauge what managerial changes are required.

6.5 Summary

Community management of forest entails numerous tasks that the locals have to perform, such as administrative work, day-to-day forest protection operations and monitoring income and expenditure. They also have to perform more technical tasks such as maintaining sustainable balance of forest resources and conducting harvesting operations.

These three case studies illustrate that forest can be managed in a sound manner by the locals following their Operational Plans or traditional norms as formulated by the villagers themselves through their experiences over the years. Apart from fuelwood and fodder benefit shared between the CFUG members, the CFUG also has a steady cash flow which is reinvested in numerous rural development works within their village benefiting those outside these groups as well. Carbon sequestration (as quantified in Chapter 5) from these three sites is an environmental service extended globally which is the by-product of protecting and maintaining this forest and which is not yet identified by the management as a potential income in the future. Thus CFUGs have been managing carbon as a result of forest management but unintentionally.

At one level, it is evident that communities are fully capable of managing their forest and carbon with it, in a sustainable manner as suggested by data from Chapter 5. Even under traditional management practices, for example in Manang, the CFUG are successfully managing carbon, but this will not suffice for compliance from the carbon market. At another level, if they are to add value to their existing management by taking part in carbon crediting, they have to upgrade their management system at CFUG level to meet the compliance standards by undertaking the following:

- Maintain better records.
- Have a guarantee that carbon stocks will be maintained.

The whole notion of forest management by the communities has to become more formal with carbon trading as climate regimes demand more formal management (Minang *et al.,* 2007). There needs to be a better record keeping of their annual carbon stock, financial record and administrative processes such that the whole management system is more transparent and formal. Then there also needs to be a guarantee that carbon stocks will be maintained because there is a high level of risk from unforeseen illegal logging activity. For this, the CFUGs may increase investment on hiring more local forest guards such that this risk can be reduced. Finally, there also needs to be a firm commitment in the form of a contract for protecting carbon stock over a period of time because looking at the current management practice, there is no guarantee that these communal lands will continue to maintain carbon pool levels beyond the 5-Year Operational Plan.

These are local level management improvements which the CFUGs can easily undertake as they have the capacity to implement these improvements. But what is also equally needed is a managerial improvement at the national level. At the national level, there needs to an institutional development through a new policy which manages and regulates these CFUGs across the country for carbon trading as explained in Chapter 4 (Section 4.3). This is vital for linking the individual CFUG management with carbon management at the national level. This is because under RED, baseline and payments will be managed at national level as explained in Chapter 3 (Section 3.7).

But what is yet to be seen is whether by up scaling their management at local and national levels, CFUGs can benefit from the market based mechanisms of carbon trading or not. Should the community managed forests be permitted to sell carbon credits via the national-level institution in the global carbon market in the future, cost benefit and sensitivity analysis with different scenarios must be undertaken to see its impact which will be presented in Chapters 8, and before this, it is important to see the linkage between managing community forest and subsistence livelihood. The next chapter (Chapter 7) considers what impacts carbon trading could have on the livelihood by analyzing the nexus between forest and livelihood.

Chapter 7

Socio-Economic Profile of CFUG Member Households

7.0 Introduction

This chapter presents descriptive data about households that are members of the forest user groups to answer the research question whether carbon trading will have an impact on livelihood. This household-level socio-economic data was collected to show the nexus between livelihood and community forest resources so to provide a background against which the impact of carbon trading on CFUG members will be assessed in Chapter 8.

In the last chapter it was revealed that CFUGs were able to successfully manage carbon and that capacity to undertake changes to make management more formal to guarantee protection over the project period might be possible. In this chapter, the objective is to find out whether and how CFUG members will be effected if they sold carbon credits and what any restriction in resources extraction, if there are any for the purpose of carbon management, would mean in terms of local livelihood. This information will allow us to analyze impacts under different carbon trading scenarios and to evaluate the benefit and cost of adding management of carbon to existing forest management practices. The chapter deals with four important sets of data:

1) General profile of study sites
2) Livelihood conditions of households
3) Use of forest products
4) CBO as social capital

This chapter starts by elaborating on the sampling design for conducting household surveys. It then reports on the analyzed data by giving a general profile of the study sites so that it sets the context for presenting the socio-economic profile of CFUG member households. The socio-economic profile of CFUG households presents data on livelihood condition, use of forest products by households, and also analyses CBO as a social capital as described in Chapter 4 (Section 4.3) by CFUG members which is linked to the findings of Chapter 6 on managerial aspects as well.

For determining the socio-economic profile of CFUG members at household level, a detailed socio-economic survey was carried out in each site based on the livelihood approach as it deals with livelihood issues to illustrate the relationship between forests and people. This socio-economic household survey uses a standard data gathering procedure as described in the next section on sampling design. Focus group discussions with CFUG members were done several times to triangulate the quantitative data such as to recheck the socio-economic results. The results of the analysis should however be seen as indicative and directional, rather than as absolute.

7.1 Sampling Design

This section elaborates the sampling design in conducting the socio-economic household survey in the three study sites and covers the sample frame, sampling methodology and the selection of actual sample households as described below.

7.1.1 Sample Frame

The socio-economic survey was conducted in three sites and targeted at CFUG members from Namuna Community Forest in Ilam, Kafle Community Forest in Lamatar, and Manang Community Forest in Manang in the physiographic zone of Nepal Himalaya as explained in Chapter 1 (Section 1.5) with the household as basic sampling unit. Around equal number of households were selected from each community forest as shown in Table 7.1. One reason for taking equal number of households from each site is because the population was normally distributed and the other reason for this was, it allows for quick and easy field logistics as explained below in Section 7.1.2.

Table 7.1: Sample frame for livelihood survey

Name of Community Forest	Area of Community Forest (ha)	Total no of member households	Sample population size (N)	% of household
Namuna CF	383	450	34	8%
Kafle CF	96	60	35	58%
Manang CF	240	164	36	22%
Total			105	

A sample of ±35 households was taken from each community forest site. A sample larger than this would not increase the confidence level of the results when the underlying distribution was a normal population as in this case (Damodar, 1999: 66-72). Household selection was done using the random walk technique.

7.1.2 Sampling Methodology

To keep the survey simple yet effective, equal samples from the three sites were taken, a methodology described by Frerichs and Tar, (1989) and also by Bennett *et al.,* (1991) for working in rural areas of developing countries. This methodology was used by the WHO in Expanded Program of Immunization (EPI) and the UNICEF to monitor immunizations of children within large areas and consequently the methodology came to be known as EPI and now is also used by the World Bank to assess poverty levels in developing countries (Henry *et al.,* 2003). This methodology allows flexibility in logistic in that it allows equal-proportion sampling, in this case from the three clusters, which can be done relatively quickly even when the village information is not centralised or when the exact population of CFUG members are not known. The village level information does not match with the CFUG information as CFUG households are spread over different VDCs as explained in Chapter 6. There were no data available to verify how well the sample population represented those CFUG member households as the CFUG did not have data on livelihood conditions of their members.

7.1.3 Selection of Actual Sample Households

The selection of households followed the classic random sampling method. As a list of all the households were not available, the random walk technique was deployed as described in the EPI Cluster Design method (Henry *et al.,* 2003: 42-44). This consists of identifying the centre of the village from where the settlement is divided into equal quarters. The enumerators take turns to spin a pen or a bottle on a flat surface and head in the direction pointed to conduct the survey in randomly selected households. Enumerators walk in as straight a line as possible and depending on the village density, the enumerators determine their interval number for sampling such that they meet their designated numbers. The steps followed in the random walk technique are described below in Box 7.1.

Box 7.1: The random walk technique

Step 1. Approximate the village or locality boundaries of sampled CFUG household members and draw a rough map
Step 2. Determine a central point and assess the density of households.
Step 3. Divide the area into quarters.
Step 4. Randomly select one or more directions by spinning a pen or a bottle to determine the quarter to be sampled.
Step 5. Follow the direction for the random walk and select households at intervals of a predetermined number based on household density.
Step 6. Replace non-member households by sampling the very next member household.

Source: Henry et al., 2003: 44.

In the field, not all villagers were members of a CFUG under investigation since the forest is divided between different CFUGs, Step 6 therefore refers to households that were not members of the specific CFUG concerned.

7.2 General Profile of Case Study Sites

The households surveyed in this research were members of the case study CFUG. These households that formed the unit of observation were scattered in the vicinity of their community forest and often consists of households from different settlements and even districts as mentioned in Chapter 6 (Section 6.1.1). Table 7.2 presents the general profile of the case study sites from where the household surveys were taken so that it provides a context for the livelihood related data.

All three sites were mainly rural, with Manang being a remote rural village as it is three-days walk from the nearest road head. In terms of geographical aspect, all the three case study sites are in the Nepal Himalaya region though at different altitudes as described in Chapter 5 (Sections 5.1 and 5.2). Being in the Nepal Himalaya, access to markets is always an issue for mountain villages. In this case, only Lamatar has easy access to a large urban market in Kathmandu. Villages in Ilam also have access to urban markets in the plains and to India, although this is further away. In Manang, markets are absent as it is a remote mountain village. Distance from the road head, geographic aspects and access to markets have influenced the occupation in the village.

Table 7.2: General profile of case study sites

	Ilam	Lamatar	Manang
CFUG settlement type	Rural village	Rural village adjacent Kathmandu	Remote rural village
Distance from road head	Linked with road	Linked with road	3 days of walking from the nearest road head.
Geographic aspect	Low hill, agriculture lands in the plains and CF in the slopes.	Mid hill, agriculture lands in the valley plain and CF in the slopes.	High mountain, with limited agricultural land in the river plain and CF in mountain slopes.
Access to market	Urban markets 15 km away	Kathmandu city 10 km away	No access to urban markets
Major occupation	Majority in agriculture and animal husbandry	Limited employment from service sector in addition to agriculture	Agriculture and animal husbandry plays an important role and tourism is also important
Soil fertility	Very fertile soil	Very fertile mainly with dark alluvial soil in the valley	Poor soil fertility
Village infrastructure	Bus stop, school, health post, bank, electricity supply	Bus stop, school, health post, bank, electricity supply	Airport, school, health post, bank, electricity supply, tourist destination

All the research sites are mainly confined to subsistence economy based on agriculture and livestock rearing. In Lamatar, this is complimented by employment from the service sector being located nearby Kathmandu; Ilam and Manang are much more agriculture based than Lamatar. The agricultural lands in the research site of Ilam are fertile with dark alluvial soil, subsequently agriculture plays a dominant role in the economy as it is the major occupation of the population. Agricultural lands in Lamatar are also very fertile as they are located in the valley. In Manang, the soil fertility is poor being located in the high Himalayan ranges, but as options are little, the local people have little choice but to depend on agriculture and livestock rearing in addition to tourism.

Village infrastructure wise, these settlement have a fairly good access to services and infrastructure within their settlements. Many of these facilities and services such as school and roads (in Ilam) are also supported by the revenue generated from CFM as described in Chapter 6. Manang is the only settlement in the three sites that does not have a motorable road and is only linked with a small seasonal airport and is a major tourism destination.

The general profile of CFUG settlements from these three research sites gives the picture that these settlements are rural and mainly based on subsistence economy where agriculture still plays a major role. It is essential to understand these aspects as it provides a context before presenting the livelihood conditions of the CFUG households, their use of forest products and their perception towards community organisations as their social capital.

7.3 Livelihood Conditions of CFUG Members

The socio-economic data collected from the CFUG member households in the three research sites reflect the descriptive characteristics of households in subsistence economy and illustrate their dependency on CFM. This section presents the livelihood condition of CFUG members based on:

- Demographic characteristics
- Educational level
- Occupational characteristic
- Ownership of farm size

7.3.1 Demographic Characteristics

The demographic characteristics illustrate the distribution of age and gender of a household and the size of CFUG households. These characteristics are important as it has direct implications on their relationship between forest and demography as discussed below.

Table 7.3 shows the sex ratio i.e. the number of males per 100 females in the CFUG sample population. In the economic active age bracket of 15 years to 59 years old, of the three sites only Manang has fewer men while Ilam and Lamatar have higher numbers of men relative to women indicating more membership of men in CFM. This is because, Manang have no markets and poor agriculture land and so men are forced to out migrate leaving the women behind to work in the community forest. Lamatar has the highest number of men in relation to female because in this village men do not have to migrate as agricultural lands are fertile and plenty of job opportunities available being located within Kathmadu valley.

Table 7.3: Sex ratio by site and age group			
Age group	**Ilam**	**Lamatar**	**Manang**
0-14 years	83.3	201.4	325.0
15-59 years	105.0	134.2	94.7
60 + years	460.0	158.4	100.0
Average	216.1	164.7	173.2

Table 7.4 below shows the average household size and the distribution of family size in the three research sites. Interestingly the community in the lowlands of Ilam has the largest household size which decreases with increasing altitude of the settlement with the smallest being in Manang. The average household size over the three sites (5.3) is the same as that recorded for the country in CBS (2004a: 25).

Table 7.4: Average household size by site and family size									
		Household size				**% distribution of households by family size (no. of members)**			
Sites	**N**	**Mean**	**St. Dev.**	**Min**	**Max**	**Small (1-4)**	**Medium (5-8)**	**Large (9+)**	**Total**
Ilam	34	5.6	2.3	2	11	35.3	52.9	11.8	100
Lamatar	35	5.5	2.3	3	13	42.9	45.7	11.4	100
Manang	36	4.9	2	1	9	47.2	44.4	8.3	100
Average	105	5.33				41.8	47.67	10.5	

Manang has the largest percentage (47.2%) small family consisting of 1 to 4 members. The fertile agricultural plains in the low lands of Ilam bordering Jhapa have the highest percentage (11.8%) of households having more than 9 members. This is quite natural as mountain environment can sustain smaller population density than the low lands that are more fertile and receive more rainfall as well. Lamatar in the middle hills has the average family size (5.5) smaller than Ilam (5.6) and larger than in Manang (4.9).

This data presented in Table 7.4 on household size is also consistent with the population density per forested area presented in Table 7.1. Ilam has the highest population density of 6.68 person per ha of forest even though it has the largest forested (383 ha) and Manang was found to have the least density of 3.35 persons per ha forest. This trend is also consistent with the biomass growth rate presented in Chapter 5 (Section 5.7.2) which shows Ilam has the highest rates while Manang was found to have the lowest biomass growth rates.

7.3.2 Education Level amongst CFUG Household Members

During the field work when conducting forest inventory for carbon measurement, it was found that education levels had an important role in determining the capacity of CFUG members to undertake carbon measurement activity and also in determining the management regime. Hence in this section we analyse the educational level of CFUG members.

Based on the survey results presented in Table 7.5, it was found that 19% of the CFUG population were illiterate and another 20% had never received formal education. These rates are better than the national average for Nepal which shows only 50.6% as literate for the entire population 6 years and older (CBS, 2004a: 65).

Table 7.5: Education of household members (6 years and above) by site and sex (%)

Site	Sex	Illiterate (%)	No Formal Education (%)	Primary (%)	Lower Second-ary (%)	Second-ary (%)	Higher Second-ary & above (%)	Total (%)
Ilam	Male	6.10	28.10	22.00	8.50	18.30	17.10	100
	Female	16.10	25.30	20.70	16.10	16.10	5.80	100
	Total	11.10	26.70	21.35	12.30	17.20	11.45	100
Lamatar	Male	5.30	12.60	7.40	7.40	28.40	39.00	100
	Female	25.80	13.50	16.90	7.90	25.80	10.10	100
	Total	15.55	13.05	12.15	7.65	27.10	24.55	100
Manang	Male	21.10	23.70	15.80	13.20	19.70	6.60	100
	Female	37.00	17.40	14.10	7.60	17.40	6.50	100
	Total	29.05	20.55	14.95	10.40	18.55	6.55	100

Note: Primary (1-5 class), Lower secondary (6-8 class), Secondary (9-10), Higher Secondary and above (11 class and above)

Manang had the highest illiteracy rate (30%) but the lowest percentage (7%) of sample population to complete higher secondary or above compared to Ilam (11%) and Lamatar (25%). Manang being remote and in a harsh mountain environment suffers high illiteracy rate as government education programmes fail to easily reach the far mountain villages. On the other hand, not only do Ilam and

Lamatar have better education levels but both the CFUGs in these two villages support the local school from the revenue they generate from community forest. Even non members of this CFUG can benefit. Ilam pays a teacher for the school as government teacher alone is not sufficient.

In terms of literacy rate in gender, as would be expected for Nepal, across the three sites and across all the categories, men were better educated than women. In the sample population over a quarter (26%) of the female population were illiterate, but which is far better than the national average of 61.6% of illiterate women (CBSa, 2004: 65). CFUG members are not only better educated than the national average, but also women in CFUG have far better literacy rate than the national average for woman as we found in these three villages. CFUG and other community based groups present in the village are an important social capital (also stated in Chapter 4) that acts as a catalyst for promoting development at grassroots levels.

The higher illiteracy rate in Manang was also reflected when the locals were trained to carry out forest inventory work for generating data presented in Chapter 5 (Section 5.3). This training was most easily carried out in Lamatar where a quarter of the population had education levels of higher secondary and also reflected higher competency in carrying out forest inventory work with better education. This education level may also explain the formal management with better record keeping practiced in Lamatar and the traditional management regime used in Manang as described by the case studies in Chapter 6 (Section 6.4).

Table 7.6 shows that education levels are quickly increasing in the younger generation. The younger generation (6-14 years) in all the sites, is becoming more literate irrespective of their location and their gender awareness for primary education is rising. Better literacy rates will lead to better education that would transform forest management into more formal and transparent affair especially in places like Manang. Given the observation in Lamatar, we can expect more formal management with improved record keeping as more population become better educated. Education levels amongst CFUG members is of great importance under carbon management when CFUG will be required to maintain records that will be acceptable to carbon credit buyers.

7.3.3 Occupational Characteristics of CFUG Members

Occupational characteristic is another indicator that is important in reflecting the livelihood condition of CFUG members which shows their dependency in forest resources.

Table 7.7 shows the primary occupation of CFUG members of 15 years and above. The population in Ilam is heavily dependent on agriculture and animal husbandry (72%) while Lamatar has the highest proportion in the service sector

(47%). Manang has the highest proportion (9%) engaged in business and trade as they rely on the tourism sector. As mentioned earlier, this is in line with the abundance of resources in each village, Ilam has good fertile agriculture base, Lamatar's location within Kathmandu valley has job opportunities, and Manang's natural gift to attract international tourists has endowed it with the aesthetic beauty. In Manang, tourism sector plays a crucial role in supplementing mountain farming system to fulfill the needs of local community.

Table 7.6: Literacy rate distribution of sample population (for 6 years & above) by age, site and sex in %.

Site	Sex	6-9 Years (%)	10-14 Years (%)	15-29 Years (%)	30-44 Years (%)	45-65 Years (%)	66 + Years (%)	Total (%)
Ilam	Male	100.00	100.00	100.00	88.90	33.30	66.70	81.48
	Female	100.00	96.40	90.00	41.20	0.00	0.00	54.60
	Total	100.00	98.20	95.00	65.05	16.65	33.35	68.04
Lamatar	Male	88.90	100.00	91.30	100.00	100.00	85.70	94.32
	Female	100.00	100.00	76.00	33.30	0.00	0.00	51.55
	Total	94.45	100.00	83.65	66.65	50.00	42.85	72.93
Manang	Male	100.00	90.00	93.30	41.20	0.00	60.00	64.08
	Female	100.00	94.70	50.00	0.00	0.00	11.10	42.63
	Total	100.00	92.35	71.65	20.60	0.00	35.55	53.36

Table 7.7: Percentage distribution of adult members 15 years & above by primary occupation

Site	Primary Occupation (%)						
	Agriculture & Animal Husbandry	Business & Enterprise	Service	Study	Wage Labour	Others	Total (%)
Ilam	71.70	4.05	0.80	13.25	2.35	7.90	100
Lamatar	13.85	1.80	26.15	18.40	3.20	36.60	100
Manang	49.50	8.50	9.15	20.35	2.80	9.70	100

At the national level, employment in agriculture sector is 71% (6.8% for wage in agriculture and 64.3% for self employed in agriculture) and for the wage labour outside agriculture sector, it was 10.2% (CBS, 2004b: 52). This shows that even at the national level, agriculture is the major occupation as was the case in these research sites except for Lamatar that depends less on agriculture than Ilam and Manang.

So far we have reviewed data on the general socio-economic characteristics of CFUG member population on the three sample sites. This has shown that there are quite large differences between them, and the impact of carbon trading will obviously also vary between the CFUG which will be examined in Chapter 8 under different carbon trading scenarios.

7.3.4 Ownership of farming land

Having seen that CFUG household members are mainly dependent on the agriculture sector for employment for their primary occupation (Table 7.7), it is important to see the ownership of their farming land to better understand their agriculture based livelihood.

Table 7.8 below shows the distribution of landholdings, the most important asset in rural Nepal for self employment. In the sample population, there are 66.32% marginal and small scale farmers with land holding size <0.5 ha; at the national level only 45% of farmers own <0.5 ha (CBS, 2004b: 9).This indicates that CFUG members in these three villages mainly consist of marginal farmers that own less land than national average.

Table 7.8: Sample households' farm size distribution in percentage

Sites	N	Landless (%)	Marginal (%)	Small (%)	Medium (%)	Large (%)	Total (%)
Ilam	34	0.0	26.50	14.70	20.60	38.20	100
Lamatar	35	2.90	28.60	48.60	17.10	2.90	100
Manang	36	0.00	33.33	47.22	19.44	0.00	100
Total	105	0.97	29.48	36.84	19.05	13.70	

Note: Farm size is grouped as Marginal (<0.2 Ha), Small (0.2-0.5 Ha), Medium (0.5-1.0 Ha) and Large (1.01 Ha and above).

In the sample population, Ilam and Manang have zero landless, and Lamatar has only 2.9% landless amongst the CFUG members. As Lamatar has more opportunities for off farm employment, dependency on land is less than in Ilam and Manang where there are fewer options for employment. Ilam has a greater number of large scale farmers especially as the agricultural fields are located in the fertile plains of Jhapa district. A population of small-scale tea growers add to the larger landholding size. Manang has the highest number (33%) of marginal farmers where agriculture land is extremely limited and also infertile in the arid high altitude environment. Manang has very limited area of arable land along the river valley, the majority of the land in this area is non arable.

Hence, another characteristic of CFUG population is that they consist of rural farmers living in biomass based subsistence economy. However, what the agriculture landholding does not say is about the productivity of land. Manang has the least productive land with semi arid cold desert conditions that only grow a single crop. Whereas agriculture lands in the lower altitudes of Ilam and Lamatar are some of the most fertile agricultural lands in the country. For this reason more men migrate (Table 7.3) from Manang compared to Ilam and Lamatar where agriculture plays a more prominent role in subsistence livelihood.

Based on the education and ownership of land, it shows that CFUG members from these three case study villages, although consists of greater proportion of marginal farmers compared to national figure, CFUG members were found to be more literate than the national average. Maybe this could also be due to the reason that these CFUGs were supporting schools in their local area from the CFM revenue.

7.4 Use of Forest Products by CFUG Members

Access to and uses of forest resources in a sustainable manner are the key to CFM policy in Nepal Himalaya. If carbon management is to be added to the existing CFM, carbon market mechanisms must be seen in relation to the current benefits obtained from these forests. This section quantifies the households' dependency on fuelwood which is the most important forest product they rely on. Based on this data, in Chapter 8 gross margin analysis will be conducted to see whether the benefits from carbon trade are more than the current benefits to the CFUG households.

7.4.1 Fuelwood as a Source of Energy

According to the State of the Environment report published by MOPE (2003), fuelwood is the major source of energy accounting for 76.30% of the total energy consumption for Nepal which decreased from 80.6% in 1996 (Amatya and Shrestha 1998). In this thesis, the survey picks up data on fuelwood consumption by household as it is the main forest product harvested by all the CFUG members. In Manang timber harvesting is totally banned and is very restricted in Ilam and Lamatar. Fuelwood extraction is the major forest activity that causes deforestation and degradation of forest, and this section quantifies the fuelwood extraction rate only and does not quantify other products such as timber, NTFP, and fodder extraction which are harvested, in far lesser quantity and value, and by fewer number of CFUG members as well.

Based on our survey, the energy use data at household level is particularly important as it shows the dependency of CFUG members on forest for meeting their energy requirements. Also important from a climatic point of view, energy data shows the fuelwood consumption rate per household in relation to the biomass regeneration rate.

The data presented in Table 7.9 shows the average household consumption of fuelwood per annum based on winter and summer season. Households in Ilam in the low lands consumes the highest amount of fuelwood (3287 $kgyr^{-1}$) followed by Lamatar (3178 $kgyr^{-1}$) while households in Manang were found to consume the least fuelwood (2152 $kgyr^{-1}$).

Table 7.9: Average fuelwood consumption per household ($kgyr^{-1}$) by sites and season

	Winter season		Summer season		Both seasons total		
Sites	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**N**
Ilam	1987.57	854.17	1299.74	463.38	3287.30	1289.82	34
Lamatar	1925.94	1968.90	1251.86	1279.79	3177.79	3248.69	35
Manang	1370.20	1576.80	746.66	621.19	2116.86	2152.24	36

In the three villages, the highest consumption of fuel wood in Ilam (3287 $kgyr^{-1}$) also correlates with the highest biomass growth per ha (6.4 $tha^{-1}yr^{-1}$) from Chapter 5 and interestingly also the highest population density (6.58 persons per ha forest), where as the opposite was true for Manang which had the lowest fuelwood consumption rate (2117 $kgyr^{-1}$), lowest biomass growth (2.2 $tha^{-1}yr^{-1}$) rate and also the lowest population density (3.35 persons per ha of forest). So population is not the driving force for fuelwood consumption, but rather communities relate their fuelwood consumption to the regeneration capacity of their forest. If the biomass growth is low, one can expect fuelwood consumption from that forest to also be small because communities are driven by the incentive, primarily for fuelwood, in managing their forest in a sustainable manner as results from the three case study shows.

Table 7.10: Comparison of average fuelwood consumption by household with various case studies undertaken for the hills

Site	HH fuelwood consumption per year (tyr^{-1})	Source
Ilam	3.3	Fuelwood consumption data from the field
Lamatar	3.2	
Manang	2.1	
Case 1	2.8	Bardhan et al., 2002: 19.
Case 2	3.9	Edmonds, 2002: 93.
Case 3	2.1	The Biogas Support Programme, 2001.
	2.3	
Case 4	2.2	Gorkhaly, 1996: 6.
	2.4	
Case 5	1.0	Mahat et al., 1987.
Case 6	3.8	Bajracharya, 1983.
Case 7	3.4	FAO, 1999

The data presented in Table 7.9 was compared to other research data[25] on fuelwood consumption by households. Table 7.10 compares the data collected from this livelihood survey to fives case studies that present household level consumption of fuelwood.

Of the several cases found in various literature on fuelwood consumption for the hills of Nepal, only two case studies report higher consumption than Ilam (Case 2 and Case 6) while two other case studies report less or equal to consumption rate of Manang.

The figures on household consumption presented above must also be seen with regard to the regeneration capacity of the forests. So the figures for fuelwood harvesting from the three villages (Table 7.10) are compared in relation to the biomass growth rates for each forest as shown in Table 7.11. This is important for two reasons, firstly it tells us about the sustainable management practice and secondly from a climatic perspective about renewable bio fuel.

Table 7.11 shows the consumption of fuelwood in relation to biomass growth presented in Chapter 5. In each of the sites we find forest incremental regeneration rate after fuelwood extraction indicating incremental carbon sequestered. This makes fuelwood a renewable bio energy which is of significant importance from a climatic point of view. In this thesis, biomass survey is conducted when forest resources are extracted, the data presented in Chapter 5 is the biomass growth occurring after sustainable harvest by the local communities.

[25] Case 1 (Bardhan et al., 2002: 19) reports the consumption rate at 5.87 bhari (bundle= 40 kg) per household per month, which would measure up to 2818 kg per household per annum.

Case 2 (Edmonds, 2002: 93) finds household consuming 98.18 bhari (bundle) per household per annum which translates to 3927 kg per household per year.

Case 3 The Biogas Support Programme study (BSP, 2001) shows that fuelwood consumption ranged from 5.69 to 6.32 kg per day per household which would translate to 2071 kg to 2307 kg per household per year.

Case 4 (Gorkhaly, 1996: 6) finds that the per capita consumption of fuelwood ranged from 410 to 460 kg per year. The lower limit would translate to (with 5.3 members per household) 2173 kg per household per annum and the higher limit would translate to 2438 kg per household per year.

Case 5 (Mahat et al., 1987 in Gilmour and Fisher, 1991: 27) shows consumption of fuelwood at 198 kg per capita per year that would amount to 1049 kg per household if a household had an average size of 5.3 members.

Case 6 (Bajracharya, 1983 in Gilmour and Fisher, 1991: 27) data most closely confirms to the findings from this study. It estimates 715 kg fuelwood per capita that translates to about 3790 kg per household per year by taking the same average for the population of a household as Case 5.

Case 7 (FAO, 1999: 33) reports 640 kg per capita for the hills which will amount to 3379 kg fuelwood per annum per household.

Table 7.11: Household consumption of fuelwood in relation to biomass growth rates in community managed forests						
	Year	Total biomass per ha tha^{-1}	Biomass change per year tha^{-1}/yr^{-1}	Total biomass increment in CF tyr^{-1}	Biomass increment per household tyr^{-1}	Fuelwood consumption rate per household tyr^{-1}
Ilam	1	115.47				
(383 ha)	2	121.68	6.21			
(450 HH)	3	128.31	6.63			
Mean		121.82	6.42	2458.86	5.46	3.30
Lamatar	1	101.77				
(96 ha)	2	104.69	2.92			
(60 HH)	3	107.69	3.00			
Mean		104.71	2.96	284.16	4.74	3.20
Manang	1	61.89				
(240 ha)	2	—				
(164 HH)	3	66.24	2.18			
Mean		64.06	2.18	523.20	3.19	2.10

It is even more interesting to note that the greater the biomass growth rate, the greater was the fuelwood consumption rate. It is clear to say that the area of forest and the population density are less important than the growth rate of the forest for determining the consumption of fuelwood. So people in the warmer subtropical regions were found to harvest more from their forest than those relying on the high altitude temperate forest as biomass growth rates are higher in lower regions that are warmer. However, it must also be noted that Manang depends less on fuelwood also due to the fact that it receives subsidized fuel and other alternative technology from the tourism revenue through ACAP.

The data in Table 7.11 shows that biomass is increasing even when households continue to harvest fuelwood; this balance is met because of management practices which aim for sustainable management of resources as is explicitly stated in their Operational Plan and which also forms the objective of the CFUGs as mentioned in Chapter 6. As reported by CFUG members, there is always the danger that if forest protection measures are relaxed or harvesting criteria relaxed for even one season, these forests could easily move towards unsustainable management. The day-to-day operation of the CFUGs are an important factor in determining the balance of these forests and we have to also remember that there is no guarantee that the management will continue to maintain such levels of sustainability as depicted above after the Five-Year Operational Plan as there are no written plans beyond the Operational Plan, which is a concern from a climatic point of view. Risks from illegal loggers are also always high as reported by the CFUG members.

7.4.2 Cooking Technology Used

Clearly in the study sites, the major pressure on community forest is exerted by the energy demand for cooking. The technology used for cooking determines the amount of fuelwood a household consumes. As depicted in Table 7.12 of our sample, 97% of the households in Ilam and all the sample households in Lamatar use traditional open fireplace cook stoves or mud stoves. In Manang this scenario is opposite, all the households use improved cook stoves (including 3% use kerosene/gas stove) as improved stoves are subsidised by ACAP in the Conservation Area from the revenue collected from tourism permits.

ACAP has been involved in promoting clean alternative energy in the Conservation Area with the objective of reducing pressure on forest resources in the fragile mountain ecosystem. Solar water heaters, solar cookers, back boilers, improved cook stoves and low wattage cookers are some of the technology ACAP promotes in the region through a subsidy. Locals, that are also forest users, have to put in some of their own finances as well to acquire these. In addition ACAP has also established kerosene and gas (LPG) depot in the region through a seed grant which is now managed by the locals. Though kerosene and LPG are available at subsidised rates to the locals, they are still more expensive than in urban centres as they have to be transported on mules for over three days to reach Manang. All lodges catering to tourists have to use kerosene or gas for cooking and cannot cook on fuelwood. There are random checks carried out to the kitchen to see if fuelwood is being illegally used.

This also means that with a combination of stringent policy and subsidy, efficient fuelwood burning technology can be adopted quite easily. The low consumption of fuelwood in Manang, controlled by the low permitable extraction rate enforced by the locals to maintain sustainable management, is even more importantly supported by the technology of improved cook stoves. The household-level demand for fuelwood in Manang is 57% less than in Ilam and 52% less than in Lamatar. What this shows is that even though Manang is a special case that lies in the Conservation Area and receives subsidy for improved cook stoves, cooking technology plays an important role in reducing pressure on forest through efficient burning of fuelwood.

This data (on Table 7.12) thus supports literature which states that traditional cook stoves (open fire place and mud stoves) as those most extensively used in rural Nepal were found to have low fuel efficiency level between 10 to 15 % (ICIMOD, 1997), thus requiring excess use of fuelwood. With the adoption of improved cooking stoves, higher fuel efficiency is attained which can save between 26% to 40% of fuelwood (Sulpya, 1991 in Bajracharya and Gongal, 1998).

Table 7.12: Percentage of sampled households using various stoves by sites					
Site	**Open fireplace**	**Mud stove**	**Improved cook stove**	**Kerosene/ gas**	**Total**
Ilam	29.1	67.65	2.94	0	100
Lamatar	74.29	25.71	0	0	100
Manang	0	0	97.22	2.78	100

For a country like Nepal where over three quarters of the population relies on fuelwood for meeting their energy requirements, cooking technology plays a significant role to reduce the pressure on forest resources. This is an important area for contributing to reducing deforestation and increasing the capacity of forests as carbon sinks. There exists scope to reduce fuelwood consumption in Ilam and Lamatar by adopting improved cook stoves as in Manang.

7.4.3 Dependency on Fodder from Forest

A typical characteristic of the CFUG members is that they rear livestock to support their subsistence livelihood. Livestock rearing, agriculture and community forest are all intricately linked in subsistence economy (Gilmour and Fisher 1991: 26-27). Forest provides supplementary fodder (leaves) and bedding material. Leaves from the forest are mixed with dung to make compost which is applied as manure in agriculture fields. This research does not quantify the fodder consumption per household, but ownership of livestock can indicate the dependency on forest for fodder.

In the three sites as shown in Table 7.13, livestock is reared as an integral part of subsistence livelihoods and also one that interlinks agriculture with forest management. Lamatar has the least population of livestock per household (4.59). Lamatar does not permit grazing in community managed forests, and off-farm employment means less dependency on livestock rearing. Ilam has more livestock per household (15.67) than Lamatar and more larger animals like bullock and buffaloes that assist with agriculture system and also higher population of goats. Unlike Lamatar, Ilam has designated area for livestock grazing in community forest, but at night all livestock is kept in home stead.

Of the three villages, Manang clearly has the greatest number of livestock per household (32.79), there is a much higher population of goats (mountain goat) and yaks that are included in the other livestock category. The main reason for high livestock population ownership per household in Manang is because in the temperate climatic conditions, agriculture is limited to a single cropping season and people end up depending on livestock for meeting their food security requirements. So in order to make livestock rearing easier, in Manang there is a particular period when livestock is left in the forest for grazing. This community forest also has common corral made in the forest so that livestock can be kept there. These corrals are shared by the CFUG members rearing livestock; mainly smaller animals like goats and sheep are kept in the corrals at night. Manang also has vast tracts of range lands that lie beyond the forest area of concern in this thesis, in the mountain slopes above 4000 masl in altitude which is used as range land for livestock grazing (mountain goats, sheep, horses and yaks) during the summers. For these reason, there are more livestock per household in Manang than in the other two villages.

Table 7.13: Average number of various types of livestock per household by sites

Livestock	Ilam	Lamatar	Manang	Total
Cows	1.33	1.15	1.27	3.75
Bullocks	2.08	0.00	2.04	4.12
Calves	1.41	1.11	1.00	3.52
Buffaloes	0.00	0.00	0.00	0.00
Buffaloes calves	2.00	0.00	0.00	2.00
Goats	3.85	1.33	20.30	25.48
Sheep	0.00	0.00	1.00	1.00
Pigs	4.00	0.00	0.00	4.00
Donkey, mule/ horse	0.00	0.00	1.85	1.85
Other livestock	1.00	1.00	5.33	7.33
Total	15.67	4.59	32.79	

There is one other more obvious reason that explains the need for more livestock population per household in Manang. As there are no motorable roads, there are greater numbers of donkeys, mules and horses in Manang; in average every household has 1.85 donkey, mule or horse where as in Ilam and Lamatar there are none. So CFUG members in villages with higher livestock population such as Manang and Ilam are more dependent on forest for fodder than villages with less livestock population like Lamatar. Although we did not quantify the fodder amount collected, livestock population itself tells the dependency with forest for fodder.

Livestock dependency is important to note because under carbon trading, if fodder is banned from the forests, it could cost heavily on the subsistence economy where livestock rearing is important especially in villages like Manang and Ilam with high population of livestock per household.

7.4.4 Income from Forest Products

Having learnt about the major consumption of forest products, the livelihood survey also asked the household respondents to report on monetary income percentage from various sources so that contribution from the community managed forests could be seen in relation to other sectors. This is important for being able to compare where the return from carbon trading would stand with regard to household income.

Table 7.14 shows the income percentage from different sectors at household level including from the community forestry sector. For Ilam, over seas remittance (32%) was followed by vegetable farming (17%). Migrant labourers to Middle East and to South East Asia is an important source of income for Ilam. As Ilam also has fertile plain lands in the south bordering Jhapa and with good road network, vegetable farming is profitable when there is a huge Indian market present at the other side of the border.

Table 7.14: Income percentage distribution of household income

Main Sources	Ilam	Lamatar	Manang	Total Share
Food crop	12.6	15.6	8.7	12.3
Fruits	3	0	0.1	1
Vegetables	17.1	42.2	5.2	21.5
Livestock sales	8.1	0	1.2	3.1
Livestock products	10.9	0	0.2	3.7
Forest products	1.2	0	0.0	0.4
Land rent	0.3	0	0.2	0.2
Wage income-agriculture	1	0	0.1	0.4
Wage income-non-agriculture	7.6	42.2	1.8	17.2
Business-shop, trade	1.1	0	51.7	17.6
Remittance-Nepal	0.3	0	9.3	3.2
Remittance-Overseas	32.1	0	9.3	13.8
Others	4.7	0	12.3	5.7
Total	100	100	100	

In Lamatar it was found that vegetable farming (42%) and wage outside agriculture (42%) were major sectors for household income. Lamatar also has fertile plain agricultural lands with perennial source of irrigation and with the nearby market, vegetable farming have become a good source of income. As mentioned earlier, income from off-farm jobs are also equally important as vegetable farming. Being in Kathmandu valley, Lamatar enjoys employment opportunities unlike the rest of the country.

Manang does not have agricultural land for vegetable farming nor does it have markets for farm produce, and there exist only limited employment opportunities from tourism sector. In Manang, the main sources for income were business and trade (52%) followed by other sources (12%). Being a prime tourist destination in the Annapurna Conservation Area, people of Manang have enjoyed income from the tourism related business which is not available in Ilam and Lamatar. In the village of Manang, nearly every household is in one way or the other, linked directly or indirectly with tourism industry.

However, what we find from this result is that financial income from forest is almost non-existent. Households in Ilam claimed that income from forest products only contributed to about 1.2% of their income and for Lamatar and Manang this was nil. The CFUG members do derive a lot of benefit particularly from fuelwood extraction from the forest as quantified in Table 7.10 for their own consumption. But because all the three villages are based on subsistence economy as described in Section 7.2 of this chapter, and as fuelwood cannot be sold, locals do not regard fuelwood as an income. Benefits of fuelwood are not seen in monetary terms. Economic valuation of fuelwood consumption per household will be carried out in Chapter 8 for gross margin analysis.

7.5 Community Based Organisations (CBOs) as Social Capital

One of the assets of rural people is the ability to form community based bodies to manage their affairs or when the need arises, and such community mobilisation is regarded as an important social capital under the livelihood framework which was also described in Chapter 4 (Section 4.2.3). Although the managerial aspects were analysed through case studies in Chapter 6 based on information from focus group discussions with the CFUG members, this data from household survey compliments the managerial aspects of CFUG analysed in Chapter 6 as this is based on quantitative data. Hence this section of the data is presented as one component of the socio-economic profile of CFUG households by viewing it as a social capital, rather than presenting it in the case study analysis in Chapter 6.

There are several local level bodies in addition to CFUG in all the three sites, for example the Women/Mothers Group, Drinking Water User Group, Youth Club, and the Saving and Credit Group. These group formations are regarded as social capital, hence in this socio-economic survey, the sample households were asked of their perception on such community based organisations within their village including the CFUG into three main aspects as illustrated in Tables 7.15 to 7.17. We specifically asked the respondents to comment on the overall CBO capacity within their village rather than focussing only on CFUG because, if they were only to comment on the CFUG, the responses would directly relate to the specific members of the FUG committee members and so their answers might be biased. Getting an overall picture of the CBOs would best reflect their perception towards their CFUG as well and indeed indicate the status of their social capital.

7.5.1 Perception Toward Capacity of CBOs

In this section, the perception of households towards the capacity of their CBOs is analyzed because local perceptions can be indicative of the performance of the CBOs. As shown in Table 7.15 on the degree of participation in CBO, sample households that saw their degree of participation for making rules and regulations as moderate was highest for Lamatar (51%) followed by Ilam (47%) and least for Manang (33%). Interestingly for Manang which also has a traditional management system (mentioned in Chapter 6, Section 6.3), 22% of the household felt that degree of participation for making rules and regulations was also very low. Respondents in Lamatar reported moderate to high participation while Ilam followed but for Manang, the majority of the respondents were between moderate to very low for participation.

Table 7.15: Degree of participation: local perception towards community based organizational (CBOs) capacity						
Degree of Participation						
Making Rules & Regulations						
Sites	**Very low (<20%)**	**Low (20%-50%)**	**Moderate (50%-60%)**	**High (60%-80%)**	**Very high (80%+)**	**Total**
Ilam	11.76	20.59	47.06	20.59	0.00	100
Lamatar	0.00	25.71	51.43	22.86	0.00	100
Manang	22.22	13.89	33.33	13.89	16.67	100

In the decision making processes regarding making rules and regulations for benefit sharing and for selection of group leaders as shown in Table 7.16, in Lamatar 97%, in Ilam 65% and in Manang 47% reported as CBO decisions were made by majority rule or by voting. In Manang, an additional 19% said they didn't know the decision making process for making rules and regulation for benefit sharing nor on the selection process of group leaders. While a very high percentage of respondents claimed benefit sharing and group leader selection decisions were made by majority/voting in Lamatar, a lesser majority claimed the same for Ilam. There still exists a substantial household population of nearly a fifth in Manang that do not know the CBO decision making processes for benefit sharing and selection of group leaders which is very much consistent with the case study findings on Manang presented in Chapter 6 (Section 6.3).

When it came to assessing how accountable the group was towards its members as shown in Table 7.17, we found the same trend where Lamatar ranked the highest with 86% saying accountability was medium, followed by Ilam (65%) and then Manang (53%) which is consistent with the management system as described in Chapter 6: Lamatar with formal management, Ilam with less formal and Manang with traditional management and the least transparent.

Table 7.16: Decision making processes: local perception towards community based organizational (CBOs) capacity						
Decision making processes						
Making rules and regulations for benefit sharing						
Sites	**Don't know**	**Imposed from NGO**	**Imposed from group leader**	**Majority rules/voting**	**Consensus**	**Total**
Ilam	14.71	0.00	17.65	64.71	2.94	100
Lamatar	2.86	0.00	0.00	97.14	0.00	100
Manang	19.44	0.00	16.67	47.22	16.67	100
Selection of Group Leaders						
Sites	**Don't know**	**Imposed from NGO**	**Imposed from group leader**	**Majority rules/voting**	**Consensus**	**Total**
Ilam	11.76	0.00	20.59	64.71	2.94	100
Lamatar	2.86	0.00	0.00	97.14	0.00	100
Manang	19.44	0.00	16.67	47.22	16.67	100

Table 7.17: Accountability: local perception towards community based organizational (CBOs) capacity						
Accountability						
How accountable is your group to its members						
Sites	**Negligible**	**Low**	**Medium**	**High**	**Very high**	**Total**
Ilam	2.94	20.59	64.71	11.76	0.00	100
Lamatar	0.00	14.29	85.71	0.00	0.00	100
Manang	2.78	19.44	52.78	11.11	13.89	100
Total	1.91	18.11	67.73	7.62	4.63	

Overall in the three villages what we find from the perception of the CFUG member households towards CBO capacity is that there is a moderate level of participation with strong system of majority rule or voting practiced for decision making on benefit sharing and for the selection of group members. In terms of accountability, the majority claimed that there was a medium level of accountability shown by the group towards its members. Within each village, CBOs in Lamatar faired the best in all these three aspects, followed by Ilam and Manang and this trend was consistent throughout out the three aspects. This finding also coincides with the results of case studies presented in Chapter 6 that shows Lamatar had a better CFUG management system in place followed by Ilam and least in Manang. What is learnt from the analysis of CFUG perception towards CBOs is that CFM is an important social capital that is well coordinated and forming a social fabric in rural subsistence economy that binds the locals together. If CFM is excluded from rural livelihood, it is a loss in social capital terms.

7.6 Will Carbon Trading Have an Impact on the Livelihood?

Clearly community forestry is an integral part of subsistence livelihood (Gilmour and Fisher, 1991; Hobley, 1996; LFP, 2003) and this is the rationale communities have been managing their forest in the Nepal Himalaya without the need of revenue from carbon payment. And because communities already have a rational and motive to manage forests for fulfilling their subsistence livelihood, they are not additional in Kyoto terms and therefore fail the additionality test. But in the future with RED and or under the voluntary carbon market, mechanisms can be developed for such community managed forests to market their incremental carbon sequestered through their management interventions. Selling carbon credits, whether under the RED and/or voluntary market, will definitely have an impact at the local forest users. But what kind of an impact and how it will effect their livelihood depends on how crediting is permitted.

If carbon credit is awarded to the biomass increment after the allowance of fuelwood and timber harvesting at a sustainable rate, then the financial income generated from carbon credits becomes an added value and an added benefit to the existing community forest management. Considering that households in Ilam only make a negligible amount of financial income from forest resources and in Lamatar and Manang, community forest does not contribute to household income, income from carbon may be regarded as an added financial benefit. This will only bring benefit but of course at extra cost for carbon management, so we need to know how the net costs and benefits weigh, which will be analyzed in Chapter 8.

But on the other hand, if crediting is limited to forest where harvesting is totally prohibited, then this will add a huge social and economic burden on the existing forest users having to forgo fuelwood extraction. If they have to forgo sustainable forest resource extraction, then the very purpose of managing community forest may cease to exist. Policy on resources use will be critical under the new treaty which will determine whether the carbon market under the UNFCCC will be conducive to communities that manage forest. Whichever way carbon crediting is permitted, one major difference that exist is between how the locals value forestry from a subsistence perspective and how the polluting industrialised countries perceive it from a climatic perspective associated with the value for ton of CO_2, and this difference is going to have an impact on the decision households make on carbon trading.

7.7 Conclusion

CFUG members from the case study villages were mainly marginal farmers with above national average literacy rates; especially women members were more literate than the national average for woman. However, still a quarter of the women population (26%) in the CFUG are illiterate. It was learnt that education rates were reflected in the management style of the CFUGs as explained in Chapter 6: Lamatar with higher education rates followed by Ilam also had better management practice in place; Manang with the least education level amongst CFUG members relied on a more traditional management system.

In terms of the meeting energy requirements from the CFM, the highest fuelwood consumption per household was found in Ilam (3287 kgyr^{-1}) followed by Lamatar (3178 kgyr^{-1}) and the least in Manang (2152 kgyr^{-1}). These fuelwood extraction rates were related to biomass growth rates, higher extraction rates of Ilam also had higher biomass growth rates, the least fuelwood harvested was in Manang which had the lowest biomass growth rate, but this occurred in Manang also due to the widely adopted technology of improved cook stoves. It is due to such variations between community managed forests that nested baselines as mentioned in Chapter 3 (Section 3.7.2) becomes more relevant to account and reflect ground realities at national level baseline system.

Population density did not determine the fuelwood consumption rate, in fact the opposite occurred. Ilam with highest population density per forested area of 6.58 person per ha consumed the highest fuelwood per household (3.30 tyr^{-1}) and Manang with 3.35 persons per ha had lowest fuelwood consumption rate per household (2.10 tyr^{-1}). Again, cooking technology also played an important role in assisting to maintain sustainable management of forest resources. This was evident from Manang where 97% of the households used improved cook stoves and the reaming 3% used kerosene/gas which was as a result of ACAP subsidy from tourism revenue. In this research it is not possible to say by how much what attributes are responsible for carbon saving as it can only give an indication. However, it is now learnt that a simple regression model could have been developed to see what variables are actually responsible and by how much for carbon saving.

Excluding fueldwood consumption, financial income from community forest was negligible; it made up 1.2% of household income in Ilam and did not contribute anything in Lamatar and Manang. This is because benefits derived from CFM are not weighted in monetary terms, but it is understood that CFM has a high social benefit mainly from supplying fuelwood. This needs to be valued in the next chapter to better weigh the value of economic benefit from CFM which can then be compared with the potential monetary benefit from carbon revenue.

In viewing CBOs from a social capital perspective, it is evident that the concept of community based user groups as social capital is well institutionalised within the village as shown by the higher degree of participation and decision making and accountability perceived by the members. In all aspects, CBOs are an important social asset forming a necessary social fabric in mobilizing the local people together. In terms of the capacity of the CBOs, Lamatar faired better than the other two villages as participation, decision making and accountability were higher in Lamatar as they also had higher literacy and education rates than in Ilam and in Manang.

Any attempt to engage community forest in carbon trading will affect the forest users because CFUG members are dependent on forest resources. As mentioned earlier in Chapter 3 (Section 3.7), though the COP 13 decision on RED (2/CP13) explicitly states the policy must recognize the needs of local and indigenous communities when action is taken to reduce emissions from deforestation and forest degradation in developing countries, it does not explicitly state whether sustainable resource harvest will be permitted. This is an important policy in the interest of CFM because CFUG members are local indigenous people that rely on forest resources for meeting their sustenance needs and any decision on access to resource use in the future treaty will have an effect on their livelihood. How households will be affected and at what price, is calculated in terms of gross margin analysis with sensitivity analysis under different scenarios in Chapter 8. It is clear that in order for CFUGs to see benefit from carbon market, carbon management must be able to bring more benefit than the households are currently deriving from CFM as illustrated in this chapter.

Chapter 8

The Cost of Carbon Sequestration under Community Forest Management

8.0 Introduction

Biological sequestration of carbon was quantified in Chapter 5 and the management regime in each site was explained in Chapter 6. In Chapter 7 we identified the implication of CFM for sustenance requirements. From these three chapters we learnt that community forests, when managed in a sustainable way for subsistence purposes, were also sequestrating carbon while meeting the sustenance needs of the villagers. The purpose of this Chapter is to answer whether carbon trading will be attractive economic incentive to CFUG members that are already managing their forest.

This chapter sets out to estimate the cost of carbon sequestration based on the sequestration rates measured in the field as reported in Chapter 5. It starts by analyzing the cost of reducing carbon from other projects globally as sited in various literatures such that it can be compared to the CFM abatement cost from Nepal Himalaya. It then explains the type of baseline used in this thesis for estimating the credit and then explains how different scenarios were created to conduct gross margin analysis so that the break even price of carbon offset for each site is estimated and net benefit under different scenarios are know. For participating profitably in carbon trading, the net gains must be above what the CFUGs have been currently deriving and so this chapter analyses whether the net gain under carbon trading is attractive or not.

This Chapter weighs the benefit of forest management and carbon measurement under different management scenarios by selling carbon credits at a very conservative price (at \$ 1 and \$ 5 per tCO_2)[26], thus finding whether carbon trading could be more profitable to local communities than their current management, and if so, under what conditions, as there is an incremental cost in managing forest for carbon, and cost for marketing carbon credits. The

[26] There is great deal of uncertainty on the price of CER which are traded for between \$23 to \$25.5 per tCO_2 in May 2008 in the energy sector. This thesis takes the prices of \$ 1 and \$ 5 per tCO_2 to conduct sensitivity analysis to maintain conservative estimates.

underlying consideration is that if this trade appears to be more beneficial than the current benefits derived from CFM to local communities, then there may be scope for CFUGs to participate in the global carbon market under the UNFCCC in the post Kyoto treaty. In future, if forest management becomes an allowable strategy for carbon crediting in the post Kyoto era under RED, it will be important to know the incentive of producing CERs from CFM.

To obtain this kind of accounting, we first have to develop a reference scenario also known as baseline in CDM terminology. It must be realised that the case studies in this research are not additional in CDM terms as CFM already existed from before. In this thesis, for each site, the first measurement in 2004 established the reference point from where the estimate for carbon credit started. Under the proposed RED policy, the baseline scenario will be at a national level negotiated for the country and additionality will not be a problem anymore. For this research it was not possible to compute a national-level baseline scenario for community managed forests in Nepal Himalaya as the RED policy is still under discussion.

It must be noted that all the figures presented in this chapter are estimates to indicate the margin of benefits by valuing the non-monetary costs and benefits based on the calculations shown on Appendix 1 to 3.3 expressed in US$ (1 US $ ≅ NRs. 69). All figures presented in the text are only estimates of margins of benefits and costs rather than exact figures and are rounded up to one dollar, so they will be different to the exact figures presented in the appendix. However, the breakeven prices per ton CO_2 are given to two decimal places in cents as these rates consist of smaller numerical value.

8.1 The Cost for Reducing Carbon

There are a growing number of researches that show the cost of reducing carbon globally which is discussed in this section so that it can be compared with the cost of carbon reduction from CFM based on the field work from this thesis.

The global cost for reducing a tonne of carbon varies and it depends on the method of calculation. There are two ways to calculate this cost as suggested by Pearce (2003: 481). One way is to calculate the cost of offsetting by substituting a non-carbon fuel for a carbon fuel, this cost is also known as abatement cost. The second way of estimating the cost for carbon reduction is by calculating the damage avoided, this cost is also known as adaptation cost or control cost.

CDM projects are offset projects (i.e. carbon reducing projects) which offset carbon by promoting carbon saving technology. Afforestation, reforestation and community forests are also projects that offset carbon. The cost of CDM projects are the cost of offset. Whereas, the avoided damage cost takes into account the cost saved by avoiding the damage that would be inflicted. Damage costs are a measure of society's loss of wellbeing resulting from the damage arising from a specific adverse climatic impact.

8.1.1 Offsetting Cost

Emission reduction from reduced deforestation could be one of the least cost solutions (Stern, 2007). The Stern Review (Stern, 2007) analyzed eight studies from the tropics and estimated the value for stemming deforestation under $ 2/ tCO_2 as cited by Skutsch *et al.,* (2007) for 65% of the world's forest. In another estimate, the IPCC 2007 estimated that reductions could be achieved at less than or equal to US $ 20 per tCO_2 with large variation between regions to stabilize atmospheric concentration of CO_2 at 450 ppm (Nabuurs *et al.*, 2007: 543).

Van Kooten *et al.,* (2004) undertook a study based on meta regression analysis to examine 55 studies that reports on the cost for creating carbon offset forestry projects from tropical to non tropical forests as shown below in Table 8.1.

Table 8.1: The cost for creating carbon offset forestry project

Activity	Cost per tCO_2	Estimate	
Forest conservation		12.71	70.99
Tree planting	cost increases by	257%	297%
Agroforestry	cost increases by		261%
If biomass is used to substitute fossil fuel	cost reduced by		50%
If opportunity cost of land is accounted for	cost increases by US$	12.27	>354.55
Source: Adopted from van Kooten et al., 2004.			

Interestingly van Kooten *et al.,* (2004: 246) find planting of forest (afforestation and reforestation) 257-297% more expensive compared to forest conservation (i.e. avoiding deforestation) and agroforestry 261% more expensive than conservation. In line with the findings of van Kooten *et al.,* (2004: 247) which established that if biomass is used to substitute fossil fuel in energy production, the cost of carbon reduction may lower by a half, this thesis needs to explore this option as CFUG members rely on fuelwood use as mentioned in Chapter 7 (Section 7.4.1). They argue, as do Kinsman and Trexler (1993), in favour of biomass fuels as a long-term strategy for reducing fossil fuel emission in an efficient manner. And in the context of CFM, this needs to be analyzed as it could lead to a cheap solution in abatement cost as biomass is used as fuel. The cost of carbon uptake in forestry projects are greatly determined by the substitution for fossil fuel by fuelwood. With these insights provided by various researches on the range of cost of offset, gross margin analysis with and without fuelwood usage needs to be conducted to see how the fuelwood usage effects the cost of carbon sequestration.

According to the study by van Kooten *et al.,* (2004: 248), there is another important factor that determines the cost per tCO_2 which is the opportunity cost of land. When opportunity cost is taken into account, the price of tCO_2 increases by

$ 12.27 to more than $ 354.55. These costs are derived from case studies spanning tropical to non-tropical areas covering 55 different case studies. But based on this thesis, for the Nepal Himalaya case, the opportunity cost is not problematic as community managed forests exists in marginal land which are on slopes of mountains. This should assist in making the cost of sequestration cheap and competitive in the Nepal Himalaya region.

8.1.2 Cost of Damage

A study by Tol, (2005: 2071) analyzes the cost of marginal damage by CO_2 emission based on 28 published studies containing 103 estimates. This study concludes that though climate change impacts are highly uncertain, and that costs are different across countries, the mean of the cost of damage of all the studies shows $ 93 tC which is equivalent to $ 341 tCO_2 and for peer-reviewed literature it was $ 50 tC ($ 13.64 tCO_2). If these portray a real estimate on the cost of damage inflicted by a tonne of CO_2; then removing this through the forestry sector needs to be estimated in this thesis as CFM may result in comparatively cheap option compared to the cost of damage.

While commenting on the costs and benefits of taking action on climate change, it is necessary to review the findings of the Stern Review (2007) as it is considered the most extensive international review on the economics of problem of climate change (Grub, 2006: 507). The Review (Stern, 2007) values the cost of damage from the business as usual scenario at $ 85 per tCO_2, and says this cost is well over the marginal abatement cost in many sectors. But when the climatic stabilization target is fixed at 450 – 550 ppm CO_2 equivalent, the non-monetary cost of carbon would be between $ 25-30 tonne of CO_2, a third of the business as usual scenario. It also views curbing deforestation as a highly cost-effective way to reduce emissions and a globally least cost solution as well. Another study by Hope (2006) also looks at the marginal impacts of CO_2 and other GHG gases. It uses the PAGE2002 model based on Scenario A2 of the IPCC (IPCC, 2001: 64). It estimates the mean value of CO_2 at about $ 5 per tonne which is considerably lower than other rates mentioned before.

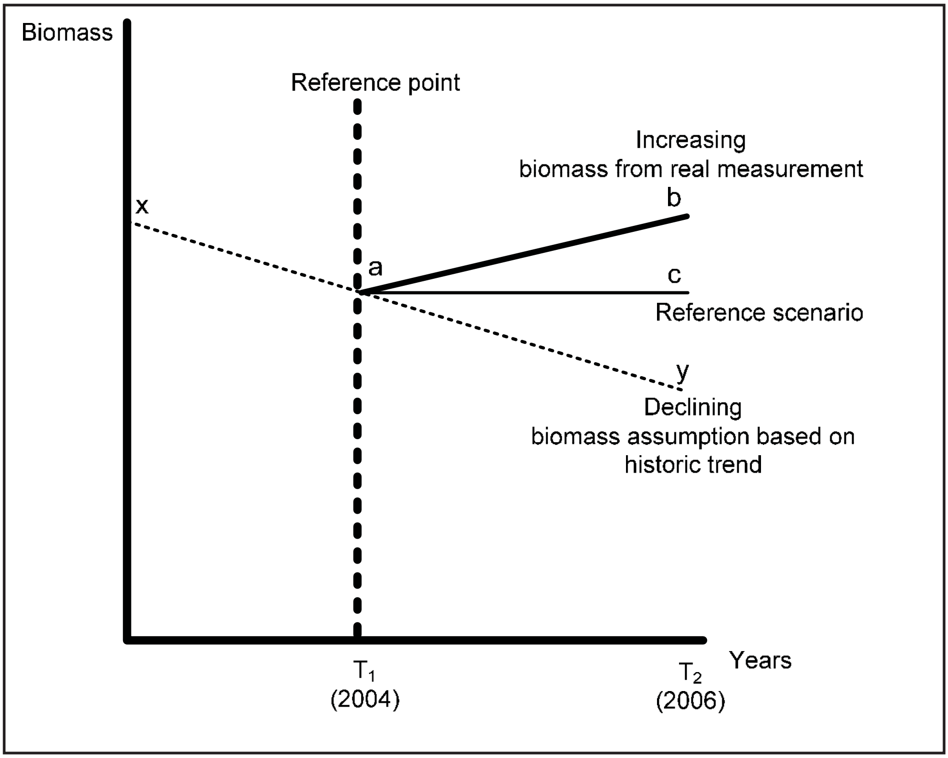
In the following sections, the cost of abatement from CFM will be estimated so that it can be compared with the cost of offsetting and avoided damage from other projects as discussed above. As communities are already managing their forests, what additional benefits will carbon trading accrue to the CFUGs is the key question that will determine whether carbon trading will take place as the benefits must be more than what they are currently getting out of CFM. This will enable to establish where CFM will potentially stand with regard to other projects.

8.2 Setting the Baseline for C Measurement

Before conducting the gross margin analysis, this section explains how baseline is measured in this thesis. CDM afforestation/reforestation projects start from barren/degraded land with no forest cover since 1990 as explained in Chapter 3 (Section 3.4). So in principle the baseline is barren/degraded land and all biomass growth is considered additional and is therefore credited. But when dealing with management of an existing forest, baselines become more complex and there is no standard methodology as some form of forest already exists.

The case studies in this thesis are about managing existing forests managed by community. In an existing forest, there are two components while measuring carbon; 1) the increased carbon stock resulting from forest enhancement (i.e. recognizing forest as sinks) and 2) the avoided emission from carbon stock due to stemming deforestation and forest degradation (i.e. recognizing forest as sources). Graph 8.1 shows the two different components of carbon measurement.

As illustrated in Graph 8.1, with regard to the first component, line ab shows the real increment trend in biomass measured between 2004 and 2006. This thesis takes the first measurement in 2004 as its reference point. Any point above line ac represents enhanced carbon stock as shown by triangle cab. This measurement only accounts for the increased carbon stock relative to what was found in 2004. In other words this is the rate of biomass growth.



Graph 8.1: Drawing baseline for community managed forests.

The second component takes into account the avoided emission from stemming deforestation and degradation. Here it is assumed that line xy shows the business as usual scenario with declining biomass. The assumption is that there were no management interventions in time T_1 and so the forest continued to lose biomass. When there is an intervention at T_1, then biomass starts increasing shown by line ab, reversing the declining trend of line ay. From this method, the avoided emission from carbon stock due to stemming deforestation and forest degradation is represented by triangle yac. Under this method, only emission avoided (triangle yac) is credited and not the incremental part as used in this thesis. The field measurements taken in this thesis refer only to forest enhancement (first component).

There are three reasons why this thesis did not use the second method of estimation.

1. Firstly, there are no data to determine the local historic deforestation trends (line xa) in each site and from it to be able to predict what would be the situation without CFM intervention (i.e. extending the line xa to ay).
2. Secondly, there is uncertainty and difficulty in establishing the reference point. CFM management stared at different points of time in the different sites (as explained in Chapter 6). For simplicity, T_1 (reference point) represents 2004 because that was the year when measurements started for this thesis. Increasing biomass trend could have started earlier, we do not know exactly when since management had already begun before this.
3. Under the current CDM practice, only incremental carbon is accounted, and that is why this thesis tries to follow the CDM procedures as much as possible. The proposed policy under RED may account for avoided deforestation by recognizing forests as sinks, but again there is no agreement yet on the baseline and the standard methodology for accounting, thus we cannot speculate.

Since all the forests in the area of the three case studies are under management already, there is no control site available were measurements of deforestation/ degradation rates could be made. These areas have been under management for at least over a decade, and data on loss rates before that is simply not available. In Nepal Himalaya region, all forests in the vicinity of settlements are under community management; control sites were therefore not available for comparison either. Therefore for this research, only the first of these two components have been considered where the annual biomass growth for crediting purpose is only accounted and not the entire pool.

The graph above is based on the concept of national level baseline under the proposed RED model which in reality will be a negotiated average for the country. For practical purposes in this thesis, a reference scenario is adopted for each site individually in the first year of measurement and any annual change in biomass above this point is accounted for measurement. If and when RED is implemented, then each CFUG will have to compare their biomass relative to the national baselines and will not have such project specific baselines as used by the CDM and also as used in this thesis.

The baseline constructed in this thesis presents a conservative estimate of carbon sequestration rate as only the increment is accounted. In reality, the carbon gains are considerably more than what is measured in this thesis because it only accounts for triangle cab (incremental from year 2004) when triangle yac is also emission reduced. Each community forest has its own sequestration rate dependent on the rate of biomass growth and rate of forest resources extracted. Forests nearing their maximum carbon capacity will have a smaller marginal increment rate of biomass growth than juvenile forests. The overall size of carbon pool will of course be greater in forests reaching their maximum biomass level, but the baseline does not take into account the size of the pool because it is only accounting for the incremental change. The next section gives the details on how three different scenarios were analyzed in this thesis for estimating the cost of carbon offset credits.

8.3 Creating Different Scenarios to find Marginal Benefits for Carbon Management

In order to understand what the benefit of carbon management would be, there is a need to compare forest management as it is being currently undertaken with carbon management. To estimate the cost of carbon sequestration in forested land, three different scenarios were established so that the marginal benefits could be analysed for different scenarios; these three scenarios try to capture every possible way these forests could be utilized for carbon offset projects.

These three scenarios are listed in Box 8.1. **Scenario 1** is 'business as usual' in which communities continue to manage their forest with the objective of meeting their subsistence needs without receiving any payment for carbon. The benefits derived are harvesting of fuelwood, fodder, timber and NTFP while the costs include labour, day-to-day-management and operation cost, and forest protection work.

Scenario 2 is the addition of carbon management to Scenario 1. Communities continue to meet their sustenance needs from the forest by harvesting forest resources and at the same time sell credits for what remains (sequestered) after meeting their sustenance needs. Since forest biomass estimations were conducted when the forest was being managed and harvested as usual, carbon sequestration rates estimated were net after timber and fuelwood extraction. In this scenario, additional benefits include carbon revenue derived from forest at rates \$ 1 and \$ 5 per tonne CO_2. For this, additional costs incur. Additional costs for carbon management include carbon measurement (forest survey), prepare project proposal, marketing of credits, adopt formal management, and employ more forest guards, which as was shown in Chapter 6 were typical costs that would be incurred for carbon management. These are shown in Box 8.1 as benefits and costs under Scenario 2.

Box 8.1: The cost of adding carbon in forest management

	Scenario 1	Scenario 2	Scenario 3
Benefits	Fuelwood	Fuelwood	
	Fodder	Fodder	
	Timber	Timber	
	NTFP	NTFP	
		Carbon revenue	Carbon revenue
Costs	Labour	Labour	Labour
	Management	Management	Management
	Forest protection	Forest protection	Forest protection
		Carbon measurement	Carbon measurement
		Prepare project proposal	Prepare project proposal
		Marketing carbon credits	Marketing carbon credits
		Formal management	Formal management
		Forest guards	Forest guards
			Fuelwood (foregone)
			Fodder (foregone)
			Timber (foregone)
			NTFP (foregone)

Scenario 3 reflects the case of forest managed solely for carbon sequestration, in which extraction of forest resources are not permitted. Under this scenario, the annual fuelwood consumption rate estimated from the socio-economic survey is converted to carbon credits as fuelwood extraction is not permitted. Under Scenario 3, the benefits enjoyed under Scenario 1 and 2 from using fuelwood, fodder, timber and NTFPs become additional cost as their usage are foregone as depicted in box 1. The forest is only used for sequestrating carbon.

8.4 Valuing Benefits and Costs to Local Communities

As shown above in Box 8.1, benefits and costs are only estimated for direct use values, which are outputs that are directly used by the locals and easily valued; other indirect use values and option values and other non-use values are not included in the valuation as this is not a total economic valuation of a forest but only a gross margin analysis under change management scenarios.
The benefits and costs are calculated from direct use values of forest resources

consumed by the local people. Where the use values are traded in money, monetary values are given (e.g. for timber); where the values are not traded in monetary terms directly, non-monetary values are given (e.g. for voluntary labour) and then converted to their economic values. Economic values for non-monetary transactions were estimated in consultation with the local CFUG members and where possible, national average wage rates were used to reflect the real market value. Hence, costs and gains depict both types of transactions: monetary and non-monetary.

The details for the computations of gross margin analysis are shown in **Appendix 1, Appendix 2** and **Appendix 3.** Appendix 1 shows the headings for costs and benefits in terms of monetary and non-monetary values. These rates are then computed for over a five-year project cycle. Appendix 2 shows biomass growth rate and CO_2 sequestration rates for each site over a fiver year period and estimates the carbon revenue under of $ 1 and $ 5 per tonne CO_2. It also shows the total carbon sequestration in the forest under Scenario 3 when fuelwood harvesting is banned by converting fuelwood saved into carbon credits. Appendix 3 shows the result of gross margin analysis indicated by the monetary and non-monetary net gains for each village under the three different scenarios presented in 12 tables labelled A to L. The positive net gain in each table depicts net profit while negative net gain depicts loss.

8.5 Gross Margin Analysis of Benefits to Local Communities

Based on real time data from the financial record of CFUGs and biomass of forest from a survey conducted over three years, gross margin analysis was conducted over a five-year period, representing one commitment period under the current CDM project cycle. Estimation for the fourth and fifth year was done in consultation with the CFUG members based on their expectation of the output of their sustainable management practices.

8.5.1 Net Benefit for Ilam

Ilam Scenario 1 'Business as Usual'
In Table A, we see the benefits after costs are deducted in terms of monetary and non-monetary values in managing community forest as described here under Scenario 1 which represents 'business as usual' case for Ilam. Carbon trading is not considered and consequently benefits and costs associated with carbon trading are not included.

The figures shown in Table A, suggests that communities managing forest derive more non-monetary benefits than monetary benefits; monetary gain is less (about half of the non-monetary gains). In a subsistence economy, community managed forests play a vital role in providing sustenance needs to the local households where many of these benefits consumed by households are not valued in monetary terms. In this site, the CFUG derive non-monetary benefits valued at $ 37,175 per annum while the monetary income is $ 20,481 only.

At a household level, the value of net non-monetary gain per annum is $ 83 per household and monetary gain is $ 46; hence households' total net gain stands at $ 128 per annum. This high value of net gain as returns from managing forests is one important non-monetary rational for community members to manage their forest. Communities see this net gain as an incentive to manage and conserve their forest in a sustainable manner to meet their subsistence requirements.

Ilam Scenario 2 with Trading at $ 1 and $ 5 rates

In Table B, Scenario 2 is presented that shows carbon trading taking place in community forest at two different prices, at $ 1 and $5 per tonne CO_2. Under this scenario, CFUG members are permitted to extract forest products as they would under Scenario 1 ('business as usual', as they have been doing currently) in addition to selling carbon credits for the amount of carbon the forest sequesters annually. Hence in this scenario, the additional costs are those associated with managing carbon, while the additional benefit includes revenue from sale of carbon credits.

This shows that when carbon trading is introduced into community forest management, there is a rise in cost, but this is quickly offset by the revenue. When carbon credits are marketed at $ 1 per tCO_2, monetary gain for the CFUG is over $ 22,446 and at $ 5 rate, the monetary gain jumps to over $ 40,207; these figures are net figures after deducting the cost of managing carbon. The break even price per tCO_2 under this scenario is $ 0.55. The non-monetary gain remains the same under $ 1 rate and $ 5 rate for tCO_2.

At household level, the net benefit (monetary and non-monetary) stands at $ 172 per household per annum at $ 5 rate. For the perspective of the local CFUGs, this is the most favourable scenario for the local community as they get monetary reward in addition to the non-monetary benefits they have been already deriving by using the forest resources to meet their sustenance needs which have a very high non-monetary value.

Ilam Scenario 3 Trading without Extraction of Fuelwood

We also consider a scenario in which the forest resources are not permitted to be harvested. The Table C shows Scenario 3 with returns from carbon trading when forest resources are not permitted to be used. From the investors' perspective, it might be preferable to ban all uses of forest other than carbon management, partly to increase the carbon output and partly to minimise risks of loss (by deforestation, forest degradation, illegal logging and fire) by keeping people out of the forest. Under this scenario, however a large quantity of forest resources use for their subsistence needs is foregone by the villagers.

In this scenario, the foregone fuelwood and timber harvest are thus converted to CO_2 and added to carbon credit. The fuelwood and timber not used are also valued and accounted as non-monetary cost of not having to use them. The household level socio-economic survey established shown on Chapter 7 (Section 7.4.1) that, fuelwood consumption per household was 3.3 t per household per annum in Ilam which is converted to tCO_2 and accounted as additional carbon sequestered by forest.

When forest resources are not permitted to be harvested, the monetary loss incurred from forgoing the sales of surplus forest products is always there, but the greater portion of lose comes from forgoing non-monetary benefit which amounts to net loss. At $ 1 rate per tCO_2, there are both monetary (-$ 14,398) and non-monetary (-$ 48,970) losses. At this rate, households end up loosing -$ 141 per annum.

When the rate increases to $ 5 rate per tCO_2, the net monetary gain is turned around and positive ($ 14,102). But the communities face huge non-monetary losses (-$ 48,970) from forgoing subsistence use of fuelwood, it makes the net gain negative (-$ 34,869). Hence households end up loosing approximately -$ 77 per annum under Scenario 3 even when the price of CO_2 is at $ 5 per tonne. Because under this scenario, the break even price is as high as $ 8.95/tCO_2.

8.5.2 Net Benefit for Lamatar

Lamatar Scenario 1 'Business as Usual'
Table D representing Scenario 1 shows the gross margin in a community managed forest as it is being managed currently ('business as usual') for Lamatar. We find that monetary gain is relatively small; 13% of non-monetary gain. The CFUG gained $ 498 as monetary gain and $ 3,792 as non-monetary gain, which translates to net gain at household level of $ 72 per annum. This is the economic incentive for the community in managing and conserving their forest in Lamatar.

Lamatar Scenario 2 with Trading at $ 1 and $ 5 rates
In Table E, Scenario 2 is presented showing carbon trading taking place in community forest management at two different prices, $ 1 and $ 5, per tonne CO_2 under 'business as usual' scenario with extraction of forest products.

Under this scenario, the monetary gain under the $ 1 rate per tCO_2 is negative because there is not sufficient cash in this CFUG to cover for the additional cost incurred for carbon management. When carbon is managed, the management cost increases which incur additional monetary cost. This means usually the cash starved Lamatar CFUGs require more upfront finance as in the first year monetary cost increases when carbon management is added. But also because they benefit less under this scenario at $ 1 rate ($ 12,673) compared to 'business as usual' scenario ($ 13,919) due to additional cost of carbon management, there is no economic rational to take part in carbon trading.

When carbon is traded at $ 1 rate per tCO_2, the net monetary gain per annum is always negative as there is more monetary expenditure than income from carbon revenue; and so there is monetary loss every year. At this rate, although the net non-monetary gain can offset the monetary losses, where the CFUG has a net gain of $ 2,902 per annum and at household level this translates to new lower gain (compared to Scenario 1) of $ 48 per annum. At this rate there is also simply no cash to start this business. Community will not start this business as they were better off without carbon trading.

But at $ 5 rate for tCO_2, things look different as the whole business scenario is turned around as monetary income increases; the CFUG has a monetary gain of $ 1,168 with non-monetary gain remaining the same ($ 3,972). This means the CFUG has a net benefit of near $ 4,956 per annum which translates to $ 83 as net gain per household per annum. Under this scenario, the break even price is $ 3.7/tCO_2.

Lamatar Scenario 3 Trading without Extraction of Fuelwood
Table F shows Scenario 3 with returns from carbon trading when forest resources are not permitted to be used. Under this scenario, a large quantity of forest resources is foregone by the villagers. As shown by household level socio-economic survey in Chapter 7 (Section 7.4.1), fuelwood consumption per household was 3.2 t per household per annum which for Lamatar is converted to tCO_2 and accounted as additional carbon sequestered by forest.

In this scenario, under US$ 1 per tonne CO_2, there is a continuous monetary loss of -$ 2,142. More importantly, with the restriction on forest resources use, the net non-monetary loss is valued at - $ 12,961. With both monetary and non-monetary losses, the net gain is a whooping loss of - $ 15,103. At household level, this loss is valued at -$ 252 per annum.

At the rate of $ 5 per tCO_2, the monetary gain is positive with nearly $ 1297 income annually, but the non-monetary loss is huge (-$ 12961), net gain to the CFUG is still negative at -$ 11,664 per annum which translates to -$ 194 per household as net loss because the break even price under this scenario is $ 17.44/tCO_2.

8.5.3 Net Benefit for Manang

Manang Scenario 1 'Business as Usual'
As shown in Table G, under the business as usual scenario for Manang, there is more monetary gain than non-monetary gain. Non-monetary gain ($ 3,462) is only a third of the monetary gain ($ 10,458). There are two reasons for this. Firstly, because the community managed forest lies inside a conservation area, hence it receives a financial subsidy from the tourism revenue through the government supported ACAP as described in Chapter 6 (Section 6.4.8), making the monetary income greater than the non-monetary gains. Secondly, in Manang,

there is a restriction in timber harvest and the limitation on fuelwood collection as well which is supported by making available various alternative energy technologies through ACAP subsidy; these contribute to suppressing the value of non-monetary gains by reducing to some extent the use of fuelwood.

Under this scenario, net gain to the community is \$ 13,919 which when divided at household level translates to net gain of \$ 85 per household. Of this, \$ 64 is derived from monetary gain (which mainly comes from government subsidy) and \$ 21 per household per annum from non-monetary gain. This is the non-monetary incentive for the people of Manang in managing and conserving their forest.

Manang Scenario 2 with Trading at \$ 1 and \$ 5 rates

In Table H, Scenario 2 is presented showing carbon trading taking place in community forest management at two different prices, \$ 1 and \$ 5, per tonne CO_2 under 'business as usual' scenario with extraction of forest products.

Under this scenario, there is both net monetary and non-monetary gain as communities continue to harvest fuelwood and also market carbon credits. At \$ 1 rate, the CFUG receives a net gain valued at \$ 12,673 which at household level translates to \$ 77 per annum. However, these gains are lesser than 'business as usual' scenario where net gain was valued at \$ 13,919 which at household levels translates to \$ 85; hence carbon trading under Scenario 2 at \$ 1 rate per tCO_2 provides no benefit.

At \$ 5 rate, the net gain increases to \$ 16,734 for the CFUG and at household levels, it touches \$ 102 per annum. This is a highly favourable condition for carbon trading business for the locals as under this scenario, the break even price is \$ 2.3/tCO_2.

Manang Scenario 3 Trading without Extraction of Fuelwood

Table I shows Scenario 3 with returns from carbon trading when forest resources are not permitted to be used. Under this Scenario 3, a large quantity of forest resources is foregone by the villagers. A household level socio-economic survey established that, fuelwood consumption per household was 2.10 t per household per annum in Manang which is converted to tCO_2 and accounted as additional carbon sequestered by forest.

In this scenario, under US\$ 1 per tonne CO_2, there is a continuous non-monetary loss of -\$ 26,920 resulting from restriction on forest resources use. At this rate, the net benefit to the CFUG is -\$ 20,302 which at household level translates to -\$ 124 per annum.

Even at the rate of \$ 5 per tCO_2, the monetary gain is greater but not quite sufficient to cover the non-monetary losses. The monetary subsidy from tourism revenue through ACAP is not sufficient to cover this non-monetary loss. Hence the net gain is valued at -\$ 14,042 which at household levels is approximately -\$ 86 per household per annum because under this scenario, the break even price is $ 12.78/tCO_2.

8.6 Summarizing the Three Sites under Different Scenarios

Based on the findings shown above, we now compare the net benefit gained for each site under different scenarios at CFUG level and at household level.

As Table J shows, under Scenario 1 with current management or 'business as usual', CFUG in Ilam gain the most at CFUG level ($ 57,656) and also at household level ($ 128). The CFUG in Manang ($ 13,919) gain more than Lamatar CFUG ($ 4,290) from managing and conserving their forest, and the trend is the same at household level, in Manang households derive $ 85 per annum where as in Lamatar it is about $ 72. These figures estimate the value derived from managing and conserving mountain forests by the communities for fulfilling their sustenance needs; from these values we can say a typical household derives the value ranging from $ 85 to $ 128 from managing the forests. And they are largely dependent on the size of the forest. The importance of these statistics is that they provide a benchmark. To participate profitably in carbon trading, the returns must be above what they have been currently deriving (Scenario 1).

Table K shows the gains at CFUG and household levels for each site under Scenario 2. Under this scenario, the forest inventory and carbon assessment costs are included which is $ 3 ha^{-1} for the first year and then $ 2 ha^{-1} per annum from the second year onwards; while marketing costs are levied at 1.5% of carbon revenue.

When the rate for tCO_2 is $ 1, net gain in Ilam increases compared to Scenario 1, but for Lamatar and Manang, net gain reduces (from $ 4,290 to $ 2,903 and from $ 13,919 to $ 12,673 respectively) compared to Scenario 1 for each site. This indicates that at $ 1, the cost for managing carbon is more than the monetary gain. This effect is more noticeable in Lamatar, since it has a smaller forest, and its cash flow is small. Manang is better off under 'business as usual' than to participate in carbon trading. Because the break even price for tCO_2 under this scenario for Ilam is $ 0.55, Lamatar is $ 3.7 and Manang is $ 2.3, only Ilam can operate at $ 1 tCO_2 rate; which reiterates the impact of the size of the forest. The larger the forest, less the cost due to economies of scale.

Table L shows the gains at CFUG and household levels for each site under Scenario 3, i.e. when forest resources are not harvested for consumption but converted to CO_2 credits. In this scenario, the loss from not being able to use forest resources is so high in non-monetary terms that any additional carbon revenue even at $ 5 rate is not sufficient to make the net gains profitable. Larger forested areas like Ilam loose more from forgoing greater volume of fuelwood use for subsistence needs. Consequently, Ilam has a net gain of -$ 34,869, Lamatar -$ 11,664 and Manang -$ 14,042. At the household level, Ilam looses -$ 77, Lamatar -$ 194 and Manang -$ 86. Hence, the larger the forest area, the bigger the loss adds up to from forgone use of fuelwood. Therefore, under such scenario, it is highly unlikely for carbon trading to occur as the break even price for tCO_2 is very high; for Ilam it is $ 8.95, for Lamatar $ 17.44, and for Manang $ 12.78. .

8.7 Results of Net Benefits from Gross Margin Analysis

Before drawing the conclusion on computing the net benefits for the sites under different scenarios, it is important to note the variance of factors between the sites. As illustrated below in Table 8.2, various factors such as forest area, biomass growth rate, population pressure and fuelwood consumption rates between the three sites differ and it is due to these differences that there are differences in net benefits as shown in Tables J, K and L. The break even price of CO_2 is also crucial.

Table 8.2: Value of net benefit derived from CFM and break even prices for CO_2 credits under Scenarios 2 and 3

Site	Biomass growth per ha	Household per ha	Fuelwood consumption per household	Value of benefit derived from CFM Scenario 1	Break even price for tCO_2 under Scenario 2	Break even price for tCO_2 under Scenario 3
	$tha^{-1}yr^{-1}$	$hh\ ha^{-1}$	$thh^{-1}yr^{-}1$	$\$hh^{-1}yr^{-1}$	$\$/tCO_2$	$\$/tCO_2$
Ilam (383 ha)	6.42	0.85	3.3	128	0.55	8.95
Lamatar (96 ha)	2.96	1.60	3.2	72	3.7	17.44
Manang (240 ha)	2.18	1.46	2.1	85	2.3	12.78

Taking the example of Ilam (from Table 8.2 above), we find that the largest forest (383 ha) yields more benefit ($ 128 per hh) even with the highest population pressure (0.85 hh/ha forest) consuming the highest quantity of fuelwood (3.2 t/hh/yr). And Ilam also has the lowest break even price for tCO_2 ($ 0.55) compared to other sites. From this Table we find that area of forest is a major factor that determines: 1) the level of net benefit in managing the forest and 2) break even price of tCO_2.

In addition, when dealing with CFM and carbon trading, it is important to keep in mind that benefit and cost levels vary because of the many differences between the sites, and not least the altitude and the management practices mentioned in Chapter 5 which also affect these levels of benefit and cost.

From this analysis under three scenarios it is found that:

- Scenario 1: CFUGs derive greater non-monetary benefits than monetary benefits from managing community forests; and these benefits are the economic rationale for them to manage and conserve their forest as is being currently done.
- Scenario 2: When CFUGs are permitted to use forest resources and market additional carbon sequestrated, at \$ 1 per tCO_2, this rate will not be sufficient for some CFUGs like Lamatar and Manang due to their relative smaller area of forest to cover their upfront cost for managing carbon, but at \$ 5 rate per tCO_2, all CFUGs were found to make profits. Under Scenario 2, the break even price for tCO_2 is \$ 0.55 for Ilam, for Lamatar it is \$ 3.7, and for Manang it is \$ 2.3.
- Scenario 3: As the non-monetary benefits from use of fuelwood are very high compared to monetary income for CFUG, banning the use of forest resources has a huge cost, which even the carbon revenue at \$ 5 rate cannot cover as break even prices for tCO_2 under Scenario 3 are for Ilam \$ 8.95, Lamatar \$ 17.44 and Manang \$ 12.78.
- For the local CFUG members, carbon trading is only attractive when forest resources are permitted under Scenario 2 where gains from carbon management are additional to gains from CFM.
- Size of the area of forest is a major variable determining net benefit level and the break even price for tCO_2. The larger the area (e.g. Ilam), the less the cost in managing the forest and higher benefits with lower break even price for tCO_2.
- As evident from the three sites, CFUGs are already managing their forest in a sustainable manner (Chapter 5 and Chapter 6); revenue from carbon will in practice not operate as an incentive for better forest management for these CFUGs nor will it bring more area under sustainable forest management.
- However, revenue from carbon can be an attractive incentive for the communities to carry out forest inventory and maintain data on carbon stock in their forest on an annual basis as this work is not carried out at the present.

Comparing the break even price presented in Table 8.2, with the figures from literature for both offsetting carbon as well as the cost of damage (as presented in Section 8.1), the cost for tCO_2 described under Scenario 2 for CFM as found in this thesis is low. Currently (in May 2008) the CERs are traded between \$23 to \$25.5 per tCO_2 in the energy sector and prices from the supply side from CFM as evident from Table 8.2 is relatively cheap under Scenario 2 compared to the energy CER price.

Most literatures refer to the opportunity cost of forest , but in reality with CFM in Nepal, as much of it is practiced in gradient slopes that are non-arable, opportunity cost does not factor in as a big value. Forested lands are marginal lands on mountain slopes. Carbon reduction in the tropics through biological sequestration is expected to cost the lowest as explained by Moura-Costa *et al.*, (1998) due to high growth rates coupled with relatively low land and labour costs, which also holds true for Nepal Himalaya.

8.8 General Summary and Three Conclusions

For estimating the net benefit with carbon trading under different scenarios, a baseline had to be constructed by taking the first measurement as the reference point and valuing for all incremental carbon relative to this reference point. This was done for estimating a conservative value and did not include for emission avoided as a result of management intervention.

Local communities have been managing forest without carbon revenue because CFM already provides an incentive for forest management and this has been the reason for CFM to be successful in Nepal Himalaya. As carbon trading will only be attractive when benefit from carbon management exceeds benefit from existing management, from this chapter, it is evident that carbon revenues can bring about additional benefit under certain conditions as shown under Scenario 2.

Firstly, a general conclusion from this chapter is that a cheap way to mitigate climate change is to make sure existing forests stay intact. The cost estimated for sequestrating atmospheric CO_2 in this thesis may be one of the least cost options for offsetting carbon in the world based on the break even price under Scenario 2 which ranges between from $ 0.55 to $ 3.70 per tCO_2. These prices are low because of the gains from fuelwood extraction that lowers the cost of forest management.

Secondly, when the local communities managing forest are paid for the carbon sequestered, this payment provides an incentive to conduct forest inventory and carbon assessment on a yearly basis which otherwise would not be performed. This chapter shows clearly that the social gains from sustainable management of forest to the local communities is high and consequently the only incentive provided from carbon revenue is for the CFUG to carry out forest inventory work and carbon assessment. It also clearly shows that strict forest protection measures only aimed at increasing carbon sequestration by banning all forest off take from the forest is not a feasible option.

Thirdly, the best results are found under Scenarios 2 when sustainable harvesting of forest resources by local communities are permitted and credit is only awarded for what is left after the off take. In other words, RED must be built upon the existing CFM policy where communities are recognized with their forest use rights.

Chapter 9

Conclusion

9.0 Introduction

This research set out to demonstrate that CFM can play a significant role in reducing global emission taking Nepal's community forestry sector as a case. The thesis shows (in Chapter 3) how community managed forests can successfully contribute towards reducing global atmospheric CO_2 concentration from their local action albeit that forest management is not yet eligible for carbon crediting under the Clean Development Mechanism of the Kyoto Protocol (KP) which came into force in 2005. The community forestry sector in Nepal is well developed and has resulted in reducing emissions from deforestation and degradation by avoiding loss of forest cover, and increasing carbon sequestration as a result of forest enhancement. In Nepal, over 13,000 CFUGs are managing and conserving 1.1 million ha of community forest (Kanel, 2007). Of this area, 93% lie in the Himalaya region and only 7% lie in the plains of Terai region (Springate-Baginski *et al.,* 2004: 47). In this thesis there are no field data from the Terai region, as the implementation CFM has not been as successful as in the Himalaya region (Bhatia, 1999). Hence Nepal Himalaya provides a best case for analysis of local communities' efforts to manage forest and how this could be integrated into the international climate accords.

It is increasingly common to seek solutions to the world's problems ranging from poverty to over-fishing through markets rather than through government interventions. Governments of the world have also agreed upon applying this neo-liberal approach to deal with climate change as discussed in Chapter 2. From the neo-liberal perspective, climate change is considered a market failure and the policy measures to combat it are mostly market based, though the markets are very heavily controlled and regulated. The cap-and-trade policy of the KP, for example, allows markets to regulate emission levels globally, but does not recognize the role of CFM in climatic stabilization and will not issue credits for this as illustrated in Chapter 3. It is clear that for the CFM sector to access the global carbon market, the global treaty has to recognize CFM as ***sinks*** and ***sources*** and have policies that address technical bottlenecks. Also there need to be some changes in management at local and national levels to make carbon market and carbon trade compatible with CFM management that is conducted in subsistence economy primarily for meeting livelihood needs as illustrated in Chapter 7.

9.1 Problem Statement

CFM as practiced in Nepal Himalaya can be scientifically regarded as an effective (Chapter 5 and Chapter 6) and efficient (Chapter 8) way to reduce global carbon emission through actions taken by local communities. But the KP fails to acknowledge this role since it does not provide credits under CDM for any forest management. This makes the global climate treaty flawed (shown in Chapter 3) as it cannot address emissions from deforestation in developing countries, which constitute nearly a quarter of global GHG emissions. Since the CDM does not recognize avoided deforestation and the reduced emissions that come from conserving forests, credits are not issued for such activities in non-industrialized countries.

9.2 Addressing the Research Questions

Given the significant role that CFM in Nepal Himalaya plays in reducing global carbon emissions, this thesis considers how and under what conditions CFM could work together with the global carbon market under the UNFCCC if access were to be opened up in the new treaty (scheduled for 2012) based on the lessons learnt from the KP. The research hypotheses in this thesis were guided by three broad research questions each with a subset of smaller questions, as indicated in Chapter 1 and recapitulated here. The answers to the research questions are discussed below.

9.2.1 Does CFM in Nepal Himalaya have the potential to participate in global carbon trading?

- 9.2.1.1 Does community forest in Nepal Himalaya sequester carbon?
- 9.2.1.2 Is the current CFM policy in Nepal favourable for supporting carbon trade?
- 9.2.1.3 Can the current management system undertake carbon trading?

9.2.2 Can CFM meet the challenges of carbon trading?

- 9.2.2.1 Will carbon trading have an impact on the livelihood?
- 9.2.2.2 Does carbon trading provide an attractive incentive?
- 9.2.2.3 What needs to be changed at management level to support carbon trade?

9.2.3 What kind of an international treaty would be needed to allow CFM to participate in global carbon market?

- 9.2.3.1 What are the conditions necessary at global level to bring CFM under climate regime?
- 9.2.3.2 What needs to be changed in the climate treaties if CFM is to be eligible and able to participate?

9.2.1 Does CFM in Nepal Himalaya have the potential to participate in global carbon trading?

9.2.1.1 Does community forest in Nepal Himalaya sequester carbon?

From the data presented in Chapter 5, it is scientifically evident that CFM acts as a sink and sequesters CO_2 at rates ranging from 3.99 to 11.77 $tCO_2ha^{-1}yr^{-1}$ (Chapter 5, Section 5.7.3) after off-take of fuelwood at the three research sites in Nepal Himalaya. Viewing it as a potential source, the mean carbon pool size in woody biomass in the three sites was 504.31 tCO_2ha^{-1} (Chapter 5, Section 5.7.5). In addition, forested land was found to retain soil carbon amounting to about 327 tCO_2ha^{-1} (Chapter 5, Section 5.7.4) up to a depth of 1m. These pools could easily be emitted into the atmosphere if forested land is converted to other land uses. It is evident that CFM plays an important role as both sink and in retaining a potential source of carbon.

In reality it would be difficult to generalize these biomass data to the whole of Nepal Himalaya as mentioned earlier in Chapter 1 (Section 1.5), but at some point it will be necessary to estimate for this region and for this we can take the conservative value from this thesis as an indication rather than an absolute value; the IPCC (2003) also uses conservative figures when it has to extrapolate data and there is a high level of uncertainty.

This figure when extrapolated for the whole of Nepal Himalaya region would be significant in terms of reducing CO_2 concentration from the global atmosphere. Nepal Himalaya accounts for 93% of the total area under CFM in Nepal and amounts to 1.02 million ha (Springate-Baginski *et al.,* 2007: 47).

When taking the lower value from the fieldwork data presented in this thesis, 3.99 $tCO_2ha^{-1}yr^{-1}$ (excluding soil carbon) for the 1.02 million ha of community forest for Nepal Himalaya, the potential to sequester will be as much as 4.07 m tCO_2yr^{-1}. Though not all sites in Nepal may be as thriving as those studied, this could be seen as a conservative estimate of the national contribution to mitigation of emissions through CFM in Nepal Himalaya. It is conservative because it does not account for the avoided deforestation nor of carbon stored in the soil and even the $ per tCO_2 values taken in Chapter 8 are the lower estimates.

This means that it accounts only for the annual incremental carbon measured, not for the emissions avoided as a result of management intervention. In this research it was not possible to make any measurements of typical loss rates in unmanaged forests (i.e. at control sites) since all forests in the country adjacent to villages are under community management, especially in the Nepal Himalaya region. However, it is not clear at the moment whether under RED policy crediting will be done on the basis of annual increments of carbon stock or on estimates of avoided emissions from deforestation and forest degradation. These are some questions which the new policy in the post Kyoto period will have to address. It is evident, however, that rewarding both the avoided degradation and the enhanced biomass quantities would be the most favourable for CFM and provide the greatest incentives. More discussion on how this issue could be tackled will be found in Section 9.4.2 on baseline construction and Section 9.4.3 on estimating from reference scenarios.

9.2.1.2 Is the current CFM policy in Nepal favourable for supporting carbon trade?

Nepal is a leading country in the world as regards institutionalization of the concept of CFM in mainstream national forestry policy where about 35% of the total population of the country manage around 25% of the national forest (Kanel, 2004). As analyzed in Chapter 4, CFM developed as a process over several decades of experimentation. Clearly, the greatest lesson learnt is that in order for forest protection to be effective, a significant paradigm change was needed to devolve authority for forest control from the state to the local communities. This decentralized policy engendered forest management institutions at grassroots level (CFUGs) which are the hall mark of Nepal's community forest policy. These CFUGs could be the grassroots level institutions for implementing carbon trading should crediting of avoided deforestation and enhancement of carbon stocks in natural forest be permitted in future international policy agreements.

However, as noted above, CFM has not been equally successful all over Nepal. The impact of CFM policy has been positive in the Nepal Himalaya in reducing deforestation and forest degradation, but the same level of success have not been found in the lower Terai region (Blaikie and Springate-Baginski, 2007: 80; Bhatia, 1999:11) that represents 7% of the area under CFM in the country. This indicates that CFUGs may only be successful as carbon traders if the physical and economic circumstances are conducive. Further research would be needed to understand in more detail why CFM has not been so successful in the Terai plains.

At the national level, the development process of CFM suggests that national policy is resilient yet adaptive enough, and certainly could facilitate the development of new policies that permit carbon trading. The government has taken interest in adding value to CFM by exploring carbon market. The current Three-Year Interim Plan (2008-2011) under the Interim Constitution seeks to promote carbon trade and mentions the forestry sector, recognizing carbon trading as an opportunity to enhance poverty reduction and promote conservation (NPC, 2008). In March 2008, the Foreign Aid Coordination Division under the Ministry of Forests and Soil Conservation (MOFSC) for the first time called a consultative meeting with various INGOs, NGOs and FECOFUN to provide feedback to the government on what should be done in the future and what policies are required to create a conducive environment for Nepal in which it can benefit from RED.

It is not yet fully clear how RED policy will operate, but one thing that is fairly certain is that it will be aimed at national level governments, unlike CDM which is financed at the level of individual projects. The discussions on developing a carbon forestry policy within Nepal have just started and as shown in Chapter 4, it is unlikely that CFM policies will be a constraint or a hindrance for carbon trading. In fact the global climate treaty could learn from the experiences of the CFM policy when RED policy is being developed, as regards recognizing the role played by communities in climate change mitigation. Nepal's CFM policy could be a 'good practice guide' for all communities that manage forests and provides the world's best example of successful decentralized approach. There is room to believe that CFM policy in Nepal could adapt to carbon trading should the local community see benefit from carbon trading, if and when the global treaty removes the barrier and allows forest management to enter the global carbon market.

What is missing is an internal system by which RED payments- which will be made to the central government level on the basis of national baselines- may be dispersed to all the different CFUGs and other actors who are responsible for lowering deforestation and degradation rates and enhancing stocks of forest carbon. This is not a simple problem to solve, as the country will have to decide on a redistribution policy; whether via a market-based system to maintain efficiency of the carbon market or a regulatory system. The country will be paid a lump sum on the basis of average reductions in carbon emissions, and will have to develop an equitable means of providing incentives to actors like CFUGs within the country. This will have to do justice to the fact that some CFUGs may be more successful in carbon reductions than others. That is why one of the prerequisites for CFM to work with the global carbon market is the establishment of a national institutional arrangement that coordinates the consolidated action of CFUGs with the national level baselines that are negotiated for the country. This point will be taken up in Section 9.5.4. In Nepal's case, there is already a national umbrella organisation (federation) for the CFUGs called the FECOFUN which is also a legal entity, and this could serve as a starting point in building a system to link national baselines with the achievements of individual CFUGs as discussed in Chapter 4. This is important because the FECOFUN already monitors that CFM is implemented in a participatory and inclusive manner. It can do the same for RED while redistributing the national base lines at local level and bundling the CFUGs together at a regional level.

9.2.1.3 Can the current management system undertake carbon trading?

Community management of forest entails numerous tasks that the locals have to perform, such as administrative work, day-to-day forest protection operations and monitoring income and expenditure. There are also more technical tasks such as maintaining a sustainable balance of forest resources and conducting harvesting operations.

The three case studies analyzed in Chapter 6 illustrate how forests are managed in a sustainable manner by the locals following their Operational Plans or traditional norms which have been formulated by the villagers themselves through their experiences gained over the years. What is common between the three case studies is that management foremost takes into account the basic necessity of providing fodder and fuelwood at nominal prices for households; this is the main objective in CFM .

The three CFUGs illustrate that the CFUGs have the capacity to effectively manage and conserve forest resources in a sustainable manner which also means they have been simultaneously effective in managing carbon, as a by-product of their other activities in forest management. The management regime and the management plan for each CFUG is based on the objective of meeting subsistence needs, and while doing so, unintentionally the CFUG are managing carbon levels. The CFUG's can easily manage carbon levels within their forest for trading purposes but only after their subsistence needs are met first. Banning all harvesting will leave no rationale for forest management by local communities; carbon trading must take into account of meeting the indigenous (local) peoples' rights of securing livelihood needs first.

As described in Chapter 5, the CFUG members also had the capacity to conduct field biomass measurements independently once they were trained. They were trained to use hand held GPS sets in finding the permanent plots where they recorded data on biomass change over a three-year period. It was found that the better educated CFUG members were more competent at conducting carbon measurement than less educated ones, as mentioned in Chapter 7 (Section 7.3.2). This is an important requirement in getting the CFUGs to prepare for carbon management and with growing literacy rates in the younger population, it can be said that in the future, capacity of CFUGs will be enhanced as regards formal management.

9.2.2 Can CFM meet the challenges of carbon trading?

9.2.2.1 Will carbon trading have an impact on livelihoods?

Based on the analysis from Chapter 7, it was evident that CFUG members in the three case study sites in Nepal Himalaya mainly consisted of marginal farmers who were dependent on forest resources. The household survey data revealed that CFUG members depend on their community forest for extracting various products that went towards fulfilling their subsistence needs; their most important need being met from the forest was household energy requirement (fuelwood). Community forest also supports livestock rearing that is an important livelihood option not only for remote areas like Manang but also for Ilam. Under the management plans for CFUGs, firewood is being extracted without causing net loss of biomass, indeed the study shows that biomass is increasing. There will always be a trade-off for CFUGs between extraction of forest products and increased carbon profits, and as the calculations in Chapter 8 showed, there will be optimal points in this trade-off, such as that typified as Scenario 2. Under this scenario, CFUG members would continue to extract fuelwood from community forests and crediting would only be awarded for the incremental carbon sequestered after the off take of fuelwood. If international policy were to accept only full conservation (with no extraction of any wood products) as described by Scenario 3, then it would not be in the interests of CFUGs to participate; they would lose more than they would gain. As mentioned in Chapter 3, the policy debate has progressed since this research began four years ago and now there is a strong possibility that sustainable extraction of fuelwood will not be a problem as under the proposed RED policy.

From a social capital perspective, CFUG and the FECOFUN are important assets to local communities for organizing themselves to manage and conserve forest and to promote local sustainable development in their villages. Such institutions form the social fabric in rural Nepal which binds the locals together. Should carbon trading restrict CFM activities, this social capital could be lost. Therefore, carbon trading needs to be built around the existing use values as explained in Scenario 2.

9.2.2.2 Does carbon trading provide an attractive incentive?

In carbon trading there will always be a difference in the way locals' value forestry from a subsistence perspective and how the polluting industrialised countries value it from a climatic perspective. From the point of view of the buyer, referring to Chapter 8 (Table 8.2), it is evident that the break even for carbon credits from CFM is very low, ranging from \$ 0.55 to \$ 3.7 per tCO_2 under Scenario 2; this includes measurement cost (\$ 3 ha^{-1} for first year and \$ 2 ha^{-1} from second year) and marketing cost (1.5% of carbon revenue), but does not include costs for verification and monitoring. This shows that CFM has the potential to attract buyers as carbon credits are produced in a very cost efficient way; CERs were traded from \$23 to \$25.5 per tCO_2 in May 2008 in the energy sector.

From the point of view of the seller, there is ample scope for CFUGs to voluntarily enter the carbon market with very competitive prices for CER but only when access to sustainable extraction of forest resources are permitted as described by Scenario 2. With the vast difference of over \$ 20 per tCO_2 between the breakeven price and the global CER cost in energy sector, it can be said that the marginal cost in trading carbon can quite easily be met. In the long run, under Scenario 2, there is scope for carbon revenue from carbon trade to attract the CFUG members to work under the climate treaty to maximize their financial incomes for the CFUG. However, when we discuss incentives, there are many more questions that need to be answered, that are outside the scope of this research but briefly discussed below.

People have been engaged in CFM in Nepal for many years without any payment for the carbon they have saved. In what sense, then, should carbon trading provide an attractive incentive to further improve their forest management? As communities in the Nepal Himalaya are already managing and sequestering carbon without any carbon payment, what then would constitute a carbon incentive?

It is not known whether this payment will be an incentive for bringing more forested area under CFM nor can one say whether this payment could be an incentive for better forest management than that is being currently undertaken. However, one point can certainly be made. This payment can be an incentive for forest inventory and carbon pool assessment, as it will provide the necessary finance for covering the cost of detailed forest inventory which otherwise is not preformed. Based on Chapter 8, it was found that carbon revenue, when credits are permitted for what is left after fuelwood extraction, can be an incentive for biomass and carbon inventory work.

This means it will be an incentive to the government because under the RED policy, payment will come to the national level. Government can utilize this fund to monitor carbon flux which will in all probability be a required activity for carbon trading. The government could conduct the forest inventory by outsourcing the task to local CFUGs and paying them to conduct their own surveys annually. The government could claim carbon revenue which it can distribute to the local CFUGs such that this fund will cover the cost for biomass inventory and carbon pool assessment across the country. Government does not manage community forest, but if it markets carbon credits, it could pay CFUGs for maintaining better biomass and carbon inventory data for the country, and it is this that may be the main incentive from carbon revenue for the CFUGs as well as for the government. So the carbon revenue can either be paid out to CFUGs for sequestering carbon, or be utilized as an incentive for forest inventory.

9.2.2.3 What needs to be changed at management level to support carbon trade?

The CFM policy analysis and the three case studies on the management of community forest show that changes in management level must come at two levels: local level and national level.

Based on Chapter 6, we have seen that different communities have different forest management regimes; some are more formal while others take a more informal approach which can be also very effective. However, should the CFUGs want to participate in the global carbon market, they need to improve their current management which is at present often quite informal and relaxed and ad hoc. If

CFUGs want to tie up with the credit buyers, they will have to upgrade to formalize their management system to meet the compliance standards (Minang *et al.,* 2007). For this they need to undertake the following changes:

- Maintain better records.
- Have a guarantee that carbon stocks will be maintained.

CFM as represented by these three case studies has only been catering to the needs of the local community, once it enters the global carbon market, it will have to take on board processes of the global market and also under go a strict compliance process.

At the local management level, as explained in Chapter 6, CFUGs will be expected to keep a better record of their annual carbon stock, financial records and administrative processes such that the whole management system is more transparent and formal. Then there also needs to be a guarantee that carbon stocks will be maintained. This needs to be done in two ways, firstly by deploying more effective forest protection measures such as hiring local forest guards to reduce the threat from illegal logging. Secondly, there needs to be a firm commitment in the form of a contractual agreement between the CFUG and the national institution coordinating the baselines, for maintaining carbon stocks over a committed period of time. These are changes which the local management has the capacity to undertake where there is sufficient economic incentive to cover the costs of better management.

At the national management level as explained in Chapter 4 (Section 4.3) and also reiterated in Chapter 6 (Section 6.5), there needs to be a national level institution which signs and monitors the contract with CFUGs. This institution must also coordinate the concerted efforts of CFUGs and regulate payment and penalty mechanisms within the country such that there is a fair system in place; better performing CFUGs should not be penalized by poorly performing CFUGs.

There is clearly an institutional vacuum to implement RED as there are many tasks that are required to be coordinated at the national level. Right now, as explained in Chapter 4, the DNA is the coordinating agency for carbon trade, which falls under the MOEST but the forestry sector is coordinated by the MOFSC. Although one person represents MOFSC in the 11-member steering committee of the DNA, when the DNA makes submissions to the SBSTA regarding RED, the MOFSC is not aware; such gaps can easily make a tussle in the future between the two ministries. In addition, community forests and CFUG management must also be monitored by a national level institution to ensure that the indigenous peoples' rights are not ignored while action is taken to reduce global emission. The whole process needs to remain fair and transparent. The necessity of a national level management institution is further discussed in more detail in section 9.4.5.

9.2.3 What kind of an international treaty would be needed to allow CFM to participate in global carbon market?

9.2.3.1 What are the conditions necessary at global level to bring CFM under climate regime?

In order for the new treaty to make use of CFM as an effective and efficient means of reducing emission from deforestation in developing countries, there must be conditions in the new treaty that will be conducive to avoided deforestation. For this, the role of forests must be seen both as ***sink*** and a ***sources***.

As discussed in Chapter 3, under the current CDM of the KP, forest are only viewed as sinks and not as sources, thereby not accounting for nearly a quarter of the global GHG emissions from deforestation in developing countries nor having the mechanism to control this through market incentive of the CDM. The proposed RED policy on the other hand is expected to recognize forests as sources and account for reduced emission from avoided deforestation and degradation. But CFM plays the role of sink and source because CFM is about avoiding deforestation, reducing forest degradation and forest enhancement. Therefore, the first condition that would be necessary in the new treaty is to recognize forests as sinks and sources.

In doing so, not only would forest management activities in developing countries be a permitted activity, but more importantly, it would make the RED policy more conducive towards CFM specifically. This would also remove the barrier posed by additionality criteria pertaining to the CDM projects. Additionality was one regulation that prevented CFM from accessing the CDM market.

9.2.3.2 What needs to be changed in the climate treaties if CFM is to be eligible and able to participate?

As mentioned above, when the role of forests as sink and source is recognized, this will open the door for CFM under the climate treaty, but this would not necessarily be sufficient to attract CFM to the carbon market. The RED policy needs to address the areas of:

- carbon accounting criteria
- baseline construction
- indigenous people's right

These are three allegedly technical issues as mentioned in the COP 13 decision on RED (2/CP13). However, the indigenous people's rights are actually a political and cultural issue. These three technicalities need to be changed in the current treaty if the future treaty is to include CFM activities under the proposed RED policy.

The carbon accounting method needs to be able to account for 1) avoided deforestation, 2) reducing forest degradation and 3) enhancement of forest. CFM affects the carbon pool level by undertaking these three types of activities; having a carbon accounting criteria that would reward for the three activities does justice to the climate impacts of CFM.

As discussed in Chapter 3, CFM is about managing existing forest; hence a method must be developed for constructing a suitable baseline. One way the reference scenario for RED can be developed is through nested baselines. Nested baselines are 'mini baselines' which reflect different conditions in different parts of the forested area of a country but which together give full account of the whole national level baseline. That is, when nested baselines are summed, they add up to the national reference emission scenario. Such a system of nested baselines is one approach for implementing RED within any country and can be tailored to the different geographic regions and which may also account for different forest regimes e.g. national parks, buffer forest, community forest and private forest. Such a national level baseline has two advantages in addition. Firstly, individual CFM efforts by CFUGs would not have to conform to the additionality test and secondly, leakage within a country would be addressed.

One of the concerns about carbon trading is the threat of the exclusion of people from the forest, reverting back to the centralized control of resources. What the new treaty needs to permit is a sustainable extraction of forest resources such that local and indigenous communities' rights are protected as they continue to extract resources for meeting their livelihood needs, and crediting is awarded to what is left after resource extraction, with penalty for over extraction. The proposed RED policy is expected to permit sustainable resource extraction which the KP failed to include. So at one level, this may not be such a big hurdle as the other two points mentioned above. At COP 13 in Bali (2007), the decision on RED (2/CP 13) states that crediting should be allowed whether under strict protection or sustainable harvesting, though CFM is not explicitly mentioned. But should the treaty fail to allow sustainable resource extraction when it is declared in December 2009, then there is a strong likelihood that communities will not see any benefit in the treaty and thus may not participate in carbon trading as explained in Chapter 8.

These three changes to the current treaty when incorporated in the post 2012 climate treaty, will enable the treaty to address specific needs of the CFM sector. This will enable CFM to participate in the global carbon market under the UNFCCC by allowing reducing global emission in an effective and efficient manner.

9.3 Answering the Hypotheses

This research on the economic viability of community carbon forestry as a global least cost strategy to mitigate climate change, was based on two hypotheses that are discussed below.

The first hypothesis is that CFM as practiced in Nepal Himalaya region can play an important role in contributing to reducing global emissions.

In this thesis it was shown that CFM sequestered net CO_2 ranged from 3.99 to 11.77 $tCO_2ha^{-1}yr^{-1}$ (Chapter 5, Section 5.7.3), after excluding fuelwood uses; and in addition retained soil carbon in forested land of about 327 tCO_2ha^{-1} (Chapter 5, Section 5.7.4) up to a depth of 1m. Taking the lower value of 3.99 $tCO_2ha^{-1}yr^{-1}$ (excluding soil carbon) for the 1.02 million ha of community forest for Nepal Himalaya, the potential to sequester would be as much as 4.07 m tCO_2yr^{-1}.

With the concept of CFM institutionalized within national policy as well as amongst the grass root level communities, CFM has been successful in providing sustenance needs to the rural communities whilst at the same time sequestering carbon. Hence the first hypothesis proved true, as we have seen that CFM can play an important contributing role to reduce global emissions from the actions taken by marginal farmers, albeit not recognized by the global climate treaty.

The second hypothesis is that CFM will only be able to participate in carbon trading under the UNFCCC if the global treaty has policy instruments that recognize forests as sinks and sources, and when changes are also made at the management level.

This thesis has proven that real and practical measures need to be taken to synchronize the global climate policy to that of the CFM. The new global climate treaty could work towards addressing a common goal between UNFCCC and CFM by reducing emission while promoting sustainable development, but only when adjustments are made to the treaty as well as at the management level of CFUGs.

The new treaty to succeed the KP needs to recognize forests as sinks and sources. But for the CFM to participate in the global carbon market, recognition of forests as sinks and sources under the policy of the RED will not suffice. The climate treaty, with the assistance of RED policy must have technical details in place that are conducive to CFM, and that would incentivise them to participate in the market voluntarily. For this to be achieved, the policy under RED must specifically come up with a carbon accounting method that takes into account reduction in deforestation, reduction in forest degradation and forest enhancement as a result of management intervention. This could be backed by a nested baseline approach where there will be one baseline negotiated for the country, with a subset of smaller regional baselines. The other technical change required is that carbon trading should be permitted while allowing for sustainable extraction of forest resources.

At the management level, changes are required at two levels. Firstly, at the local level, CFUGs need to improve their overall management by better record keeping and secondly, having a guarantee that carbon stocks will be maintained over the project period. These are managerial improvements which the CFUGs can undertake as they already have the capacity for this as discussed in Chapter 6, Section 6.5.

At the national level, there needs to be a national level institution that coordinates and regulates the concerted efforts of the participating CFUGs as discussed in Chapter 4, Section 4.3. The role of such an institution will be to coordinate a payment and penalty mechanisms within the country such that there is a fair system in place, one that also protects the rights of indigenous people’s access to forest resources.

9.4 Recommendations for Copenhagen

By referring to the existing treaty of KP, this thesis is in a position to say what needs to be incorporated in the new post 2012 treaty to allow CFM to access the global carbon market. The new treaty is expected to be unveiled in Copenhagen in December 2009.

From this thesis it is now clear that there must be changes made at different levels to allow the market mechanisms of climate treaty to work together with CFM based on the learning experiences from the KP. Here, this thesis specifically refers to the KP because at the moment technical details of RED policies under the new treaty are not certain and still being discussed; hence the recommendations are based on experiences gained from KP. This section points out the specific technical conditions that are required in the RED policy if the RED and CFM are to work together such that concerns, as raised on market mechanisms in Chapter 2, are also addressed while developing carbon markets.

9.4.1 Accounting Criteria

As mentioned in Chapter 3, CFM is about avoiding deforestation in existing forests. Hence what is important in the RED policy for CFM is how carbon will be credited. CFM reduces emission by management intervention that leads to avoiding deforestation of current stocks, reduces forest degradation by conserving forest biomass and enhances forest biomass by regeneration of biomass. This poses a complicated question on how each of these are measured and credited; in this thesis only forest enhancement was measured, as presented in Chapter 5. The reason for this are explained below.

Avoiding deforestation accounts for the expected loss from ‘business as usual’ scenario. This is estimated against a historic baseline; however in this thesis, baseline for each site could not be estimated as we do not have sufficient data on historic trends for the sites. Reduction in forest degradation is preventing the loss of biomass and carbon density from a forested area; although CFM has been able to reduce forest degradation, it is difficult to measure this as there is no standard technique to quantify forest degradation. There are no historical record of the spatial pattern of forest degradation relating to areas or the levels of degradation and no control sites. Forest enhancement is the growth of biomass after management intervention resulting in forest regeneration, in Nepal's case as a result of CFM. This can be measured by recording the annual increment in biomass as shown in Chapter 5. However, because CFM also contributes to stabilizing atmospheric concentration of CO_2 through avoiding deforestation and degradation, these actions should also be estimated and rewarded for credits.

9.4.2 Baseline Construction

There must be a uniform and unambiguous methodology on accounting for reduced emission from avoided deforestation and conservation work. Currently the KP methodology only accounts for the incremental carbon sequestered under afforestation and reforestation on land that did not have forest cover before 1990; this does not reflect the real and the potential emissions from existing forest. Community forests must be recognized for their contribution in avoiding deforestation of the current stock, halting forest degradation, and forest enhancement through increased biomass stock. Hence crediting must be awarded for not only what is prevented from being emitted if the forest is converted to other land uses or from reducing degradation, but also for the incremental biomass from forest enhancement. Although forest when protected which will eventually reach a biological maximum, forest under CFM is managed in a way where communities continuously harvest forest products and this maximum is unlikely to be reached. A detailed discussion is given below on how a suitable reference scenario, also called baseline, can be drawn for CFM.

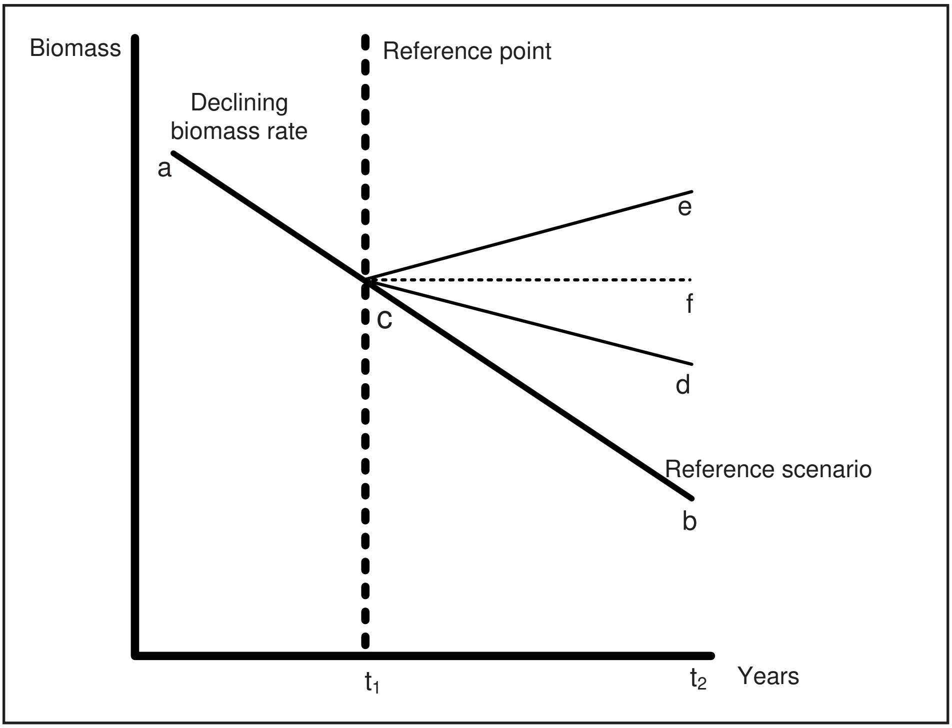
One way the reference scenario for RED can be developed is through nested baselines as explained earlier. These would be based on ground-reality for the different geographic regions and forest typology and forest regimes. The other way to implement RED may be without a nested baseline but following one national baseline for the entire country; this will give less flexibility than through a nested baselines approach. The latter will be a better option to provide incentives to stakeholders within the country. In other words, to enable the state to account in a fair way for gains and losses and to reward stakeholders who are responsible for reductions in carbon losses. This system of accounting, as mentioned earlier, does account for leakage within a country, however it falls short of accounting for trans-boundary or trans-continental leakage. So even under this system, there is room for further improvement.

The nested baseline approach proposed here and the measurement system accounting for all biomass over and above the reference scenario would enable the CFM sector to access the global carbon market through the government channel. This only solves one aspect of the baseline issue, the other important aspect is on how actual measurements are made from the baseline. This will be dealt with in the next section.

9.4.3 Estimating from Reference Scenario

This section shows how a reference scenario or a baseline under RED should be estimated for CFM in Nepal under the future global climate agreement. For Nepal, the overall national trend of the forest cover is subject to biomass loss as shown in Graph 9.1 by line ab that forms the baseline or the reference scenario. With management intervention at time t_1 which is also taken as reference point, biomass loss is reduced to line cd. This trend may eventually reverse when biomass starts increasing in absolute terms as was the case in the three sites where measurements were conducted for this thesis. This can be denoted by the line ce. So the question arises, from where do we start the calculation for estimating carbon credits?

One argument is that only avoided loss of carbon from deforestation should be compensated for under the compensated reduction approach that was first raised at the COP 9 (2003 in Milan) (Santilli *et al.,* 2005). Under this approach, anything above the reference scenario of line cb and up to line cf can be claimed (i.e. up to triangle bcf) and will be accredited as reduction in loss. If the proposed



Graph 9.1: Reference scenario for CFM under sustainable management

RED only recognizes forests as sources of emission, then crediting will only be awarded up to this level.

However, forest management will eventually sequester incremental carbon through forest enhancement depicted by line ce, and triangle fce will be the additional carbon sequestered till at some stage the forest reaches its biological maximum. This thesis only measured the incremental amount of absolute change in tree biomass as mentioned in Chapter 5 (Section 5.7.5) for practical purpose and for simplicity, which was explained in Chapter 8 (Section 8.2)

It is not known how the successor of the KP will account, and whether it will account for triangle bcf (potential loss), or triangle fce (absolute increment). Ideally, and to reflect the real carbon exchanges, the CFUGs should be awarded credits for triangle bce (triangle bcf plus triangle fce, i.e. sources and sinks respectively). Moreover, if this accounting system is adopted, there will not be any perverse incentive for the CFUGs to maintain their forest below the natural carbon storage potential by being paid for incremental carbon as well.

The increase in carbon stock (absolute increment) that results from forest management should be credited in addition to the avoided losses (potential loss) due to deforestation and degradation. In this case, the CFUG would accrue more benefits than estimated in this thesis. But as the historic declining rates of biomass loss for the different sites are not known, it was not possible to include the compensated reduction approach; estimating it would be speculative in this thesis. And more importantly, as communities started management at different stages in the three sites, it would be difficult to come up with an average reference period for all the three sites. For implementing RED in the CFM sector, it should have to rely on a default value for reference point.

9.4.4 National Level Payment Criteria

Under the global RED policy, it is expected there will be a national level baseline, as explained above. Under national level baseline approach, payment will be made at country level and then dispersed at local level based on market mechanisms. This has several advantages for the CFM. Firstly, it may develop a systematic approach in controlling deforestation at a national level based on the country's performance, giving the country the authority on how it achieves its targets domestically. Secondly, this could lead to a national level payment system that will be based on a reward and penalty system for those that manage forest and or fail to comply, therefore developing a fair system. Thirdly, national level payment system may be more transparent, legally binding, more market oriented than if negotiations and payments are made directly at local project level. Leaving the dealing to the project level could be non-transparent and without the usage of a uniform standard methodology. Local level payments with individual CFUGs dealing with individual credit buyers would never consolidate and institutionalize the effort to reduce emission at a national level; it would be futile to keep the effort at piece-meal level. Fourthly, the transaction cost would be lower when negotiating payments and credits at the national level.

Payments for RED credits, whether through a market or through a fund, may be made by at the national level on the basis of verified reductions in carbon lost through avoided deforestation and gained through forest enhancement over a given commitment period. This can be based on the national reference scenarios for deforestation and degradation agreed by the country and UNFCCC. How the funds are used by the government, is in principle a matter of national sovereignty. Either the government can redistribute this payment to CFUGs depending on their ability to reduce carbon emission from forest management, or the government can use this revenue as an incentive to measure carbon in the forest by paying the CFUGs to undertake forest inventory. Carbon revenue could be an incentive for the government to conduct forest inventory and carbon assessment on a regular basis in community managed forests. To support a national level payment system, a suitable policy and an institutional arrangement at the national level is also required, as is explained in Section in 9.4.5.

The data presented in Chapter 5 also reflect the CFUGs capacity in conducting forest inventory in their forest. Once trained, communities can use hand-held GPS sets to locate permanent plots and record forest inventory. And as mentioned in Chapter 8, carbon revenue can be regarded as an incentive for conducting forest inventory and carbon assessment by paying the CFUG members to collect field-level data. With the establishment of a national level institution for implementing RED, the national level payment system could further facilitate in redistributing the RED payment to CFUG level across the country as an incentive for forest inventory works.

9.4.5 Institutional Arrangement

To implement RED policy of carbon trading under the climate accord in the CFM sector, there is an institutional vacuum at present. We have learnt from Chapter 4 that there is a conducive policy at national level to support CFM, and in Chapter 6, we learnt that at grassroots level CFUGs are autonomous bodies demonstrating capable capacity in forest management and conservation; and with this policy and grassroots level institutions, CFUGs are already managing carbon although not intentionally.

However, once we relate these local and national endeavours to the international treaty on climate change, there are additional tasks to be preformed which require the support of additional institutions with suitable expertise. Under RED, there will almost certainly be a national level reference scenario as opposed to a project level baseline as required by the CDM. National level baselines require a national level institution to develop and monitor the baseline and to come up with a mechanism to allocate this at regional levels. Carbon credits must be allocated to the different CFUGs operating in different regions by a coordinating institution and they must be monitored and verified as well; the sum must tally with the national account.

Under RED policy, payment and incentives will also be at the national level. Since RED payments are done on the basis of national level baseline, a lump sum will be paid. Then this carbon payment may be redistributed across the country to different CFUGs based on their forest management performance or as an incentive for conducting forest inventory and carbon assessment on a yearly basis. How this payment is shared across the country needs to be monitored as much as transparency and accountability must be maintained when dealing between national level to local level. The redistribution policy within Nepal of this globally efficient abatement strategy rests ultimately with the policy and institution in Nepal and whether it opts for a market based system or a command-and-control measure one (regulatory instrument). If it chooses the latter approach, some of the efficiency gains in carbon trading will be lost. The redistribution of RED payments within the country must be addressed in the new policy to implement RED in Nepal with responsibility for monitoring and implementing this by setting up of a new institution.

It is necessary for a national level institution to implement RED in the country because without it, as shown in Chapter 4, it will be difficult to implement and administer a carbon trading mechanism such as RED. The DNA to the UNFCCC is the MOEST, whereas community forests fall under the MOFSC. While climate treaty related expertise and GHG emission accounting authority remain with the DNA, forestry related expertise and in particular CFM related information are maintained and regulated by the Department of Community Forestry under the MOFSC but who are little informed about the developments in the climate arena.

The role of a national level institution will be at two levels: international and national. At the international level, its purpose will be to link the domestic actions with the global protocol and be in a position to negotiate with the Parties to the UNFCCC. It will be a clearing desk for the RED CERs for the country. At the national level, it will coordinate with line ministries like MOEST, MOFSC and the Ministry of Finance and other line agencies like the DNA, the FECOFUN and CFUGs for redistributing carbon payment. For this reason, it is crucial that a new institution is formed so that the country can deal with RED mechanism effectively and efficiently without conflicting interests between stakeholders. At the national level it is also crucial that there is a clear and transparent policy to support this institution for regulating payment and penalty mechanisms within the country in a fair manner and one that could be based on market approach. By taking a market based approach, the efficiency could be maintained over other regulatory approaches, but as a prerequisite, care must be taken to address the market issues that pertain to marginal farmers as explained in Chapter 2 (Section 2.7). In addition, community forests and CFUG management must also be monitored by a national level body to ensure that the local and indigenous peoples' rights are protected.

9.4.6 Permitting Sustainable Fuelwood Extraction

Chapter 7 illustrated the dependency of households on forest resources use. Households on average consumed fuelwood ranging from 2.10 to 3.3 $tyr^{-1}hh^{-1}$ (Section 7.5.1). Chapter 8 estimated the value of this dependency in economic terms. The conclusion can be drawn based on Chapter 8, that because CFM has a substantial non-monetary reward in return for sustainable management, it was this incentive that made the community manage and conserve their forest. Carbon trading must be built upon this value system; if the uses of resources are not permitted under carbon trading, then CFM may cease to exist because management is held together by the incentive provided by resource extraction. The payment for carbon cannot substitute for the non-monetary benefit derived from using fuelwood as shown in Chapter 8 (section 8.8); because carbon payment is relatively small compared to the non-monetary benefits gained by households. Also it has been established from Chapter 7 (section 7.4.2) that cooking technology plays a critical role in fuelwood consumption as shown from Manang, therefore, in a country like Nepal dependent on fuelwood, promotion of improved cook stoves will assist in more efficient carbon offsetting.

9.4.7 Link Community Level Field Data with Satellite Remote Sensing Data

In 2004, Nepal had over 13,000 CFUGs covering over 1.4 million households (i.e. 35% of population), spatially distributed over the country managing about 25% of the total national forests in around 1.1 million ha. (Kanel, 2004) of which 93% lies in the Nepal Himalaya region. Monitoring carbon at national level even under the RED policy will be a cumbersome task and on-site monitoring and validation still very expensive over the mountainous terrain, even when the economic incentive is present to conduct field based measurements from carbon revenue.

Remote sensing using commonly available medium resolution images (Landsat) can identify deforestation but not degradation (DeFries, 2007). It is possible that high resolution images (IKONOS/Quickbird or Lidav Technology) could identify at least some of the degradation. But these systems are very expensive and require expertise which is not available in most developing countries. Therefore an alternative means is needed to measure and monitor degradation and forest enhancement. Therefore to get a more accurate estimate of carbon change, local level data must be linked with national level data generated from remote sensing technology.

This thesis has already proven in Chapter 5, that local people can be mobilised after giving them training to conduct forest inventory work, and this data can be fed to a central data base relying on remote sensing technology. This way transaction cost can be minimised as well as the level of accuracy and precision increased. Linking community level forest inventory and carbon pool data with satellite remote sensing data at national level may be further developed to become for getting RED to work with CFM. More research, however, needs to be done in this area as the technology is rapidly developing.

9.5 Reflection and Way Forward

On reflecting over the research process, methodology and results, areas have been identified where improvements could be made to make the research more effective as discussed below.

9.5.1 Forest Typology Representation

The three sites in the Himalayan region are too few to generalize for the whole Nepal Himalaya region, and hence only conservative values for estimates were used. If the research could have had selected additional sites across the Himalayan region, then the coverage would be more representative of the forest typology in Nepal Himalaya. However, for the reasons as explained in Chapter 1 (Section 1.5), specifically three case studies were selected in Nepal Himalaya to conduct in depth analysis of the cases.

9.5.2 Policy Level Uncertainties

During the research period, from 2004 to 2008, there were policy level uncertainties pertaining to forestry sector under the climate accord. This research started by analyzing the CDM of the Kyoto Protocol in 2004, but with recent developments and a shift towards a new proposed policy of Reduced Emission from Deforestation (RED) in developing countries, the research had to analyze the global policy in a new changing context that will determine the viability of CFM, but without knowing on exactly what RED will be as it will only be declared in December 2009 in Copenhagen at the UN climate conference.

Thus the research was based on a hypothetical setting, because under the KP the type of forest activity analyzed in this thesis is not recognized although discussion are on going to include avoided deforestation under the RED policy. Whether and if, it becomes an eligible activity under the new UNFCCC treaty, will only be known in December 2009. An assumption has been made for reference scenario because measurement has to start relative to some point. This assumption was made in the absence of a clear methodology on avoided deforestation. Similarly, the prices of CER in the forestry sector used in this thesis do not fully reflect the market prices. However, it is reasonable to expect that a functional market for carbon in the LULUCF sector will soon develop and most likely, at higher prices than applied in this thesis.

The carbon emission reduction activity calculated and analyzed in this research, although additional in terms of its own baseline, is not additional in KP's CDM terms. This is because these community forests already exist. However, now there is a strong possibility that they could be recognized in the future under RED. This research was conducted in the backdrop of these policy development that were uncertain, as the objective of this study is designed to prepare the ground for the future.

9.6 Concluding Note

Climate change is considered a market failure and measures to combat this change have taken a neo-liberal approach to correcting it because in theory, permitting markets to take control of regulating emissions looks innovative and beneficial for both parties that sell and buy credits. However, there are several important concerns that need to be taken care of when dealing with market mechanisms in developing countries, especially in the environment sector with subsistence farmers. In practice, there is the risk of market mechanisms having unintended results by increasing the vulnerability of marginalized communities and consequently the market for carbon must be developed taking into consideration the conditions of marginal farmers in small nations like Nepal.

The CDM is a market mechanism with the objective to reduce emission in an efficient manner. In principle it is supposed to assist developing countries in promoting sustainable development while reducing emission on a voluntary basis. In this regard, CDM was also viewed as a promotional agent for conservation with other benefits such as technology transfer to non-industrialized countries and as a source of funding clean technology projects that would not have otherwise occurred. In practice, this did not happen. Small economies like Nepal rarely benefitted, as much of the benefits from CDM are being tapped by larger economies of Brazil, China and India during the first commitment period. The carbon market is a regulated market where policies under the climate agreement are not very conducive to small and less developed countries like Nepal. For these reasons, the CDM is undergoing immense criticism for being counter productive and failing to meet its intended purpose and allegedly failing to make real emission reductions (Vidal, 2008). Due to the shortcomings in the CDM, the successor of the KP will have a new policy on RED such that gaps in the current policy pertaining to the forestry sector in non-industrialized countries are addressed.

In the context of CFM in Nepal Himalaya, with regard to the global climate treaty, it is evident that care must be taken to create a conducive carbon market at the global level embracing an objective to safeguard the interests and rights of the local and indigenous peoples. At the national level, new policy and a new institution must be formulated to support RED such that the redistribution of the global policy within Nepal is also market based, maintaining the efficiency in emission reduction.

The CFM policy in Nepal Himalaya is a progressive one developed over many decades and shaped by changes in politics, ecology and global development paradigms. The analysis on the development of CFM as a mainstream national policy suggests that this policy is still open for refinements. The government has recently (March 2008) initiated the consultative process in exploring ways to be in a position to benefit from RED and the post Kyoto treaties, such policy developments in this sector are encouraging.

The institutionalization of CFM policy and programmes in Nepal Himalaya is now widely acknowledged to have been very successful in reducing deforestation and reversing forest degradation while simultaneously serving the subsistence requirements of rural livelihoods of marginal groups. Not only has the policy worked to the benefit of the forests, it has also provided an improvement of livelihood for large numbers of rural population, including indigenous communities that are forest dependent, giving access to better lives and legitimating their access to basic forest products. And it has been shown that CFUGs have also already been successfully managing carbon, albeit unintentionally.

Where mountain communities manage forest for their subsistence needs, the question arises as to how such forests may be recognized for payment for carbon credits. Will the local people's rights to continue using forest resources be taken away? There is always the danger of forests being managed only for carbon credits. As community forests have been well developed and institutionalized in the region, it is imperative to develop carbon crediting by building upon the existing CFM policy rather than undoing what has already been established and tested for over two decades. Ideally for the rural mountain communities, the new climate treaty should recognize their efforts and make payments for avoiding deforestation, avoided degradation and forest enhancement with reference to specific baselines for each geographic area. This thesis shows that carbon trading can and should continue by allowing sustainable use of forest resources; a policy that needs to meet local needs first before fulfilling global services. It is also evident that carbon revenue would be an incentive for maintaining forest inventory and carbon assessment in the country by paying the CFUGs to conduct detailed forest inventory of their forests. This conclusion was drawn based on a conservative estimate which included calculating only the incremental biomass and not the avoided deforestation, nor did it include soil carbon, and the values for carbon credit taken were less than the trading rate in the energy sector.

The issues raised by this thesis need to be addressed in the post Kyoto climate treaty if global concerted effort to reduce emission is to be effective and efficient. It is important for the UN climate treaty to recognize the efforts of subsistence farmers who manage and conserve forests, as the world has been free riding on the global services they have been rendering. Though carbon is not a major concern for the subsistence farmers of Nepal Himalaya, it is imperative to bring them under the fold of the new climate treaty so that such forestry activities, currently outside of the KP, are accounted for and monitored for climatic purposes.

It is hoped that the gaps identified together with the recommendations presented in this thesis will encourage the climate treaty negotiators to acknowledge and recognize the role of CFM in climate stabilization whilst drafting of the new treaty to be declared in December 2009.

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Appendix 1

SBSTA Submission from Nepal

22 April 2008

ENGLISH/FRENCH ONLY

ADVANCE VERSION

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE
Twenty-eighth session
Bonn, 4–13 June 2008

Item 5 of the provisional agenda
Reducing emissions from deforestation in developing countries: approaches to stimulate action

Views on outstanding methodological issues related to policy approaches and positive incentives to reduce emissions from deforestation and forest degradation in developing countries

Submissions from Parties

1. The Conference of the Parties, by its decision 2/CP.13, requested the Subsidiary Body for Scientific and Technological Advice (SBSTA) to undertake a programme of work on methodological issues related to a range of policy approaches and positive incentives for reducing emissions from deforestation and forest degradation in developing countries.

2. As part of this programme of work, Parties were invited to submit to the secretariat, by 21 March 2008, their views on how to address outstanding methodological issues including, inter alia, assessments of changes in forest cover and associated carbon stocks and greenhouse gas emissions; incremental changes due to sustainable management of the forest; demonstration of reductions in emissions from deforestation, including reference emission levels; estimation and demonstration of reductions in emissions from forest degradation; implications of national and subnational approaches, including displacement of emissions; options for assessing the effectiveness of actions in relation to paragraphs 1, 2, 3 and 5 of decision 2/CP.13 and criteria for evaluating actions. The SBSTA requested the secretariat to compile these submissions for its consideration at its twenty-eighth session.

3. The secretariat has received 14 such submissions. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced[*] in the language in which they were received and without formal editing.

[*] These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

FCCC/SBSTA/2008/MISC.4

GE.08-

PAPER NO. 8: NEPAL

Submission by NEPAL
21 March 2008

Reducing Emissions from Deforestation in Developing Countries

(Outstanding Methodological Issues Relating to REDD with special reference to degradation and involvement of local stakeholders)

Background

Decision (FCCC/SBSTA/2007/L.23) of the 13th Session of the Conference of Parties (CoP13) to the UN Framework Convention on Climate Change (UNFCCC) invites Parties to submit, by 21 March 2008, their views on how to address outstanding methodological issues (decision 7.a), including, *inter alia,* assessments of changes in forest cover and associated carbon stocks and greenhouse gas emissions, incremental changes due to sustainable management of forest, demonstration of reductions in emissions from deforestation, including reference emissions levels, estimation and demonstration of reduction in emissions from forest degradation, implications of national and subnational approaches including displacement of emissions, and options for assessing the effectiveness of actions.

Nepal considers this agenda item a forward looking approach to reduce greenhouse gas emissions from deforestation and forests degradation at the global level, in particular in the developing countries. This initiative should best utilize the appropriate methods and efforts made to address methodological issues that would help the communities and individuals involved in reducing deforestations and forests degradation, and benefit them for their untiring self-motivated sustainable forest management initiatives.

Forests have multi-fold benefits to maintain and improve the environmental condition at all levels (global, regional, national and local levels), and people are involved in developing, conserving and managing the forest resources. There are several examples where communities have played significant role in managing the forest resources even by daring to put their immediate livelihood benefits at stake. Such efforts should be recognized and rewarded in such a way that it provides benefits from environmental goods and services thereby also increasing the income level of the rural population.

A number of methodological challenges are of significance as regards to stakeholder involvement in reducing greenhouse gas emissions from deforestation and forests degradation. In order for national governments and local communities involved in forest management benefited, and contributing to the global efforts of minimizing the greenhouse gas emission from reducing deforestation and forests degradation in the developing countries, Nepal proposes the following technical issues relating to proven effective policy measures including community-based forest resource management for consideration in the forth-coming session of the SBSTA and the COP to UNFCCC.

1. Reference scenario (baselines) for deforestation and forests degradation is required to assist developing countries, in particular the least-developed mountainous countries, to benefit from REDD mechanism

In order for the new REDD policy to be fair, effective and efficient, and to enable stakeholders, including community groups involved in forest management to participate in the mechanism, it is urgently required to:

a) Develop reference scenarios, and assist in particular the least-developed mountainous countries to develop national reference scenarios, separately, for accounting (a) deforestation (in terms of hectares forest lost/annum), and (b) forest degradation (in terms of tons carbon/ha/annum). In case of degradation relating to subsistence use of forest products by local communities, the reference scenario should be developed on the basis of average per capita extraction of forest biomass.

However, for degradation relating to selective logging, the reference scenario should consider the statistical records relating to timber and/or biomass extraction.

b) Develop a system of nested reference scenarios (baselines) specific to different regions (areas) within a country, whose total emissions and sinks sum up to the national reference scenario.
c) Adopt a system in which not only the carbon saved by reduced deforestation and forests degradation, but also the additional carbon sequestered by sustainable forest management, shall be subject to crediting.
d) Set up a transparent system of institutional arrangement for implementing REDD, to support communities, individuals and institutions to benefit from REDD mechanism.

2. Assessment of reductions in forests degradation rate would provide a basis for the effective participation in REDD initiatives

Once a reference scenario has been established for forests degradation including deforestation, assistance should be provided to countries for assessments of greenhouse gas reductions from those activities. This opportunity will be conductive to the local stakeholders whose actions may have had direct bearing to reduce forests degradation. In order for validation of these carbon credits, a statistically sound sample check will be needed. For this, Parties should be encouraged and assisted to:

a) Identify forest areas managed and improved, including the ones by the communities, to counter forests degradation;
b) Undertake stakeholder carbon assessments in the identified forest areas at time t_1 and t_2 using IPCC Good Practice Guideline 2003 Tier 3 procedures; and
c) Assist least-developed mountainous countries to carry out routine spot check following credible methods to validate carbon credit claims and to ensure no degradation leakage, if any, in other areas.

3. A Nested Baseline should be in place

As also proposed by other Parties before COP13, a system of nested baselines for both deforestation and forests degradation should be in place. This will reflect different conditions in different parts of the forest of a country and it together will give full coverage of the different forests and which, summed, add up to the national reference emission scenario. For this, it is necessary to:

a) Encourage and assist countries to develop nested baselines for forests degradation and deforestation which reflect spatially definable areas under different management types and ecological zones.
b) Follow the Tier 3 Country-Specific Methods as described in the IPCC Good Practice Guidelines, 2003 for carbon accounting system for the national baseline as well as for the nested baselines for deforestation and forests degradation in order to maintain uniformity in accounting emissions and removals from forest areas.
c) Carry out reporting on emissions and removals for national and nested baselines in the format outlined by the IPCC Good Practice Guidelines 2003.

4. Rewarding system for carbon sequestered as a result of sustainable forest management is urgently required to put in place

A system of incentives for carbon stocking and sequestration should be recognized and rewarded to benefit poor people involved in developing, conserving and managing the forest resources even by putting their immediate livelihood benefits at risk. This would (also) encourage mountainous countries to increase carbon stocks in natural and man-made forests, thereby also supporting sustainable livelihood of the forest dependent communities. It is equally important to recognize and reward the role of conservation in improving the forest conditions. In order to recognize and reward the community-based forest management, it is necessary to:

a) Put in place the crediting mechanism for the increase in carbon stock that would result from sustainable forest management in addition to the avoided losses due to deforestation and forests degradation; and

b) Carry out measurement of incremental carbon stock brought about by stakeholders themselves as suggested in # 2 (assessment of reductions) above and may be validated as suggested in #5 below.

5. Validation of emission claims should be simple and affordable

Under REDD, validation is bound to be cumbersome particularly in the remote mountain areas. Transaction cost would also be high and measurement would be expensive in small patches of forests scattered across the mountainous terrain. In order to address it, remote sensing technique might be one of the appropriate tools in the mountain forests for validations (over the large areas. Hence, Nepal proposes to:

a) Use affordable and credible validation method including remote sensing to the largest extent possible with the objective to lower transaction cost; and
b) Base the validation on a credible ground.

20 March 2008, Thurday

2 March 2007

ENGLISH/FRENCH/SPANISH
ONLY

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE
Twenty-sixth session
Bonn, 7–18 May 2007

Item 5 of the provisional agenda
Reducing emissions from deforestation in developing countries

Views on the range of topics and other relevant information relating to reducing emissions from deforestation in developing countries

Submissions from Parties

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-fifth session, invited Parties to submit to the secretariat, by 23 February 2007, their views on ongoing and potential policy approaches and positive incentives, and technical and methodological requirements related to their implementation; assessment of results and their reliability; and improving the understanding of reducing emissions from deforestation in developing countries, in order to facilitate discussions at the second workshop,[*] to be held in Cairns, Australia, from 7 to 9 March, 2007. The SBSTA requested the secretariat to make available this information for discussion at the second workshop and to compile this information for consideration by the SBSTA at its twenty-sixth session (FCCC/SBSTA/2006/11, paras. 88–89).

2. The SBSTA also invited Parties, in their submissions referred to in paragraph 1 above, to consider, as appropriate, relevant provisions of other conventions and also the work of multilateral organizations (FCCC/SBSTA/2006/11, para. 90).

3. The secretariat has received 19 submissions from Parties. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced[**] in the language in which they were received and without formal editing.

[*] The first workshop on this matter was held in Rome, Italy, from 30 August to 1 September 2006.
[**] These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

FCCC/SBSTA/2007/MISC.2

GE.07-60601

NEPAL
25th Session of SBSTA
Agenda item 5
(In Relation to FCCC/SBSTA/2006/L.25)
Reducing emission from deforestation in developing countries

Background
Reducing emission from avoided deforestation has not yet been recognized under the Kyoto Protocol. In Nepal, over 25% of the forested land is handed over to the local communities for its management and protection from the state. Although the process of devolution in forest resource management started since mid 1980s, Nepal started handing over of government-managed natural forests to local community user groups from mid-1990s based on the Forest Act, 1993 and Forest Regulation, 1995.

To date, over 1.1m ha of government-managed forest has been handed over to about 14000 user groups with an outreach to nearly 8 million population (almost 40% of the population). In field trials, such community managed forests have been reported to sequester anywhere around 2 - 4 t ha^{-1} yr^{-1} in above ground biomass only under normal management conditions which means after extracting forest products such as fuelwood, timer, fodder, grass/herbs, litter, non-timber products for supporting their sustenance needs. The local institutions, known as Community Forest User Groups, are faced with a dearth of financial resources as much of their products are sold at minimal price in the local market. There is tremendous scope to generate revenue from CER traded internationally to benefit the environmental and social aspects of managing such forests. Sale of carbon credits on the one hand would provide livelihood opportunities to poor marginalized communities thereby helping in poverty reduction and contribute to the sustainable development principles of the climate change regime on the other.

Policy recommendations
In order for rural people to be benefited, the policy under the UNFCCC for avoiding emission from deforestation should address the concerns highlighted below:

1. Baseline period should be more realistic taking into account the deforestation rate in the countries concerned in order to provide additional benefits to local and poor communities that dedicated themselves to conservation earlier.
2. Community managed forests are avoiding deforestation in natural forests. The CER from avoiding deforestation must be regarded at par with regular CER as real emission is reduced. This is real emissions reduction, and should not be rewarded therefore with tCERs or lCERs
3. Transaction cost to measure carbon pool in small patches of forest scattered over the mountainous terrain is expensive. Hence, a generalized baseline should be developed at the national level rather than at project levels. Research has shown that local communities can effectively and efficiently measure the changing carbon stock in their forests using standard forest inventory methods for example as suggested in the Good Practice Guide.
4. The definition of forest must be developed at country level taking into account geographic aspects such as mountain, mid hills and low land forests.
5. Capacity building and financial assistance are urgently needed in particular to mountainous and land-locked countries for maintaining reliable forestry database compatible with carbon assessments at national level and for training the local forest users to monitor their forest carbon stocks at local level.

21 February 2007

Appendix 2

Biomass growth and CO_2 sequestration rates for each site

Ilam							
		2004	**2005**	**2006**	**2007**	**2008**	**2009**
Biomass	t/ha	115.47	121.68	128.31	134.73	141.15	147.57
Biomass growth rate	t/ha/yr		6.21	6.63	6.42	6.42	6.42
Total biomass in forest	tC (383 ha)		46603.44	49142.73	51601.59	54060.45	56519.31
Total C	tC (383 ha)		23301.72	24571.37	25800.80	27030.23	28259.66
C per ha	tC/ha		60.84	64.16	67.37	70.58	73.79
Total CO_2 per ha	CO_2/ha		223.08	235.24	247.01	258.78	270.55
CO_2 sequestration rate	t/ha/yr		11.39	12.16	11.77	11.77	11.77
CER revenue at $1 per tCO_2	$/ha		11.39	12.16	11.77	11.77	11.77
CER revenue at $ 5 per tCO_2	$/ha		56.93	60.78	58.85	58.85	58.85
Total CER revenue @ US$ 1	$ in 383 ha		4360.46	4655.37	4507.91	4507.91	4507.91
Total CER revenue @ US$ 5	$ in 383 ha		21802.28	23276.83	22539.55	22539.55	22539.55
Fuelwood consumption	t/hh/yr		3.30	3.30	3.30	3.30	3.30
CO_2 per hh from fuelwood	CO_2/hh/yr		6.05	6.05	6.05	6.05	6.05
in whole CFUG (from 450 HH)	CO_2/yr		2722.50	2722.50	2722.50	2722.50	2722.50
CO_2 per ha (from fuelwood only)	CO_2/ha/yr		7.11	7.11	7.11	7.11	7.11
CER sequestration + fuelwood saved	CO_2/ha/yr		18.49	19.26	18.88	18.88	18.88

Lamatar							
		2004	2005	2006	2007	2008	2009
Biomass	t/ha	101.77	104.69	107.69	110.65	113.61	116.57
Biomass growth rate	t/ha/yr		2.92	3.00	2.96	2.96	2.96
Total biomass in forest	tC (96 ha)		10050.24	10338.24	10622.40	10906.56	11190.72
Total C	tC (96 ha)		5025.12	5169.12	5311.20	5453.28	5595.36
C per ha	tC/ha		52.35	53.85	55.33	56.81	58.29
Total CO_2 per ha	CO_2/ha		191.93	197.43	202.86	208.29	213.71
CO_2 sequestration rate	tCO_2/ha/yr		5.35	5.50	5.43	5.43	5.43
CER revenue at $1 per t$CO_2$	$/ha		5.35	5.50	5.43	5.43	5.43
CER revenue at $ 5 per tCO_2	$/ha		26.77	27.50	27.13	27.13	27.13
Total CER revenue @ US$ 1	$ in 96 ha		513.92	528.00	520.96	520.96	520.96
Total CER revenue @ US$ 5	$ in 96 ha		2569.60	2640.00	2604.80	2604.80	2604.80
Fuelwood consumption	t/hh/yr		3.20	3.20	3.20	3.20	3.20
CO_2 per hh from fuelwood	CO_2/hh/yr		5.87	5.87	5.87	5.87	5.87
in whole CFUG (from 60 HH)	CO_2/yr		352.00	352.00	352.00	352.00	352.00
CO_2 per ha (from fuelwood only)	CO_2/ha/yr		3.67	3.67	3.67	3.67	3.67
CER sequestration + fuelwood saved	CO_2/ha/yr		9.02	9.17	9.09	9.09	9.09

Manang							
		2004	2005	2006	2007	2008	2009
Biomass	t/ha	61.89	64.07	66.24	68.42	70.59	72.77
Biomass growth rate	t/ha/yr		2.18	2.18	2.18	2.18	2.18
Total biomass in forest	tC 240 ha)		15375.60	15897.60	16419.60	16941.60	17463.60
Total C	tC (240 ha)		7687.80	7948.80	8209.80	8470.80	8731.80
C per ha	tC/ha		32.03	33.12	34.21	35.30	36.38
Total CO_2 per ha	CO_2/ha		117.45	121.44	125.43	129.42	133.40
CO_2 sequestration rate	tCO_2/ha/yr		3.99	3.99	3.99	3.99	3.99
CER revenue at $1 per tCO_2	$/ha		3.99	3.99	3.99	3.99	3.99
CER revenue at $ 5 per tCO_2	$/ha		19.94	19.94	19.94	19.94	19.94
Total CER revenue @ US$ 1	$ in 240 ha		957.00	957.00	957.00	957.00	957.00
Total CER revenue @ US$ 5	$ in 240 ha		4785.00	4785.00	4785.00	4785.00	4785.00
Fuelwood consumption	t/hh/yr		2.10	2.10	2.10	2.10	2.10
CO_2 per hh from fuelwood	CO_2/hh/yr		3.85	3.85	3.85	3.85	3.85
in whole CFUG (from 164 HH)	CO_2/yr		631.40	631.40	631.40	631.40	631.40
CO_2 per ha (from fuelwood only)	CO_2/ha/yr		2.63	2.63	2.63	2.63	2.63
CER sequestration + fuelwood saved	CO_2/ha/yr		6.62	6.62	6.62	6.62	6.62

Appendix 3

Net Benefit from Gross Margin Analysis under Different Scenario

Table A. Scenario 1: Business as usual

Ilam: Scenario 1					
	Business as Usual				
US$	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
Net Monetary Gain	20336.50	20481.43	20481.43	20481.43	20481.43
Net Non-monetary Gain	37174.58	37174.58	37174.58	37174.58	37174.58
Net Gain	57511.08	57656.01	57656.01	57656.01	57656.01
Per HH					
Monetary gain per HH	45.19	45.51	45.51	45.51	45.51
Non-monetary gain per HH	82.61	82.61	82.61	82.61	82.61
Net gain per HH	127.80	128.12	128.12	128.12	128.12

Table B. Scenario 2: Carbon trading at $ 1 and 5 per tCO_2 with forest resource extraction

	Ilam: Scenario 2					Ilam: Scenario 2				
	US$ 1 per tonne CO2					US$ 5 per tonne CO2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	21194.58	22592.70	22445.58	22445.58	22445.58	38382.32	40942.39	40206.74	40206.74	40206.74
Net Non-monetary Gain	37174.58	37174.58	37174.58	37174.58	37174.58	37174.58	37174.58	37174.58	37174.58	37174.58
Net Gain	58369.16	59767.28	59620.16	59620.16	59620.16	75556.90	78116.97	77381.32	77381.32	77381.32
Per HH										
Monetary gain per HH	47.10	50.21	49.88	49.88	49.88	85.29	90.98	89.35	89.35	89.35
Non-monetary gain per HH	82.61	82.61	82.61	82.61	82.61	82.61	82.61	82.61	82.61	82.61
Net gain per HH	129.71	132.82	132.49	132.49	132.49	167.90	173.59	171.96	171.96	171.96

Table C. Scenario 3: Carbon trading at US$ 1 and 5 per tCO_2 with forest resource extraction not permitted

	Ilam: Scenario 3					Ilam: Scenario 3				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	-14546.92	-14252.01	-14397.55	-14397.55	-14397.55	13354.86	14829.41	14101.71	14101.71	14101.71
Net Non-monetary Gain	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35	-48970.35
Net Gain	-63517.27	-63222.36	-63367.90	-63367.90	-63367.90	-35615.49	-34140.94	-34868.64	-34868.64	-34868.64
Per HH										
Monetary gain per HH	-32.33	-31.67	-31.99	-31.99	-31.99	29.68	32.95	31.34	31.34	31.34
Non-monetary gain per HH	-108.82	-108.82	-108.82	-108.82	-108.82	-108.82	-108.82	-108.82	-108.82	-108.82
Net gain per HH	-141.15	-140.49	-140.82	-140.82	-140.82	-79.15	-75.87	-77.49	-77.49	-77.49

Table D. Scenario 1: Business as usual

	Lamatar: Scenario 1				
	Business as Usual				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	353.04	497.97	497.97	497.97	497.97
Net Non-monetary Gain	3792.39	3792.39	3792.39	3792.39	3792.39
Net Gain	4145.43	4290.36	4290.36	4290.36	4290.36
Per HH					
Monetary gain per HH	5.88	8.30	8.30	8.30	8.30
Non-monetary gain per HH	63.21	63.21	63.21	63.21	63.21
Net gain per HH	69.09	71.51	71.51	71.51	71.51

Table E. Scenario 2: Carbon trading at $ 1 and 5 per tCO_2 with forest resource extraction

	Lamatar: Scenario 2					Lamatar: Scenario 2				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	-1718.92	-884.09	-889.77	-890.73	-890.73	304.67	1196.23	1167.86	1163.13	1163.13
Net Non-monetary Gain	3792.39	3792.39	3792.39	3792.39	3792.39	3792.39	3792.39	3792.39	3792.39	3792.39
Net Gain	2073.48	2908.30	2902.62	2901.66	2901.66	4097.06	4988.62	4960.25	4955.52	4955.52
Per HH										
Monetary gain per HH	-28.65	-14.73	-14.83	-14.85	-14.85	5.08	19.94	19.46	19.39	19.39
Non-monetary gain per HH	63.21	63.21	63.21	63.21	63.21	63.21	63.21	63.21	63.21	63.21
Net gain per HH	34.56	48.47	48.38	48.36	48.36	68.28	83.14	82.67	82.59	82.59

Table F. Scenario 3: Carbon trading at US$ 1 and 5 per tCO_2 with forest resource extraction not permitted

	Lamatar: Scenario 3					Lamatar: Scenario 3				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	-2148.46	-2134.06	-2141.74	-2141.74	-2141.74	1263.26	1335.26	1296.86	1296.86	1296.86
Net Non-monetary Gain	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23	-12961.23
Net Gain	-15109.69	-15095.29	-15102.97	-15102.97	-15102.97	-11697.97	-11625.97	-11664.37	-11664.37	-11664.37
Per HH										
Monetary gain per HH	-35.81	-35.57	-35.70	-35.70	-35.70	21.05	22.25	21.61	21.61	21.61
Non-monetary gain per HH	-216.02	-216.02	-216.02	-216.02	-216.02	-216.02	-216.02	-216.02	-216.02	-216.02
Net gain per HH	-251.83	-251.59	-251.72	-251.72	-251.72	-194.97	-193.77	-194.41	-194.41	-194.41

Table G. Scenario 1: Business as usual

	Manang: Scenario 1				
	Business as Usual				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	10312.82	10457.75	10457.75	10457.75	10457.75
Net Non-monetary Gain	3461.74	3461.74	3461.74	3461.74	3461.74
Net Gain	13774.56	13919.49	13919.49	13919.49	13919.49
Per HH					
Monetary gain per HH	62.88	63.77	63.77	63.77	63.77
Non-monetary gain per HH	21.11	21.11	21.11	21.11	21.11
Net gain per HH	83.99	84.87	84.87	84.87	84.87

Table H. Scenario 2: Carbon trading at $ 1 and 5 per tCO_2 with forest resource extraction

	Manang: Scenario 2					Manang: Scenario 2				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Net Monetary Gain	8246.20	9210.84	9210.84	9210.84	9210.84	12451.15	13271.78	13271.78	13271.78	13271.78
Net Non-monetary Gain	3461.74	3461.74	3461.74	3461.74	3461.74	3461.74	3461.74	3461.74	3461.74	3461.74
Net Gain	11707.94	12672.58	12672.58	12672.58	12672.58	15912.89	16733.52	16733.52	16733.52	16733.52
Per HH										
Monetary gain per HH	50.28	56.16	56.16	56.16	56.16	75.92	80.93	80.93	80.93	80.93
Non-monetary gain per HH	21.11	21.11	21.11	21.11	21.11	21.11	21.11	21.11	21.11	21.11
Net gain per HH	71.39	77.27	77.27	77.27	77.27	97.03	102.03	102.03	102.03	102.03

Table I. Scenario 3: Carbon trading at US$ 1 and 5 per tCO_2 with forest resource extraction not permitted

	Manang: Scenario 3					Manang: Scenario 3				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
Net Monetary Gain	6618.77	6618.77	6618.77	6618.77	6618.77	12878.65	12878.65	12878.65	12878.65	12878.65
Net Non-monetary Gain	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87	-26920.87
Net Gain	-20302.09	-20302.09	-20302.09	-20302.09	-20302.09	-14042.22	-14042.22	-14042.22	-14042.22	-14042.22
Per HH										
Monetary gain per HH	40.36	40.36	40.36	40.36	40.36	78.53	78.53	78.53	78.53	78.53
Non-monetary gain per HH	-164.15	-164.15	-164.15	-164.15	-164.15	-164.15	-164.15	-164.15	-164.15	-164.15
Net gain per HH	-123.79	-123.79	-123.79	-123.79	-123.79	-85.62	-85.62	-85.62	-85.62	-85.62

Table J. Value of net benefit derived under scenario 1 at community and household levels for each site

	Scenario 1				
	Business as Usual				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Ilam: Net Gain	57511	57656	57656	57656	57656
Ilam: Net gain per HH	128	128	128	128	128
Lamatar: Net Gain	4145	4290	4290	4290	4290
Lamatar: Net gain per HH	69	72	72	72	72
Manang: Net Gain	13775	13919	13919	13919	13919
Manang: Net gain per HH	84	85	85	85	85

Table K. Value of net benefit derived under scenario 2 at community and household levels for each site

	Scenario 2					Scenario 2				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Ilam: Net Gain	58369	59767	59620	59620	59620	75557	78117	77381	77381	77381
Ilam: Net gain per HH	130	133	132	132	132	168	174	172	172	172
Lamatar: Net Gain	2073	2908	2903	2902	2902	4097	4989	4960	4956	4956
Lamatar: Net gain per HH	35	48	48	48	48	68	83	83	83	83
Manang: Net Gain	11708	12673	12673	12673	12673	15913	16734	16734	16734	16734
Manang: Net gain per HH	71	77	77	77	77	97	102	102	102	102

Table L. Value of net benefit derived under scenario 3 at community and household levels for each site

	Scenario 3					Scenario 3				
	US$ 1 per tonne CO_2					US$ 5 per tonne CO_2				
US$	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Ilam: Net Gain	-63517	-63222	-63368	-63368	-63368	-35615	-34141	-34869	-34869	-34869
Ilam: Net gain per HH	-141	-140	-141	-141	-141	-79	-76	-77	-77	-77
Lamatar: Net Gain	-15110	-15095	-15103	-15103	-15103	-11698	-11626	-11664	-11664	-11664
Lamatar: Net gain per HH	-252	-252	-252	-252	-252	-195	-194	-194	-194	-194
Manang: Net Gain	-20302	-20302	-20302	-20302	-20302	-14042	-14042	-14042	-14042	-14042
Manang: Net gain per HH	-124	-124	-124	-124	-124	-86	-86	-86	-86	-86

Summary

The climate change agenda is more important in global politics today than ever before. This research set out to examine whether community forest management (CFM) can play a significant role in reducing global emissions, by taking Nepal's community forestry sector as a case. The thesis selects three community managed forests in Nepal's Himalaya region to investigate the extent to which management of such forests by the local communities can successfully contribute towards reducing global atmospheric CO_2 concentration (Chapter 1). The results of this analysis are used to make policy recommendations as regards the formulation of the new climate treaty that is expected to replace the Kyoto Protocol (KP) after 2012.

The thesis shows that climate change can be viewed essentially as a market failure and explains that, as a result, global efforts to mitigate this change are also based on market mechanisms. It is certainly expected that the new treaty to replace the KP will be also market oriented. Climate is a global public good or common resource that requires international management, so the nations have jointly developed the KP to combat the dangers of climate change by regulating emissions. This has largely been done through a cap-and-trade mechanism. This limits the emission levels a country or an industry can emit and then allows individual countries or firms to buy and sell credits.

The philosophy behind this neo-liberal policy is that the market is more efficient than government interventions, which entail high transaction costs. Neo-liberal economic theory was originally intended for trade and commerce, only later was it applied to environment management and protection. However, relying on market mechanisms to regulate environmental pollution also has some pitfalls. The international market for carbon, though based on a cap-and-trade mechanism, is in fact heavily regulated by quotas and restrictions and thus not really a free market. There are arguments that neo-liberal economic principles often work against marginalized groups in society and in favour of the more powerful and rich, and poor nations could benefit less than richer ones (Chapter 2). This is shown to be the case in the Clean Development Mechanism (CDM) of the KP. In the new global climate treaty, the interests of weaker players, such as subsistence farmers involved in CFM should be taken into account so that they can also reap the benefits. In a subsistence economy, it was found that community managed forests have a high social value for the local communities, and that the values assigned by the carbon market may not reflect the true value of the forest resources.

It has been scientifically established that forests play a significant role in the global carbon cycle because they sequester carbon as a sink and also emit carbon as a source. Emissions from loss of forests in tropical countries are thought to account for 20 -25% of all current greenhouse gas emissions. In spite of this, the KP provides only two narrow windows for crediting forestry activities in developing countries. The two activities that qualify under the CDM are afforestation and reforestation (AR), that is to say, creation of new tree plantations. CFM, however, is about avoiding deforestation and forest degradation in existing forests, and enhancement of forest biomass. Hence, community managed forests such as those found in Nepal Himalaya cannot qualify as carbon sink projects under CDM/AR project.

Realising these deficiencies of the KP, the Subsidiary Body for Science and Technology (SBSTA) of the UNFCCC has started engaging the Parties in discussions with the aim of developing a policy on reduced emissions from deforestation in developing countries (RED), which will include forest management and conservation activities, areas previously neglected by CDM. The proposed RED policy for developing countries will recognize and provide payment for forest activities that reducing emissions from deforestation and forest degradation, for example through sustainable management and forest conservation. It has not yet been decided whether credits will also be given for enhancement of forest carbon stocks. The 2007 Bali Decision on RED was important in that the Parties agreed to strengthen and support RED policy, and this Decision (2/CP13) for the first time makes possible the inclusion of CFM activities. Moreover, it recognises the rights of indigenous people that are dependent on forest resources for meeting their sustenance needs.

However, the recognition of forests as both sink and source may not suffice to attract CFM to participate in carbon trading. This research has shown that CFM has unique characteristics and that for it to participate, there will have to be suitable technical processes that create a conducive environment, if community forest user groups (CFUGs) are to enter the carbon market. RED policy needs specifically to address the areas of a) carbon accounting criteria, b) baseline construction and c) indigenous people's right, to make the policy attractive to CFM. These are three of the technical issues that are mentioned in Decision 2/CP13, although indigenous people's rights is in fact a political and cultural issue (Chapter 3).

There is good reason for selection of Nepal as the focus of this research. Nepal is a pioneer in having CFM policy as a mainstream forestry policy. Though communities have always in some way managed forests, CFM was introduced as a formal policy in the late 1970's and its widespread implementation was only possible after the 1990 restoration of multi-party democracy in the country. The development of CFM policy in Nepal has been shaped by internal and external factors. Internal factors that influenced and shaped the way forest resources are managed include: 1) changes in the political and administrative system and 2) developments in national forestry policy. External factors that have influenced the development of CFM in the country include: 1) perceived ecological change and 2) the economic development paradigm of the period. These changes together have shaped the devolution of forest management which characterises forestry policy in Nepal today. CFUG members have organized themselves to form a federation called Federation of Community Forestry Users-Nepal (FECOFUN), which has become a legal entity, in fact the largest civil society in the country with more than 10 thousand CFUGs as members. This is quite unique and characterises Nepal's progress in the CFM sector. CFM policy in the country is resilient yet adaptive as it is strongly founded on democracy and neoliberal ideals but at the same time embraces elements of local empowerment and sustainable development (Chapter 4).

The time has now come to analyze CFM in the broader context of the global climate treaty. Following the ratification of the KP by Nepal in 2005, the government has been showing interest to participate in the global carbon market and has recently initiated a consultative process to prepare national policies in line with the global climate treaty in the forestry sector.

To quantify the amounts of carbon sequestered by CFM, carbon was monitored in three case study sites over a three-year period. The three sites are located within Nepal Himalaya region where 97% of the area under CFM is found. They lie in the physiographic zones of high mountain (Manang), middle mountain (Lamatar) and Churiya/Siwalik hill (Ilam). From field measurements it was found that the average carbon pool size of a community managed forest (excluding litter and herbs, shrubs) was 138 $tCha^{-1}$ or 504 tCO_2ha^{-1} including soil organic carbon up to 1m depth in the three sites of Nepal Himalaya. What this shows is that should such community forest be converted to other land uses, this pool (above ground carbon and below ground carbon) will be lost and released back into the atmosphere. In addition, the annual increment rate for carbon sequestration in forest under CFM was found to be between 1.92 $tCha^{-1}yr^{1}$ and 7.04 $tCO_2ha^{-1}yr^{1}$ excluding soil organic carbon.

In terms of carbon sequestration in these forests, although the annual increment in biomass was found to be small, it is nevertheless important as it indicates that these forests managed by the community are not degrading but are providing environmental additionality by increasing the carbon reservoir. Even the small increment is significant, because this is happening despite the fact that the forests are harvested in a managed way for fuelwood, timber, fodder and NTFPs by the local people to meet their subsistence needs (Chapter 5).

These three case studies illustrate that forest can be, and is, managed in a sound manner by the locals. Even under traditional management practices, for example in Manang, the CFUG are successfully managing carbon. However, this will not suffice for compliance with the carbon market. If CFUGs are to add value to their existing management by taking part in carbon crediting, they will have to upgrade their management system to meet the compliance standards by: 1) maintaining better records and 2) having a guarantee that carbon stocks will be maintained. The whole notion of forest management by the communities will have to become more formal (Chapter 6).

This thesis also shows that CFUG members from the case study villages were mainly marginal farmers with above average literacy rates; women members in particular were more literate than the national average for women. It was learnt that education rates were reflected in the management style of the CFUGs as members with higher education and literacy rates had adopted a more formal management practice, as shown by Lamatar, while those with less education and lower literacy rates had a more traditional management system, which was correspondingly less transparent, as in Manang.

It was found that in the subsistence economy, households relied on CFM mainly for extracting fuelwood. In terms of meeting energy requirements from the CFM, the highest fuelwood consumption per household was found in Ilam (3.3 tyr^{-1}) followed by Lamatar (3.2 tyr^{-1}) and was least in Manang (2.1 tyr^{-1}). These fuelwood extraction rates were related to biomass growth rates; higher extraction rates of Ilam were backed by higher biomass growth rates, while the least fuelwood was harvested in Manang which has the lowest biomass growth rate. However, it must also be noted that Manang depends less on fuelwood also due to the fact that it receives subsidized fuel and other alternative technology from the tourism revenue through ACAP as part of the management plan for the conservation area (Chapter 7).

Apart from fuelwood consumption, financial income from community forest was found to be negligible; it made up 1.2% of household income in Ilam and did not contribute anything at all in Lamatar and Manang. The main social benefit of CFM was shown to be the supply of fuelwood. It was found that the concept of community based user groups as social capital is well institutionalised within the villages as shown by the high degree of participation, decision making and accountability as perceived by the locals. In all aspects, community based organisations are an important social asset forming a necessary social fabric in mobilizing the local people to manage local resources.

The thesis reviews secondary literature to compare the cost of reducing carbon from other options (Chapter 8). It found that cost of certified emission reduction (CER) credits from the CFM sector is highly competitive. It also considers whether, when trading, CFUGs can derive more benefits than they do currently, since CFUG members will not be attracted if carbon trading does not accrue more benefits than what is being currently harnessed.

In order to understand what the benefit of carbon management would be under carbon trading, three scenarios were created for the purpose of comparing the benefits. Scenario 1 is 'business as usual' in which communities continue to manage their forest with the objective of meeting their subsistence needs without receiving any payment for carbon. Scenario 2 is the addition of carbon management to Scenario 1. Communities continue to meet their sustenance needs from the forest by harvesting forest resources and at the same time sell credits for what remains (sequestered) after meeting their sustenance needs. In this scenario, additional benefits include carbon revenue derived from forest at rates $ 1 and $ 5 per tonne CO_2; low estimates are used in this thesis to avoid speculation. In this scenario, additional costs are incurred in terms of measuring and accounting the carbon. Scenario 3 reflects the case of forest managed solely for carbon sequestration, in which extraction of forest resources are not permitted. Under this scenario, the annual fuelwood consumption rate estimated from the socio-economic survey is converted to carbon credits as fuelwood extraction is not permitted.

Based on data from the financial record of CFUGs and biomass of forest from a survey conducted over three years, gross margin analysis was conducted over a five-year period representing one commitment period under the current CDM project cycle. This analysis revealed that

- CFUGs derive more non-monetary benefits than monetary benefits from managing community forests; and these benefits are the economic rationale for them to manage and conserve their forest at present, as described by Scenario 1.
- When CFUGs are permitted to use forest resources and market additional carbon sequestrated, under Scenario 2, the break even price for tCO_2 is $ 0.55 for Ilam, for Lamatar it is $ 3.7, and for Manang it is $ 2.3.
- As the benefits from use of fuelwood are very high, banning the use of forest resources has a huge cost, which carbon revenue even at a rate of $ 5 cannot compensate, as break even prices for tCO_2 under Scenario 3 are for Ilam $ 8.95, Lamatar $ 17.44 and Manang $ 12.78.
- For the local CFUG members, carbon trading is only attractive when forest resources are permitted under Scenario 2 where gains from carbon management are additional to current gains from CFM.
- CFUGs are already managing their forest in a sustainable manner (Chapter 5 and Chapter 6); revenue from carbon will in practice not operate as an incentive for better forest management for these CFUGs nor will it bring more area under sustainable forest management.
- However, revenue from carbon can be an attractive incentive for the communities to carry out forest inventory and maintain data on carbon stock in their forest on an annual basis as this work is not carried out at the present.

Therefore, this thesis has proved that a cheap way to mitigate climate change is to make sure existing forests stay intact. The cost estimated for sequestrating atmospheric CO_2 in this thesis may be one of the least cost options for offsetting carbon in the world, based on the break even price under Scenario 2 ranging between $ 0.55 to $ 3.70 per tCO_2. These prices are low because the gain from fuelwood extraction lowers the cost of forest management. They include the cost of the CFUGs work in conducting forest inventory and carbon assessments on a yearly basis, since otherwise these would not be performed. In all the villages, it was found that CFUG members could be trained both to locate permanent plots and to carry out standard forest inventory work themselves.

The first hypothesis, that CFM as practiced in Nepal Himalaya region can play an important role in contributing to reducing global emissions is thus shown by the thesis to hold true. The second hypothesis was that CFM will only be able to participate in carbon trading under the UNFCCC if the global treaty has policy instruments that recognize forests as sinks and sources, and when changes are also made at the management level. This thesis has proven that real and practical measures need to be taken to synchronize the global climate policy to the characteristics of CFM. The new global climate treaty could work towards reducing emissions while promoting sustainable development, but only if adjustments are made to the treaty as well as at the management level of CFUGs (Chapter 9).

The new treaty to succeed the KP needs to recognize forests as sinks and sources. But if CFM is to be able to participate in the global carbon market, recognition of forests as sinks and sources under the policy of the RED will not suffice. The climate treaty, with the assistance of RED policy, must have technical details in place that are conducive to CFM, and that would incentivise communities to participate. For this to be achieved, the policy under RED must provide a carbon accounting method that takes into account three different indicators: reduction in deforestation, reduction in forest degradation and forest enhancement, in as far as these result from management intervention. Any activities which give positive results on these indicators, including sustainable extraction of forest resources, should be permitted. This should be backed by an approach in which national baselines are complemented by a subset of nested baselines, so that achievements of communities in reducing emissions and increasing sequestration can be recorded.

At the management level, changes are required at two levels. At the local level, CFUGs need to improve their overall management by better record keeping and by having a guarantee that carbon stocks will be maintained over the project period. These are managerial improvements which the CFUGs can undertake as they already have the capacity for this, as discussed in Chapter 6.

At the national level, there needs to be an institution that coordinates and regulates the concerted efforts of the participating CFUGs as discussed in Chapter 4. The role of such an institution will be to coordinate payment and penalty mechanisms within the country such that there is a market based system in place, one that also protects the rights of indigenous people’s access to forest resources.

The thesis concludes by giving seven recommendations for the new treaty that is expected to be unveiled in Copenhagen in December 2009. These recommendations relate to measures needed to ensure that the special characteristics of CFM are catered for in the agreement. In this way, global effort to fight climate change will become more effective and efficient.

Samenvatting in het Nederlands

Verandering van klimaat is vandaag de dag belangrijker dan ooit als agendapunt voor mondiaal beleid. In dit onderzoek wordt onderzocht of bosbeheer door locale gemeenschappen (Community Forest Management, CFM) een rol kan spelen in de vermindering van de wereldwijde uitstoot van CO_2, door locale gemeenschappen in de bosbouwsector van Nepal als casus te nemen. In dit proefschrift zijn drie bossen, onderhouden door locale gemeenschappen in de Himalaya regio van Nepal, geselecteerd om na te gaan in hoeverre het beheer van dergelijke bossen op succesvolle wijze kan bijdragen aan de vermindering van de CO_2 concentratie in the atmosfeer (Hoofdstuk 1). Op grond van de resultaten van de analyse zijn beleidsaanbevelingen gemaakt ten behoeve van het nieuw klimaatsverdrag dat naar verwachting na 2012 het Kyoto Protocol (KP), zal vervangen.

Het proefschrift toont aan dat verandering van klimaat in essentie beschouwd kan worden als een falen van marktwerking; en het legt uit dat, als gevolg daarvan, de wereldwijde pogingen tot vermindering van deze verandering evenzeer zijn gebaseerd op marktmechanismen. Het is zo goed als zeker dat het nieuwe verdrag ter vervanging van het KP ook gericht zal zijn op het functioneren van de markt. Klimaat is een wereldwijd publiek goed, ofwel een gemeenschappelijke hulpbron, dat een internationaal beheer vereist en daarom hebben de landen gezamenlijk het KP ontwikkeld door, ter bestrijding van de gevaren van klimaatverandering, de uitstoot te reguleren. Dit gebeurt grotendeels door toepassing van een zogenoemd '*cap-and-trade*' (vaststellingenverhandeling) mechanisme. Hiermee worden de niveaus van uitstoot van een land of van een industrie ingeperkt en vervolgens wordt aan een individueel land of bedrijf toegestaan carbon kredieten te kopen of te verkopen.

De gedachte achter dit neo-liberale beleid is dat de markt efficiënter is dan een overheid omdat die hoge transactie kosten nodig heeft. De neo-liberale economische theorie was oorspronkelijk bedoeld voor handel en bedrijfsvoering. Pas later werd die ook toegepast op milieubeheer en bescherming. Echter, de toepassing van marktmechanismen op het reguleren van milieuvervuiling kent ook zijn valkuilen. Hoewel de internationale markt voor carbon op een '*cap-and-trade*' mechanisme berust, is die in feite sterk gereglementeerd door de vaststelling van quota en beperkingen, en is er dus helemaal geen sprake van een vrije markt. Neo-liberale economische principes werken vaak in het nadeel van gemarginaliseerde groepen in de samenleving en ten gunste van de bevoordeelden; en arme landen profiteren er minder van dan rijkere landen

(Hoofdstuk 2). Dit wordt aangetoond in het zogenoemde Schone Ontwikkeling Mechanisme (Clean Development Mechanism, CDM) van het KP. In een nieuw wereldwijd klimaatsverdrag zouden de belangen van de zwakkere spelers, zoals de boeren in CFM die economisch zelfvoorzienend zijn, verdisconteerd moeten zijn zodat zij er eveneens de vruchten van kunnen plukken. Binnen een economie gebaseerd op zelfvoorziening blijkt dat bossen die door locale gemeenschappen worden beheerd een hoge sociale waarde hebben voor die locale gemeenschappen; en dat de waarden die aan een carbonmarkt worden toegekend de werkelijke waarde van bossen als hulpbron niet weergeven.

Er is wetenschappelijk vastgesteld dat bossen een belangrijke functie vervullen binnen de carboncyclus omdat zij carbon als een spons absorberen maar ook een bron zijn voor de uitstoot van carbon. De uitstoot als gevolg van verlies aan bossen in de tropen wordt geschat op 20-25 % van alle huidige uitstoot van broeikasgassen. Desondanks verschaft het KP slechts twee beperkte mogelijkheden tot creditering van bosbouwactiviteiten in ontwikkelingslanden. Twee activiteiten worden binnen CDM erkend, namelijk bebossing en herbebossing (*afforestation and reforestation, AR*), dat wil zeggen, de aanleg van nieuwe bosplantages. CFM heeft echter betrekking op het tegengaan van ontbossing en van de degradatie van bestaande bossen en op de uitbreiding van biomassa van bossen. Vandaar dat het beheer van bossen door gemeenschappen, zoals dat gebeurt in de Himalaya regio van Nepal, niet valt onder de carbonopvang projecten van CDM/AR.

Dergelijke tekortkomingen van het KP onderkennend, is het SBSTA (*Subsidiary Body for Science and Technology*) van UNFCCC begonnen de Partijen te betrekken bij discussies gericht op het formuleren van beleid dat moet leiden tot vermindering van uitstoot als gevolg van ontbossing in ontwikkelingslanden (RED); binnen dat beleid zijn dan bosbeheer en beschermingsactiviteiten opgenomen, twee terreinen die door CDM worden verwaarloosd. Het voorgestelde RED beleid voor ontwikkelingslanden erkent en voorziet in betaling voor bosbouwactiviteiten die uitstoot verminderen als gevolg van ontbossing en van degradatie van bossen, zoals duurzaam bosbeheer en bescherming van bossen. De beslissing is nog niet genomen of er ook kredieten worden toegekend voor de vergroting van carbonvoorraden door bos. In 2007 is op Bali een belangrijke beslissing genomen ten aanzien van RED. De daar aanwezige Partijen kwamen overeen het RED beleid te versterken en te steunen. Deze beslissing, 2/CP13, maakt het voor het eerst mogelijk CFM activiteiten op te nemen. Bovendien erkent zij de rechten van de inheemse bevolking die in haar zelfvoorziend bestaan afhankelijk is van bos als hulpbron.

Echter, de erkenning van bos als opvang en als bron van uitstoot is mogelijk niet voldoende om CFM deel te laten nemen aan de handel in carbon. Dit onderzoek heeft aangetoond dat CFM unieke eigenschappen heeft en dat er, om locale gebruikersgroepen van bossen (CFUGs) te laten participeren in carbonhandel, bruikbare technische processen aanwezig moeten zijn. Een RED beleid zal in het bijzonder op de volgende aspecten gericht moeten zijn: a) criteria voor carbon boekhouding, b) het opstellen van uitgangspunten voor metingen (*baseline*), en c) de rechten van inheemse volken, zodat het beleid aantrekkelijk wordt voor CFM. Dit zijn de drie technische punten die genoemd worden in het 2/CP13 Besluit, hoewel de rechten van inheemse volken feitelijk politiek en cultureel van aard zijn (Hoofdstuk 3).

Er is gegronde reden Nepal als aandachtsregio voor dit onderzoek te kiezen. Nepal loopt voorop wat betreft CFM beleid als hoofdbestanddeel van zijn bosbouwbeleid. Hoewel locale gemeenschappen van oudsher al op enigerlei wijze betrokken waren bij bosbeheer, werd CFM eindjaren zeventig formeel als beleid geïntroduceerd; de wijde toepassing ervan werd pas mogelijk na het herstel in 1990 van de meerpartijen democratie in het land. De ontwikkeling van CFM beleid in Nepal is bepaald door zowel interne als externe factoren. De interne factoren die van invloed waren en vorm gaven aan de wijze waarop de hulpbronnen van bossen werden beheerd, omvatten: 1) veranderingen in het politieke en bestuurlijke systeem, en 2) ontwikkelingen binnen het nationale bosbouwbeleid. De externe factoren die van invloed zijn geweest op de ontwikkeling van CFM in het land, zijn: 1) veronderstelde ecologische veranderingen, en 2) de economische paradigmata van die jaren. Deze veranderingen hebben gezamenlijk de ontwikkeling bepaald van het bosbeheer dat zo karakteristiek is voor het huidige bosbouwbeleid in Nepal. Leden van de CFUGs hebben zich verenigd in een federatie van gemeenschappen van bosgebruikers in Nepal, FECOFUN, die een rechtspersoon is en feitelijk de grootste maatschappelijke organisatie is met meer dan 10.000 CFUGs als leden. Dit is vrij bijzonder en karakteriseert de vooruitgang in Nepal op het gebied van CFM. Het CFM beleid is zowel weerbaar als flexibel omdat het sterk is gebaseerd op democratische en neo-liberale idealen, maar tegelijkertijd óók elementen bevat van locale mondigheid en duurzame ontwikkeling (Hoofdstuk 4).

Het is nu nodig CFM te analyseren in de wijdere context van een wereldwijd klimaatsverdrag. Na de ratificering door Nepal van het KP in 2005 heeft de overheid interesse getoond in de carbonhandel op wereldschaal en heeft zij onlangs een proces op gang gebracht om nationaal beleid voor te bereiden dat aansluit bij de bosbouwsector van het wereld klimaatsverdrag.

Om de hoeveelheid opgenomen carbon door CFM vast te stellen, werd in drie onderzoekslocaties over een periode van drie jaar carbon gemeten. Deze drie locaties bevinden zich in de Himalaya regio van Nepal waar 97% van het gebied onder CFM valt. Zij liggen respectievelijk in de hoge bergen zone, (Manang), de middelhoge bergen zone, (Lamatar), en in de Churiya/Siwalik heuvels, (Ilam). Veldmetingen in de drie bossen in de Himalaya regio van Nepal die beheerd worden door locale gemeenschappen gaven aan dat de gemiddelde grootte van de carbonvoorraad (exclusief blad- en takafval, planten en struikgewas) 138 tC/ha bedraagt, ofwel 504 $tC0_{2/}$ha, inclusief het organische carbon tot één meter diep in de grond. Dit houdt in dat wanneer een dergelijk gemeenschapsbos zou worden aangewend voor ander gebruik deze boven- en ondergrondse carbonvoorraad verloren gaat en wordt teruggestoten in de atmosfeer. Bovendien bleek de jaarlijkse toename van opvang van carbon in bossen onder CFM beheer tussen 1,92 tC/ha/jaar en 7,04 $tCO_{2/}$ha/jaar te liggen, exclusief het organisch ondergrondse carbon.

Hoewel de jaarlijkse toename van biomassa, wat betreft carbonopvang in deze bossen, gering bleek, is deze toch van belang omdat zij aantoont dat deze bossen onder beheer van de locale gemeenschappen niet achteruitgaan maar een toegevoegde milieuwaarde hebben doordat zij de carbonvoorraad vergroten. Zelfs een kleine toename is van belang omdat dit gebeurt ondanks het feit dat de bossen door de locale bevolking worden benut voor het verzamelen van brandhout, houthandel, voedsel voor dieren en voor niet-verhandelbare bosproducten om in hun dagelijkse behoeften te voorzien (Hoofdstuk 5).

Deze drie locatie studies tonen aan dat bossen door de locale bevolking op een gezonde manier kunnen worden beheerd, en dat dit hier ook inderdaad het geval is. Zelfs in een traditioneel beheersysteem, zoals in Manang, beheert de CFUG op succesvolle wijze carbon. Deze wijze volstaat echter nog niet om deel te nemen aan de carbonmarkt. Indien CFUGs ook gebruik zouden willen maken van het kredietsysteem voor carbon dan moeten zij hun beheersysteem verbeteren om te voldoen aan de eisen die een carbonmarkt stelt: 1) het bijhouden van een goede registratie van gegevens, en 2) het kunnen garanderen dat carbonvoorraden blijven voortbestaan. De hele opzet van bosbeheer door de locale gemeenschappen zal formeler moeten worden (Hoofdstuk 6).

Het proefschrift toont ook aan dat de leden van CFUGs in de bestudeerde locaties voornamelijk gemarginaliseerde boeren waren met een bovengemiddeld niveau van leesvaardigheid; speciaal de vrouwelijke leden waren meer geletterd dan het gemiddelde landelijk niveau voor vrouwen. Het niveau van onderwijs kwam ook tot uitdrukking in de beheerssysteemstijlen van de CFUG; leden met een hoger onderwijs en leesvaardigheidniveau hebben een meer formeel beheersysteem, zoals in Lamatar, terwijl diegenen met een lager onderwijs en leesvaardigheidniveau, zoals in Manang, een traditioneler beheersysteem hanteren dat minder doorzichtig is.

Huishoudingen binnen een zelfvoorzienend economisch systeem gebruiken CFM voornamelijk voor het verzamelen van brandhout. Wat betreft het voorzien in de behoeften aan energie door middel van CFM, werd het hoogste brandhoutgebruik genoteerd in Ilam (3,3 ton/jaar), gevolgd door Lamatar (3,2 ton/jaar) en het laagste in Manang (2,1 ton/jaar). Deze getallen voor het brandhoutgebruik werden gekoppeld aan de groeicijfers voor biomassa; het hogere brandhoutgebruik in Ilam werd gecompenseerd door hogere groeicijfers voor biomassa, terwijl in Manang de biomassa toename ook het laagst was. Al moet worden opgemerkt dat in Manang de afhankelijkheid van hout minder was door het aanbod van gesubsidieerde brandstof en andere vormen van technologie vanwege inkomsten uit de toeristensector via ACAP, als onderdeel van een beheersplan voor dit natuurgebied (Hoofdstuk 7).

Behalve voor het gebruik van brandhout bleek er nauwelijks sprake te zijn van enig inkomen uit de gemeenschapsbossen; in Ilam was dit slechts 1,2 % van het inkomen en in Lamatar en Manang was er geen enkele vorm van inkomsten. De voorziening van brandhout bleek dan ook het belangrijke maatschappelijke voordeel te zijn van CFM. Het concept van CFUG, als sociaal kapitaal, is goed verankerd binnen de dorpen zoals verwoord door de locale bevolking in zake de hoge participatiegraad, de besluitvorming en kwesties van verantwoording. Op alle terreinen zijn gemeenschapsorganisaties van groot belang als onderdeel van de maatschappelijke samenhang en het mobiliseren van de bevolking bij het beheer van hun locale hulpbronnen.

In het proefschrift worden op basis van gegevens uit de literatuur de kosten voor beperking van carbon in de atmosfeer door middel van CFM kost effectief vergeleken met andere mogelijkheden (Hoofdstuk 8). Het bleek dat de kosten voor kredieten voor gecertificeerde emissie vermindering (CER) van de CFM sector zeer concurrerend zijn. Ook is onderzocht of, indien carbonhandel wordt toegepast, CFUGs meer voordeel zouden kunnen ontvangen. Want de leden van CFUG zullen niet zo gemotiveerd zijn voor carbonhandel indien zij niet meer voordeel behalen dan zij nu al hebben.

Om te begrijpen wat het voordeel van carbonbeheer zou kunnen zijn indien carbonhandel wordt toegepast, werden drie scenario's ontworpen met het doel de voordelen te kunnen vergelijken. Scenario-1, 'het gangbare beheer', waarbij de gemeenschappen hun bossen beheren zoals zij gewend zijn te doen om te voldoen aan een zelfvoorzienend levensstijl zonder een beloning voor carbon. Scenario-2 is dan een aanvulling op 1, met carbonbeheer. Gemeenschappen blijven hun behoeften voor een zelfvoorzienende levensstijl betrekken uit het bos maar verkopen tegelijkertijd kredieten voor de opname van carbon dat daarna nog overblijft. In dit scenario wordt dit extra voordeel van carbonopvang berekend op $ 1 tot $ 5 per ton CO_2; dit zijn lage schattingen om geen al te hoge verwachtingen te scheppen in dit onderzoek. In dit scenario zijn de kosten voor meting van en berekening voor carbon verrekend. Scenario-3 gaat uit van een bosbeheer geheel gericht op de opvang van carbon, en waarbij het niet is toegestaan iets aan het bos te onttrekken. In dit scenario is de jaarlijkse hoeveelheid aan brandhout behoefte op basis van een socio-economisch onderzoek geschat en omgerekend naar kredieten voor carbon, omdat het verzamelen van brandhout dan niet meer is toegestaan.

Op basis van de financiële rapportage van de CFUGs en van gegevens over de biomassa verkregen door onderzoek over een periode van drie jaar, werd een berekening gemaakt van de verschillen tussen de drie scenario's voor een periode van vijf jaar, conform de huidige CDM cyclus. Hieruit bleek:

- CFUGs ontlenen meer niet-financiële dan financiële voordelen aan het beheer van gemeenschapsbossen; deze voordelen vormen voor hen de economische reden hun bossen te beheren zoals zij nu doen, zoals blijkt in Scenario-1.
- Indien CFUGs hun hulpbronnen van het bos mogen blijven gebruiken en de opvang van het toegevoegde carbon mogen verhandelen, zoals in Scenario-2, dan is de kritische prijs per tCO_2 in Ilam $ 0,55; in Lamatar $ 3,7 en in Manang $ 2,3.
- Omdat de voordelen van brandhout zeer hoog zijn, vormt het verbod van het gebruik van de hulpbronnen van bos een te hoge prijs, die zelfs met een $5 prijs niet kan worden gecompenseerd omdat de kritische prijzen per tCO_2 in Scenario-3 voor Ilam $ 8,95; voor Lamatar $ 17,44 en in Manang $ 12,78 bedragen.
- Voor de locale leden van een CFUG is carbonhandel alleen aantrekkelijk indien zij de hulpbronnen van bos, zoals in Scenario-2, mogen blijven benutten waarbij de winsten van carbonbeheer toegevoegd worden aan de huidige inkomsten van CFM.
- CFUGs beheren hun bossen al op een duurzame wijze (Hoofdstukken 5 en 6); inkomsten uit carbon vormen voor deze CFUGs dan ook geen extra motivering voor beter bosheer en het zal ook geen groter areaal onder duurzaam bosbeheer brengen.
- Inkomsten uit carbon kunnen echter wel een aantrekkelijke aanmoediging vormen voor gemeenschappen tot het maken van een jaarlijks overzicht van het bosbestand en het bijhouden van gegevens over carbonvoorraden in hun bossen omdat deze werkzaamheden nu niet worden uitgevoerd.

De conclusie kan worden getrokken dat dit onderzoek heeft aangetoond dat er een goedkope manier is klimaatverandering te verminderen door bestaand bos in stand te houden. De geschatte kosten in dit proefschrift voor vermindering van CO_2 in de atmosfeer vormen mogelijk een van de goedkoopste oplossingen voor het wereldwijd neutraliseren van carbon, gebaseerd op de kritische prijzen, variërend tussen $ 0,55 en $ 3,70 per tCO_2, in Scenario-2. De prijzen zijn zo laag omdat het voordeel uit het gebruik van brandhout de kosten voor bosbeheer verlaagt. Het betreft hier de kosten voor het maken van een jaarlijks bosbestand en een inschatting van carbonvoorraden omdat deze taken anders niet zouden worden uitgevoerd. In alle dorpen bleken de leden te kunnen worden getraind in het vaststellen van de locaties voor de metingen die de basis vormen voor het zelfstandig uitvoeren van standaard inventarisatie van bossen.

De eerste hypothese, namelijk dat CFM zoals in de Himalaya regio van Nepal toegepast, een belangrijke rol kan spelen als bijdrage tot het verminderen van wereldwijde uitstoot van CO_2, is in dit onderzoek juist gebleken. De tweede hypothese luidde, dat CFM alleen dan zal kunnen participeren in carbonhandel in UNFCCC verband indien een wereldwijd verdrag beleidsinstrumenten bevat waarin wordt erkend dat bossen zowel als een opvang van als ook een oorzaak voor carbon worden erkend, en waarin er veranderingen in beheer worden doorgevoerd. Dit onderzoek heeft inderdaad aangetoond dat concrete en praktische maatregelen dienen te worden getroffen om een wereldwijd klimaatsbeleid te laten aansluiten op de bijzondere kenmerken van CFM. Het nieuwe wereld klimaatsverdrag zou kunnen functioneren ter vermindering van uitstoot van CO_2 en tegelijkertijd duurzame ontwikkeling kunnen nastreven, maar alleen indien er naast aanpassingen in het verdrag ook aanpassingen op beheersniveau worden doorgevoerd (Hoofdstuk 9).

Het nieuwe verdrag dat het KP zal vervangen moet bossen als 'opvang' en als 'bron' beschouwen. Maar ook als CFM in staat zullen zijn deel te nemen aan een wereldwijde carbonhandel, dan is de erkenning van bos als 'opvang' en als 'bron' in het kader van een RED beleid niet voldoende. Het klimaatsverdrag, met behulp van RED, zal technische onderdelen moeten bevatten die het voor CFM toegankelijk maken, en die voor locale gemeenschappen als aanmoediging dienen om deel te nemen. Om dit te bereiken, zal een RED beleid een methode voor carbon boekhouding moeten bevatten bestaande uit drie verschillende indicatoren: vermindering van ontbossing, vermindering van degradatie van bossen, en de uitbreiding van biomassa van bossen, voor zover die afhankelijk zijn van ingrepen als gevolg van bosbeheer. Elke activiteit met positieve gevolgen voor deze indicatoren, inclusief duurzaam gebruik van de hulpbronnen van bossen, moet worden toegestaan. Dit zal ondersteund moeten worden door een benadering waarbij nationale uitgangspunten voor metingen (*baselines*) worden aangevuld met een serie van gerelateerde uitgangspunten op subnationaal niveau zodat resultaten op het terrein van vermindering van uitstoot en vergroting van de opvang behaald door gemeenschappen kunnen worden vastgelegd. Op het gebied van beheer zijn op twee niveaus veranderingen noodzakelijk. Op locaal niveau moeten de CFUGs hun al geheel beheer verbeteren door betere verslagen op te stellen en door te waarborgen dat de carbonvoorraden zullen blijven bestaan gedurende de periode van het project. Dit zijn beheersverbeteringen die CFUGs kunnen uitvoeren zoals besproken in Hoofdstuk 6.

Op nationaal niveau moet een instantie worden ingesteld die tot taak heeft de gezamenlijke inspanningen van de deelnemende CFUGs te coördineren en te reguleren, zoals aangegeven in Hoofdstuk 4. De rol van die instelling is het coördineren van uitbetaling- en bestraffingmechanismen binnen het land zodat er een marktconform systeem ontstaat; een systeem dat tegelijkertijd de rechten van de inheemse bevolking op toegang tot de hulpbronnen van bossen beschermt.

Het proefschrift eindigt met de formulering van 7 aanbevelingen voor het nieuwe verdrag dat naar verwachting in december 2009 in Kopenhagen zal worden vastgesteld. Deze aanbevelingen zijn gericht op het nemen van die maatregelen die nodig zijn om er voor te zorgen dat de specifieke kenmerken van CFM worden opgenomen in het verdrag. Op die wijze zal de wereldwijde inspanning in de strijd tegen klimaatsverandering effectiever en efficiënter zijn.

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