FINAL REPORT for APN PROJECT
ARCP2009-10NSY-Gautam

Assessment of Role of Community Forests (CFs) in CO_2 Sequestration, Biodiversity and Land Use Change

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Project Reference Number: ARCP2009-10NSY-Gautam
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OVERVIEW OF PROJECT WORK AND OUTCOMES

Non-technical summary

Community Forestry, a successful program for protecting and rehabilitating the forests has received highest priority of all the programmes of Nepal's forestry sector since 1978. Community Forests (CFs) are getting wide attention not only because they constitute a major component of livelihood in the rural areas but also due to emerging policy process such as mainstreaming the climate change issue in development agendas. However, the studies on CO_2 sequestration, species diversity, and land use change relevant to CF are limited. Therefore, this study aimed to: estimate carbon deposit in forest, document tree species diversity, map land use change areas in selected CFs, and analyze the role of CFs in CO_2 sequestration, biodiversity, and land use change. The major project activities included: review of relevant literature, Focus Group Discussion (FGD) and Participatory Rural Appraisal (PRA) regarding the process of land use change and knowledge of biodiversity among the locals, vegetation survey, interpretation of satellite images, analysis of biodiversity, estimation of carbon deposit, organization of stakeholder meeting and workshop in Kathmandu, and finally report writing. The study showed that CFs have been playing crucial role in increasing forest cover and tree density in public and private lands, and contributing to a substantial increment in carbon sequestration.

Objectives

The main objectives of the project were:

- To estimate carbon deposit in selected CFs,
- To document tree species diversity in selected CFs,
- To map the land use change in selected CFUGs affected areas, and
- To analyze the role of Community Forests in CO_2 sequestration, biodiversity and land use change.

Amount received and number years supported

A total of US$ 38050 (Thirty eight thousand and fifty US Dollars) was awarded to this project for 2009/2010.

Activity undertaken

Major project activities undertaken were:

- Review of literature,
- Collection of the data and information of the 10 selected community forests,
  - Field work to verify the present boundaries,
  - Questionnaire survey and PRA regarding the land use and biodiversity in CFs,
  - Vegetation survey to record species and measure the diameter at breast height (DBH) and height of the tree,
- Analysis of biodiversity and estimation of carbon deposit,
- Sharing of relevant information and knowledge from collaborative countries, and
- Organization of stakeholder meeting and knowledge sharing workshop.

Results

Key results are given below:

- CFs have been playing crucial role in increasing forest cover and tree density in public and private lands, and ultimately the sequester carbon,
- The community forest user groups (CFUGs) are unaware about the role of CFs on land use changes and carbon sequestration,

- Compared to other hilly areas of Nepal, the tree species diversity observed at the sites investigated was richer; nevertheless, some species were already extinct and some were largely depleted,
- The project provided CFUGs and other related stakeholders an opportunity to understand the possible benefits of CFs in terms of ecosystem services and carbon trading in addition to the silvicultural practices and social equity of which they were already aware,
- Land use change analysis between 1988 and 2009 in the selected areas of CFs showed great changes in forest and cultivated lands: increase in forest land and decrease in cultivated land in almost all studied areas, and
- Carbon deposit was found higher in climax than the secondary succession forests due to the presence of big sized trees.

Relevance to APN's Science Agenda and objectives

The project has addressed the three APN science agendas: climate, biodiversity and land use, and use of resources. Importance of sustainable CFs management is not only confined within local and national level, but also a matter of great concern at regional and global level. The growth and degradation of surface vegetation produces changes in the global atmospheric concentration of CO_2; and changes in the land surface. This reflects a variation in surface energy budgets affecting local, regional and global climate. Besides, forest management was directly related to socio-economic development and had several consequences in the regeneration process, community structure and plant diversity. CO_2 emission and climate change are global issues and also related to CO_2 sequestration capacity of CFs. As APN Strategic Plan 2005-2010 emphasizes the needs to contribute to solving social and economic problems associated with global change, the project activity was considered highly relevant to APN mission. Regarding the policy agendas, the output of this project was anticipated to be useful for local/national/regional policy making process. The third important attribute of the project contributed in amending the CF operational plans and in raising the awareness of users and management authorities. In addition, participation of key experts from national and international level during the workshop was a major component towards addressing institutional agenda.

Self evaluation

A self evaluation was made as follows:

- Altogether 10 Community Forest User Groups (CFUGs) in Nepal were selected for the project activities. They are now aware on biodiversity and concept of carbon trading through the activities of this project,
- Awareness level of CFUGs, forest related authorities and development practitioners was also found to be enhanced,
- The analysis and investigations of initial stage indicated that majority of CFUG members are entirely unknown about the main component of this project; carbon trading and biodiversity,
- It was observed that the academic background of participants from CFUGs differed, therefore, the delivery of the content and concept of the project was not to the level as expected, and

- The analysis and investigations indicated a need of further research on a few aspects like REDD and CO_2 sequestration.

Potential for further work

This study has opened the door for further work in incorporating climate change issues with community forests. If the similar study is continued on yearly basis, we can get the potential of the community forests in sequestering carbon dioxide. Also further work in such study can provide a database and a framework through which REDD (Reducing Emission from Deforestation and Degradation) can provide financial and livelihood benefits.

Publications

A few publications are in progress.

References

Acknowledgments

Project team appreciates the help extended by Graduate school of Environmental Science, Hokkaido University, Japan and Institute of Ecology, Padjadjaran University, Indonesia to conduct the project activities. The contribution and support of chief executive officers and junior officers of the District Forest Offices and member of concerned CFUGs is also highly appreciated. Finally, we would like to extend sincere thanks to National Science Foundation (NSF) for financial support through APN.

TECHNICAL REPORT

Preface

This technical report titled "Assessment of Role of Community Forests (CFs) in CO_2 Sequestration, Biodiversity, and Land Use Change" provides an overview of a research project executed by Nepal Development Research Institute (NDRI) and funded by Asia Pacific Network for Global Change Research. The findings of the report are based on the primary and secondary information collected from the selected 10 community forests in Nepal. The report also includes feedback/comments from the workshop. It is expected that the report in present form will be useful for further research studies.

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Punya Prasad Regmi, PhD
Executive Director

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Acronyms

CFP - Community Forest Program

CFs – Community Forests

CFUGs- Community Forests User Groups

CO_2 - Carbon dioxide

CP - Chisapani Community Forest

DB – Dulbu Community Forest

DBH – Diameter at breast height

DD - Diyale Dada Community Forest

DFO- District Forest Office

GCPs – Ground Control Points

GPS – Global Positioning System

IMP – Importance Percentage

IPCC – Intergovernmental Panel on Climate Change

IY - Indrayani Ka/Kha Community Forest

KS – Kantheswara Community Forest

NDRI – Nepal Development Research Institute

NGOs – Non Governmental Organizations

PRA – Participatory Rural Appraisal

RB – Ramche Bihare Community Forest

REDD – Reducing Emissions from Deforestration and Degradation

SM – Seltap Mangalmai Community Forest

SN - Sivanari Community Forest

SSM – Salme Surke Mahabir Community Forest

ST -Sulithumka Community Forest

CHAPTER I

INTRODUCTION

1.1 Background

Community Forestry Program (CFP), a successful program for protecting and rehabilitating the forests has received highest priority of all the programmes of Nepal's forestry sector since 1978. According to CFP, national forests were handed over to the Community Forest User Groups (CFUGs) for protection, management and utilization as per Forest Act, 1993. Thus, Community Forests (CFs) are managed by CFUGs according to the operational plan that is approved by the District Forest Office (DFO). By June 2008, 1.22 million hectares (about 20.5 % of the Nepal's forest area) of forest has been handed over to more than 14,000 CFUGs involving 1.65 million households (40% of Nepal's total households) (CFB, 2008). The guidelines of community forest operational plan has emphasized on social inclusion and gender for equal distribution of forest resources among the users community rather than sustainable way of forest use. Thus, CFs is getting wider attention not only because they constitute a major component of livelihood in the rural areas but also due to emerging policy process such as biodiversity and climate change.

Importance of sustainable CFs management is not only confined within local and national level, but also a matter of great concern at regional and global levels. The growth and degradation of surface vegetation produces changes in the global atmospheric concentration of CO_2 and changes in the land surface. This reflects a variation in surface energy budgets affecting local, regional and global climate (Marland *et al.*, 2003). The CO_2 emission and climate change are global issues and also related to CO_2 sequestration capacity of CFs. Besides, forest management is directly related to socio-economic development and has several consequences in the regeneration process, community structure and plant diversity. Nevertheless, the practices of using few selected species for plantation, firewood, and conservation of dominant species in such managed forests have several consequences in the regeneration process, plant diversity and community structure of forests (Gautam and Watanabe, 2005). Furthermore, above consequences reflect on land use practices in nearby areas of the CFs since the agriculture system is well integrated with forests in Nepal. Moreover, the existing documents related to CF have not adequately addressed the issues of carbon trading and land use management that are directly associated with the CF.

1.2 Objectives

- Review, analysis and assessment of the relevant research literature on CO2 sequestration, biodiversity, and land use change,
- Interpretation of available satellite images/air photographs for mapping the land use change area,
- Fieldwork will be conducted to verify the present-day boundaries of land use types in the selected areas,
- Carry out questionnaire survey and PRA in selected CFs regarding the process of land use change and knowledge of biodiversity among the locals,
- Vegetation survey will be made to record species and measure diameter at breast height (DBH) and height of the tree,
- Analysis of biodiversity and estimation of carbon deposit,
- Sharing of relevant information and knowledge from collaborative countries,
- Suggest a mechanism to incorporate the results and findings in CF operational plan documents,
- Workshop is carried out to create awareness on CO2 trading ,
- Final Report Preparation.

1.3 Justification

As APN Strategic Plan 2005-2010 emphasizes the needs to contribute to solving social and economic problems associated with global change, this study is considered highly relevant to APN mission. Regarding the policy agenda, the output of this project is anticipated to be useful for local/national/regional policy making process. Since the research focuses on climate, biodiversity, land use issues and use of resources, it will help in exploring opportunities in carbon trading and clean development mechanism applicable to sustainable CFs management. In this regard, the outcomes of this study are expected to be incorporated in CF operational plan including the action plan and management strategy, and also in preparation of guidelines to operate particular CF in raising the awareness of users and management authorities. Thus it will be helpful to explore opportunity in carbon trading, protection of biodiversity, and management of CFs in sustainable way.

1.4 Organization of the report

In this study, the first chapter begins by highlighting sustainable community forest management and carbon trading issues in Nepal. It further explains the objective of this study. The second chapter provides an overview of methodology applied in the study. A section of this chapter highlights the proceedings of the stakeholders meeting and an international knowledge sharing workshop. Similarly, the third chapter focuses on findings from the 10 community forests on land use change, biodiversity and carbon deposit. Chapter four provides the summary of key findings and conclusion drawn from the analysis of data and information.

CHAPTER II

METHODOLOGY

2.1 Selection of the community forests

Community forests which are managed by local people for at least 10 years were selected for the study in this research. Ten representative CFs; Kantheswara, Ramche Bihare, Chisapani, Sivnari, Dulbu, Diyale Danda, Indrayani Ka/Kha, Seltap Mangalamai, Salme Surke Mahabhir and Sulithumka were selected throughout the mid hill regions of central and western Nepal (Table 2.1). Reasons for selection of these forests CFs are:

- It is believed that community forest program is very successful in the hilly areas of Nepal. Subsistence farming system is well integrated with forestry and cattle grazing in this area. Thus, community forestry program have higher impact on biodiversity and land use pattern in Nepal.
- It is expected that the species diversity in these community forests is quite similar so that a good comparison can be made to draw meaningful conclusion.

Besides above facts, *Schima-Castanopsis* forest type, forest condition (very good and good), and accessibility (within three to four hours walking distance from the motorable road/district headquarter) were also considered while selecting these community forests.

Table 2.1 Selected community forests

Community Forests	District	Village Development Committee (VDC)	Households*
Kantheswara (KS)	Palpa	Madan Pokhara	114
Ramche Bihare (RB)	Syanja	Phaparthum	332
Chisapani (CP)	Kaski	Rupakot	75
Sivnari (SN)	Lamjung	Baglungpani	62
Dulbu (DB)	Kathmandu	Lapsephedi	145
Diyale Danda (DD)	Lalitpur	Godawari	148
Indrayani Ka/Kha (IY)	Kavre	Panauti	687
Seltap Mangalamai (SM)	Sindhupalchok	Phulpinkot	302
Salme Surke Mahabhir (SSM)	Dolakha	Thulo Patal	113
Sulithumka (ST)	Ramechhap	Okhareni	240

Source: Department of Community Forest, Government of Nepal, 2009.
* Filed survey, 2009.

2.2 Data collection and analysis

2.2.1 Land use change

Satellite images were used to assess the land use change. Landsat TM 1998 with spatial resolution of 30m and ALOS AVNIR-2 with spatial resolution of 10m imagery were used to compare the land use changes during 20 years period. The ALOS images were transformed to 30m resolution to match with the spatial resolution of Landsat TM images. For analysis of land use change, ArcGIS 9.2 and Imagine Eradas 8.4 softwares were used.

A field survey through Participatory Rural Appraisal (PRA) was conducted to delineate the buffer area of CF including the user settlements. The buffer area of CF was outlined in the topographic maps and global positioning system (GPS) used to take ground control points (GCPs) for image rectification and classification. Land use changes were assessed in the CF including buffer area of each community CF

which was delineated during the field visit. The following flowchart shows the steps of data collection and analysis for land use in this research.

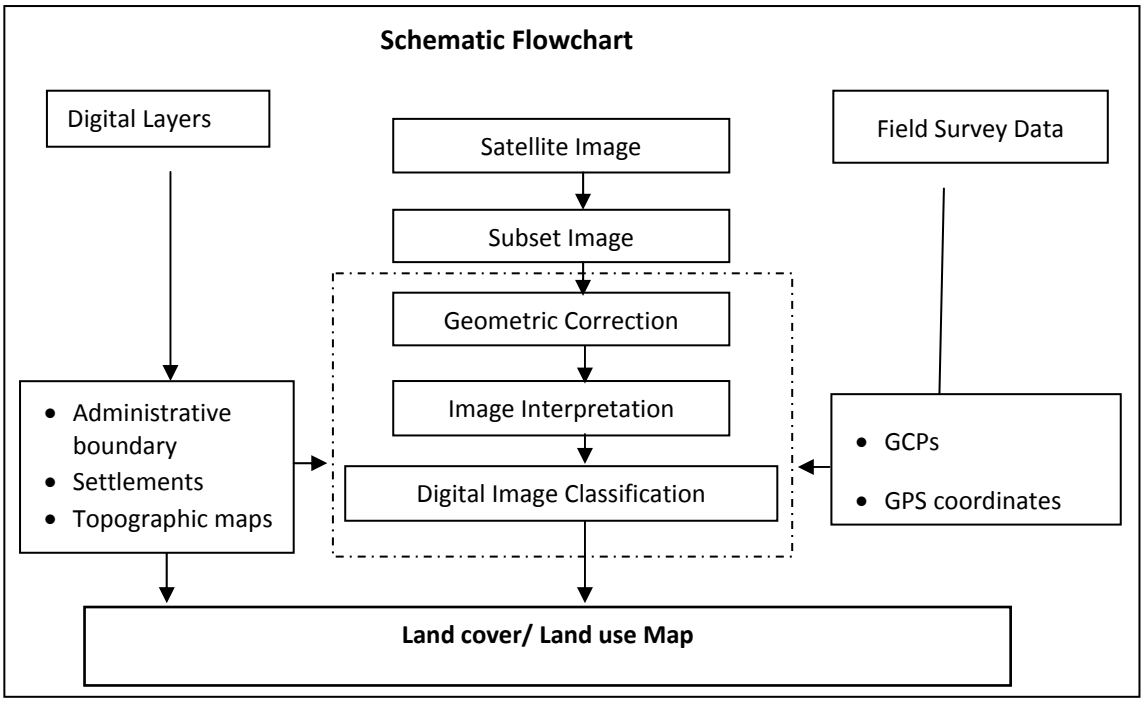

Figure 2.1: Schematic flowchart of data collection and analysis of landuse change

2.2.2 Biodiversity

Data collection: Species area curve method was used to determine sample plots for collecting data to analyse tree species diversity. However, the number of sample plots varies according to size, aspect, elevation, and area of the forests. The total number of plots was 118 and each of them covered an area of 100 m^2 (Table 2.2). The circular plot with radius 5.64 m was designed to easy for slope correction in the mountainous area and meet standard of sample size for estimating carbon deposit (MacDicken, 1997). The location of the sample plot was chosen by the help of topographical maps (1992) applying stratified systematic sampling grid method and verified using GPS, eTrex VISTA®, in the field. After choosing first plot by systematic sampling, the remaining sample plots were established at pre-determined regular intervals, starting from the first sample plot (Tucker et al., 2005). At each sampling plot co-ordinates and altitude were recorded using a GPS.
In each plot, total number of woody species (tree) for stands with diameter greater than 5 cm was counted. Diameter at breast height (DBH) at 1.3 meter height was measured. Species was identified at first by local name in the field through the help of local people and with the ecologist's knowledge. Unidentified species were identified by cross compiling with the reference literatures (Polunin & Stainton, 1984; Stainton, 1988; Shrestha, 1998; DPR, 2001; Lama *et al*. 2001; IUCN, 2004). Vegetation survey was conducted in November - December 2009 and January 2010 depending upon the condition and location of the selected community forests.

Discussions at various levels were held with community forest user groups during the vegetation survey. Participatory Rural Appraisal (PRA) tool was applied to record any change in dominant, common, rare and extinct species. The change occurred confirmed that it was induced by human activities, after the declaration of community forest.

Numbers of sample plot ranges from 9 to 14 in surveyed CFs. Least number of sample plot were laid for those CF which is similar in most attributes. Further number of plots was determined by species area curve method. Plants that were not represented in the quadrants were also recorded during the survey and list of all available plants within the area is given in Annex 2.

Table 2.2 Number of sample plots for vegetation survey in each CF.

Community Forests	Elevation range (meter amsl)	Sample plots (each covers 100 m^2)
Kantheswara (KS)	878 - 1107 (± 8)	10
Ramche Bihare (RB)	1235 - 1873 (± 8)	12
Chisapani (CP)	755 - 1345 (± 11)	11
Sivnari (SN)	1472 - 1698 (± 10)	12
Dulbu (DB)	1430 - 1878 (± 9)	9
Diyale Danda (DD)	1551 - 2223 (± 11)	13
Indrayani Ka/Kha (IY)	1490 - 1734 (± 11)	14
Seltap Mangalamai (SM)	1635 - 2092 (± 9)	12
Salme Surke Mahabhir (SSM)	2020 - 2305 (± 13)	13
Sulithumka (ST)	1392 - 1576 (± 10)	13

Data analysis: Relative density, relative frequency and relative dominance of each species were calculated for finding the importance percentage (IMP) of each species after Mueller-Dombois and Ellenberg (1974). The dominant and co-dominant species of each forest were identified on the basis of IMP. The species having highest IMP was defined as dominant and having second highest IMP defined as co-dominant species.

- Relative density = (number of individuals of a species/total number of individuals (*100)
- Relative frequency = frequency of a species/sum frequency of all species (*100)
- Relative dominance = dominance of a species/dominance of all species (*100)
- Importance value (IV) = relative density + relative frequency + relative dominance
- Importance percentage (IMP %) = Importance value/3

Dominance is defined as the sum of basal areas of all individuals of a species.

The species richness (number of species per unit area), evenness (distribution of abundances among the species), and Simpson's diversity index were calculated after Eq 1 (Pielou, 1969) and Eq 2 (Simpson, 1949) which are the most commonly used measures of diversity indices by ecologists.

$$\text{Evenness}\,(E) = \frac{H'}{\ln(S)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.1)$$

$$\text{Simpson's Diversity}\,(D) = 1 - \lambda, \quad \lambda = \sum_{i=1}^{s} p_i^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.2)$$

Where S = number of species

ln = natural logarithm

n = total number of individuals in the area

pi = the proportion of individuals found in the species

λ = Simpson's concentration of dominance

2. 3 Carbon deposit

Estimation of carbon in forest was made according to the standards set by the IPCC (2003) for the Land Use, Land Use Change and Forestry (LULUCF) sector. For that, A Guide to Monitoring Carbon Storage in Forestry and Agro-forestry Projects developed by MacDicken (1997) were reviewed carefully. However, the carbon estimation for Nepal is based on standard forest inventory principles and techniques, with minor differences to suit differing field conditions, forest types, local forest management, and available technical resources (Banskota et al., 2007).

Biomass estimation: To estimate above ground biomass of trees, the national allometric biomass tables developed by the Department of Forest Research and Survey and Department of Forest, Tree Improvement and Silviculture Component, were used. This table had simplified equations that required only DBH as a single input variable to calculate biomass of the tree species. Since the allometric table does not contain all species found in the studied CFs, value of similar species was used. Biomass of species not covered by allometric table was primarily grouped as per the genus, family and other similar characteristics and then the value of similar genera was used for the biomass calculation. For below ground biomass, root: shoot ratio value of 0.125 was used (Tewari and Karky, 2007). Fifty percent of the biomass was taken as the carbon deposit (MacDicken, 1997).

2.4 Assessment of role of CFs in CO_2 sequestration, biodiversity, and land use change

To assess the role of CFs in CO_2 sequestration, biodiversity, and land use change, following activities were conducted:

- The results of land use change and tree species diversity obtained from this study were verified with the consultation of CFUGs through stakeholder meeting.
- Discussion was made with CFUGs about the land use change and tree species diversity to confirm whether the change was due to community forest or any other factors.
- Awareness program in carbon measurement and trading was conducted among the studied community user groups and documented their knowledge about this matter.
- The role of community forests in land use change and biodiversity were assessed based on results obtained.

2.5 Interaction with stakeholders

NDRI arranged a stakeholder meeting titled "Assessment of Role of Community Forests (CFs) in CO2 Sequestration, Biodiversity, and Land Use Change" on April 25, 2010 in Dhulikhel, Nepal. The main objective of the stakeholder meeting was to discuss the importance of community forests in CO2 sequestration and biodiversity and to share the knowledge/ finding of the project so far. A total of 27 participants including chairperson from different community forest user groups (CFUGs), government authorities and other concerned stakeholders attended the meeting.

The meeting consisted of two sessions; opening session and technical session. Dr. Tara Nidhi Bhattarai, President of NDRI chaired the opening session. Dr. Punya Prasad Regmi, Coordinator (Policy Studies) of

NDRI delivered the welcome speech on behalf of NDRI. The programme was inaugurated by lighting the panas by chief guest Secretary of Ministry of Forestry and Soil conservation, Mr. Yubaraj Bhusal which was followed by the opening remarks. He emphasized the need of coordination between government and private sector in materializing the carbon trading from community forest. Dr. Chintamani Gautam, Project Leader presented a background paper highlighting the brief introduction of the project, study site and aim of the project. Dr. Nawa Raj Khatiwada, the then Executive Director presented the brief introduction of NDRI which was followed by the presentation of Mr. Ram Asheshwar Mandal, Forest Officer, REDD-Forest and Climate Change Cell, on "Climate Change in Nepal and preparation of REDD for Climate Change" highlighting the present status of REDD in Nepal. Finally, Dr. Tara Nidhi Bhattarai, President of NDRI delivered the vote of thanks and concluded the opening session.

The technical session consisted of a joint paper presentation by three team members on the results and findings of the project. Dr. Chintamani Gautam, Project Leader presented first part titled "Income generating successful project and Climate Change" was followed by Mr. Dipesh Pyakurel, Ecologist on "Biodiversity and CO2 Sequestration ". Third part was presented by Mr. Man Bahadur Kshetri, Senior Research Associate, NDRI on "Landuse"

All the presentations were followed by discussion where participants put forward their queries regarding the project. After the presentation, a group work was assigned to the participants and the results were discussed by the team members. Finally, Dr. Tara Nidhi Bhattarai thanked all the participants and adjourned the event. The program was evidenced by the active participation from the CFUGs and other stakeholders. Ms. Sriju Sharma, Research Associate of NDRI served as a Master of Ceremony/Facilitator during the whole event.

2.6 Organization of a workshop

NDRI organized a one day knowledge sharing international workshop titled "Role of Community Forests in CO2 Sequestration, Biodiversity and Land Use Change" on June 28, 2010 in Kathmandu. The main objective of the workshop was to discuss and share knowledge on the importance of community forests in sequestering carbon dioxide, conservation of biodiversity and its impact on land use changes. A total of 78 participants from different sectors including government authorities, national and international organizations, academic and research institutions attended the program. International participants from Japan, Indonesia, Thailand and India were also present.

The workshop consisted of three sessions; opening session, technical session and a panel discussion. The opening session was chaired by Dr. Tara Nidhi Bhattrai, President of NDRI and inaugurated by the chief guest Dr. Ganesh Raj Joshi, Secretary, Ministry of Environment. On the occasion, Dr. Jaya Kumar Gurung, member of NDRI welcomed all the participants and brief introduction of NDRI was presented by Dr. Punya Prasad Regmi, Executive Director of NDRI. Dr. Shovakar Dhakal, Executive Director of Global Carbon Project, National Institute for Environmental Studies, Japan delivered the Keynote address on "Global trends of carbon emissions and sinks with emphasis on land use change and the inter-linkages". He highlighted on the global scenario of the carbon concentration, present issues and benefits from REDD+. Dr. Ganesh Raj Joshi delivered the opening remarks and congratulated NDRI for its achievement in such a short period of time. He highlighted the recent work done by the ministry to combat the impacts of climate change. Finally, Dr. Bhattarai delivered the vote of thanks and concluded the opening session. Ms. Sriju Sharma served as a Master of Ceremony of the event.

The first technical session was chaired by Dr. Laxmi P. Devkota, NDRI member and former NPC member that consisted of two presentations. The first presentation was on the findings of the APN-NDRI joint study on Role of Community Forests in CO2 Sequestration, Biodiversity and Land Use by Dr. Nawa Raj Khatiwada, Mr. Dipesh Pyakurel and Mr. Man Bahadur Kshetri. Second presentation was regarding the Status of REDD in Nepal by Mr. Ram Asheshwor Mandal, Forest Officer from REDD and Climate change

cell, ministry of forests and soil conservation. At the end of the technical session there was a floor discussion where participants put forward their queries.

The second session chaired by Dr. Sunil Babu Shrestha, NDRI member and former NPC member consisted of three presentations followed by the floor discussion. Foreign participants from Thailand, Indonesia and India presented the paper on Recent developments on REDD and forestry sector representing their respective countries. Speakers included Mr. Dendi Muhamad from IOE, Indonesia, Dr. Qwanruedee Chotichanathawewong, Assistant President from Thailand Environment Institute and Dr. Puja Sawhney from New Dehli, India. Many participants expressed their views and provided feedback during the discussion.

Finally, there was a Panel discussion session on the topic "Prospects of Regional Collaboration on REDD and Forestry" which was chaired by Mr. Resham Bahadhur Dangi, Joint Secretary in Ministry of forests and soil conservation and all the speakers served as a panelist. At the end of the programme, Dr. Punya Prasad Regmi thanked all the participants, guests and the organizers for their contribution for the successful completion of the event.

2.7 Desk analysis and report writing

Field study and desk analysis were performed to visualize the management of community forests. Literature and research papers were reviewed in a team to extract major information and methodologies relevant to the study objectives. Data were analyzed using different software. In addition to this, a stakeholders meeting and knowledge sharing international workshop was also organised in Kathmandu.

CHAPTER III

RESULTS & DISCUSSION

3.1 Results

3.1.1 Land use change

The four types of land use; cultivation, forest, shrub, and grass land were identified (Table 3.1.). The details information of land use change (Annex 1) between 1988 and 2009 of each CF are as follows.

Table 3.1 General description of land use categories

Land use	General description
Cultivated land	Area of crop production, including settlements.
Forests	All land with forest cover used only for forestry.
Shrub land	Same as forest but without well-defined stems.
Grass land	Area covered by grass and small plants used locally as livestock fodder.

Surke Salme Mahabhir: This community forest lies in Thulopatal VDC of Dolakha district. The community forest and its buffer zone cover 398.27 hectare land area (Table 3.2). During 1988 – 2009, forest area is increased by 19.45 percent. The increment of cultivated land is negligible i.e. 1.87 percent. Similarly, shrub land has been completely removed and indicated that it must be shifted to forest land (Table 3.2).

Table 3.2 Land use change in buffer area of Surke Salme Mahabhir CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	201.96	205.73	3.77	1.87
Forest	161.34	192.72	31.38	19.45
Shrub	34.97	0	-34.97	-100
Total	398.27	398.45	0.18	-

Source: NDRI, 2009

Sulithumka: This community forest lies in Pakarbas VDC of Ramechhap district. The community forest and its buffer zone cover 751.52 hectare land area (Table 3.1.3). During 1988 – 2009, forest area is

increased by 145.12 percent. The shrub land is increased by16.11 percent. Similarly, the cultivated land is decreased by 25.52 percent and indicated that the cultivated land is shifted to shrub land (Table 3.3).

Table 3.3 Land use change in buffer area of Sulithumka CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	598.90	446.03	-152.87	-25.52
Forest	99.44	243.75	144.31	145.12
Shrub	53.18	61.75	8.57	16.11
Total	751.52	751.53	0.01	

Source: NDRI, 2009

Seltap Mangalamai: This community forest lies in Phulpingkot VDC of Sindhupalchowk district. The community forest and its buffer zone cover 740.8 hectare land area (Table 3.4). During 20 years period, the forest area is decreased by 25.78 percent. The grassland is completely removed in the area. Similarly, the shrub land is also decreased by 95.34 percent. The cultivated land is increased by 79.84 percent. It is found that the forest and shrub land is decreased due to devastation of forest area by landslide hazard.

Table 3.4 Land use change in buffer area of Seltap Mangalamai CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	236.42	425.19	188.77	79.84
Forest	419.72	311.50	-108.22	-25.78
Grassland	3.38	0	-3.38	-100
Shrub	81.27	3.79	-77.48	-95.34
Total	740.80	740.48	-0.32	

Source: NDRI, 2009

Indrayani Ka/Kha: This community forest lies in Panauti VDC of Kavrepalanchowk district. The community forest and its buffer zone cover 538.22 hectare land area (3.5). In between 1988 – 2009, forest area is increased by 44.04 percent. The increment of the shrub land is found the highest i.e. 332.45 percent. Similarly, the cultivated land is decreased by 10.29 percent and indicated that the cultivated land is shifted to shrub land.

Table 3.5 Land use change in buffer area of Indrayani Ka/Kha CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	462.46	414.88	-47.58	-10.29
Forest	70.83	102.02	31.19	44.04
Shrub	4.93	21.32	16.39	332.45
Total	538.22	538.22	0.00	

Source: NDRI, 2009

Dulbu: This community forest lies in Lapsiphedi VDC of Kathmandu district. The community forest and its buffer zone cover 295.24 hectare land area (Table 3.6). In between 1988 – 2009, forest area is increased by 8.12 percent. The shrub land is completely removed. Similarly, the cultivated land is decreased by 3.12 percent. It is indicated that cultivated and shrub land is shifted to forest area.

Table 3.6 Land use change in buffer area of Dulbu CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	103.22	100.00	-3.22	-3.12
Forest	180.58	195.25	14.67	8.12
Shrub	11.44	0	-11.44	-100
Total	295.24	295.25	0.01	

Source: NDRI, 2009.

Diyale Dada: This community forest lies in Godawari VDC of Lalitpur district. The community forest and its buffer zone cover 224.71 hectare land area (Table 3.7). During 20 years period, forest area is increased by 4.13 percent. The cultivation land is decreased by 64.96 percent. The increment of shrub land is the highest and indicated that the cultivated land is shifted to shrub and forest land.

Table 3.7 Land use change in buffer area of Diyale Dada CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	23.63	8.28	-15.35	-64.96
Forest	201.08	209.38	8.30	4.13

Shrub	0.00092	7.04	7.04	764369.5
Total	224.71	224.70		

Source: NDRI, 2009

Shivanari: This community forest lies in Baglungpani VDC of Lamjung district. The community forest and its buffer zone cover 320.25 hectare land area (Table 3.8). During 20 years period, forest area is increased by 8.73 percent. The cultivated land is decreased by 25.70 percent and indicated that the cultivated land is shifted to forest area.

Table 3.8 Land use change in buffer area of Shivanari CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	81.23	60.35	-20.88	-25.70
Forest	239.02	259.89	20.87	8.73
Total	320.25	320.24	-0.01	-

Source: NDRI, 2009

Chisapani: This community forest lies in Rupakot VDC of Kaski district. The community forest and its buffer zone cover 422.20 hectare land area (Table 3.9). During 20 years period, forest area is increased by 21.10 percent. The cultivated land is decreased by 46.62 percent and indicated that the cultivated land is shifted to forest area.

Table 3.9 Land use change in buffer area of Chisapani CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	131.54	70.21	-61.33	-46.62
Forest	290.66	351.99	61.33	21.10
Total	422.20	422.20	0.00	

Source: NDRI, 2009

Ramche Bihare: This community forest lies in Phaparthum VDC of Syangja district. The community forest and its buffer zone cover 710.26 hectare land area (Table 3.10). During 20 years period, forest area is

increased by 3.57 percent. The shrub and cultivated land are decreased by 49.66 and 2.55 percent, respectively. It indicated that the cultivated and shrub land are shifted to forest area.

Table 3.10 Land use change in buffer area of Ramche Bihare CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	364.27	354.98	-9.29	-2.55
Forest	340.23	352.37	12.14	3.57
Shrub	5.76	2.90	-2.86	-49.66
Total	710.26	710.25	-0.01	

Source: NDRI, 2009

Kantheswara: This community forest lies in Madanpokhara VDC of Palpa district. The community forest and its buffer zone cover 202.98 hectare land area (Table 3.11). During 20 years period, forest area is increased by 26.37 percent. The cultivated and shrub land are decreased by 11.47 and 11.35 percent, respectively. It indicated that the cultivated and shrub land are shifted to forest area.

Table 3.11 Land use change in buffer area of Kantheswara CF

Land use type	Area (ha)		Change	Change%
	1988	2009		
Cultivation	124.56	110.28	-14.28	-11.47
Forest	61.48	77.69	16.21	26.37
Shrub	16.94	15.02	-1.92	-11.35
Total	202.98	202.99	0.01	

Source: NDRI, 2009

3.1.2 Species composition and diversity

Species area curve: A species-area curve for natural forest reveals a quick addition of newer species in consecutive plots in the beginning and it remains more or less constant (Shankar *et al*., 1998). In the study area, the rate of species addition increased gradually up to the 5th plot and remained constant from upwards for ST, SM, RB and SN (Figure 3.1). In forest DD, IY and SSM, the curve gradually increased up to 10th plot and after it leveled. The curve was almost constant after the 6^{th} plot for forests KS, CP and DB. So, the curve of all forests showed that the sample plots were enough for these specific forests. The species-area curve showed that the number of species in forests ST, SM, and RB are smaller than that in other forests whereas forests DD and IY has the largest number of species than the others (Figure 3.1).

Forest status: Two stages of forest were recorded during the survey. Six CFs were in secondary succession stage whereas four of them were in climax stage (Table 3.1.12). Ramche Bihare was the representative of climax forest with low plant density and high basal area cover. DBH of more than 100 cm were recorded in Ramche Bihare CF. Kantheswara and Dulbu were representative of secondary

succession stage forest. Numbers of trees were very high but trees were of small size. Silvicultural practice is needed in most of the CFs where the forest was in secondary succession stage.

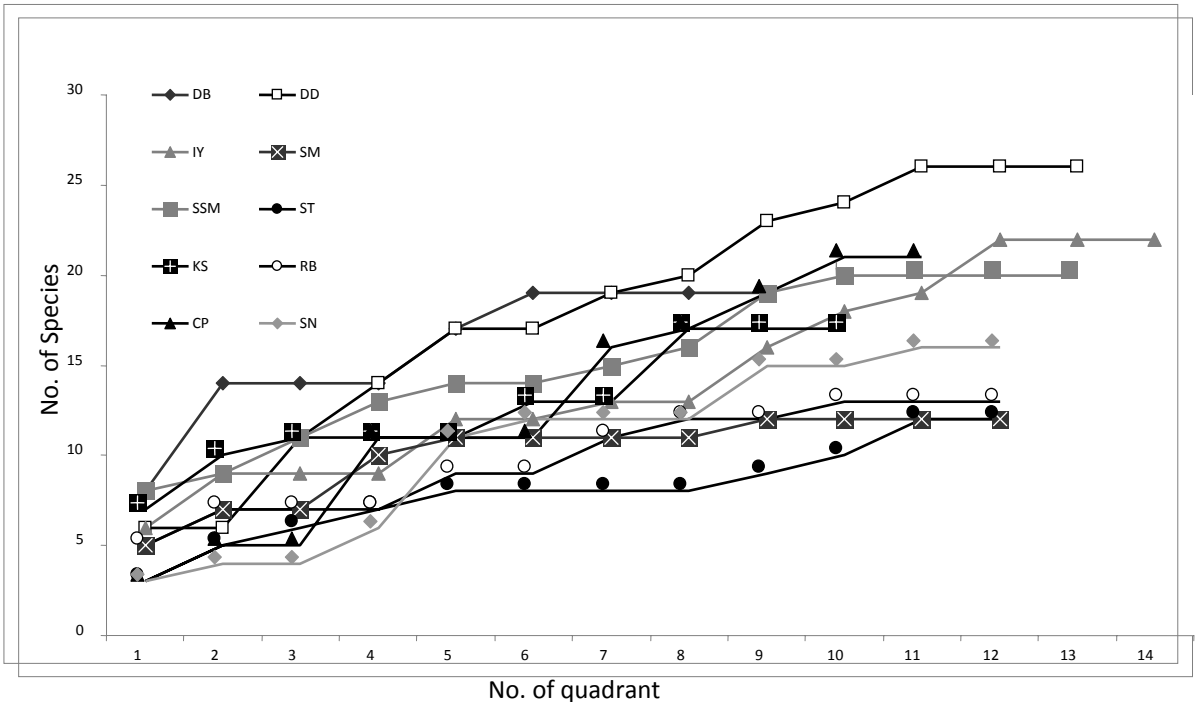

Figure 3.1 Species area curve of each CF

Table 3.12: Stages of surveyed CFs

Community Forests	Nature
Ramche Bihare	Climax forest
Surke Salme Mahabhir	Climax (Partial thinning)
Chisapani	Climax-highly disturbed
Sivanari	Climax-moderately disturbed
Diyale Dada	Secondary succession (Regular thinning)
Dulbu	Secondary succession (Regular thinning)
Indrayani Ka/Kha	Secondary succession (Regular thinning)
Seltap Mangalamai	Secondary succession and plantation

Sulithumka	Secondary succession
Kantheswara	Secondary Succession (Regular thinning)

Source: Field survey, 2009

Tree species Composition: Tree species composition of all forests, recorded during the vegetation survey, is given in (Annex 2) According to important percentage (IMP), *Schima wallichii* is the dominant species in forests CP, SN, KS, RB, and ST whereas it is found as a co-dominant for forests DD, IY, and SM (Table 3.13). *Castanopsis tribuloides* is the dominant species in forests IY and DD. *Quercus glauca, Pinus patula*, and *Pinus wallichiana* are the dominant species of forests DB, SM, and SSM, respectively. The co-dominant species in these forests, however, are quite different. *Castanopsis indica* is a co-dominant species in forest SN and CS whereas *Rhododendron arboreum* characterize ST and SSM. *Pinus roxburghii*, *Shorea robusta* and *Daphniphyllum himalense* are the co-dominant species of forests DB, KS and RB, respectively. *Schima wallichii* is found as a common species of all forests. *Rhododendron arboreum* is also found in the majority of forests except KS. Likewise, *Engelhardia spicata* (except DD and RB), *Eurya acuminata* (except KS and ST), *Lyonia ovalifolia* (except KS and SM), *Myrica esculenta* (except KS and ST) *Castanopsis indica* (except SSM, SM, and ST) species are found in the majority of forests.

Table 3.13 Dominant and co-dominant species in the studied CFs

Community Forests	Dominant species	Co-dominant species
Kantheswara (KS)	*Schima wallichii*	*Shorea robusta, Engelhardia spicata*
Ramche Bihare (RB)	*Schima wallichii*	*Daphniphyllum himalense, Castanopsis indica*
Chisapani (CP)	*Schima wallichii*	*Castanopsis indica, Shorea robusta*
Sivanari (SN)	*Schima wallichii*	*Castanopsis indica, Rhododendron arboreum*
Dulbu (DB)	*Quercus glauca*	*Pinus roxburghii, Myrica esculenta*
Diyale Dada (DD)	*Castanopsis tribuloides*	*Schima wallichii, Persea odoratissima*
Indrayani Ka/Kha (IY)	*Castanopsis tribuloides*	*Schima wallichii, Myrica esculenta*
Seltap Mangalamai (SM)	*Pinus patula*	*Schima wallichii, Myrica esculenta*
Salme Surke Mahabhir (SSM)	*Pinus wallichiana*	*Rhododendron arboreum, Lyonia ovalifolia*
Sulithumka (ST)	*Schima wallichii*	*Rhododendron arboreum, Quercus glauca*

Source: Field survey 2009.

Some species are found only one forest having very poor value of IMP. Such species are: *Antidesma bunius* in ST, *Pyrus pasia* in DB, *Berberis aristata* and *Trichilia connaroides* in SN, *Betula alnoides*, *Juglans regia*, and *Tsuga dumosa* in SSM, *Bombax ceiba*, *Ficus benjamina*, *Ghorke* (Nepali name), *Michelia champaca*, and *Sapium insigne* in CP, *Cinnamomum camphora*, *Ficus neriifolia*, *Pandanus nepalensis*, and *Xylosma controversum* in DD, *Cornus oblonga*, *Mallotus philippensis*, *Terminalia alata, Toona serrata* and *Ziziphus incurva* in KS. Forest IY doesn't have any distinct species like other forests. *Kamale* (Nepali name) is found only in SM having fourth position in important percentage. Forest SSM and KS have distinct forest composition among the all forests having the lowest number of common species compared to other forests.

Associated species: *Schima-Castanopsis* was dominant tree species of the study sites. However, 150 species of associated plants were recorded from ten CFs. Champ (*Michelia champaca*) was almost extinct from all the surveyed sites due to extensive looping and felling for high valued timber. Satuwa (*Paris polyphylla*) which was once abundant, now has been disappeared from Ramche Bihare CF. Likewise, Simal (*Bombax ceiba*) was disappeared from Indrayani CF. Kafal (*Myrica esculenta*) and Guras (*Rhododendron arboreum*) were conserved species in few CFs including Sivanari CF of Lamjung. Similarly, Dar (*Debregeasia salicifolia*) was endangered due to the collection of bark. Few Non Governmental Organizations (NGOs) are working in the CFs of surveyed sites but are more focused on CF management, silvicultural practices and social equity issues. Even the executive members of CF are unaware about the biodiversity and land use change and there are not a single program that work on biodiversity and carbon sequestration.

Tree species diversity: Table 3.14 shows the diversity pattern of the tree in the studied forests. The species richness ranges from 10 to 26, with the highest value for forest DD, and the lowest for forest ST. The forests, SM and RB are also recorded lowest value of species richness with compared to other forests. The diversity indices of Simpson's revels the highest value of 0.89 for forests DD and SSM where evenness is also recorded highest, 0.80 and 0.81, respectively. The lowest values of diversity are recorded in forests CP and SN where the values of evenness are also lowest. However, the highest number of species is recorded in CP after the forest DD. Indeed, poor number of species in forest ST and SM, the value of diversity and evenness are found satisfactory than the CP and SN.

Table 3.14 Tree species diversity in the studied forests

Community Forests	Species richness	Simpson's diversity	Evenness
Kantheswara (KS)	17	0.85	0.77
Ramche Bihare (RB)	13	0.83	0.79
Chisapani (CP)	21	0.76	0.62
Sivnari (SN)	14	0.75	0.67
Dulbu (DB)	19	0.86	0.78
Diyale Danda (DD)	26	0.89	0.80
Indrayani Ka/Kha (IY)	21	0.86	0.75
Seltap Mangalamai (SM)	12	0.83	0.79
Salme Surke Mahabhir (SSM)	20	0.89	0.81
Sulithumka (ST)	10	0.82	0.76

3.2 Carbon deposit:

Table 3.15 shows the summary of vegetation parameter and carbon deposit of each studied forests. The number of trees in forest DB, 3167 ha^{-1}, is significantly higher than the other forests. However, the value of basal area is quite low than the forests SSM, SN and RB, and almost similar to other remaining forests. The largest value of basal area, 96.2 m^2 ha^{-1} is found in forest SSM followed by 62.3 m^2 ha^{-1} and 58.1 m^2 ha^{-1} in forests SN and RB, respectively. The lowest value of basal area, 27.9 m^2 ha^{-1} is found in forest IY where the number of trees is found second highest, after DB among the studied forests.

Table 3.15 Tree density, basal area and carbon deposit in the studied forests

Community Forests	Tree density (individuals ha^{-1})	Basal area (m^2 ha^{-1})	Carbon deposit (ton ha^{-1})
Kantheswara (KS)	2020	30.8	97.6
Ramche Bihare (RB)	1050	58.1	393.0
Chisapani (CP)	1490	35.2	169.0
Sivnari (SN)	1736	62.3	374.0
Dulbu (DB)	3167	29.3	95.9
Diyale Danda (DD)	1785	28.2	86.8
Indrayani Ka/Kha (IY)	2871	27.9	77.8
Seltap Mangalamai (SM)	1875	32.8	81.9
Salme Surke Mahabhir (SSM)	1723	96.2	175.0
Sulithumka (ST)	2525	26.7	87.9

The result of this study shows that the values of basal area are quite high in the forests where the lowest number of tree was found. In contrast, the lowest value of basal area is found where the number of trees was observed quite high. It may be due to domination of large diameter size trees in the forests; SSM, RB and SN and the small diameter size trees in forests; DB, IY, ST and KS.

The carbon deposit in the studied CFs ranged between 77.8 ton ha^{-1} and 393.0 ton ha^{-1}. The highest value of 393.0 ton ha^{-1} carbon is found in the forest RB which is almost 5 times than the lowest value, 77.8 ton ha^{-1}, recorded forest IY. The value of carbon deposit is found in between 77.8 ton ha^{-1} and 100 ton ha^{-1} in the majority of forests IY, SM, DD, ST, DB, and KS (Table 3.15).

3.3 Discussion

Land use change: The result of the land use change analysis between 1988 and 2009 in the selected areas of CFs showed great changes in forest and cultivated lands: increase in forest land and decrease in cultivated land in almost all studied areas (Table 3.16). Shrub land was transformed to forests in most of the surveyed CFs. Some areas of CFs has gained shrub land, however, it is significantly lower than the decreased area of shrub land in other areas. Rather than expansion of forest land, it was observed that tree density was also increased in forested and cultivated lands (Plate 1). Similar findings were observed in other areas of hilly region (Gilmour and Nurse, 1991; Gautam *et al*., 2002). Grass land is found only in areas of SM in 1988 which is completely disappeared in 2009 due to pine plantation in between 1988 and 1995 by CFUGs in supports of Australian Community Forestry Program.

Table 3.16 Summary of land use change in the studied CFs between 1988 and 2009

Community Forest	Land use Change (area in hectare)				Total area
	Cultivated land	Forest	Shrub	Grass	
SSM	+3.8 (1.9)	+31.4 (19.5)	-35.0 (100)	-	398.6
ST	-152.9 (25.5)	+144.3 (145.1)	+8.6 (16.1)	-	751.0
SM	+188.8 (79.8)	-108.2 (25.78)	-77.5 (95.3)	-3.38 (100)	740.5
IY	-47.6 (10.3)	+31.2 (44.04)	+16.39 (332.5)	-	538.2
DB	-3.2 (3.1)	+14.67 (8.1)	-11.4 (100)	-	295.2
DD	-15.4 (65.0)	+8.3 (4.1)	+7.0 (100)	-	224.7
SN	-20.9 (25.7)	+20.8 (8.73)	-	-	320.3
CP	-61.3 (46.6)	+61.3(21.1)	-	-	422.2
RB	-9.29 (2.6)	+12.14 (3.6)	-2.9 (49.7)	-	710.6
KS	-14.3 (11.5)	+16.21 (26.8)	-1.9 (11.4)	-	203

Note: + increased, - decreased and parenthesis indicates percentage of respective land use

Expansion of forest land seems to have been rapid compared to the rate of decrease found in cultivated lands. This rapid expansion of forest land in CFs may be attributed to the protection, conservation and plantation of trees in public lands as regulated by Community Forest Program (CFP). However, the cause/reason of change in cultivated and forest land are quite different. Permanent migration in the lowlands and district headquarters for better livelihood opportunities, going abroad for foreign employment and higher education, intensification of agricultural activities in limited lands, and alternative occupations rather than agriculture activities in nearby city areas were the main causes of transformation of cultivated land to forest land.

Plate 1: Trees of *Schima wallichii* grown inside the cultivated land in a part of Lamjung distrct since regular collection of forest resources are banned in Community Forests. (Photo by Chinta Mani Gautam)

Plate 2: Land use conversion pattern in the area of Sivanari CF, middle hills of Nepal, from cultivated land to grass/forbs, shrub and ultimately in forest land. (Photo by Chinta Mani Gautam) Fallow/shrub land and finally to forests (Plate 2).

In the surrounding area of Sulithumka CF, large area of cultivated land has been converted to forest land in the initiative of local people in efforts to conserve forest resources in certain unproductive areas of cultivated and shrub lands. Now, they use limited land for cultivation using high variety of improved seeds and chemical fertilizer with compost manure, and produce cash crops (e.g., vegetables, potato) in alternation of traditional low value cereal crops (barley, buckwheat, and millet). Such trend was also observed in the areas of KS, RB, CP, and SN. Since open access was restricted in most of the CFs, people stated to protect and conserve plants in their own lands, primarily for the fuelwood supply and fodder. This activity helped farmers to increase tree density in their own lands and expansion of forest cover in public lands, as confirmed by the local people during the field visit and participants of stakeholder meeting. Therefore, the study concluded that CFs played crucial role in increasing forest cover in the public and private lands in the hilly areas of Nepal rather than other factors associated with land use changes (e.g., migration). Such findings were also observed in the middle hills and mountains of Nepal (Gautam, 2005; Gautam and Watanabe, 2004). Therefore, this study is concluded that community forestry program have been played crucial role to increase forest cover in the public and private lands in the Hilly areas of Nepal.

Tree species composition and diversity: Analysis of tree species composition of the studied CFs shows a different combination of species with different dominants and co-dominants. *Schima wallichii* is dominant species in Forests KS, RB, CP, SN, and ST whereas *Castanopsis tribuloides* in forests DD and IY. Dominant species in forests DB, SM and SSM are quite different than the other forests. Forest RB, CP and SN have some similarities in species composition than the other forests. Forest SSM appears distinct among the studied forest. This difference might be due to impact of geographical factors (i.e. altitude, slope, aspect and properties of soil) and anthropogenic disturbances (Gautam and Watanabe, 2005). This difference might be due to impact of altitude, slope, aspect and properties of soil. A similarity in species composition is found for forests RB, SN, CP, DD, IY, DB and ST. However, there are some species that are found only in particular forests. Majority of studied CFs were dominated by same species, which is rational as *Schima-Castanopsis* forest was the basis of selection of CFs. The differences in the species composition may be controlled by altitude (Oshawa, 1983), and intensity of human disturbances (Gautam and Poudel, 2010; Khatry-Chhetry, 1997).

Indeed local people were unaware about the biodiversity; the observed value of tree species diversity in the studied forests was quite similar with the previous studies (Tachibana and Adhikari, 2002; Gautam, 2005). However, no any efforts were taken by CFP to conserve rare and indigenous species in the area. Therefore, some species (e.g., *Michelia champaca*) are almost extinct and some (e.g., *Debregeasia salicifolia*) are in threat of being extinction from the CFs.

Index of diversity shows high value in secondary succession forests under regular thinning. However, climax with partial thinning forest, SSM, has high value of diversity index. This may be due to wide altitudinal variation (Table 2.2.2) that was also found in the other areas of Nepal (Osawa 1983). The result of this study indicates that secondary succession forest under regular thinning helps to maintain diversity for tree species. Higher values of diversity for trees in secondary succession under regular thinning forests may be due to a specific response to the managed-disturbance (cutting) that causes an increment in species diversity (Gautam and Watanabe, 2005).

Carbon deposit: Value of carbon deposit ranged between 77.8 ton ha^{-1} and 393.0 ton ha^{-1} with an average value of 163.9 ton ha^{-1}. The average value of carbon deposit of the studied forests is quite high than the previous study conducted in the three CFs in middle hills of Nepal (Tewari and Karky, 2007). Status of forest and tree density was found to be responsible for the wide variation in carbon value. Therefore, carbon deposit was found higher in climax than the secondary succession forests due to the presence of big sized trees.

CHAPTER IV

CONCLUSIONS

The project results show that CFs have been playing crucial role in increasing forest cover and tree density in public and private lands, and ultimately the sequester carbon. However, the community forest user groups (CFUGs) are unaware about the role of CFs on land use changes and carbon sequestration. Even most of the participants of stakeholders' meeting were unaware on the ecosystem services and their possible benefits (e.g., carbon trading) that CFs can provide. Compared to other hilly areas of Nepal, the tree species diversity observed at the sites investigated was richer; nevertheless, some species were already extinct and some were largely depleted. It is confirmed that *Michelia champaca* (local name: *Chanp*) was almost extinct from all the surveyed sites due to extensive looping and felling for high valued timber. Likewise, *Debregeasia salicifolia* (local name: *Dar*) was endangered due to the collection of bark. Few Non Governmental Organizations (NGOs) are working in the CFs of surveyed sites but they are more focused on CF management, silvicultural practices and social equity issues. Even the executive members of CF are unaware about the biodiversity and ecosystem services and not a single program deals with biodiversity and carbon sequestration**.**

To be brief, this project provided CFUGs and other related stakeholders an opportunity to understand the possible benefits of CFs in terms of ecosystem services and carbon trading in addition to the silvicultural practices and social equity of which they were already aware. Moreover, CFUGs were made aware about the conservation of rare and indigenous species and preserving the existing biodiversity found in their areas. Positive changes in CFs (increase in forest cover and tree density) are useful for foresters, planners and locals as they offer benefits through carbon trading and environmental services in both local and national level. Therefore, the outcomes of this project are useful in working out CF operational plan including the action plan and management strategy, and also in preparation of guidelines to operate particular CF. The project outcomes are also anticipated to support policy and planning, and strengthen the decision making process of the users and management authorities.

CHAPTER V

FUTURE DIRECTIONS

This study has opened the door for further research in this area. Following are some recommendations study team would like to make:

- As this study is confined to the mid hill regions of central and western regions of Nepal , for the total area coverage, estimation of the biomass carbon deposit in Terai and other development regions is strongly recommended.
- For the assessment of total CO_2 sequestration of CFs, estimation of soil carbon deposit should be taken into account for which further study is recommended.
- For further analysis, annual data of carbon deposit will provide more accurate data on estimation of CO_2 sequestration and gives higher confidence on data. Therefore, studies which have provision for the collection of annual data and their analysis are also recommended.
- Comprehensive studies on awareness raising is necessary including strong lobbying for CF on REDD framework.
- This study has other implication such as application for funding under various mechanisms; however, detailed study will be necessary.
- To harness more benefits out of CFs and biodiversity regional collaboration will be needed however, for the proper modality further study will be required.
- This study has given lot of awareness for tremendous opportunities for research, entrepreneurship, employment and involvement

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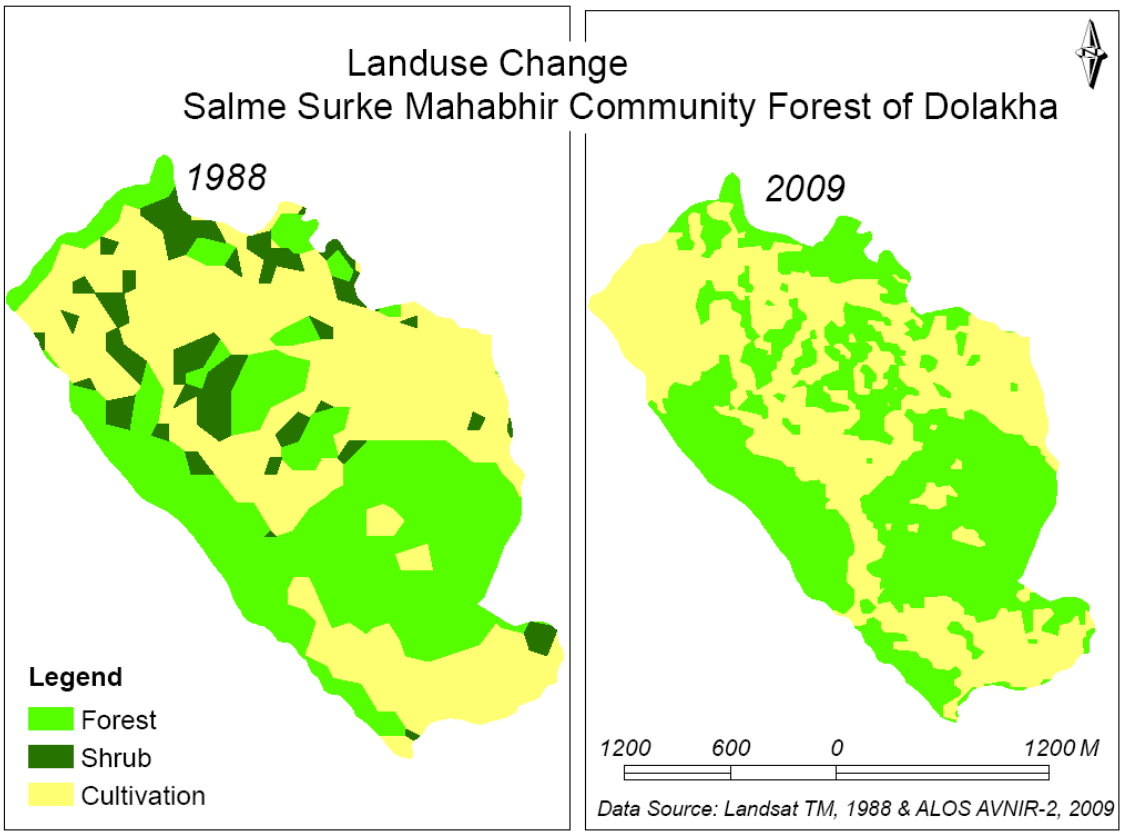
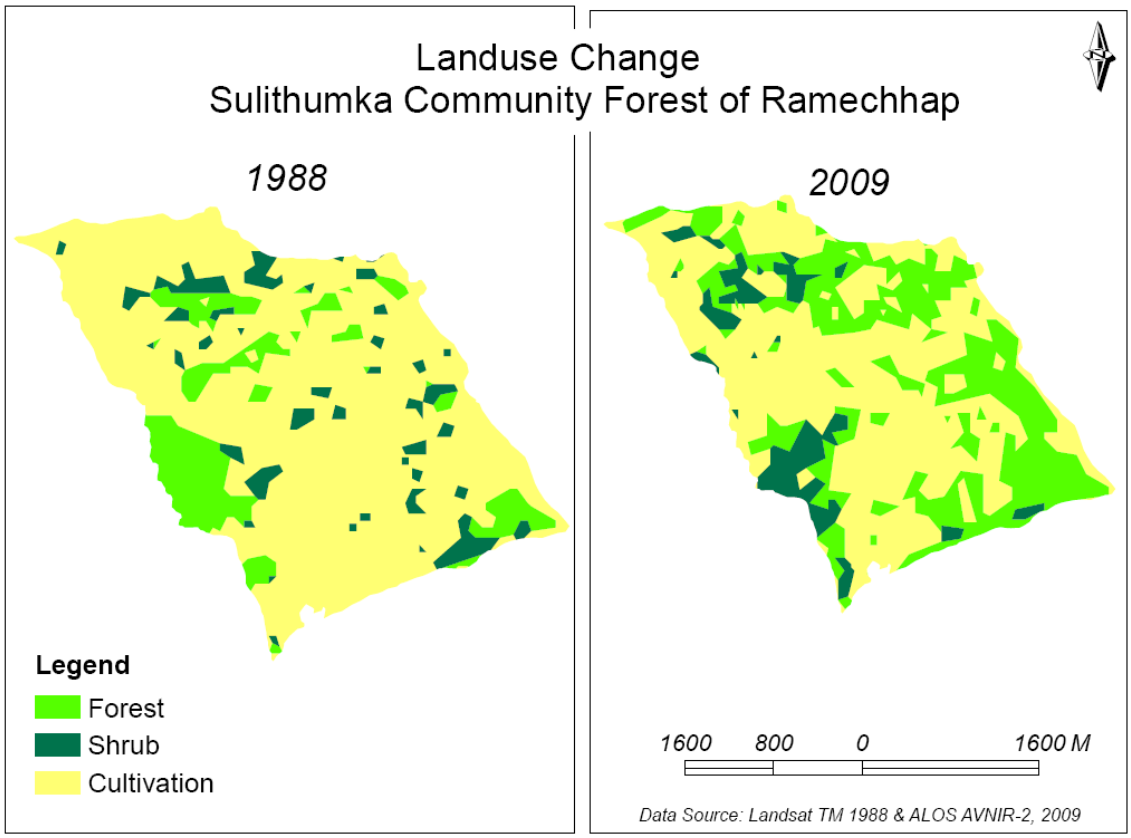
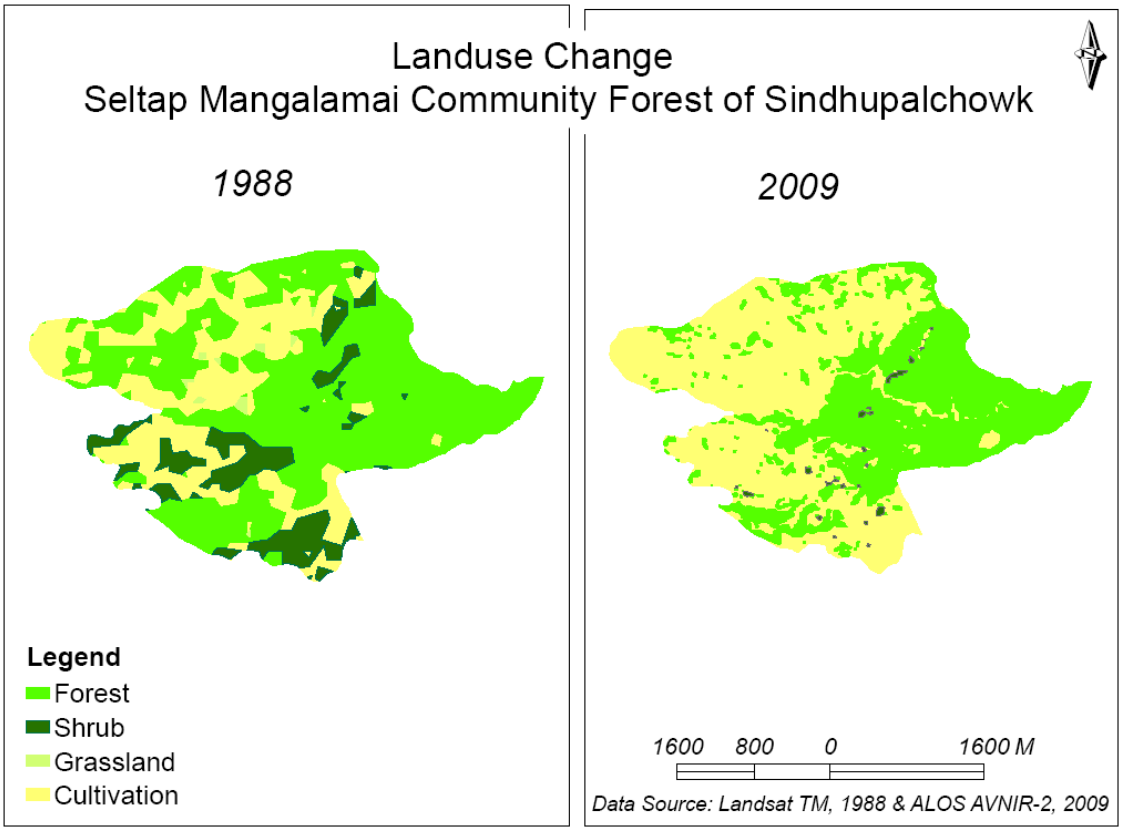
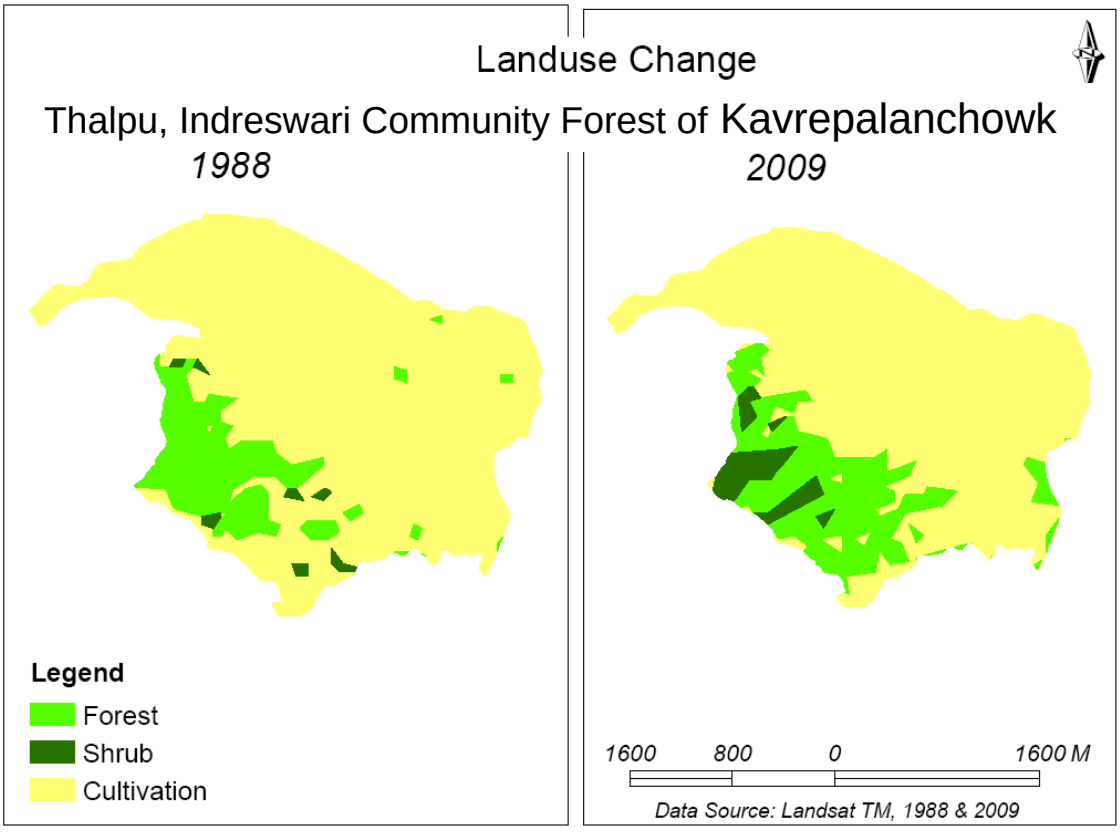
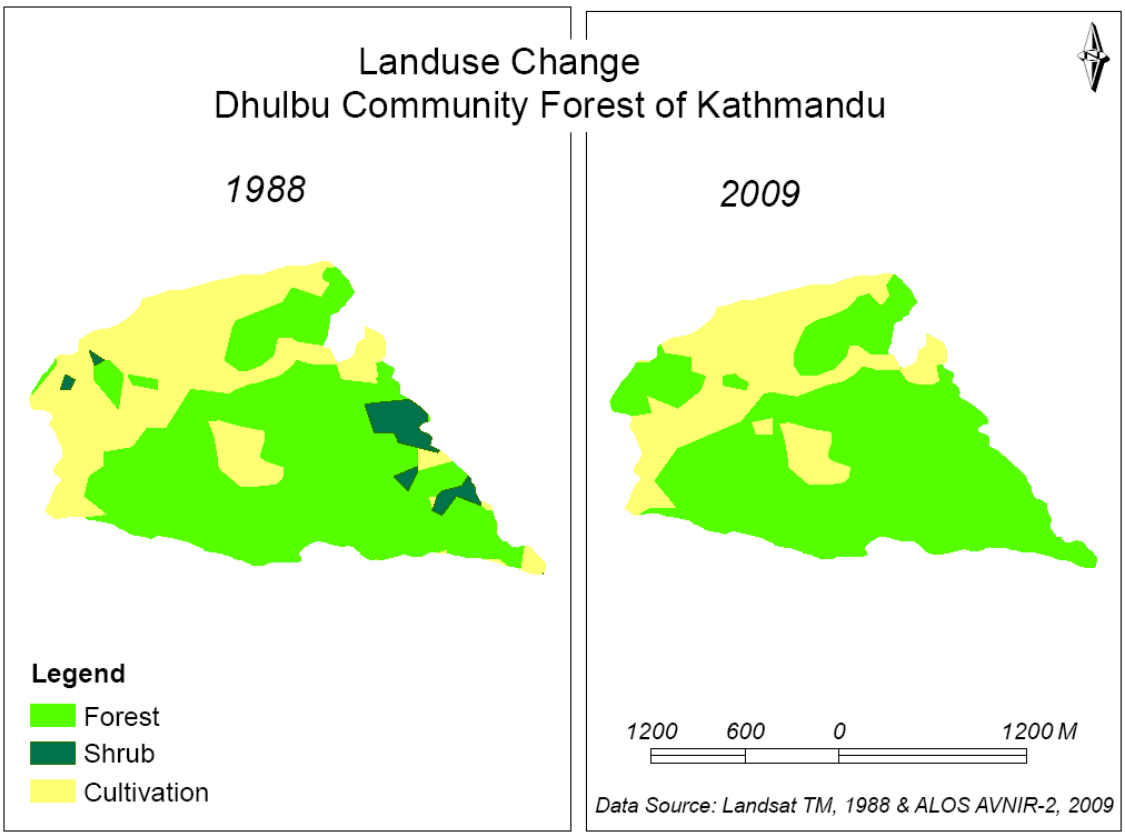
Annex 1: Landuse change between 1988 and 2009 in the studied forests

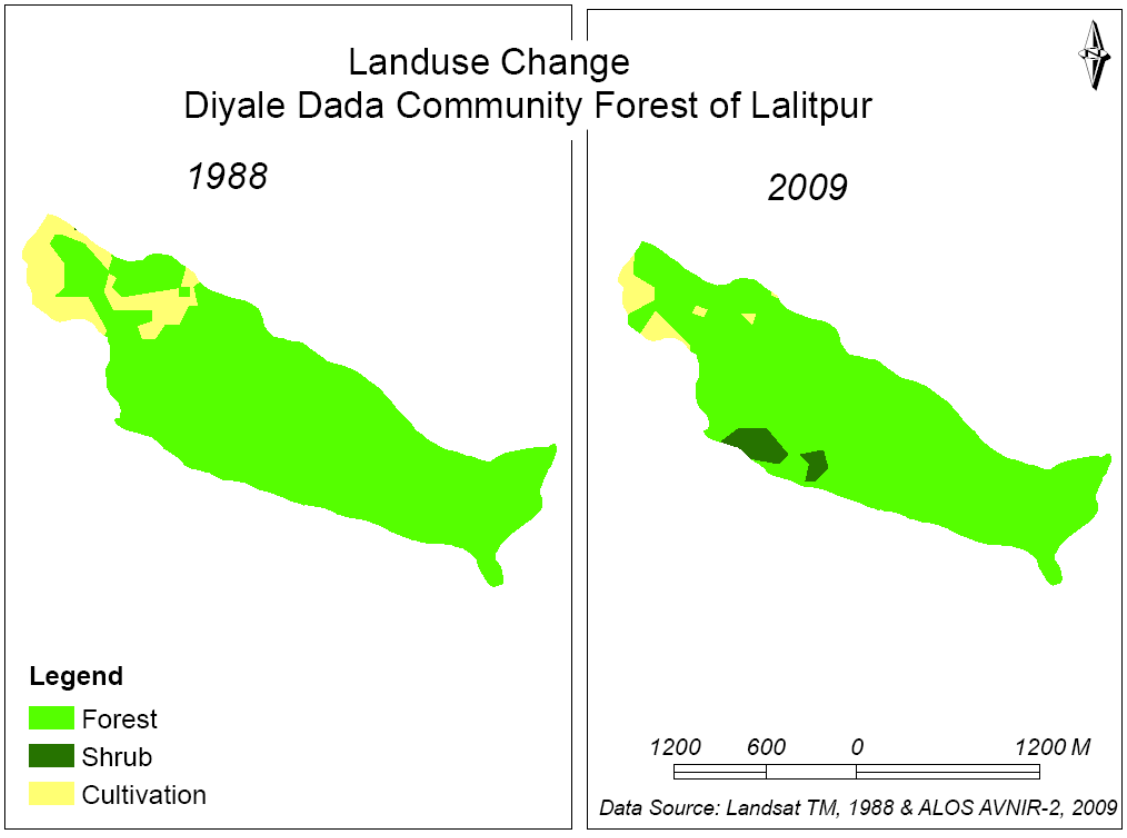


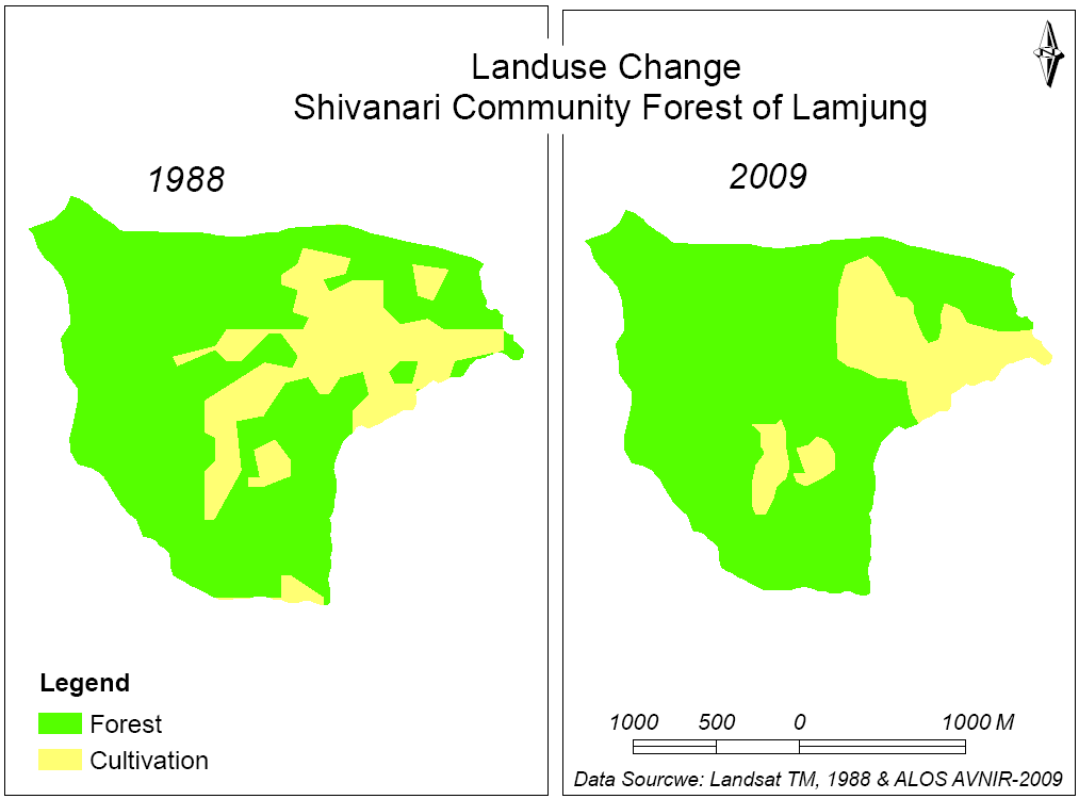


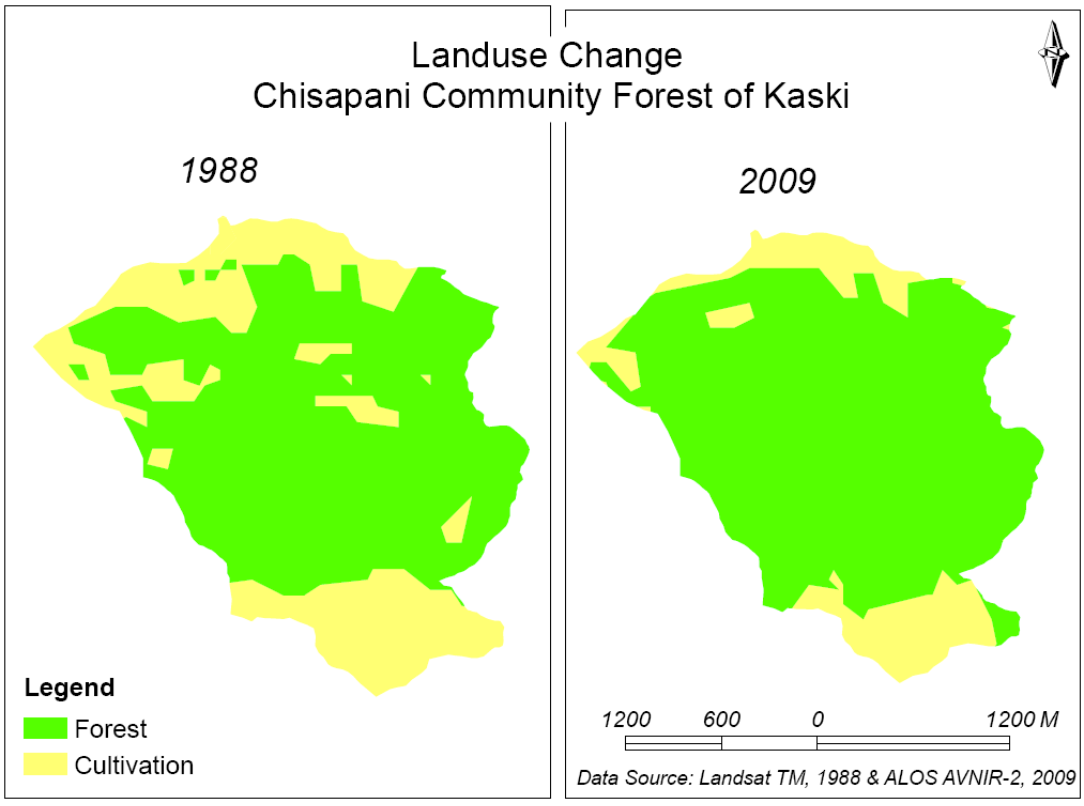

Landuse Change
Seltap Mangalamai Community Forest of Sindhupalchowk
1988
2009
Legend
Forest
Shrub
Grassland
Cultivation
1600 800 0 1600 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009

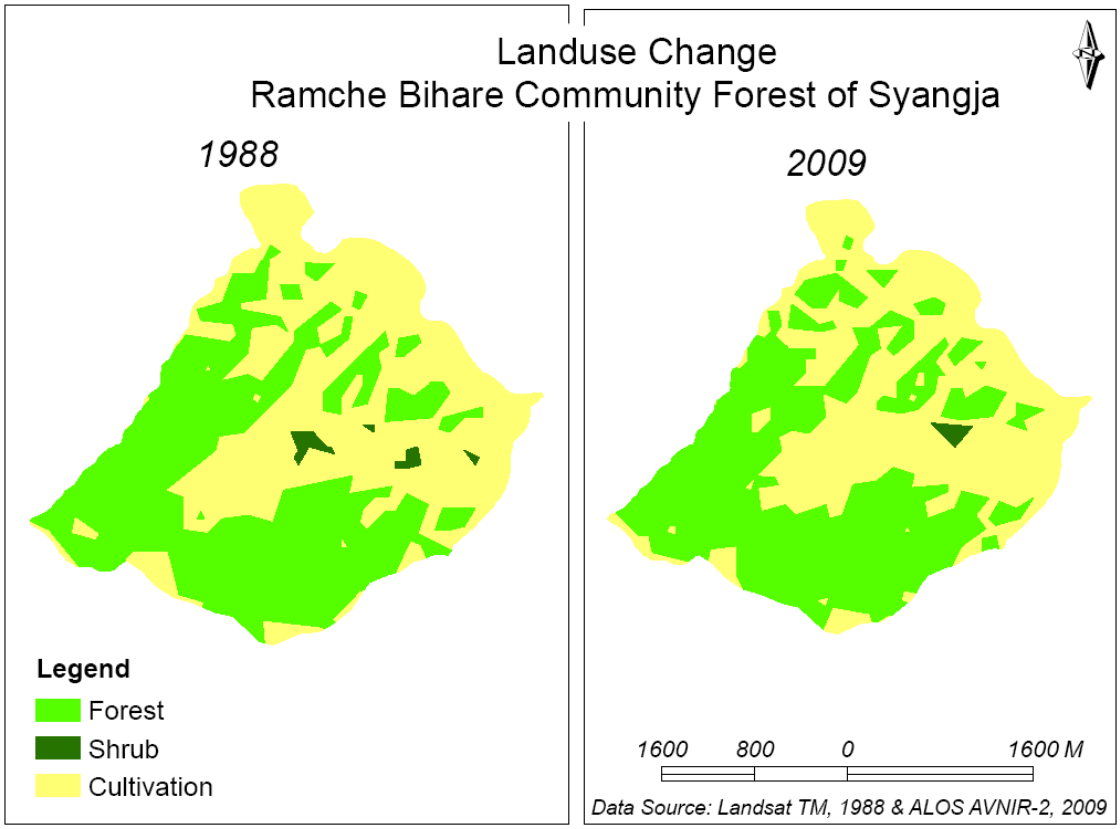

Landuse Change
Thalpu, Indreswari Community Forest of Kavrepalanchowk
1988
2009
Legend
Forest
Shrub
Cultivation
1600 800 0 1600 M
Data Source: Landsat TM, 1988 & 2009

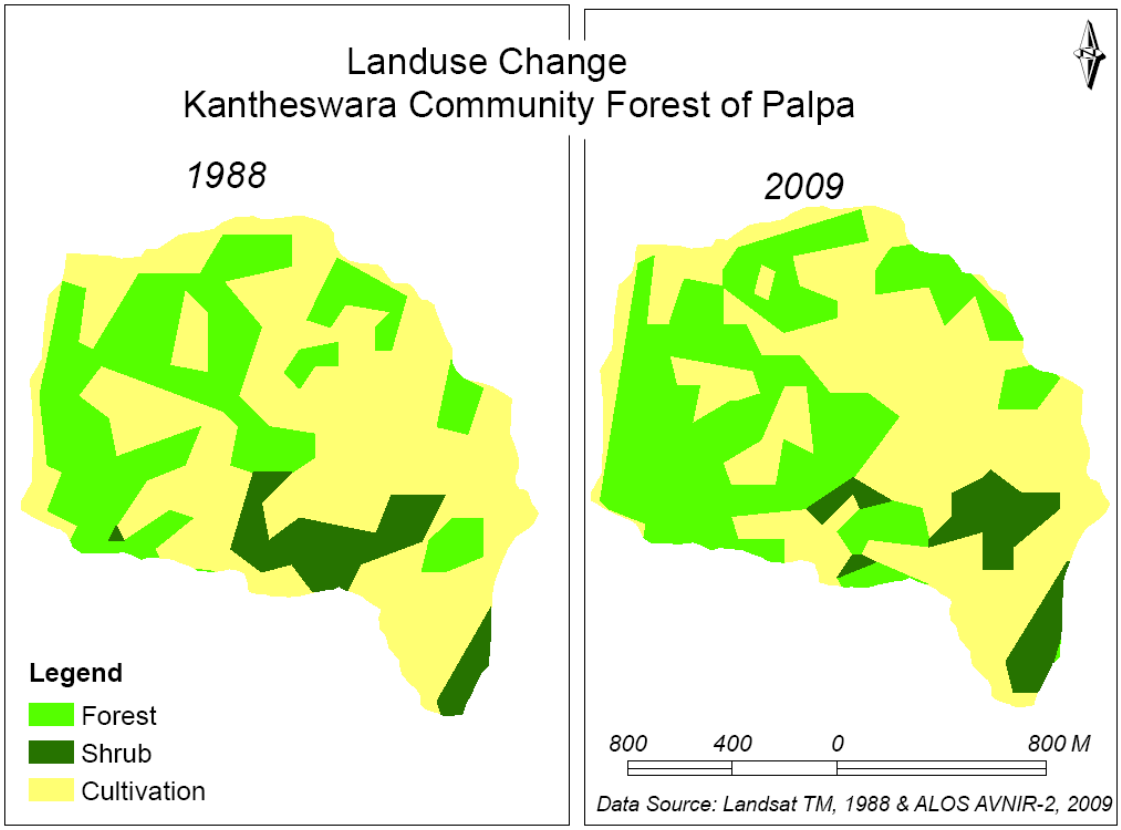

Landuse Change
Dhulbu Community Forest of Kathmandu
1988
2009
Legend
Forest
Shrub
Cultivation
1200 600 0 1200 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009


Landuse Change
Diyale Dada Community Forest of Lalitpur
1988
2009
Legend
Forest
Shrub
Cultivation
1200 600 0 1200 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009


Landuse Change
Shivanari Community Forest of Lamjung
1988
2009
Legend
Forest
Cultivation
1000 500 0 1000 M
Data Sourcwe: Landsat TM, 1988 & ALOS AVNIR-2009


Landuse Change
Chisapani Community Forest of Kaski
1988
2009
Legend
Forest
Cultivation
1200 600 0 1200 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009


Landuse Change
Ramche Bihare Community Forest of Syangja
1988
2009
Legend
Forest
Shrub
Cultivation
1600 800 0 1600 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009


Landuse Change
Kantheswara Community Forest of Palpa
1988
2009
Legend
Forest
Shrub
Cultivation
800 400 0 800 M
Data Source: Landsat TM, 1988 & ALOS AVNIR-2, 2009

Annex 2: Statistical summary of tree species in the studied forests

A. Kantheswara (KS)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Schima wallichii	23.0	26.2	13.3	62.6	20.9
2	Shorea robusta	21.6	17.8	6.7	46.1	15.4
3	Engelhardia spicata	19.6	9.4	10.0	39.0	13.0
4	Castanopsis indica	12.3	9.9	10.0	32.2	10.7
5	Eugenia formosa	5.0	11.4	11.7	28.1	9.4
6	Syzygium cumini	5.1	9.9	11.7	26.6	8.9
7	Wendlandia puberula	3.5	5.4	6.7	15.6	5.2
8	Lagerstroemia parviflora	1.4	3.5	8.3	13.2	4.4
9	Fraxinus floribunda	0.8	1.5	5.0	7.3	2.4
10	Rhus javanica	0.2	1.5	5.0	6.7	2.2
11	Albizia julibrissin	3.8	0.5	1.7	6.0	2.0
12	Ziziphus incurva	2.0	0.5	1.7	4.2	1.4
13	Tonna ciliata	0.8	0.5	1.7	3.0	1.0
14	Terminalia alata	0.7	0.5	1.7	2.8	0.9
15	Cornus oblonga	0.2	0.5	1.7	2.3	0.8
16	Myrsine semiserrata	0.1	0.5	1.7	2.2	0.7
17	Mallotus philippensis	0.1	0.5	1.7	2.2	0.7
	Total	**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

B. Chisapani (CP)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Schima wallichii	40.1	34.1	23.3	97.5	32.5
2	Castanopsis indica	20.2	31.7	20.9	72.8	24.3
3	Shorea robusta	19.5	13.4	7.0	39.9	13.3
4	Bombax ceiba	4.6	1.8	7.0	13.4	4.5
5	Choerospondias	4.1	2.4	2.3	8.8	2.9
6	Alnus nepalensis	3.6	1.2	2.3	7.2	2.4
7	Lyonia ovalifolia	0.5	1.8	4.7	7.0	2.3
8	Eurya acuminata	0.8	2.4	2.3	5.6	1.9
9	Myrica esculenta	0.6	1.8	2.3	4.7	1.6
10	Sapium insigne	1.1	1.2	2.3	4.7	1.6
11	Litsea monopetala	0.9	1.2	2.3	4.4	1.5
12	Wendlandia	0.3	1.2	2.3	3.9	1.3
13	Lagerstroemia	0.9	0.6	2.3	3.8	1.3
14	Ghokre	0.8	0.6	2.3	3.8	1.3
15	Cleistocalyx	0.6	0.6	2.3	3.6	1.2
16	Castanopsis	0.5	0.6	2.3	3.5	1.2
17	Michelia champaca	0.4	0.6	2.3	3.4	1.1
18	Fraxinus floribunda	0.2	0.6	2.3	3.2	1.1

19	Ficus benjamina	0.2	0.6	2.3	3.1	1.0
20	Rhus javanica	0.1	0.6	2.3	3.0	1.0
21	Engelhardia spicata	0.1	0.6	2.3	3.0	1.0
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

C. Ramche Bihare (RB)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Schima wallichii	65.5	28.6	24.4	118.5	39.5
2	Daphniphyllum himalense	14.0	23.0	14.6	51.7	17.2
3	Castanopsis indica	6.0	11.1	12.2	29.4	9.8
4	Eurya acuminata	5.0	11.9	9.8	26.7	8.9
5	Macaranga postulata	2.2	8.7	12.2	23.1	7.7
6	Myrsine semiserrata	3.5	3.2	4.9	11.5	3.8
7	Rhododendron arboreum	2.6	4.8	2.4	9.8	3.3
8	Myrica esculenta	0.2	1.6	4.9	6.7	2.2
9	Viburnum mullaha	0.1	1.6	4.9	6.6	2.2
10	Cleyera japonica	0.6	2.4	2.4	5.4	1.8
11	Lyonia ovalifolia	0.1	1.6	2.4	4.1	1.4
12	Diospyros malabarica	0.1	0.8	2.4	3.3	1.1
13	Viburnum erubescens	0.0	0.8	2.4	3.3	1.1
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

D. Dulbu (DB)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Quercus glauca	10.6	24.6	10.4	45.6	15.2
2	Pinus roxburghii	38.1	1.8	3.0	42.8	14.3
3	Myrica esculenta	12.7	16.1	9.0	37.8	12.6
4	Schima wallichii	11.4	13.0	11.9	36.3	12.1
5	Castanopsis tribuloides	7.9	14.4	6.0	28.3	9.4
6	Castanopsis indica	5.1	5.6	7.5	18.2	6.1
7	Rhododendron arboreum	2.4	5.3	9.0	16.6	5.5
8	Myrsine capitellata	2.6	6.0	7.5	16.1	5.4
9	Quercus lanata	3.3	4.2	6.0	13.5	4.5
10	Lyonia ovalifolia	0.8	1.8	6.0	8.5	2.8
11	Persea odoratissima	2.0	1.4	3.0	6.4	2.1
12	Semecarpus anacardium	0.3	1.1	4.5	5.8	1.9
13	Prunus cerasoides	1.1	1.1	3.0	5.1	1.7
14	Litsea monopetala	0.6	1.1	3.0	4.6	1.5
15	Engelhardia spicata	0.4	0.7	3.0	4.0	1.3
16	Eurya acuminata	0.3	0.7	3.0	4.0	1.3
17	Pyrus pashia	0.3	0.7	1.5	2.4	0.8
18	Engelhardia sp	0.2	0.4	1.5	2.0	0.7
19	Unidentified	0.1	0.4	1.5	2.0	0.7

Total	100.0	100.0	100.0	300.0	100.0

E. Sivanari (SN)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Schima wallichii	51.1	41.4	25.5	118.0	39.3
2	Castanopsis indica	28.9	21.5	21.3	71.7	23.9
3	Rhododendron arboreum	8.6	11.5	10.6	30.8	10.3
4	Eurya acuminata	1.0	7.3	10.6	18.9	6.3
5	Persea odoratissima	2.2	4.2	6.4	12.7	4.2
6	Engelhardia spicata	3.3	2.1	4.3	9.7	3.2
7	Viburnum mullaha	0.7	3.7	4.3	8.6	2.9
8	Myrica esculenta	0.7	2.1	4.3	7.1	2.4
9	Macaranga postulata	1.3	1.6	2.1	5.0	1.7
10	Lyonia ovalifolia	1.0	0.5	2.1	3.6	1.2
11	Alnus nepalensis	0.9	0.5	2.1	3.6	1.2
12	Quercus glauca	0.2	0.5	2.1	2.8	0.9
13	Trichilia connaroides	0.1	0.5	2.1	2.7	0.9
14	Berberis aristata	0.1	0.5	2.1	2.7	0.9
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

F. Indrayani Ka/Kha (IY)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important Percent
1	Castanopsis tribuloides	24.3	26.6	10.8	61.6	20.5
2	Schima wallichii	12.8	12.9	14.0	39.7	13.2
3	Myrica esculenta	9.4	9.2	10.8	29.3	9.8
4	Pinus roxburghii	17.6	6.2	5.4	29.2	9.7
5	Myrsine capitellata	4.0	12.9	11.8	28.7	9.6
6	Rhododendron arboreum	6.7	11.7	9.7	28.0	9.3
7	Lyonia ovalifolia	1.1	4.2	7.5	12.9	4.3
8	Castanopsis indica	4.7	3.7	4.3	12.8	4.3
9	Pinus patula	8.3	3.0	1.1	12.4	4.1
10	Quercus glauca	1.3	2.7	7.5	11.6	3.9
11	Albizia julibrissin	4.9	0.2	1.1	6.2	2.1
12	Rhus javanica	0.9	0.7	2.2	3.8	1.3
13	Engelhardia spicata	0.6	1.0	2.2	3.7	1.2
14	Eurya acuminata	0.4	1.0	2.2	3.5	1.2
15	Wendlandia puberula	0.4	0.6	2.3	4.0	2.0
16	Chatchate, nepali name	0.9	0.7	1.1	2.7	0.9
17	Celtis australis	0.4	0.7	1.1	2.3	0.8
18	Persea odoratissima	0.8	0.2	1.1	2.1	0.7
19	Fraxinus floribunda	0.2	0.5	1.1	1.8	0.6
20	Quercus lanata	0.2	0.5	1.1	1.8	0.6

21	Syzigium cumini	0.1	0.2	1.1	1.5	0.5
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

G. Diyale Dada (DD)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important Percent
1	Castanopsis tribuloides	18.1	26.3	10.6	55.0	18.3
2	Schima wallichii	7.7	7.8	9.1	24.6	8.2
3	Persea odoratissima	6.8	6.9	9.1	22.8	7.6
4	Castanopsis indica	5.4	11.6	4.5	21.6	7.2
5	Celtis australis	11.3	5.2	4.5	21.0	7.0
6	Rhododendron arboreum	6.2	5.6	9.1	20.9	7.0
7	Quercus lanata	15.5	2.2	3.0	20.7	6.9
8	Quercus glauca	8.2	4.7	3.0	16.0	5.3
9	Myrica esculenta	4.9	7.8	3.0	15.7	5.2
10	Quercus semecarpifolia	7.5	3.4	3.0	14.0	4.7
11	Lyonia ovalifolia	0.6	2.6	6.1	9.2	3.1
12	Unidentified	1.7	3.4	7.6	12.7	2.7
13	Maesa chisia	0.6	2.2	3.0	5.8	1.9
14	Prunus cerasoides	0.7	1.3	3.0	5.0	1.7
15	Xylosma controversum	0.6	0.9	3.0	4.5	1.5
16	Semecarpus anacardium	0.6	0.9	3.0	4.4	1.5
17	Myrsine semiserrata	0.7	2.2	1.5	4.4	1.5
18	Pandanus nepalensis	0.5	0.9	1.5	2.9	1.0
19	Persea duthiei	0.5	0.9	1.5	2.9	1.0
20	Cinnamomum camphora	0.2	0.9	1.5	2.6	0.9
21	Fraxinus floribunda	0.6	0.4	1.5	2.5	0.8
22	Eurya acuminata	0.6	0.4	1.5	2.5	0.8
23	Myrsine capitellata	0.3	0.4	1.5	2.3	0.8
24	Viburnum mullaha	0.2	0.4	1.5	2.1	0.7
25	Cleyera japonica	0.1	0.4	1.5	2.1	0.7
26	Ficus neriifolia	0.1	0.4	1.5	2.1	0.7
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

H. Seltap Mangalamai (SM)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Pinus patula	48.2	15.6	11.1	74.9	25.0
2	Schima wallichii	19.5	27.6	24.4	71.5	23.8
3	Myrica esculenta	7.7	13.8	17.8	39.3	13.1
4	Kamale	5.6	19.1	4.4	29.2	9.7
5	Eurya acuminata	5.0	5.3	8.9	19.2	6.4
6	Pinus roxburghii	5.6	6.7	6.7	18.9	6.3
7	Rhododendron arboreum	4.3	2.7	8.9	15.8	5.3

8	Engelhardia spicata	0.9	3.1	6.7	10.7	3.6
9	Myrisne semiserrata	1.0	3.1	4.4	8.5	2.8
10	Eurya cerasifolia	2.0	2.2	2.2	6.4	2.1
11	Syzigium cumini	0.1	0.4	2.2	2.8	0.9
12	Rhus javanica	0.0	0.4	2.2	2.7	0.9
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

I. Salme Surke Mahabhir

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Pinus wallichiana	49.6	14.3	14.1	78.0	26.0
2	Rhododendron arboreum	19.3	21.9	15.5	56.7	18.9
3	Lyonia ovalifolia	5.0	9.8	11.3	26.1	8.7
4	Daphniphyllum	4.1	8.9	9.9	22.9	7.6
5	Eurya acuminata	3.8	11.2	7.0	22.0	7.3
6	Myrica esculenta	4.2	8.5	8.5	21.2	7.1
7	Schima wallichii	3.4	7.1	4.2	14.7	4.9
8	Symplocos ramosissima	1.4	3.6	5.6	10.6	3.5
9	Tsuga dumosa	2.5	1.3	4.2	8.0	2.7
10	Camellia kissi	1.8	3.6	1.4	6.7	2.2
11	Rhus wallichiana	1.6	1.8	2.8	6.2	2.1
12	Juglans regia	1.3	1.3	2.8	5.5	1.8
13	Quercus semecarpifolia	0.3	1.3	2.8	4.4	1.5
14	Rhus javanica	0.8	1.8	1.4	4.0	1.3
16	Semecarpus anacardium	0.8	0.5	2.3	2.4	0.8
17	Betula alnoides	0.1	0.9	1.4	2.4	0.8
18	Albizia julibrissin	0.1	0.4	1.4	2.0	0.7
19	Engelhardia spicata	0.0	0.4	1.4	1.9	0.6
20	Viburnum mullaha	0.0	0.4	1.4	1.9	0.6
Total		100.0	100.0	100.0	300.0	100.0

J. Sulithumka (ST)

SN	Species	Relative Dominance	Relative Density	Relative Frequency	Important Value	Important percent
1	Schima wallichii	26.8	18.8	20.8	66.4	22.1
2	Rhododendron	21.4	25.4	15.1	61.9	21.4
3	Quercus glauca	25.3	25.7	11.3	62.4	20.0
4	Lyonia ovalifolia	4.1	8.9	15.1	28.1	9.4
5	Engelhardia spicata	8.0	6.9	11.3	26.2	8.7
6	Wendlandia	3.4	7.6	13.2	24.2	8.1
7	Pinus roxburghii	8.2	2.3	7.5	18.1	6.0
8	Cleyera japonica	1.1	2.6	1.9	5.6	1.9
9	Syzygium cumini	1.1	1.3	1.9	4.3	1.4
10	Quercus glauca	0.4	0.3	1.9	2.7	0.9
Total		**100.0**	**100.0**	**100.0**	**300.0**	**100.0**

Annex 3: Stakeholders meeting on "Assessment of Role of Community Forests (CFs) in CO_2 Sequestration, Biodiversity, and Land Use Change"

Programme Schedule

Organized by	:	NEPAL DEVELOPMENT RESEARCH INSTITUTE (NDRI)
Date	:	April 25, 2010 (Baisakh 12, 2067)
Venue	:	Hotel "The Himalayan Horizon", Dhulikhel, Nepal Tel: 011-490296, 490260 Fax: 977-1-490476 Email: horizondhulikhel@yahoo.com / hi.horizon@dhulikhel.wlink.com.np Web: himalayanhorizon.com.np

8.30 - 9.30 hrs	**Breakfast**
9.30 - 10.00 hrs	**Registration and Logistics**
10.00 - 12.30 hrs	**Opening ceremony**
10.00 - 10.15 hrs	Welcome address: Dr. Punya Prasad Regmi, NDRI
10.15 -10.30 hrs	Introduction of the project and stakeholder meeting: Dr. Chinta Mani Gautam, Project Leader, NDRI
10.30 -11.00 hrs	Formal opening of the meeting and Opening remarks by Chief Guest
11.00 -11.30 hrs	Introduction of NDRI: Dr. Nawa Raj Khatiwada, Executive Director, NDRI
11.30 -12.00 hrs	Presentation on "Community Forestry and Climate Channge"(Tentative):Mr. Krishna Acharya, Chief, REDD
12.00 -12.30 hrs	Closing Remarks by Dr. Tara Nidhi Bhattarai, President, NDRI
12.30-13.30 hrs	**Lunch break**
13.30-17. 00 hrs	**Technical session**
13.30-14.00 hrs	Presentation : "Assessment of Role of Community Forests (CFs) in CO_2 Sequestration, Biodiversity, and Land Use Change" Part I : Project Background Speaker : Dr. Chinta Mani Gautam, Project Leader, NDRI
14.00 - 14.30 hrs	Part II : Biodiversity and CO2 Sequestration Speaker : Mr. Dipesh Pyakurel, NDRI
14.30 - 15.00 hrs	Part III : Landuse Speaker : Mr. Man Bahadur Kshetri, Senior Research Associate, NDRI
15.00 - 15.30 hrs	Discussion
15.30- 16.00 hrs	**Tea/ coffee break**
16.00- 16.30 hrs	Distribution of material on forest inventory and briefing
16.30-17.00 hrs	Group work
17.00- 17.30 hrs	Brainstorming activities
17.30-18.00 hrs	General discussion and Feedback from participants
18.00- 20.00 hrs	**Dinner**

(Master of Ceremony/ Facilitator: Ms. Sriju Sharma, Research Associate, NDRI)

Annex 4: List of Participants of the stakeholder Meeting

S.N	Name	Designation	Organization
1	Mr. Yubaraj Bhusal	Secretary	Ministry of Forest and Soil
2	Mr. Ram Asheshwar Mandal	Forest Officer	REDD-Forestry And Climate
3	Dr. Tara Nidhi Bhattarai	Coordinator (Natural Hazard	NDRI
4	Dr. Nawa Raj Khatiwada	Executive Director	NDRI
5	Dr. Punya P Regmi	Coordinator (Policy Studies)	NDRI
6	Dr. Manjeshwori Singh	Livelihood Specialist	NDRI
7	Dr. Chinta Mani Gautam	Project Team Leader	NDRI
8	Mr. Dipesh Pyakurel	Ecologist	NDRI
9	Mr Man Bahadur Kshetri	Senior Research Associate	NDRI
10	Ms Sriju Sharma	Research Associate	NDRI
11	Mr. Ram Bahadhur Kala	Geographer	NDRI
12	Mr. Devendra KC	Chairperson	Lapsiphedi CFUG
13	Mr. Badri Gir	Vice President	Thaplu, Indreswari CFUG
14	Mr. Janak Karki	Chairperson	Seltap Mangalamai CFUG
15	Mr. Dil Bahadur Tamang	Chairperson	Surke Salme Mahavir CFUG
16	Mr. Bom Bahadur Tamang	Chairperson	Sulithumka CFUG
17	Mr. Tika Bahadur Hitanga	Chairperson	Kantheswara CFUG
18	Mr. Mohan Singh Gurung	Chairperson	Shivanari CFUG
19	Mr. Panch Singh Gurung	Secretary	Shivanari CFUG
20	Ms. Santa Neupane	President	FECOFUN
21	Mr. Govinda Shrestha	Forest Officer	FECOFUN
22	Mr. Ram Kumar Sigdel	Secretary	Baghbhirab CFUG
23	Mr. Bhanu Bhakta Dhakal	Secretary	Ramche bihare CFUG
24	Mr. Kamal Pakhrin	Facilitator SDC, Dolakha	Surke Salme Mahavir CFUG
25	Mr. Chabilal Rana	Secretary	Kantheswara CFUG
26	Mr. Bel Prasad Shrestha	Ex- Mayor of Dhulikhel	District Develpoment Office,
27	Mr. Sujas Phuyal	Forest Renger	District Develpoment Office,

Annex 5: Presentation slides of the Stakeholder Meeting

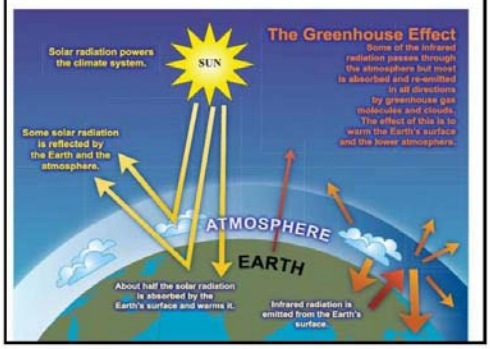
Page No.

जलवायू परिवर्तन तथा नेपालमा रेडको तयारी

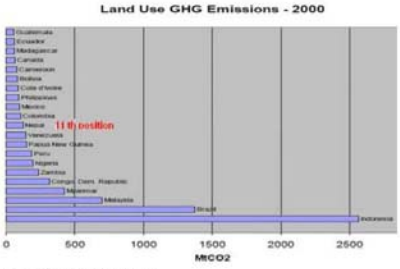
संक्षिप्त जानकारी

रेड-फरेष्ट्री तथा जलवायू परिवर्तन इकाई

Green House Gases Effect and Global Warming

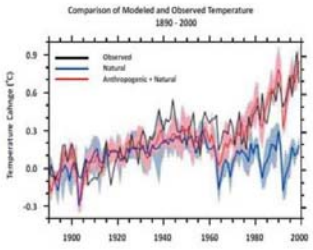


नेपालले धेरै हरीत गृह ग्यास उत्सर्जन त गर्दैन तर पनि जलवायु परिवर्तनको असर नेपालमा पनि अवश्य नै पर्छ ।



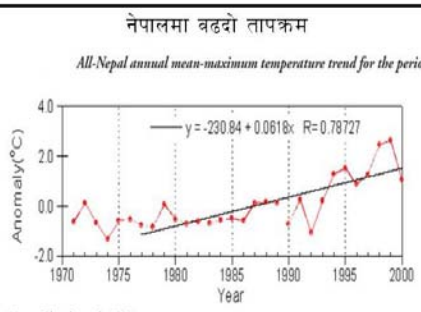
It has 11th position in the world

विश्वमा बढ्दो तापक्रम



Global temperatures increased by 0.7ºC (1.3 ºF);

नेपालमा बढ्दो तापक्रम



Source: Shrestha et al., 1999

जलवायू परीवर्तन

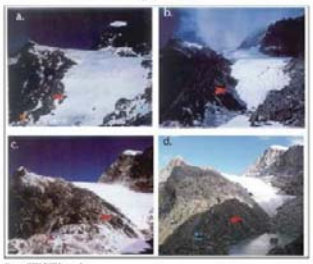
हरीत गृह ग्यासको प्रभाव: विश्व परीवेष

- विश्वस्तरमा 0.7°C (1.3 °F) ले तापक्रम वढि राखेको छ ।
- हिउँ पग्लीने क्रम द्रुत गतिमा जारी रहेको
- जिव जन्तु एवं वनस्पतिमा प्रभाव

नेपाल परीवेश

- तापक्रममा प्रतिवर्ष औषत 0.06°C ले वढेको
- हिउँ पग्लीने क्रम द्रुत गतिमा जारी छ ।

जलवायु परिवर्तनले पार्ने असरहरु



- Impacts on Water Resources: Glaciers & Rainfall trend change

जलवायु परिवर्तनले पार्ने असरहरु

- चौडापाते विरुवाको पात झर्ने समयमा फरक र पलुवा आउने समयमा फरक, विरुवाको फुल फुल्ने, फल लाग्ने तथा त्यसको असर वन्य जन्तु र चराचुरुङ्गीको आहार र वासस्थानमा असर
- कृषि वाली लगाउने समयमा फरक,
- स्वस्थ्य क्षेत्रमा: विभिन्न किसिमका रोगहरुको प्रकोप
- वढि सुख्खा, अचानक विना मौसमको वाढी -कोशी तथा कर्णालीमा भएको वाढी
- उपाय के त ?

त्यसकारण

जलवायू परिवर्तनका सवालहरुको सम्वोधन: महासम्मेलन

- १९७२ मा पहिलो Stockholm महासम्मेलन
- १९९२ मा रियो द जेनेरियो सम्मेलन:, वातावरण सम्वन्धी चासो (राजनैतिक चासो)
- १९९४ मा United Nations Frame Work Convention on Climate Change ले मान्यता प्राप्त

जलवायू परिवर्तनका सवालहरु सम्वन्धी महासम्मेलन...

- १९९७ मा Kyoto महासन्धी (जलवायू परिवर्तनका ठूलो उपलव्धी)
- २००२ मा Johns berg मा महा सम्मेलन
- २००५ मा Kyoto महासन्धीले मान्यता प्राप्त
- २००७ मा Bali Convention ले REDD लाई मान्यता

क्योटो महासन्धी, १९९७

- विकसित देशहरुले १९९० को हरीत गृह ग्यासको स्तरमा ५.२ प्रतिशतले घटाउने
- विकसित देशहरुले कम विकसित देशहरुलाई वृक्षारोपण गरेवापत सहयोग गर्ने तथा
- सफा उर्जा प्रयोगमा ल्याए वापत सहयोग गर्ने

महासन्धीहरु

- क्योटो महासन्धी, १९९७
  - २ वटा उपायमा जोड
    - **घरेलु उपाय** : विकसित देशमा रहेका उद्योगहरुको हरीत गृह ग्यास घरेलु उपाय अपनाई कम गर्नेमा जोड
    - **Flexible Mechanism:** तिन किसिमका Mechanisms हरु छन् ।
      - Joint Implementation
        - » Emission Trading र
          - Clean Development Mechanism: कम विकसित देशहरुमा काम गर्ने (स्वक्ष विकास संयन्त्र)
          - तर संरक्षित वनलाई समावेश नगरेको

वाली महासम्मेलनका क्षेत्रहरु

- Adaptation (अनुकुलन)
- Mitigation (जलवायु परिवर्तनलाई कम गर्न सकिने उपायहरु)
- Technology Transfer (प्रविधि हस्तान्तरण),
- Financing (आर्थीक सहयोग)
- रेड सम्बन्धि कार्यलाई समेत प्राथमिक्ता पाएको

कोपेनहेगेन सम्मेलन

- विश्वको तापक्रम २° सेल्सीयस भन्दा बढ्न नदिने सम्झौता
- रेड सम्बन्धि कार्यलाई समेत प्राथमिक्ता पाएको

विश्व बैंक मार्फत रेड सम्बन्धी कार्य

- विश्व बैंकले Forest Carbon Partnership Facility (FCPF) मार्फत् कार्वन व्यापारका लागि कम विकसित देशहरुसंग प्रस्ताव आव्हान गरेको
- नेपालले Readiness Plan Idea Note (R-PIN) मार्फत् देशको वनको वर्तमान अवस्था दर्साई विश्व बैंकसंग आवद्ध भएको

रेड के हो ?

- रेडको शाब्दिक अर्थ वन विनास तथा वनको गुणस्तरमा आइरहेको ह्रासको (deforestation र forest degradation) दरलाई कम गर्नु हो ।
- कम गरेबापत देशले आय आर्जन गर्न सक्छ ।
- वन संरक्षण तथा व्यवस्थापन मार्फत् कम विकसित देशहरुले वन विनास तथा वनको गुणस्तरमा आइरहेको ह्रासको दरलाई कम गराइ हरीत गृह ग्यास उत्सर्जन घटाए बापत कार्वन व्यापार गर्न सकिने अवधारणालाई आत्मसात गर्दै विकसित देशहरुले जलवायू परीवर्तनको मुद्दालाई प्राथमीक्ता दिई वन क्षेत्रमा आर्थीक लगानी गर्न अघि सरेका छन् । यो नै रेडको मूल मर्म रहेको छ ।

रेड .....contd.

- त्यसकारण रेडले वन व्यवस्थापनमा एकातिर नयाँ **अवसर** प्रदान गरेका छन् भने भने अर्कोतिर यसलाई परिपालना गर्नु त्यतीकै **चुनौतीपूर्ण** पनि छ ।
- यदि **अवसर**लाई हेर्ने हो भने वन विनास तथा वनको गुणस्तरमा आइरहेको ह्रासको (deforestation र forest degradation) दरलाई घटाए बापत स्थानीय तथा राष्ट्रिय स्तरमा आय आर्जन गर्न सकिन्छ
- यसको विपरित **चुनौती**लाई विचार गर्ने हो भने वर्तमानमा शुशासन, स्थानीय स्तरमा जिविकोपार्जन र क्योटो प्रोटोकोलको मर्म आदी तथ्यहरुको अवलम्बलन गर्नु अपरिहार्य हुन आउँछ । अर्थात् deforestation र forest degradation Drivers कारक तत्वहरु लाई घटाउन **चुनौतीपूर्ण** छ ।
- त्यसकारण रेड **चुनौतीले भरिएको अवसर** हो जहाँ नेपाल जस्तो देशले कार्वन व्यापार गर्न पाउने संभावना छ ।

दुर दृष्टि (Vision)

- नेपालले विश्व स्तरमा रेडको माध्यमबाट कार्वन संचिति व्यापार गरि हरीत गृह ग्यास उत्सर्जन कम गरे बापत, स्थानीय तथा राष्ट्रीय स्तरमा फायदा लिन सक्ने ।

लक्ष्य (REDD)

- नेपालले रेड मार्फत् हरीत गृह ग्यास कम गरि विश्वको वातावरण स्वच्छ राख्नमा सहयोग पुर्‍याउछ सो गरेबापत कार्वन संचिति व्यापारबाट प्राप्त आयले नेपाली समुदायको जिवन स्तरमा सुधार आउन सक्ने ।

उदेश्यहरु (Objectives)

यस रेड सेलको निम्न अनुसारको उदेश्यहरु रहेको छ।

- रेड मार्फत् जलवायू परिवर्तनको विरुद्धमा हरित् गृह ग्याँस उत्सर्जन कम गराउनमा सहयोग गर्नु।
- नेपाललाई २०१२ सम्ममा कार्वन व्यापार गर्नका लागि तयार गराउनु।
- नेपालमा कार्वन व्यापार गर्न सकिने संयन्त्रको विकास गर्नु।

नेपालमा रेडको अवस्था

- सोही अनुरुप विश्व बैंक मार्फत Forest Carbon Partnership Facility (FCPF) द्वारा कम विकसित देशहरुलाई कार्वन व्यापार गर्नमा सहयोग गर्ने अवधारणा आएको हो
- उक्त अवधारणा अनुसार कम विकसित देशहरुले आफ्नो देशको वनको समग्र अवस्था प्रस्तुत गर्ने विश्व बैंकबाट माग भए बमोजिम नेपालले पनि **Readiness Plan Idea Note (R-PIN)** बनाई विश्व बैंकमा बुझाएको हो।
- सोही नाताले नेपाल **FCPF** सदस्य राष्ट्र समेत रहेको छ। हाल नेपाललाई विश्व बैंकले Readiness Preparation Proposal (RPP) प्रस्तावना जसको उदेश्य नेपालले सन् २०१२ सम्ममा विश्वमा कार्वन व्यापार गर्ने तयारीको लागी ३ लाख यू. एस. डलर उपलब्ध गराई सहयोग गरिरहेको छ।
- नेपालले **Readiness Preparation Proposal (R-PP)** प्रस्तावना बनाई विश्व बैंकमा बुझाएको हो।
- अब आश गरी रेडको तयारीको लागि नेपालले फायदा पाउन सक्नेछ।

नेपालमा रेडको प्रगति

क) संगठनात्मक तयारी(Institutional Preparation)

ख) नितीगत तयारी (Policy Level Preparation)

ग) स्थलगत तयारी (Field Level Preparation)

क) संगठनात्मक तयारी

क) माथील्लो तहमा, एपेक्स बडी:

- वन भू-संरक्षण मन्त्रालय
- वातावरण मन्त्रालय, अर्थ मन्त्रालय, जल श्रोत मन्त्रालय, कृषि तथा सहकारी मन्त्रालय
- राष्ट्रीय योजना आयोग, पर्यटन तथा नागरिक उड्डयन मन्त्रालय
- भूमीसुधार तथा व्यवस्था मन्त्रालय, उद्योग तथा आपूर्ती मन्त्रालय
- विज्ञान तथा प्रविधि मन्त्रालय, स्थानिय विकास मन्त्रालय
- उर्जा मन्त्रालय

ख) विचको तहमा, रेड वर्कीङ ग्रुप:

सदस्यहरु

- संयोजक :सचिव- वन तथा भू-संरक्षण मन्त्रालय,
- रेड फरेष्ट्री तथा जलवायू परीवर्तन ईकाइका प्रमुख,
- वन विभाग तथा अनुसन्धान एवं सर्वेक्षण विभागका प्रतिनिधी (रा.प. प्रथम प्रा. २ जना),
- गैर सरकारी संस्थाका प्रतिनिधी २ जना,
- निजि क्षेत्रका प्रतिनिधी १ जना,
- दातृ संस्थाका प्रतिनिधी २ जना

तल्लो तहमा,

ग) रेड फरेष्ट्री तथा जलवायू परीवर्तन ईकाइ

- निती तथा कार्यक्रम तर्जुमा शाखा
- मापन तथा अनुगमन शाखा
- आउट रिच शाखा

यसका साथै

- रेड स्टेकहोल्डर फोरम

ख) नितीगत तयारी

यस अन्तर्गत् विभिन्न किसिमका तयारी कार्यहरु भएको छ।

- नेपालले पनि Readiness Plan Idea Note (R-PIN) बनाई विश्व बैंकमा सन् २००८ को अप्रिलमा बुझाएको हो, स्वीकृत भई सकेपछि सोही नाताले नेपाल FCPF सदस्य राष्ट्र रहेको छ।
- नेपालबाट कार्बन व्यापार गर्नका लागि Readiness Preparation Proposal (R-PP) आर. पि. पि. तयार गरि १९ अप्रिलमा बुझाएको हो।

ख) नितीगत तयारी क्रमश.....

- सामाजिक तथा वातावरणिय र भोलन्टीयरी कार्बन स्टान्डर्ड का सम्बन्धमा पायलटिङका लागि तयारी गर्ने अन्तरराष्ट्रीय स्तरमा समन्वय भइरहेको।
- जलवायु परीवर्तन सम्बन्धी निति तयार गर्ने कार्यमा वातावरण मन्त्रालयलाई पृष्ठपोषण गरेको।
- रेड सम्बन्धि निति तयारीको क्रममा रहेको।

ग) स्थलगत तयारी:

- Mitigation सम्बन्धमा विभिन्न निकायहरुसंग समन्वय कार्य (WWF, WINROCK, ComForm, ICIMOD र IUCN)
- Sharing
- CCBA संग standard को स्थलगत रुपमा piloting को तयारी (समुदाय, जलवायु तथा जैविक विविधता संरक्षणमा जोड)

रेड कार्यान्वयनका अवसरहरु

- वन व्यवस्थापनमा उच्च जन सहभागीता
- नेपालमा थुप्रै यस्ता कार्यहरु भएको छ जसले रेडको अवसर खुला छ भने सुनिश्चीत गर्न सक्छ।
- व्यवस्थीत सामुदायीक सन्जाल
- बहुपक्षीय Stakeholder को आधार
- यस देशमा रेड का लागि भए गरेको कार्यहरु
- राजनिती कर्मी तथा माथील्लो स्तरमा रेड सम्बन्धी लगातार भइरहेको अन्तरकिया
- दातृसंस्थाहरुको जलवायु परीवर्तन तथा रेड प्रति देखाएको चासो

नेपालका हरीयो वन

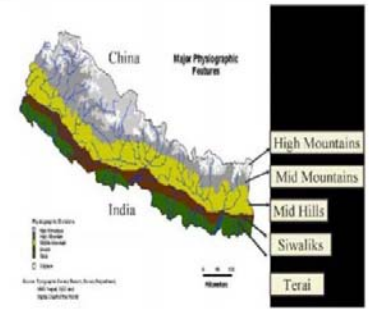
रेड कार्यान्वयनमा आउन सक्ने चुनौतीहरु

- वन विनास तथा वनको ह्रास (Forest Degradation) का मापन गर्न कठीनाई।
- वन विनास तथा वनको ह्रासलाई नियन्त्रण गर्न गरिने प्रयासहरु चुनौतीपूर्ण हुन सक्छ।
- वनको ह्रास (Forest Degradation) को अनुगमन तथा मुल्याङ्कन गर्ने कार्य गाह्रो छ।
- वनको Enhancement को भुक्तानीको सुनिश्चीत छैन्।

रेड कार्यान्वयनमा आउन सक्ने चुनौतीहरु क्रमश....

- कार्बन व्यापारबाट हुने लाभको बाँडफाँड चुनौतीपूर्ण ।
- बेसलाइन तथा रिफरेन्स सिनारीयो (Base line and reliable reference scenario) पत्ता लगाउन कठिन ।
- Leakage / Additionality / Permanency को सुनिश्चीत गर्न गाह्रो ।
- पायलटीङ गर्ने कार्यलाई शुरुवात गराउन कठिन ।
- नेपालमा रेडको निति बनाउन सकेको छैन् ।

हाम्रो नेपालको भुगोल



कार्वन सञ्चिती, भू-उपयोग परिवर्तन र जैविक विविधतामा सामुदायिक वनको भूमिका

प्रस्तोता
डा. चिन्तामणि गौतम

APN

वन सम्पदाको संरक्षण, सम्वर्द्धन, सदुपयोग र व्यवस्थापन गर्न, वन ऐन २०४९ र वन नियमावली २०५१ अनुसार स्थानीय उपभोक्ता समूहलाई हस्तान्तरण गरिएको वनलाई **सामुदायिक वन** भनिन्छ।

APN

नेपालमा सामुदायिक वनको हालको अवस्था र महत्व

- १४,३८९ सामुदायिक वन उपभोक्ता समूह लाई १२,२६,००० हेक्टर वन हस्तान्तरण गरी समूहमार्फत व्यवस्थापन गरिएको
- नेपालको कुल वनको २०.५% समूहमा हस्तान्तरण भैसकेको
- आयआर्जनमा टेवा, वैकल्पिक आयको श्रोत (गैरकाष्ठ वन पैदावार संकलन), गरिबी न्यूनिकरण, दाउरा र घाँसको श्रोत आदि
- सामाजिक सद्भावको विकास
- पर्यावरणीय सन्तुलन
- विश्वमा सफल कार्यक्रमको रुपमा परिचित
- कार्वनको भण्डार

APN

कार्वन सञ्चिती, भू-उपयोग र जैविक विविधतामा सामुदायिक वनको भूमिका

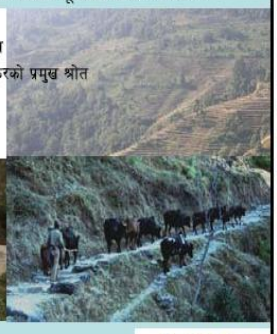
अध्ययनको आवस्यकता किन ?

APN

भू-उपयोगमा सामुदायिक वनको भूमिका अध्ययन किन ?

- वनमा आश्रित पशुपालन र कृषि
- वन: काठ, दाउरा, घाँस र पतकरको प्रमुख श्रोत

सामुदायिक वनमा नियण्त्रण



APN

जैविक विविधतामा सामुदायिक वनको भूमिका अध्ययन किन ?

यदि मौरीहरू पृथ्वीबाट लोप भए भने, ४ वर्ष पछाडि मानव जीवनको अन्त्य हुनेछ (अल्बर्ट आइस्टाइन)।

सामुदायिक वन

- प्रचुरता भएका र आर्थिक, सामाजिक तथा धार्मिक प्रयोजनका हिसाबले महत्जपूण प्रजातिको संरक्षण
- आयातित प्रजातिको वृक्षारोपण

जैविक विविधतामा कमी

APN

कार्बन सञ्चितीमा सामुदायिक वनको भूमिका अध्ययन किन ?

वायु प्रदुषण र जलवायु परिवर्तनको कारण

APN

कार्बन सञ्चितीमा सामुदायिक वनको भूमिका अध्ययन किन ?

कार्बन व्यापार: क्योटो अभिसन्धि, १९९७ ले जलवायु परिवर्तनलाई कम गर्न स्वच्छ विकास संयन्त्रको (CDM) विकास ।

बढी वायू प्रदुषण गर्ने राष्ट्रले आफूले उत्पादन गरेको वायू प्रदुषण कम गर्न अन्य राष्ट्रको वन संरक्षण तथा वातावरण मैत्री प्रविधिमा लगानि गर्ने ।

वातावरण मैत्री प्रविधि	वन संरक्षण
▪ लघु जलविधुत	▪ वृक्षारोपण
▪ सौर्य उर्जा	(Afforestation/Reforestation)
▪ बायो ग्यॉस, आदि	

Afforestation : कृत्तिमा ५० वर्ष सम्म जंगल नभएको क्षेत्रलाई वृक्षारोपण अथवा प्राकृतिक विउको संरक्षण गरी जंगलमा रुपान्तरित गर्ने ।

Reforestation: जंगलक्षेत्रबाट अन्य भू-उपयोगमा रुपान्तरित भएको जमिन जसलाई वृक्षारोपण अथवा प्राकृतिक विउको संरक्षण गरी पुन: जंगलमा रुपान्तरण गर्ने ।

APN

कार्बन सञ्चितीमा सामुदायिक वनको भूमिका अध्ययन किन ?

क्योटो अभिसन्धि पक्ष राष्ट्रहरुको सम्मेलन (कोप) १३: २००७, इण्डोनेशिया, वाली

वन फडानी तथा वन क्षेत्रको विनासबाट हुने कार्बन उत्सर्जनको कटौती Reduce Emission From Deforestation and Forest Degradation (REDD) को अवधारणा अनुमोदन ।

प्राकृतिक वन क्षेत्र संरक्षण, व्यवस्थापन र पुनरुत्पादन: कार्बन व्यापारमा सहभागि हुन सक्ने ।

कोप १४: २००९, कोपेनहेगन, डेनमार्क

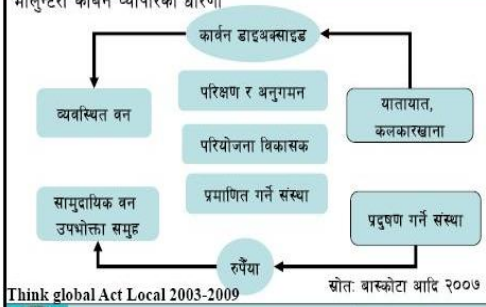
रेडको अवधारणा प्रस्तुत तर कार्यान्वयन भएन ।

कोप १५: २०१० ??????

APN

कार्बन सञ्चितीमा सामुदायिक वनको भूमिका अध्ययन किन ?

भोलुन्टरी कार्बन व्यापारको धारणा



Think global Act Local 2003-2009

स्रोत: बास्कोटा आदि २००७

APN

कार्बन सञ्चितीमा सामुदायिक वनको भूमिका अध्ययन किन ?

वातावरण मैत्री प्रविधि

वैकल्पिक उर्जा प्रबर्द्धन केन्द्रको बायोग्यॉस कार्यक्रम अन्तर्गत गोबर ग्यॉस प्लान्टले बचाएको कार्बन बापत विश्व बैङ्कको सामुदायिक विकास कोष मार्फत २०६५ सालमा ३ करोड ३२ लाख रुपैया नेपालले पाई सकेको छ ।

अहिलेको सरदर मूल्य : १ टन कार्बन = १२-१५ US$

लामाटार सामुदायिक वन (९६ हेक्टर)

	वर्ष-१	वर्ष-२	वर्ष-३
कार्बन शोषण (टन प्रति हेक्टर)	५०.९	५२.३	५३.८
वार्षिक कार्बन शोषण (टन प्रति हेक्टर)	-	१.४	१.५

स्रोत: बास्कोटा आदि २००७

वर्ष-३ मा लामाटार सामुदायिक वनले शोषण गरेको कार्बनको मूल्य कति होला?

APN

अध्ययनका उद्देश्यहरू

मूल्य उद्देश्य: कार्बन सञ्चिती, भू उपयोग तथा जैविक विविधतामा सामुदायिक वनको भूमिका निर्धारण

यस अध्ययनका सहायक उद्देश्यहरू

- सन् १९८८ र २००९ को बीचमा छनोट गरिएका सामुदायिक वनहरूमा भू उपयोगमा भएको परिवर्तनको विश्लेषण गर्ने ।
- छनोट गरिएका सामुदायिक वनहरूमा रहेका रुख प्रजातिहरूको सूचिकरण र तिनको विविधता विश्लेषण गर्ने ।
- छनोट गरिएका सामुदायिक वन उपभोक्ता समूहलाई कार्बन सञ्चिती र यसको व्यापारको बारेमा जानकारी दिने ।

APN

अध्ययन विधि

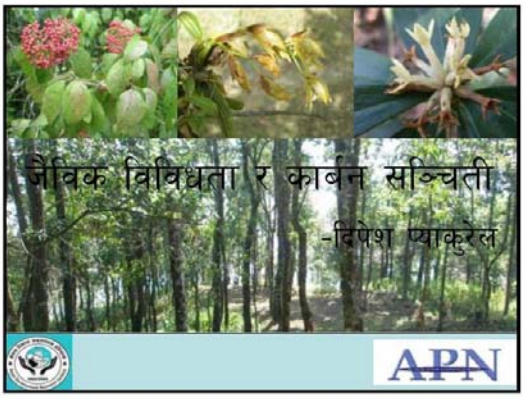
- भू उपग्रहबाट लिईएका तस्विरको माध्यमबाट भू उपयोग परिवर्तनको विश्लेषण। यसका लागि भौगोलिक सूचना प्रणाली (GIS) प्रविधिको प्रयोग गरिएको छ।
- Simpsons ले १९४९ मा प्रतिपादन गरेको Species Diversity Index को आधारमा रुख प्रजातीको विविधता विश्लेषण गरिएको छ।
- Intergovernmental Panel on Climate Change, IPCC ले सन् २००३ मा भू उपयोग, भू उपयोगमा परिवर्तन र वन क्षेत्रको लागि बनाएको मापदण्ड अनुसार Biomass को आधारमा कार्बन सञ्चितीको आँकलन गरिएको छ।
- सामुदायिक वन उपभोक्ता समूहका सदस्यहरूसँग गरिएको छलफल र सामुदायिक वन उपभोक्ता समूहका प्रतिनिधि उपस्थित सरोकारवाला गोष्ठीको आधारमा कार्बन सञ्चिती, भू उपयोग तथा जैविक विविधतामा सामुदायिक वनको भूमिका निर्धारण गरिनेछ।

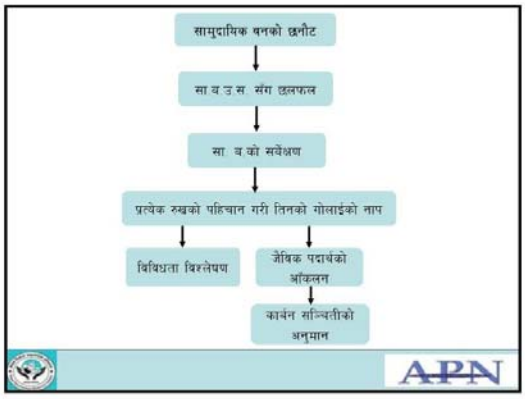
APN

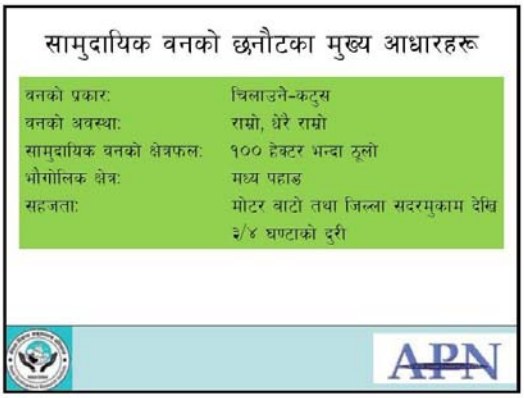
अपेक्षा

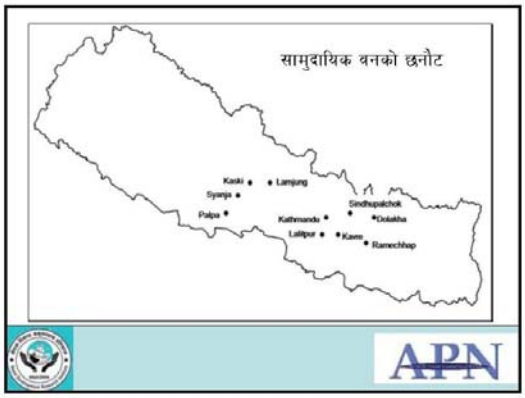
- स्थानीय, राष्ट्रिय तथा क्षेत्रीय स्तरका नीति निर्माताहरूलाई भू उपयोग तथा जैविक विविधता सम्बन्धि विश्वव्यापी परिवर्तनको अनुसन्धान गर्न यो अध्ययन सहयोगी हुने अपेक्षा गरिएको छ।
- सामुदायिक वनले भू उपयोग तथा जैविक विविधतामा पारेको प्रभावको बारेमा जानकारी गराउनुको साथै यसको प्रभावबाट जोगिन सामुदायिक वन उपभोक्ता समूहलाई उपयुक्त कदम चाल्न सहयोगी हुनेछ।
- सामुदायिक वन उपभोक्ता समूहलाई कार्बन सञ्चिती र त्यसबाट हुनसक्ने व्यापारको सम्भावित लाभको बारेमा जानकारी गराउने छ।

APN

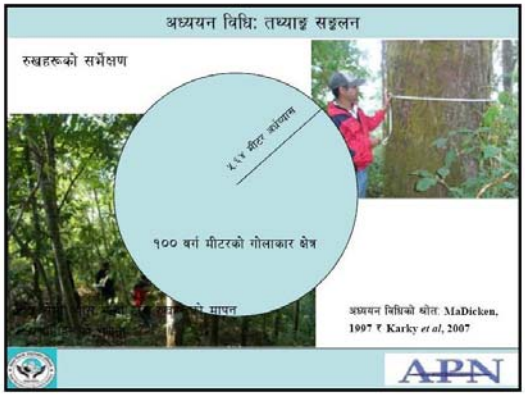

जैविक विविधता र कार्बन सञ्चिती
-दिपेश प्याकुरेल
APN


सामुदायिक वनको छनौट
स ा व उ स संग छलफल
सा व को सर्वेक्षण
प्रत्येक रुखको पहिचान गरी तिनको गोलाईको नाप
विविधता विश्लेषण
जैविक पदार्थको आँकलन
कार्बन सञ्चितीको अनुमान
APN


सामुदायिक वनको छनौटका मुख्य आधारहरू
वनको प्रकार: चिलाउने-कटुस
वनको अवस्था: राम्रो, धेरै राम्रो
सामुदायिक वनको क्षेत्रफल: १०० हेक्टर भन्दा ठूलो
भौगोलिक क्षेत्र: मध्य पहाड
सहजता: मोटर बाटो तथा जिल्ला सदरमुकाम देखि ३/४ घण्टाको दुरी
APN


सामुदायिक वनको छनौट
Kaski
Lamjung
Syanja
Palpa
Kathmandu
Lalitpur
Kavre
Sindhupalchok
Dolakha
Ramechhap
APN


छनौट गरिएका सामुदायिक वन
सामुदायिक वन | गाउँ विकास समिति | जिल्ला | क्षेत्रफल (हे)
कण्ठेश्वरा | मदनपोखरा | पाल्पा | १०४
रामेचिहारे | फाफरथुम | स्याङ्जा | २२४
चिसापानी | रुपाकोट | कास्की | २३३
शिबनारी | बास्तुङपानी | लमजुङ | १८१
दियाले डाँडा | गोदावरी | ललितपुर | १२३
दुन्दु | लप्सिफेदी | काठमाण्डौ | १२७
थल्पु | पनौती | काभ्रेपलाञ्चोक | २१३
सेलताप मंगलामाई | फुल्पिङकोट | सिन्धुपाल्चोक | १४७
सल्मे सुकें महाभिर | ठूलोपाताल | दोलखा | १७६
सुलिधुम्का | पकरबास | रामेछाप | १२७
APN


अध्ययन विधि: तथ्याङ्क सङ्कलन
रुखहरूको सर्भेक्षण
१०० वर्ग मीटरको गोलाकार क्षेत्र
अध्ययन विधिको श्रोत: MaDicken, 1997 र Karky et al, 2007
APN

सामुदायिक वनमा सर्भेक्षणका लागि लिइएको प्लट संख्या

सामुदायिक वन	नमुना संकलन
कण्ठेश्वरा	१०
राम्चेबिहारे	१२
घिसापानी	११
शिवनारी	१२
दियाले झाडा	१३
दुल्लु	९
घल्लु	१४
सेलताप	१२
सल्मे सुर्के महाभिर	१३
सुलिथुम्का	१२

रुख प्रजातिहरूको विविधता मापनका सुत्रहरू

Evenness

$$E = \frac{H'}{\ln(S)}$$

Pilou, 1969

Simpson's diversity

$$D = 1 - \lambda$$

$$(\lambda = \sum_{i=1}^{s} p_i^2)$$

Simpson, 1949

S	Number of species;
ln	natural logarithm;
n_i	total number of individual trees in the area;
p	is the proportion of the individuals found in the i^{th} species;
λ	Simpson's concentration of dominance

Shannon Index

$$H' = -\sum_{i=1}^{s} p_i \ln p_i$$

Shannon, 1949

बनमा कार्बन सञ्चितीको मापन

सतहभन्दा माथिको जैविक पदार्थ **(Aboveground Biomass, AB)**

रुखको जैविक पदार्थको मापन

Ln(W)=a+b Ln DBH

(स्रोत=वन अनुसन्धान तथा सर्भेक्षण विभाग)

Ln = Natural Log

W=Biomass in kilograms

a= Intercept of W

b= Slope or regression coefficient

सतहभन्दा तलको जैविक पदार्थ **(Belowground Biomass, BB)**

सतहभन्दा माथिको जैविक पदार्थको १२.५%

(स्रोत: वास्कोटा आदि २००७)

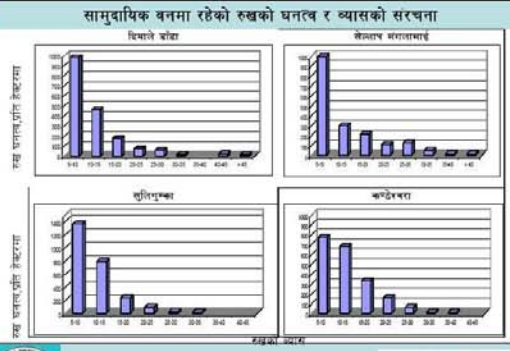
कुल जैविक पदार्थ = **AB+BB**

कुल कार्बन सञ्चिती (टन÷हेक्टर) = कुल जैविक पदार्थ÷२

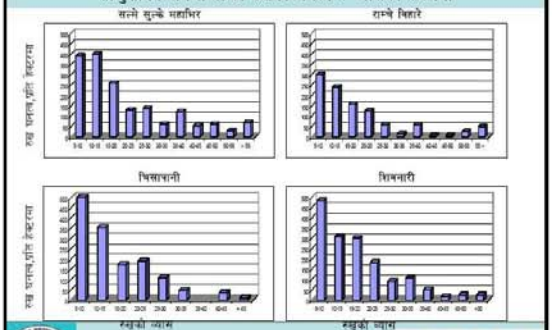
कुल कार्बन डाई अक्साइड = कार्बन × ३.६७

(स्रोत: वास्कोटा आदि २००७)

सामुदायिक वनमा रहेको रुखको घनत्व र व्यासको संरचना



सामुदायिक वनमा रहेको रुखको घनत्व र व्यासको संरचना



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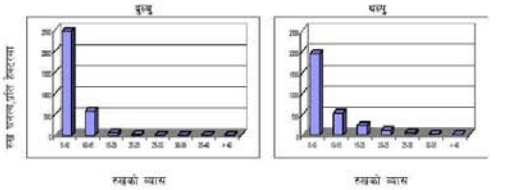


सामुदायिक वनको अवस्था

सामुदायिक वन	प्रजातिको संख्या	प्रति हेक्टर रुखको घनत्व	बेसको क्षेत्रफल वर्गमिटरमा/हे.
सुलिधुम्का	१९	२५२५	२६.७
सेलताप मंगलामाई	१३	१८७५	३२.८
राम्धेभिहारे	१३	१०५०	५८.१
शिवनारी	१४	१७३६	६२.३
कण्ठेश्वरा	१७	२०२०	३०.८
दुल्बु	१९	३१६७	२९.३
सल्मेसुर्के महाभिर	२०	१७२३	९६.२
चिसापानी	२१	१४९०	३५.२
थल्पु	२२	२८७१	२७.९
दियाँले डाडा	२६	१७८५	२८.२

सामुदायिक वनमा रुख प्रजातिको विविधता

सामुदायिक वन	प्रजातिको संख्या	विविधता सूचकाङ्क (Shimpson's Diversity)	समानुपातिक वितरण सूचकाङ्क
सुलिधुम्का	११	०.८२	०.७६
सेलताप मंगलामाई	१३	०.८३	०.७९
राम्धेभिहारे	१३	०.८३	०.७९
शिवनारी	१४	०.७५	०.६७
कण्ठेश्वरा	१७	०.८५	०.७७
दुल्बु	१९	०.८६	०.७८
सल्मेसुर्के महाभिर	२०	०.८९	०.८१
चिसापानी	२१	०.७६	०.६२
थल्पु	२२	०.८६	०.७५
दियाँले डाडा	२६	०.८९	०.८०

सामुदायिक वन कार्बन सञ्चिती टन÷हे. कार्बन सञ्चिती टन÷हे.

थल्पु	७७.८	??
सेलताप	८१.९	??
दियाले डाडा	८६.८	??
सुलिधुम्का	८७.९	??
दुल्बु	९५.९	??
कण्ठेश्वरा	९७.६	??
चिसापानी	१६९	??
सल्मे सुर्के महाभिर	१७५	??
शिवनारी	३७४	??
राम्धेभिहारे	३९३	??

सामुदायिक वन रुखका प्रमुख प्रजाति

सामुदायिक वन	रुखका प्रमुख प्रजाति
कण्ठेश्वरा	चिलाउने, साल, मौवा
राम्धेभिहारे	चिलाउने, रकचन, ढाल्ने कटुस,
चिसापानी	चिलाउने, कटुस, साल
शिवनारी	चिलाउने, ढाल्ने कटुस, गुरांस
दियाँले डाडा	मसुरे कटुस, चिलाउने, काउली
दुल्बु	फलाँट, खोटे सल्ला, काफल
थल्पु	मसुरे कटुस, चिलाउने, काफल
सेलताप	अमेरिकन सल्ला, गुरांस, अंगेरी
सल्मे सुर्के महाभिर	गोब्रे सल्ला, गुरांस, अंगेरी
सुलिधुम्का	चिलाउने, फलाँट, गुरांस

सामुदायिक वन कम पाइएका प्रजाति

सामुदायिक वन	कम पाइएका प्रजाति
कण्ठेश्वरा	सिरिष, लाटिकाठ, सिन्दुरे, सेतीकाठ, राजे, साज, टुनी
राम्धेभिहारे	तिजे, असारे, मलो, काफल, अंगेरी, बाकले
चिसापानी	मुसुरे, क्यामुना, मौवा, लाँकुरी, घोंके, रुख धंयारी, चाँप, भक्किम्लो
शिवनारी	चुत्रो, अंगेरी, फलाँट, मलातो, आँखातरे
दियाँले डाडा	बाकले, झिगानो, दुधिलो, लाँकुरी, सेतीकाठ, काली काउली, केवरा, मलो
दुल्बु	सानो मौवा, मौवा, झिगानो, मयल
थल्पु	सिरिष, काउली, जामुन, लाटो काइयो, तिल्का, लाँकुरी, बाँफ
सेलताप	भक्किम्लो, जामुन
सल्मे सुर्के महाभिर	सिरिष, मोवा, रुख भलायो, सोर, मलो, खरानि,
सुलिधुम्का	अनीकाठ, जामुन

सामुदायिक वन नयाँ प्रजाति

सामुदायिक वन	नयाँ प्रजाति
कण्ठेश्वरा	राजवृक्ष
राम्धेभिहारे	
चिसापानी	
शिवनारी	
दियाँले डाडा	
दुल्बु	
थल्पु	
सेलताप	रानी सल्ला (वृक्षारोपण)
सल्मे सुर्के महाभिर	
सुलिधुम्का	

सामुदायिक वनमा विरुवाहरूको हालको अवस्थाबारे स्थानीय जानकारी

सा. व.	विरुवाहरू	
	सा व बाट लोप भैसकेका	लोपोन्मुख
कण्ठेश्वरा		टिमुर
राम्चेविहारे	सतुवा, घोडताप्रे, चाँप	चिरेतो, सल्ला, मुसुरे कटुस
चिसापानी		
शिवनारी	सन्दन, बेत, चाँप	दार
दियाले डाँडा	चाँप, कपुर	
दुब्बु		धशिङरो, सौर
थल्पु	सिमल र सिमली	बकाइनु, चाँप
सेलताप मंगलामाई (बृक्षारोपण क्षेत्र)	लालीगुरांस, बाँझ, काफल, चिल काईयो	
सल्मेसुकें महाभिर		लौठ सल्ला, खसु, काफल, ओखर, पैयु
सुलिधुम्का		

- वन सवर्धनको कारणले गर्दा सामुदायिक वनबाट तत्काल आवस्यक नदेखिएका विरुवाहरू हटाइएको पाइएको छ।
- प्राय सवै सामुदायिक वनबाट चाँप लोप भैसकेको पाइएको छ।
- राम्चे विहारे, शिवनारी, सल्मे सुकें महाभिर र चिसापानी सामुदायिक वन हालको कार्वन सञ्चितीको हिसाबले सवैभन्दा बढी भएतापनि पुनरुत्पादन कम देखिएकोले वार्षिक कार्वन सञ्चितीमा निकै कम योगदान पुग्ने देखिन्छ।
- सामुदायिक वनमध्ये काभ्रेको थल्पु र ललितपुरको दियालेडाँडा संरक्षणको हिसाबले सवैभन्दा राम्रो पाइएको छ।
- अधिकांश सामुदायिक वनको राम्रो व्यवस्थापन भएको पाइएको छ।
- सामुदायिक वन क्षेत्रभित्र जडीबुटी खेतीको सम्भावना रहेको छ।

APN

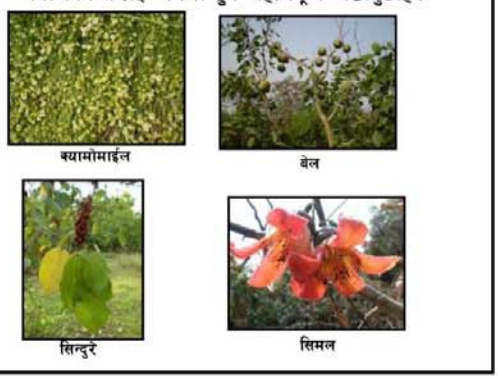
स्थलगत अध्ययनका केही तस्वीरहरू

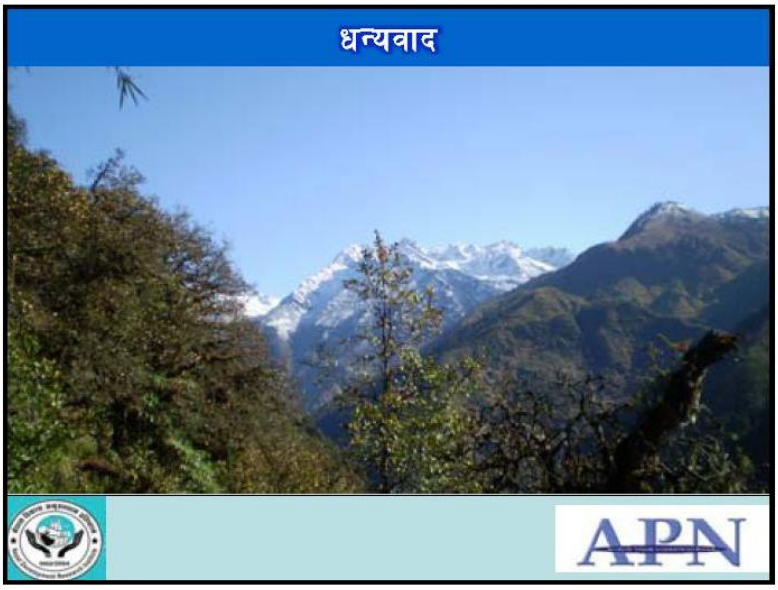
APN

नेपालको हिमाली भेगमा पाईने महत्वपूर्ण जडीबुटीहरू

नेपालको पहाडी भेगमा पाईने महत्वपूर्ण जडीबुटीहरू

नेपालको तराइ भेगमा हुने महत्वपूर्ण जडीबुटीहरू




धन्यवाद
APN

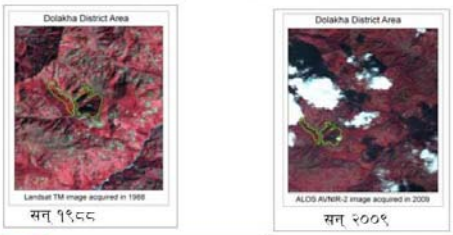
भू-उपयोगमा परिवर्तन

प्रस्तोता :
मान बहादुर क्षेत्री
बरिष्ठ अनुसन्धानकर्ता
नेपाल विकास अनुसन्धान प्रतिष्ठान
ललितपुर

APN

भू-उपयोगमा परिवर्तन: सन् १९८८/८९ र २००९

भू-उपग्रहबाट लिइएका तस्विरहरु



सन् १९८८ सन् २००९

APN

भू-उपयोगमा परिवर्तनको विश्लेषण विधि

- स्थलगत निरिक्षण र लक्षितवर्गसँग समूहगत छलफल
- स्थलरुप नक्शामा सामुदायिक वन उपभोक्ता समूहले ओगटेको क्षेत्र सिमाङ्कन
- भू-उपग्रहबाट लिइएको तस्विरहरुको संकलन
- Erdas Imagine र भौगोलिक सूचना प्रणाली

APN

अवलोकन परिणाम : भू-उपयोगमा परिवर्तन

- सार्वजनिक जमिन (सरकारी जमिन) : सामुदायिक वनमा परिणत, त्यस क्षेत्रमा वन क्षेत्र छ वा छैन
- निजि जमिन (खरबारी, खोल्सा-खोल्सि) :वन र झाडी बुट्यान क्षेत्रमा परिणत भएको छ वा छैन
- कृषि जमिन : घाँसेभूमि, झाडी बुट्यानमा परिणत भएको छ वा छैन

APN

सामुदायिक वन र उपभोक्ता समूहले ओगटेको क्षेत्रमा भू-उपयोगमा परिवर्तन

सल्मे सुर्के महाभिर सामुदायिक वन, ठूलोपातल गा. वि. स., दोलखा

भू-उपयोग	क्षेत्रफल (हे.) १९८८	२००९	परिवर्तन	परिवर्तन (प्रतिशत)
आवादि	२०१.९९	२०४.७	३.७१	१.८३
वन	१७१.३४	१९२.७	३१.३८	१९.४४
झाडी बुट्यान	३४.९७		-३४.९७	-१००
जम्मा	३९८.२७	३९८.४४	०.१८	-

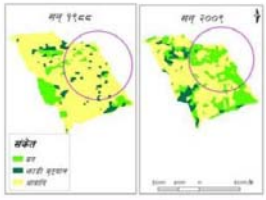
सुलिधुम्का सामुदायिक वन, पकरवास गा. वि. स., रामेछाप

भू-उपयोग	क्षेत्रफल (हे.) १९८८	२००९	परिवर्तन	परिवर्तन (प्रतिशत)
आवादि	४९८.९०	४४९.०३	-४४२.८७	-८४.४२
वन	९९.४४	२४३.७४	१४४.३९	१४४.९२
झाडी बुट्यान	४३.१८	९९.७४	८.४७	१९.१९
जम्मा	७९३.२०	७९३.४३	०.०९	-

APN

सामुदायिक वन र उपभोक्ता समूहले ओगटेको क्षेत्रमा भू-उपयोगमा परिवर्तन

सुलिधुम्का सामुदायिक वन, पकरवास गा. वि. स., रामेछाप



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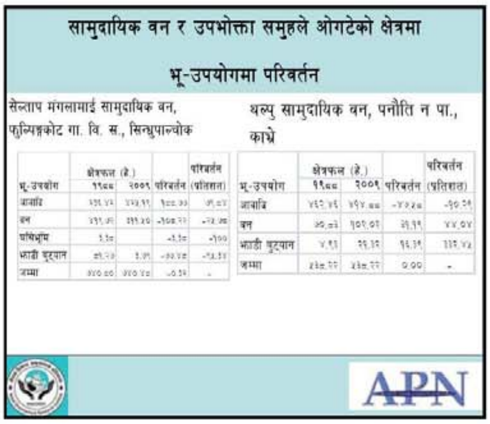
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थल्पु सामुदायिक वन, पनौति न पा., काभ्रे
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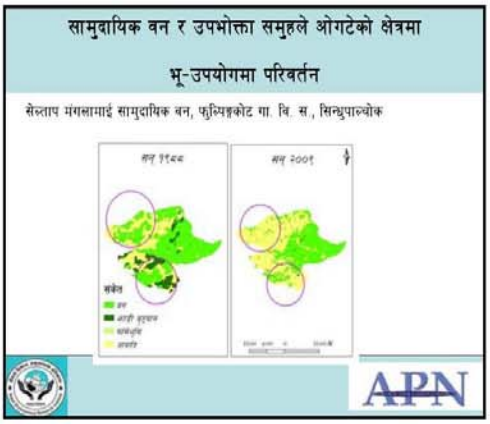
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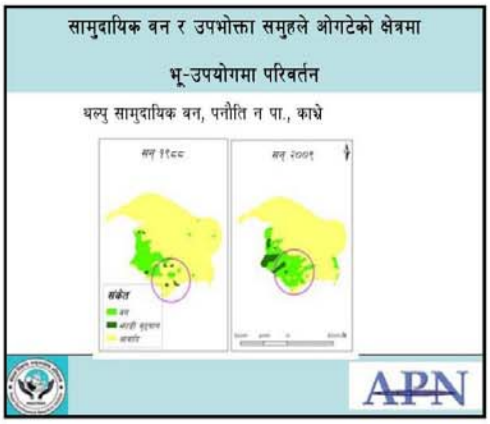
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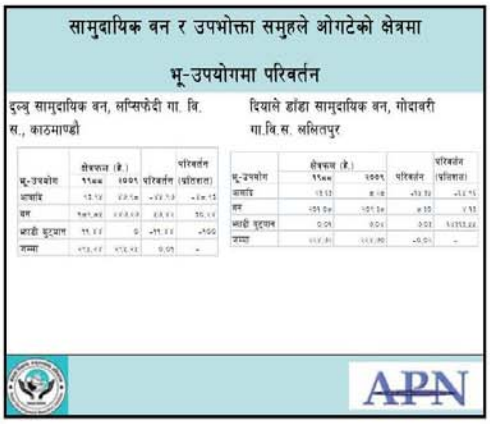
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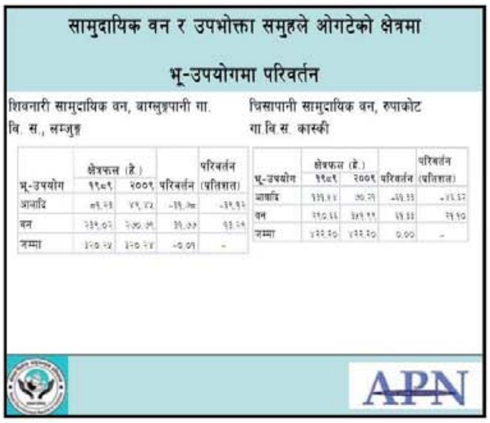
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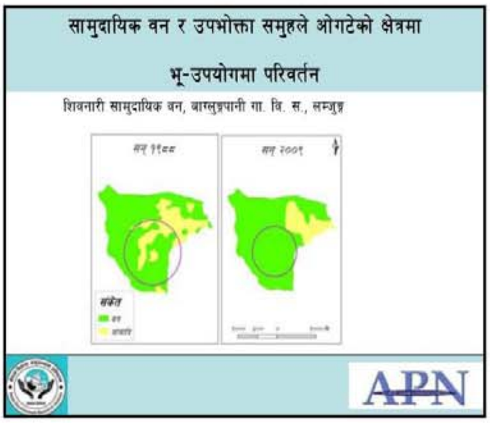
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संकेत
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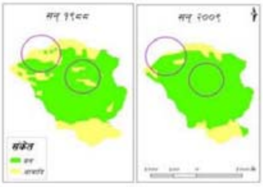
सामुदायिक वन र उपभोक्ता समुहले ओगटेको क्षेत्रमा भू-उपयोगमा परिवर्तन

चिसापानी सामुदायिक वन, रुपाकोट गा.वि.स. कास्की



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राम्चे विहारे सामुदायिक वन, फापरथुम गा. वि. स., स्याङ्जा

भू-उपयोग	क्षेत्रफल (हे.)		परिवर्तन	परिवर्तन (प्रतिशत)
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भू-उपयोग	क्षेत्रफल (हे.)		परिवर्तन	परिवर्तन (प्रतिशत)
	१९८९	२००९		
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वन	[illegible]	[illegible]	[illegible]	[illegible]
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राम्चे विहारे सामुदायिक वन, फापरथुम गा. वि. स., स्याङ्जा

स्थानिय अवधारणा : भू-उपयोगमा परिवर्तन

कृषि जमिनमा ह्रास :

बसाईसराई (७७ बाट ६६ घरधुरी, शिवनारी सामुदायिक वन)

- ❑ कृषि जमिनमा सघनता : उन्नत जातको बीउ र रासायिनिक मलको प्रयोग, प्राङ्गरिक मल बनाउनको लागि पात पतिङ्गरको उपलब्धता
- ❑ वैदेशिक रोजगार
- ❑ शिक्षा

बनले ओगटेको क्षेत्र र रुखहरुको घनत्वमा बृद्धि :

- ❑ सामुदायिक वनको योगदान
- ❑ खाली जमिनमा वृक्षारोपण
- ❑ पुर्नउत्पादित जातिहरुको संरक्षण
- ❑ सामुदायिक वनबाट परम्परागत रुपमा वन पैदावर संकलनमा बन्देज

सारंश

- ❑ रामेछाप, काभ्रे, ललितपुर, काठमाण्डौ, लम्जुङ्ग, कास्की र पाल्पामा कृषि क्षेत्रमा ह्रास र वन क्षेत्रमा वृद्धि
- ❑ सिन्धुपाल्चोक बाहेक सबै जिल्लामा वन क्षेत्रमा वृद्धि
- ❑ रामेछाप, काभ्रे र कास्की जिल्लामा वन क्षेत्रमा उल्लेख्य वृद्धि
- ❑ दोलखा र काठमाण्डौमा सबै झाडी बुट्यान क्षेत्र वन क्षेत्रमा परिणत
- ❑ स्याङ्जामा झाडी बुट्यान क्षेत्र वन क्षेत्रमा परिणत
- ❑ सिन्धुपाल्चोक र स्याङ्जामा झाडी बुट्यान क्षेत्रमा ह्रास
- ❑ काभ्रे, रामेछाप र ललितपुरमा झाडी बुट्यान क्षेत्रमा बृद्धि

धन्यवाद

Annex 6: List of photos of the Stakeholder Meeting

Photo 1: Opening session

Photo 2: Presentation by Dr. Chinta Mani Gautam

Photo 3: Remarks by the Chief Guest

Photo 4: Group photo of Participants

Annex 7: Knowledge Sharing International Workshop on "ROLE OF COMMUNITY FORESTS IN CO_2 SEQUESTRATION, BIODIVERSITY AND LAND USE CHANGE"

Organized by : Nepal Development Research Institute (NDRI)
Date : June 28, 2010 (Asar 14, 2067)
Venue : Park Village Hotel Pvt. Ltd., Chapali, Budhanilkantha, Kathmandu
Tel: 977-1-4373935/4375280

Program Schedule

Registration/Breakfast

From	To	Duration		Activities
7:30	8:30	1:00		Breakfast
8:30	9:00	0:30		Registration

Opening Ceremony

Chief Guest : Dr. Ganesh Raj Joshi, Secretary, Ministry of Environment

Chair : Dr. Tara Nidhi Bhattarai, President, NDRI

From	To	Duration		Activities
9:00	9:10	0:10		Calling upon the Dais
9:10	9:15	0:05		Welcome Address by Dr. Jaya Kumar Gurung, NDRI
9:15	9:20	0:05		Inauguration by Chief Guest: Dr. Ganesh Raj Joshi, Secretary, Ministry of Environment
9:20	9:30	0:10		Introduction of NDRI by Dr. Punya Prasad Regmi, ED, NDRI
9:30	10:00	0:30		Keynote address: **Global Trends of Carbon Emissions and Sinks with Emphasis on Land Use Change and the Inter- linkages** Dr. Shobhakar Dhakal, ED, Global Carbon Project, Institute for Environmental Studies, Japan
10:00	10:15	0:15		Inaugural Speech by the Chief Guest
10:15	10:25	0:10		Vote of Thanks and Closing Remarks by the Chair

Tea/ Coffee Break

From	To	Duration		Activities
10:25	10:45	0:20		Tea/coffee

Technical Session I

Chair : Dr. Laxmi P. Devkota, NDRI Member / Former NPC Member

From	To	Duration		Activities
10:45	11:15	0:30		Findings of the APN-NDRI joint study on **Role of Community Forests in CO2 Sequestration, Biodiversity and Land Use Change** Speakers: Dr. Nawa Raj Khatiwada, Mr. Dipesh Pyakurel and Mr. Man Bahadur Kshetri
11:15	11:45	0:30		**Status of REDD in Nepal** Speaker: Mr. Ram Asheshwor Mandal, Forest Officer, REDD and Climate Change Cell, Ministry of Forest and Soil Conservation
11:45	12:15	0:30		Floor discussion

Lunch Break

From	To	Duration		Activities
12:15	13:15	1:00		Lunch

Technical Session II

Chair : Dr. Sunil Babu Shrestha, NDRI Member/Former NPC Member

From	To	Duration		Activities
13:15	13:45	0:30		**Recent Developments on REDD and Forestry Sector in Indonesia** Speaker: Mr. Dendi Muhamad, IoE, Indonesia
13:45	14:15	0:30		**Recent Developments on REDD and Forestry Sector in Thailand** Speaker: Dr. Qwanruedee Chotichanathawewong, Assistant President, Thailand Environment Institute
14:15	14:45	0:30		**Recent Developments on REDD and Forestry Sector in India** Speaker: Dr. Puja Sawhney, New Delhi, India
14:45	15:15	0:30		Floor Discussion

Tea/ Coffee Break

From	To	Duration		Activities
15:15	15:45	0:30		Tea/coffee

Panel Discussion

Topic : Prospects of Regional Collaboration on REDD and Forestry

Chair : Mr. Resham Bahadhur Dangi, Joint Secretary, Ministry of Forests and Soil Conservation

From	To	Duration		Activities
15:45	15:50	0:05		Dr. Nawa Raj Khatiwada, NDRI, Nepal
15:50	15:55	0:05		Mr. Ram Asheshwar Mandal, Nepal
15:55	16:00	0:05		Mr. Dendi Muhamad, Indonesia
16:00	16:05	0:05		Dr. Puja Sawhney, India
16:05	16:10	0:05		Dr. Qwanruedee Chotichanathawewong, Thailand
16:10	16:15	0:05		Dr. Shobhakar Dhakal, Japan
16:15	16:45	0:30		Floor Discussion

17:00- 19:00 hrs **Reception Dinner**

Annex 8: List of Participants of the workshop

S.N	Name	Designation	Office/Organization
1.	Mr. Asish Dhakal	Environmentalist	Free Lancer
2.	Ms. Alina Karkai	Student	
3.	Ms. Amanda M. Gurung		
4.	Mr. Arun Raj Gurung	Student	Himalayan Alliance for Climate Change
5.	Mr. Aseem Dahal	Student	EMI
6.	Ms. Basanti Thapa	Reception/Admin	Nepal Development Research Institute(NDRI)
7.	Mr. Bharat Babu Shrestha	Lecturer	Central Department of Botany,TU
8.	Mr. Bhaskar Sing Karky	Resource Economist	ICIMOD
9.	Mr. Binod Adhikari	Teacher KNCM	
10	Mr. Binoj K. Shrestha	Research Associate	Institute for Social and Environmental Transition- Nepal (ISER-Nepal)
11	Mr. Bishnu Hari Poudyal	Consultant	RECOFTC
12	Mr. Bishnu Neupane	Student	Purbanchal University
13	Mr. Charles Pradhan	Facilitator	Asian Development Bank-Ministry of
14	Ms. Deepshikha Adhikari	Student	
15	Mr. Dendi Muhamad	Researcher	Institute of Ecology
16	Mr. Dharmaraj Regmi	Editor	Media mission Nepal
17	Mr. Dil Bahadhur Khatri	Senior Program	Forest Action
18	Mr. Dilli Joshi	Inst. Policy Sp.	Asian Development Bank-Ministry of
19	Mr. Dipak Dahal	Student	Tri-chandra Multiple College
20	Mr. Dipesh Pyakurel	Ecologist	NDRI
21	Mr. Eak B. Rana	Project Coordinator	ICIMOD
22	Dr. Ganesh RajJoshi	Secretary	MoENV
23	Dr. Jaya Kumar Gurung	Env. Geologist	NDRI
24	Mr. Khem R. Sharma	Student	Tribhuvan University
25	Dr. Krishna Ji Ghimire	Executive Officer	ISER-Nepal
26	Dr. Laxmi Prasad Devkota	Senior Research	NDRI
27	Mr. Mahesh Khanal	Student	Tri-chandra Multiple College
28	Mr. Man Bahadur Kshetri	Senior Researc	NDRI
29	Ms. Maniala Bajracharya	Student	HIMCCA
30	Dr. Manjeshwori Singh	Livelihood expert	NDRI
31	Mr. Manoj Kumar Shrestha	Student/Research	HIMCCA
32	Ms. Meenakshi Rokka	Research Intern	NDRI
33	Dr. Nawa Raj Khatiwada	Program Co-	NDRI
34	Mr. Nganindra Dalal	KU/Research	Kathmandu University
35	Mr. Nirmal Sigdel	Teacher	KNCMH
36	Ms. Nishma Basnet	Research Associate	NDRI
37	Mr. Peshal Wagle	Research Associate	HIMCCA
38	Mr. Prabin Kishor Sharma	Lecturer	Central Department of Environmental Science,Tribhuvan University
39	Mr. Prakash Gaudel	Student	Hamro Sampada
40	Ms. Pranita Dongol	Research Assistant	NDRI
41	Ms. Prashanti Ghale	Research Intern	NDRI
42	Ms. Pratiksha Shrestha		WETC
43	Ms. Pratima Koirala	Student	NEC

44	Dr.	Puja Sawhney	Consultant	
45	Dr.	Punya Prasad Regmi	ED	NDRI
46	Dr.	Qwanrudee	Assistant President	Thailand Environment Institute (TEI)
47	Mr.	Rajiv Ghimire	Research Intern	NDRI
48	Mr.	Ram Asheshwor	Forest Officer	REDD-Forestry and Climate Change Cell
49	Mr.	Ramesh Shakya	National Project Co-	Department of Forest Research and Survey
50	Mr.	Resham B.Dangi	Joint Secretarty	Ministry of Forests and Soil Conservation
51	Mr.	Rijan Tamrakar	Forest Officer	Asia Network for Sustainable Agricultural and Bioresources (ANSAB)
52	Mr.	Rishi Ram Kattel	Assistant Professor	Institute of Agriculture and Animal Science,
53	Ms.	Rupa Bhandari	Admin&Fin Officer	NDRI
54	Ms.	Sabina Khatri	Student	Tri-Chandra Multiple Campus
55	Ms.	Sabina Sharma	Student	Kathmandu University
56	Ms.	Sabnam Adhikari	Student	HIMCAA
57	Ms.	Santa M. Shrestha	District forest	Department of Forestry, Bhaktapur
58	Mr.	Santosh Adhikari	Student	University Campus Kirtipur
59	Mr.	Serene Khatiwada	Student	Global Change Makers(Switz.)
60	Mr.	Shambhu Dangal	Natural Resource	Forest Action/ERI
61	Ms.	Shanta Neupane	SW	FECOFUN
62	Mr.	Shiva Raj Bhandari	Student	Tri-Chandra Multiple Campus
63	Dr.	Shobhakar Dhakal	Executive Director	Global Carbon Project
64	Ms.	Shuvee Neupane		
65	Ms.	Sriju Sharma	Senior Research	NDRI
66	Mr.	Subash Chand	Participant	HIMCAA
67	Prof.	Subodh Sharma	Professor	Kathmandu University
68	Mr.	Sujan Ghimire	Research Associate	ISET-N
69	Ms.	Suman Pandey	Student	Tribhuvan University
70	Dr.	Sunil Shrestha	Member	NDRI
71	Mr.	Surendra Gautam	Senior Program Co-	Friends of Nature
72	Ms.	Sushmita Bhandari	Student	Tribhuvan University
73	Dr.	Tara Nidhi Bhattartai	Co-ordinator	NDRI
74	Mr.	Tara. N. Niraula	Researcher	School of Natural Resources
75	Mr.	Tejendra Bdr. G.C.	Student	Hamro Sampada
76	Mr.	Tommaso Mignani	Intern	WWF Nepal
77	Mr.	Ugan manandhar	Senior Program	WWF Nepal
78	Mr.	Vinod Gautam	Section Officer	Ministry of Environment

Annex 9: Rappoteur's Report

Knowledge Sharing International workshop on "Role of Community Forests in CO2 Sequestration biodiversity and Land Use Change"

INAUGURATION CEREMONY

The inaugural ceremony was started with the welcome speech by Dr. Jaya Kumar Gurung, NDRI member. He emphasized on the inability of people to synchronize the synergetic effect of intellectual minds to address the issue of climate change. He added, minds loaded with big complicated ideas overlook simple solutions which will create poor implementation of the programs. He said, this symposium is highly relevant to the emerging issues of climate change and NDRI is a leading initiative for research based strategic approach to the issue of climate change. Also he pointed out some of the unique significances of the location of the workshop like holy place with temple, Shivapuri National Park, residence of many celebrities etc. He called on the intellectuals to rectify the approach to issues about sustainable development and believed that this workshop had incredible potential to give directions for doing so.

After Dr. Gurung's eloquent and encouraging speech, the program was formally inaugurated by lighting a light on *panas* by the Chief Guest Dr. Ganesh Raj Joshi, Secretary, Ministry of Environment.

Following the welcome speech, Dr. Ganesh Raj Joshi, Secretary, Ministry of Environment delivered his inaugural speech. Dr. Joshi congratulated NDRI for a wide range of achievements within a short span of time. He said, even though Nepal's contribution to global carbon emission is very low, its impacts have been felt in various areas such as agriculture and food security, biodiversity, infrastructure and so on. He added, we are experiencing the impact of climate change in various sectors like energy, water, infrastructure, and species, especially in mountain and himalayan areas. The issue of mountain and biodiversity has not been discussed much in international negotiations so in order to change this the government is forming a mountain alliance with similar countries. He shared, cabinet has approved International Ministerial Conference in September. He added, to raise our voice in international level, we have support from ICIMOD to prepare two technical papers. And hopefully, ministers from 40-50 countries will attend the conference and this will be path making initiative by Nepalese government. As for the CDM, he shared that the two projects of micro hydropower and ICS has implemented. He emphasized on the generation of the scientific paper and quantitative data. He added, government is providing research grant in Universities to generate some basic information. At the end of his speech, he suggested that NDRI should not only diversify the work area but also the professionals from different sectors.

Following the formal inauguration, there was a brief introduction of NDRI's missions, visions, objectives and activities by Dr. Punya Prasad Regmi, Executive Director of NDRI which clearly showed the remarkable achievements of NDRI within a short span of six years since its establishment in 2004. He said, the mission of NDRI is to provide substantive analytical inputs for policy making on contemporary issues through rigorous research and dissemination of findings. The vision of NDRI is to become a center of excellence for policy research, education and development. Dr. Regmi added, some of the past and present activities conducted by NDRI like

- MAPPING of RCIW Roads and Conflict Impact Information – in partnership with World Food Programme (WFP), Nepal.

- Review and Facilitation of Public Private Partnership (PPP) in the Transport Sector in Nepal - funded by World Bank and implemented jointly by Castalia Strategic Advisors, France and ICRA Management Consulting Services Ltd. (IMaCS), India.
- Evaluation of Project on Rainwater Harvesting in Makwanpur - with the financial assistance of Plan Nepal.
- Baseline study on Raising Her Voice - supported by OXFAM and in partnership with Women Security Pressure Group (WSPG).
- Study on Environmental Change in Rural Asia - with a focus on the Use of Pesticides and its Impact on Health of Nepalese Population - in partnership with the University of Tokyo, Japan.
- Climate Change Adaptation in Trans boundary River Basins: The Karnali River Sub- Basin, South Asia and the Oldman - submitted to International Development Research Center (IDRC), Canada.
- Assessment of Role of Community Forests (CFs) in CO_2 Sequestration, Biodiversity, and Land Use Change - with the financial assistance of APN (Asia Pacific Network for Global Change Research), Japan.
- Training to Private Sector Health Service Providers on Malaria Prevention and Treatment - in partnership with Population Services International (PSI)/Nepal (Second Phase).
- Beneficiary Targeting Study and Pilot - in partnership with UN-WFP (United Nation -World Food Program).

Dr. Shobhakar Dhakal, Executive Director of Global Trends of Carbon Emissions and Sinks with Emphasis on Land Use Change and the Inter-linkages-Tsukuba International office, Japan delivered keynote speech and highlighted the global carbon budget and REDD+ regime setting. The presentation was highly informative and comprehensive. He said, despite all the talks, the CO_2 emission is still shooting up. From the IPCC projection, he showed the worst scenario due to rising up of the temperature. He added, latest studies showed that despite the financial crisis, the CO_2 emission is not decreasing.

He shed light on the aims of the REDD+. '+' sign in REDD+ stands for reducing more carbon. Afforestation, biodiversity issues are incorporated in REDD but surface reflectivity is not much discussed. Brazil and Indonesia will be benefited by 60% from REDD. Also he added some of the case from Nepal about community forestry which is mostly successful in the midhills. He expressed that since Nepal has one of the best practices of forest groups in Nepal, there is significant potential for Nepal to gain from the REDD+ mechanism. Though the forests area is decreasing the biomass or carbon stock are increasing. He shared some issues discussed in the COP15 were the link with the carbon market and the ways to distribute those resources in the country. At the end, he emphasized that REDD+ could be helpful in climate stabilization. Yet it needs to address many other issues as well.

Global Carbon emissions, highlighted by Dr. Shobhakar Dhakal

- According to IPCC, the atmospheric CO2 concentration rise from 375ppm to 380ppm in 2008.
- Annual CO2 growth rate emission in the year 2000-2008 was 3.4% but in 1990-2000 was 1% per year.
- 55% of CO2 emissions in terms of volume is from the developing countries but in terms of per capita income is high in developed countries.
- The top emitters of CO2 (>4% of the total) are U.S.A, China, Russian Fed., India and Japan. China, USA and India are responsible for the 50% of the global emission.
- Carbon emission from the tropical deforestation is 1.5 PgC/year in the year 2000-2007. Tropical Africa has low carbon emissions as compared to its deforestation share.
- The total CO2 emission from fossil fuel and land use change in 2008 is 8.7 PgC/yr and 1.2 PgC/yr respectively.
- In 2008, if 1 ton of the carbon is emitted then 450 kg remains in the atmosphere. But in 1960's if 1 ton carbon is emitted, 400kg remained in the atmosphere.

Dr. Tara Nidhi Bhattarai, President, NDRI, presented the Chief Guest and the Keynote speaker with token of appreciation. He thanked all the participants, Chief Guest, Guests, Keynote speaker for being part of the workshop in spite of the time constraints. He said, community forest is a successful program and after addition of CO2 sequestration, it would be more important. He thanked the organizers for the involvement of youth in the program as climate change issues might affect the future generations for years to come. And at the end, he requested everyone to make the program a grand success and also mentioned that identification and collaboration of relevant organizations was necessary for further research.

TECHNICAL SESSON I

Chaired by Dr. Laxmi P. Devkota, NDRI member/ Former NPC member.

In the beginning of the session, Dr. Devkota gave a brief introduction of the session and requested the paper presenter to sit in the first row and complete the session within one and half hour.

***Presentation 1: Role of Community Forests in CO_2 Sequestration, Biodiversity and Land Use Change by Dr. Nawa Raj Khatiwada, Mr. Dipesh Pyakurel and Mr. Man Bahadur Kshetri*, Findings of APN/NDRI joint study.**

Mr. Dipesh Pyakurel started the presentation with the introduction and the linkage of the community forest with biodiversity. He said, community forestry is an innovative practice in which forest area is handed over to local user groups for the conservation, sustainable use and management of forest and forest resources. He added, as CF is successful in midhills, ten community forest were selected from the ten district of midhills. The selected plots were marked with GPS and spray paint so it will help in further study. He pointed out, monocropping is more prevalent in most of the CFs which resulted in the removal of economically less important tree species. At the end he said, outcomes of the research might be useful for National level policy makers to develop/amend CF policy on landscape level.

Following the presentation on biodiversity, Mr. Kshetri started his presentation in Land Use change. He began his presentation by explaining the methodology for the conversion of the satellite image into land use classification. He highlighted the changes in land use in CFs and its peripheral zones. He said except Sindupalchowk forest area had increased in all other field sites and the reason for that decline was landslide instead of anthropogenic factors. He added the reason for diminishing agricultural land was intensive farming practices, foreign employment, education and migration. He concluded his presentation by emphasizing on the successful implementation and management of CF for the increment of forest area.

Dr. Nawa Raj Khatiwada started his presentation on "CO_2 sequestration and future prospects" by sharing his experience of moving from a brown sector to blue and green sector. He said, this project was selected in the global competition and was the second project under the funding of APN. He explained the methodology used in the research for the estimation of carbon deposit. He pointed out, the scope for further research as follows:

- Estimation of carbon sequestration in terai and other development regions.
- Estimation of soil carbon deposit.
- Lobbying for CF on REDD framework.
- Application for funding under various mechanisms
- Regional collaboration

He also shed some light on climate investment funds and setting up a mechanism like CDM. He said, there should be synergy with REDD and green sector. There is a tremendous opportunity for research, entrepreneurship, employment and involvement. He ended his presentation by acknowledging all the team members, CF users group and department of survey.

Floor was opened for the discussion. Many questions were raised about the methodology. Mr. Pyakurel added the research work followed Mac. Dicken 1997 and species area curve method. One of the participants, Mr. Pravin Kishore Sharma, faculty in CDES asked about sources of data and methods for calculating the land use change. Mr. Kshetri replied that community forests and the peripheral area were chosen for the study and satellite image was used for the calculation. He added, CF is the major factor but due to the migration, the private land was converted into the forests land which increased the forest area and decreased the cultivated land. Mr. Ugan Manadhar, senior program officer, WWF suggested to also mention something about the software used for the study. Dr. Tara Nidhi Bhattrai asked if there is any link between monocropping practices and CF and loss of livelihood in rural community in Nepal. "There is no direct link with livelihood practices, but livelihood practices is changed in the sense that if the open grazing is banned then livelihood practices shifts" he replied.

Presentation 2: Status of REDD in Nepal by Mr. Ram Asheshwor Mandal, Forest Officer, REDD and Climate Change Cell, Ministry of Soil and Forest Conservation.

At the beginning of the presentation, Mr. Mandal gave a brief introduction of the global warming and climate change. He said, though Nepal contributes very less in GHG emission, impacts of Climate Change are serious. Island and mountainous countries are more affected due to warming because of sea level rise, melting glaciers etc. Globally, in 20th century temperature increased by 0.7ºC (1.3 ºF) and in context of Nepal, annual temperature rise by 0.06^{0}C. In his presentation, he showed the critical condition of the glaciers in Nepal which are in grave danger of sudden outburst. He highlighted several conventions on climate change that are carried out globally. Nepal submitted Readiness Pin Idea Note (R-PIN) to the World Bank in15 April, 2008. He also highlighted the institutional mechanism of REDD. There are two types of institutional arrangement: REDD stakeholder forum and Apex body. The function of the apex body is to coordinate with top level and suggest to formulate the national REDD policy and the stakeholder forum serves as the principal outreach and communication platform and is already operational. Community Climate and Biodiversity Alliance has already started and piloted. "If you see the case of community forestry, there is hope for REDD in Nepal. Nepal has been getting the income from the CF and if carbon trade on REDD project is established, there will be more benefits mostly for the deprived group", he said. He added, REDD project will create a lot of job opportunity, help in combating climate change issues and decrease the deforestation and degradation in Terai. At the end of his presentation, he said, political commitment is needed and necessary changes can be made in legal and institutional aspect as Nepal is preparing new constitution.

Dr. Shovakar opened the forum for discussion asking "Have we done any National forest inventory? What average year or baseline are we taking?" Mr. Ramesh Shakya, National Project Coordinator, Department of Forest Research and Survey (DFRS) replied, the report was published in 1999 and last inventory was done in 1990. The new inventory would be done with a concentration on carbon, biomass and carbon footprint. It would be a five-year long project. Mr. Resham Dangi, Joint Secretary, Ministry of Forest and Soil Conservation, added, 1994 data was used as a baseline data. Map gives us three parameters but biomass survey and methodology is also necessary. We can use high resolution imagery and extrapolate 1990's to get a reference level. But there is still argument going on in this matter. One of the participant, Amanda M. Gurung wanted to know about the benefit-sharing mechanism in REDD and how benefits to

the community would be ensured. Mr. Mandal replied, "If you see the previous data, 22% of the forest is handed over to the community which show establishment of the sharing mechanism. People have already started discussing and conducting many programs to stakeholders". Mr. Dangi gave some of the options about benefit sharing like establishment of trust fund or CF network but at the same time warned us about the transaction cost which requires a lot of robust plan in mechanism. He apprised, by the end of 2013, we will be able to make an institutional mechanism. From the 30yrs data of glaciers, Prof. Dr. Subodh Sharma, Kathmandu University said, there has been 3m/yr recession of the glacier and 0.9^{o}C rise in temperature in the southern slopes where most glacial are present. He wanted to know about the methods used in calculating the carbon sequestration as it is related to both photosynthesis and respiration. Dr. Bhaskar Singh Karky, Resource Economist, ICIMOD, replied, IPCC (2006) has recommended a guideline which is followed by the ICIMOD, ANSAP, FECOFON for research in carbon sequestration in yearly basis. Dr. Khatiwada wanted to know about the structure of line agency to see the fund flow of project on REDD. Mr. Mandal said, when R-PP will be approved, fund will be available which might be in the next month. World Bank is funding to launch REDD activities that will support R-PIN preparation and support from internal funding agency is also available.7.6 million dollars has been proposed for R-PP.
The chair person said we are in a transitional phase and using a lot of energy. So this might open the door for a new era and concluded the session by thanking the presenters.

TECHNICAL SESSION II

Chaired by Dr. Sunil Babu Shrestha, NDRI Member/ Former NPC member

At the beginning of the session, Dr. Shrestha gave a brief introduction of the session and requested the presenters to complete the session within the given time limit.

Presentation 3: Recent Development on REDD and Forestry Sector in Indonesia by Mr. Dendi Muhamad, IOE, Indonesia.

Dr. Muhamad mentioned that since Indonesia has the third largest tropical forest in the world but is also the third biggest contributor of Greenhouse gases, the REDD mechanism in Indonesia would be a great opportunity. He added, on May 29, 2009 Indonesia became one of the first countries which produces REDD program national regulations. However, in a nation with a very high rate of deforestation and degradation due to reasons such as commercial timber logging, forestry industries, plantation industries, forest fire, the implementation of REDD mechanism is very challenging. In order to handle these challenges, Indonesia government has provided a framework and a solid legal basis in mitigating CC through REDD, including granting access to accommodate forest communities. It has also made efforts to eradicate intensive illegal logging and prioritized fight against corruption in all sectors. "REDD in Indonesia is following a three phase approach: preparation, readiness and full implementation" said Mr. Muhamad. Currently it is in the readiness phase and the third phase of full implementation will begin in 2013. REDD in Indonesia will be done gradually, with implementation at sub-national level, which is integrated into national level and sub-national implementation. Mr. Muhamad added, REDD initiatives are more likely to succeed if they build on the interest of forest communities and indigenous people. He emphasized on the importance of incentives in the form of payment or other benefits for good practices, developing alternative livelihoods, formalizing land tenure and local resource right and intensifying productivity in non-forest lands. He concluded, it was important to not only burden the forest communities for reducing deforestation but to spread out the pressure across many levels of decision making, interest groups and administration.

Mr. Ugan Manadhar, one of the participants asked if the Indonesian government had any plans prepared since the Norwegian government had allocated 2.6 billion dollar to move REDD ahead in Indonesia. To this, Dr. Shovakar answered that Indonesian government is much ahead than any other country in making lawas and regulations and preparatory planning for REDD. Mr. Resham Dangi wanted to know about the ways for addressing the issues by Indonesian government as R-PP prepared by Indonesia is more technical and safe for indigenous people. Mr. Muhamad replied, many programs are being implemented but some departments are still under the process of establishing a methodology. One of the participants asked Mr. Muhammad to elaborate on the intensive logging eradication program that he mentioned about earlier. Mr. Muhammad said that it was a difficult task that required long preparation. Prior to the regulation, it was hard to even make a case at the court but after it was implemented, cases could be reported and thus, its effectiveness was increased.Even so there are many technical problems and human resource problems. Nevertheless some progress has definitely been seen.

Presentation 4: Recent Developments on REDD and Forestry sector in Thailand by Dr. Qwanruedee Chotichanathawewong, Assistant President, Thailand Environment Institute

Dr. Qwan started her presentation with a brief introduction of the CO_2 emission from forest deforestation and degradation. She said, in Thailand, land use change and forestry comes second amongst the major emission sources in 2002. It is expected that forest conservation and reforestation would reduce the net emissions. The major issues regarding deforestation and forest degradation are no clear definition for 'forest', lack of data, financial issue, land ownership arguments and lack of awareness of impacts of deforestation and climate change. Major causes for deforestation and degradation have been illegal logging, land use for settlement and agriculture, forest fires, slash and burn practice for land use and ambiguous land registration system that gives rise to land ownership issues even in reserved or protected areas. Approaches such as a financing scheme where carbon credits are bought and sold and local participation at the community level including forest dwellers and ethnic people could encourage forest conservation. She added, currently forest monitoring and forest inventories are being handled by two bodies: the Department of National Park, Wildlife and Plant Conservation (DNP) which is responsible for resources assessment and monitoring within protected area and the Royal Forest Department which is responsible for reserved forests outside. She said that implementation of REDD mechanism could be beneficial to Thailand. Even though there is no official policy for REDD implementation, Thailand's readiness proposal to the World Bank's Forest Carbon Partnership Facility (FCPF) has already been approved. Now it will join 36 other developing countries in exploring concepts to implement REDD. She emphasized, to create a suitable environment for REDD implementation, Thailand also requires to come up with a national plan to address the drivers of deforestation in the nation and also clearly define the roles of DNP and RFD and similar other departments. However, the perception of REDD is quite different for indigenous people. They believe that instead of reducing emissions from the sources where they have been produced, REDD addresses global warming in the wrong spots. Dr. Qwan mentioned, database management and in-depth research regarding greenhouse gas emissions would push Thailand into implementing REDD efficiently. The Joint Graduate School of Energy and Environment (JGSEE) Study has already started studying and collecting database of greenhouse gases emissions across all sector for ONEP. Thai stakeholders see the need for setting up rules to ensure that the community benefits from forest. They are in favor of the fund concept rather than the market mechanism.

Presentation 5: Recent Developments on REDD and Forestry Sector in India by Dr. Puja Sawhney, New Delhi, India.

Dr. Sawhney started her presentation with an introduction of the various forest policies and national legislations in India aimed at conservation and sustainable management of forest. The implementation of progressive policies such as National Forest Policy (1988), JFM resolution (1990), National Environment Policy (2006), Green India mission and so on over the last two decades, has transformed India's forests into a net sink of CO_2. Dr. Sawhney said, although the mechanism of REDD has not been officially implemented in India there is considerable scope of its implementation, considering the extent of India's forest cover. India's approach toward the REDD mechanism is more comprehensive and termed as a 'REDD plus' approach. India along with a few other countries even demanded the inclusion of forest degradation, conservation of forest and increase in forest cover in the REDD draft text. Dr. Sawhney reiterated Mr. Muhammad's point about conducting REDD projects at the national and sub-national level and the importance of incentives to encourage people participation. She also added, communities should not only be given incentives for reducing carbon emission but also rewarded for conservation of forests. Even though India has great potential for REDD, benefit-sharing from the implementation of REDD + still remains unresolved. For instance, there is still no mechanisms to compensate the forest people whose land were taken away and diverted. Other challenges identified for REDD implementation were corruption, problem of law and order and population pressure and agricultural requirements. One of the issues raised by Dr. Sawhney was the possibility of REDD's market or fund based financial mechanism to act as a disincentive towards decentralization of forest governance. When Mr. Charles Pradhan asked her to further clarify this, she answered, even though projects like REDD involve the community forests, ownership is not transferred. The government believes that communities are incapable of managing forest on their own and therefore, centralization of forest governance remains intact. She pointed out several conditions that have to be met for the successful implementation of the REDD mechanism in India. Some of them are inclusion of indigenous forest dwellers and local communities in the process, proper utilization of funds, effective mechanisms to correctly assess the monetary value of a forest, availability of funds, transparency and accountability of transactions and capacity building of grassroots institutions to undertake monitoring. In the midst of her presentation, Dr. Sawhney concluded that as Nepal and India are similar not only in terms of forest composition but also in culture and the working system, the collaboration for further research would be beneficial for both parties. Mr. Resham Dangi wanted to know why the Indian government was still so rigid even after the lesson-learning1984 amendment. "Laws and forestry are good but there is a want to achieve a lot at the same time", answered Dr. Puja. Dr. Khatiwada requested Dr. Puja to elaborate on development of alternative livelihood. She said, even if we provide good incentives, it is not enough and we need to understand their customs. Sometimes incentives should be in the form of providing training to build skills and earn money. If they migrate to other places, they have to plant trees in the land rather leaving it fallow. "What is the situation of the staff in the organization in which Dr. Quan is involved?" asked Dr. Khatiwada. She replied, TEI works at policy level only like poverty reduction, social awareness, policy for education, waste water etc. Thanking all the presenters, Mr. Shrestha pointed out five challenges throughout the session: Policy, financial investments, capacity building, equity and political commitments. He said that we must protect the forest and embark the mitigation strategies and expand programs like CDM which is gaining popularity.

PANEL DISCUSSION

Mr. Resham Bahadur Dangi chaired the panel discussion. He gave a brief introduction of all the panelists: Dr. Shobahakar Dhakal, Dr. Quan, Dr. Dendi Muhammad, Dr. Puja Sawhney, Mr. Rameshwar Mandal and Dr. Khatiwada. Mr. Dangi requested the panelist to present their views regarding the prospect of REDD implementation and regional collaboration. Dr. Shohakar Dhakal started by mentioning the diversity of climate change. Dr. Dhakal shared his working experiences to bring international scientific community together and create a network to foster regional co-operation. He said, there exists numerous opportunity to learn from different countries that are handling REDD+ programs. He also stated that REDD could be more effective as it is less costly unlike the CDM. As most developing countries share similar complex issues such as the indigenous communities, leakage problem and so on, regional co-operation and capacity building of scientists from developing countries would be highly advantageous. The next panelist Dr. Qwan had similar views as Dr. Dhakal. She strongly advocated regional cooperation and mentioned that there are many areas to be working together. It is possible to learn from each other about how to mobilize the best techniques. She said, Thailand has many resources to work together for research. She concluded by saying that it is a great idea to work together in international conventions and be able to successfully negotiate. Dr. Dendi was next speaker. He started by saying that Indonesia is using a step-by-step approach for REDD implementation. He mentioned about some short term projects for community empowerment such as mobilizing resources, intensifying products and long term projects such as collaboration to share knowledge with other experts, researchers, NGOs and organization. He emphasized that REDD mechanism could be successfully established if there was a strong connection and alliance among participating countries. Dr. Puja Sawhney started her speech by mentioning that the workshop had been a great learning experience for her. She stressed that not only collaboration but more knowledge sharing was required in this field. Countries within a region might have similar challenges and it would be beneficial if they team up to find a solution. She highlighted the similarities of India and Nepal, not only in terms of forest, but culturally and socially as well. And added, there is lot of scope from collaboration for REDD between these two countries. She praised the mountain alliance initiative of the government and suggested that institutes such as Indian institute of science in Banglore, Indian Consul for Forestry Research be brought into the fold as well. Mr. Ramsheswhar Mandal identified3 main challenges to REDD faced by all countries in region: 1. Corruption: Not only the government side but the management side as well 2. Poverty: Acts as a catalyst in deforestation and forest degradation and 3. Use of forest land for development activities: Most development activities occur on forestland.
Thus, collaboration to address these issues would be very valuable and useful to all countries involved. He mentioned that there would be lobbying of REDD+ with India. If the use of spatial data is well managed, Nepal could collaborate with India. It could also learn from the livelihood promotional activities mentioned by Dr. Qwan . Due to the high rate of deforestation in both Indonesia and Terai, the research done in Indonesia could be carried out as a pilot in Terai. All these are areas where collaboration could prove valuable. With only limited research in carbon issue and unclear process of handling finances regarding REDD, Nepal needs expert like Dr. Dahal to play a vital role. Dr. Nawa Raj Khatiwada was the last panelist. He talked about the necessity for regional collaboration to gain access to funds that are provided through joint proposal writing. For such collaboration there should be a good network amongst academic institutions. He suggested that we could develop a network by circulating emails of common interest, putting useful and relevant links on website, signing MOUs, writing joint proposals,

exchanging researchers and providing feedback to the government regarding scientific issues. After these brief speeches by the six panelists, the floor was opened for questions and further discussion.

Several questions were raised like: What kind of knowledge should be shared? How to institutionalize from policy level to community level? After going to federal system, Nepal will need a new mechanism, so are there any such system? Dr. Eak B Rana from ICIMOD said, South Asia and South East Asia have similar kind of forest standards, indigenous issues, REDD, poverty etc. Countries in Southern Asia are suffering from complex mechanism like CDM. He suggested preparing simple REDD+ mechanism and choosing verifiers from respective countries. Dr. Khatiwada pointed out, the lack of expertise, analytical ability, clear goal and clear objectives hinder implementation of CDM's already complex methodology. Developing countries need simple rather than technical measurements. Regarding the type of knowledge to be shared, Dr Qwan replied, knowledge in terms of local people, politicians, and reporters should be classified and different channels should be used to reach different groups at different levels. Mr. Dangi added, IPCC people don't generate knowledge but are still doing well. Knowledge is there but it should be straight forward. Mr. Dendi said, commitment from policy level is needed. Commitment should not be from only the high authority but also from the local level. Dr. Puja highlighted the situation in India. She said that forest is under the control of the state government and there is no co- ordination between central, district and local level. Rights of the people need to be addressed.

The program was concluded with the closing speech by the Dr. Regmi. He thanked all distinguished guests, participants and the NDRI team for the successful completion of the program.

Annex 10: Presentation slides of the workshop

Page no.

6/28/2010

Global trends of carbon emissions and sinks with emphases on land use change and the inter-linkages

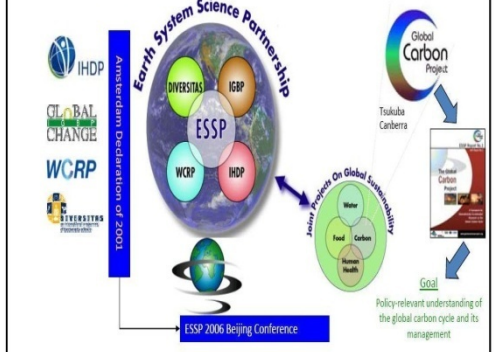
Shobhakar Dhakal
Executive Director- Global Carbon Project (GCP)
National Institute for Environmental Studies, Tsukuba, Japan

•Research Scholar, International Institute for Applied Systems Analyses (IIASA), Austria
•Visiting Associate Professor, Graduate School of Environmental Studies, Nagoya University

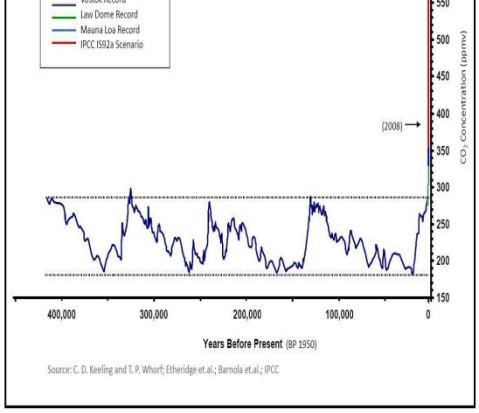
Contents

- Global carbon budget: Sink-source dynamics
  - Global carbon emissions from fossil fuel and land use change
  - Natural CO_2 sinks and their role
- REDD+ in carbon cycle science perspectives
- Considerations in REDD+ regime setting
- Concluding remarks

International Scientific Programs on Global Environmental Change Science



CO_2 concentration in Ice Cores and Atmospheric CO_2 Projection for Next 100 Years



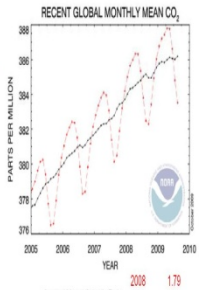
6/28/2010

Atmospheric CO_2 Concentration

Year 1750: 280 ppm (about)
Year 2008: 385 ppm

38% above pre-industrial, over 100 ppm rise

1970 – 1979: 1.3 ppm y^{-1}
1980 – 1989: 1.6 ppm y^{-1}
1990 – 1999: 1.5 ppm y^{-1}
2000 - 2008: 1.9 ppm y^{-1}

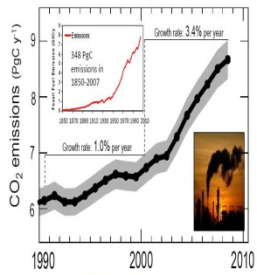


Annual Mean Growth Rate	2008	1.79
	2007	2.12
	2006	1.77
	2005	2.41
	2004	1.62
	2003	2.22
	2002	2.40
	2001	1.85
	2000	1.24

Data Source: Pieter Tans and Thomas Conway, NOAA/ESRL

Fossil Fuel Emissions and Cement Production

[1 Pg = 1 Petagram = 1 Billion metric tonnes = 1 Gigatonne = $1x10^{15}$g]



2008

Emissions: 8.7 PgC

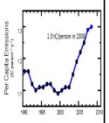
Growth rate: 2.0%

1990 levels: +41%

2000 levels: +29%

2000-2008
Growth rate: 3.4%

1990 Emissions: 6.2 Pg C y^{-1}
2008 Emissions: 8.2 Pg C y^{-1}



Le Quéré et al. 2009; Nature-geoscience; CDIAC 2009

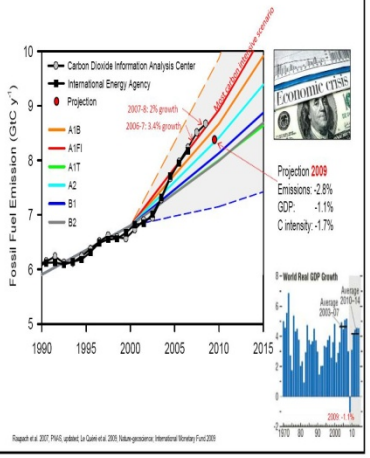
Global emission per capita

Factors that Influence the Airborne Fraction

1. The rate of CO_2 emissions.
2. The rate of CO_2 uptake and ultimately the total amount of C that can be stored by land and oceans:
   - Land: CO_2 fertilization effect, soil respiration, N deposition fertilization, forest regrowth, woody encroachment, ...
   - Oceans: CO_2 solubility (temperature, salinity), ocean currents, stratification, winds, biological activity, acidification, ...

Sprenger, Gruber et al. 2004, Island Press

Fossil Fuel Emissions: Actual vs. IPCC Scenarios

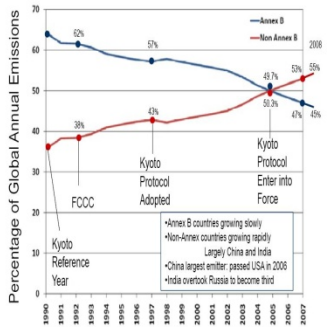


Projection **2009**
Emissions: -2.8%
GDP: -1.1%
C intensity: -1.7%

Raupach et al. 2007; PNAS; updated, Le Quéré et al. 2009; Nature-geoscience; International Monetary Fund 2009

6/28/2010

Regional Shift in Emissions Share



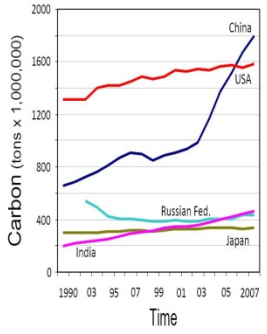
Le Quéré et al. 2009; Nature-geoscience; CDIAC 2009

Cumulative Fraction of Total Fossil Fuel Emissions 2008

Number of Countries	Country	Cumulative Fraction	
1	China	.232	3 countries 50% Global Emissions
2	USA	.419	
3	India	.477	
4	Russia	.530	10 countries 2/3 Global Emissions
5	Japan	.573	
6	Germany	.599	
7	Canada	.617	
8	UK	.633	
9	South Korea	.652	
10	Iran	.668	
20	Poland	.800	Top 5 + EU 80% Global Emissions
50 (2005)	Belarus	.941	
100 (2005)	Moldova	.992	
210		1.00	

Gregg Marland, CDIAC 2009

Fossil Fuel Emissions: Top Emitters (>4% of Total)



Global Carbon Project 2009 (Data: Gregg Marland, CDIAC 2009

Carbon Emissions from Land Use Change

2000-2007 (Net av. an. emission)

Tropical Americas, 41%	0.6 Pg C y^{-1}
Tropical Asia, 43%	0.6 Pg C y^{-1}
Tropical Africa, 17%	0.3 Pg C y^{-1}
	1.5 Pg C y^{-1}

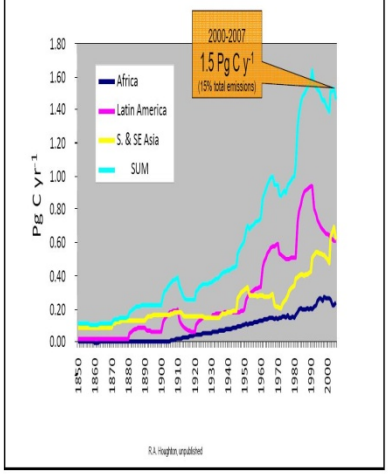
Tropical deforestation: 13 Million hectares each year
Tropical deforestation mostly responsible for emissions

[2007-Total Anthropogenic Emissions 8.5+1.5 = 10 Pg]

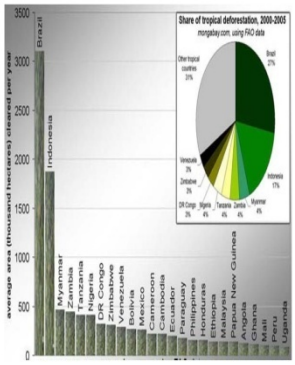
160 Pg C emission in 1850-2007 from Land Use Change

Canadell et al. 2007 PNAS; FAO-Global Resources Assessment 2005

Historical Emissions from Land Use Change

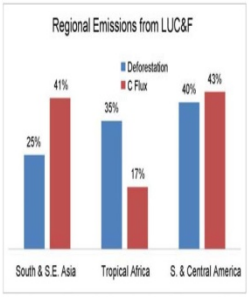


Tropical Deforestation Rates (2000-2005)



Mongabay using FAO Forest Resources 2006

Regional Share of Emissions from Land Use Change

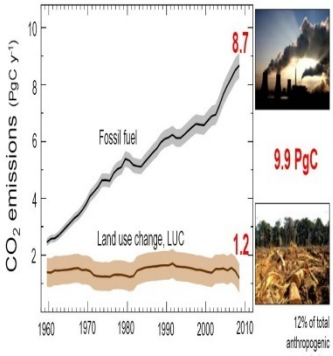


- Tropical Africa has low C emissions compared to its deforestation share
  - Dry forest with low C density
- Asia has high C emissions compared to its deforestation share
  - High C density forests

2000-2007 average

Canadell, Raupach, Houghton, 2008, Biogeosciences, submitted

Total Anthropogenic Emissions 2008



2008 CO2 emissions from LUC has significantly decreased from previous year
Probably due to wet La Niña conditions and reduced reforestation rate

Le Quéré et al. 2009. Nature-geoscience. Data: CDIAC, FAO, Woods-Hole Research Center 2009

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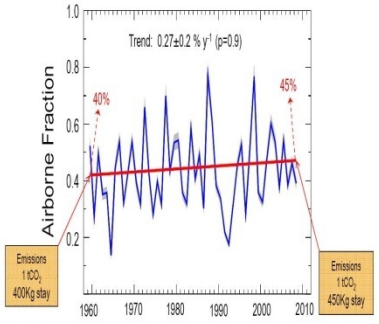
Airborne Fraction

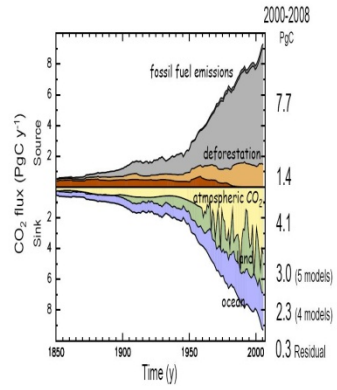
Fraction of total anthropogenic CO_2 emissions that remains in the atmosphere



Means the efficiency of sinks in removing CO2 from atmosphere has decreased by 5% over the last 50 years, and will continue to do so in the future

Le Quéré et al. 2009; Nature-geoscience; Canadell et al. 2007, PNAS; Raupach et al. 2008; Biogeosciences

Human Perturbation of the Global Carbon Budget

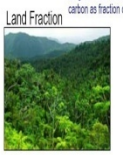


Global Carbon Project 2009; Le Quéré et al. 2009; Nature-geoscience

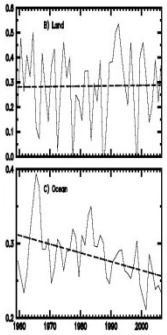
Efficiency of Natural Sinks

Long term trends show that the natural sink has increased size but the efficiency of sink (to uptake the additional carbon as fraction of total anthropogenic CO2 emissions) has declined to keep airborne fraction from increasing

Land Fraction



Ocean Fraction



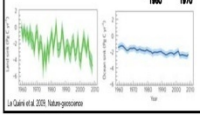
Net uptake

Land
3 PgC/yr in 2000-8

3.6 PgC in 2006
2.9 PgC in 2007
4.7 PgC in 2008 (La Niña)

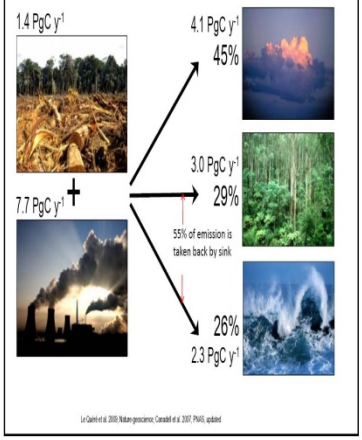
Ocean
Slower growth of ocean sink compared to growth pace of emissions

2.3 PgC/yr in 2000-8



Canadell et al. 2007, PNAS

Fate of Anthropogenic CO_2 Emissions (2000-2008)



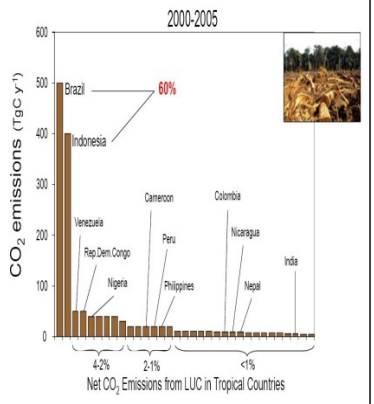
Le Quéré et al. 2009; Nature-geoscience; Canadell et al. 2007, PNAS, updated

What REDD+ aims?

- Reducing emissions from deforestation
- Reducing emissions from forest degradation
- Increasing the rate of carbon uptake by forests

- Essentially addressing 1.4 PgC portion of CO2 emissions (2000-2008 av.) PLUS increasing carbon uptake from atmosphere- both affect atmospheric carbon concentration
- However, other radiative forcing elements should be carefully addressed.....

Benefit-ters in REDD+

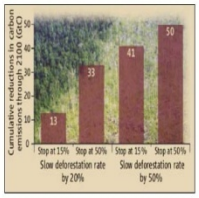


RA Houghton 2008: unpublished. Based on FAO land use change statistics

How much carbon can we save?

Gullison RE, Frumhoff PC, Canadell JG, Field CB, Nepstad DC, Hayhoe K, Avissar R, Curran LM, Friedlingstein, Jones CD, Nobre C , 2007

Tropical forests and climate change. Science 316: 985-986.



- Reducing deforestation rate by 50% of 1990 by 2050, with the aim of stopping deforestation when we reach 50% of the tropical forest remaining in 2100, would save emissions by 50 GtC
- 50 GtC means 6 years of recent annual fossil emissions and up to 12% of total reductions needed through 2100 to be consistent with 450 ppm stabilization

Case of Nepal

- Forest: 10% crown coverage; Forest land is decreasing; shrub-land is increasing
- Rate of deforestation: 1964-1978: 0.48%; 1978-1990 1.19%; 1990-2000 1.87%; 2000-2005 1.54%

Trends of deforestation in Nepal

Year	Forestland, area in ha	% of land area*	Remarks
1964	6.0 million	41.9	FAO, 2000
1978	5.6 million	39.2	LRMP, 1986
1985	5.5 million	38.5	MPFS, 1988
1990	4.8 million	33.6	FAO 2005
1994	4.3 million	30.0	NFI, 1999
2000	3.9 million	27.3	FAO 2005
2005	3.6 million	25.2	FAO 2005

Source: Energy Policy Journal, Dhakal (2010)

But for carbon, bio-mass stock is more important than forest land !!!

- Shrinking forest area but increasing bio-mass/carbon stock

Bio-mass stock in Nepal's forestland

	1990	2000	2005
Forestland area, million ha	4.8	3.9	3.6
Total carbon stock, million tons	880	961	897
Biomass stock, million tons dry oven-weight	865	1,195	1,114

- 14,389 community forestry groups managed 12 million hectares or 28% of Nepal's forestland areas in 2007
- Community forestry are mostly successful in the mid-hills and less in the southern plains

Source: Energy Policy Journal, Dhakal (2010)

Case of Nepal

- Carbon released due to deforestation in 2000-2005
  - Our estimate: 19 million tons of CO_2e (above ground) (0.35% of global)
- Means, if we could have stopped deforestation, we would have avoided 3.8 million tCO_2e per year in 2000-2005
- At the rate of 10 $/$tCO_2e$ this is equivalent to 2.6% of 2005 GDP
- If REDD mechanism is approved, Nepal has potentials to get benefited from.

Source: Energy Policy Journal, Dhakal (2010)

How CO_2 emissions from deforestation in 2000-2005 compare with other mitigation options

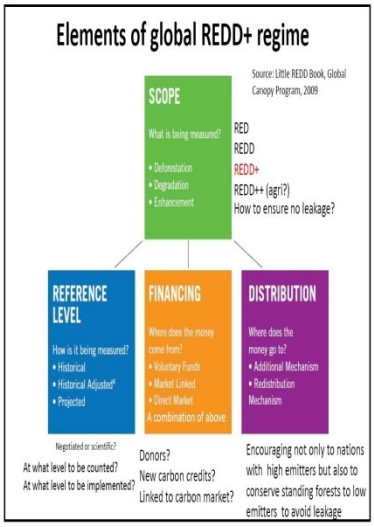
Sector	GHGs mitigation potential	Major assumptions
Biogas	5.2 million tCO_2e/yr	All economically feasible potentials are harnessed
Improved Cooking Stoves	2.5 million tCO_2/yr	ICS potential of 2.8 million units are harnessed
Bio-fuel	23 thousand tCO_2/yr by 2010 91 thousand tCO_2/yr by 2028	10% ethanol is blended to gasoline sale
Solar tuki (lamp)	460 thousand tCO_2/yr	2.4 million households switch from kerosene lamps to solar lamps
Hydropower export	15 million tCO_2/yr by 2027	All surplus electricity (with 18% annual demand growth in 2008-2027) from 23 hydro power plants, whose feasibility has been carried out, is sold to northern India
Brick kiln	0.955 million tCO_2/yr by 2028 for Kathmandu 1.6 million tCO_2/yr by 2028 for all Nepal	Annual brick demand is 11% for Kathmandu and 5% for Nepal; all FCBTK are replaced with VSBK
System of Rice Intensification (SRI)	3.3-3.7 million tCO_2e/yr	All paddy field (1.5 million ha) adopt SRI
Avoided deforestation	19 million tCO_2/yr	Based on deforestation in 2000-2005 period and the stock-loss of above-ground bio-mass

Source: Energy Policy Journal, Dhakal (2010)

Will the saved carbon be permanent?

- Is avoided carbon emissions or carbon stock increase permanent !!! Can we safeguard? No leakage?
- What would be the impact of climate change on tropical forests – such as die-back of Amazon (savannai-zation)

Elements of global REDD+ regime



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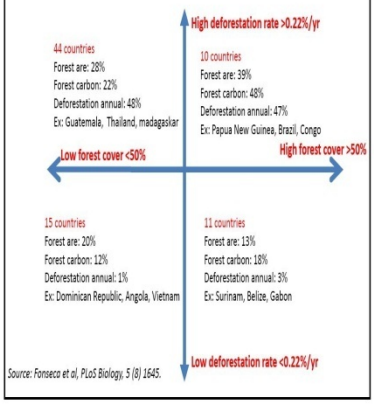
Key considerations for REDD+ regime at global and national levels?

- Economically efficient
- Politically and adminstratively feasible
- Monitoring, Reporting and Verification (MRV) reliable and doable
- Benefits equitably distributed
- Capacity building and enabling policy environment including land tenure
- Promote livelihood, bio-diversity conservation and other eco-system services? How to link with other priorities?
- Minimizing perverse incentives

Balancing the benefits is needed to avoid perverse incentives



Conclusions (i)

- Anthropogenic CO_2 emissions are growing 3.5 times faster since 2000 than during the previous decade
- Anthropogenic CO_2 emissions are closely tracking the undesirable emission scenario of the IPCC; Developing Countries are now emitting significantly more carbon than the developed Countries
- The efficiency of natural sinks has decreased by 5% over the last 60 years (and will continue to do so in the future), a trend not fully captured by climate models.
  - the longer it takes to begin reducing emissions significantly, the larger the cuts needed to stabilize atmospheric CO_2.

Conclusions (ii)

- Sink-source dynamics have accelerated atmospheric CO_2 growth 27% faster since 2000 than in the previous two decades, implying a stronger climate forcing and sooner than expected
- Land use plays important role in both emission and in carbon sequestration in natural system, especially tropical forests
- REDD+ can help climate stabilization through "both" emission mitigation and enhancing natural carbon sinks to balance carbon in air
- REDD+ global regime and its national/sub-national implementation yet needs to address many issues

Thank you

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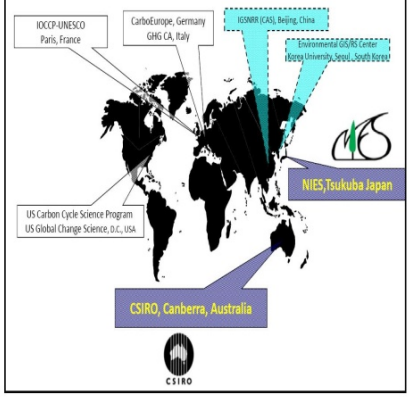
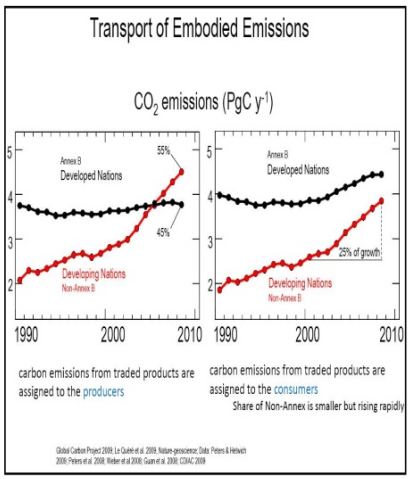
www. globalcarbonproject.org

GCP International Project Offices and Supporting Nodes



Transport of Embodied Emissions



Additional energy-related CO2 emissions by country and region in 2030 vs 2006 (ref scenario)

China contributes 20% to global energy-related CO2 emissions in 2006
Additional global CO2 in 2030 over 2006: 12.6 GtCO2, about half from China

(Note: this is CO2 equivalent; NOT Carbon; need to divide by 3.667 to compare

World Energy Outlook, 2008

Causes of the Declined in the Efficiency of the Ocean Sink

- Part of the growth decline is attributed to a 30% decrease in the efficiency of the Southern Ocean sink over the last 20 years.
- This sink removes annually 0.7 Pg of anthropogenic carbon.
- The decline is attributed to the strengthening of the winds around Antarctica which enhances ventilation of natural carbon-rich deep waters.
- The strengthening of the winds is attributed to global warming and the ozone hole.

Le Quéré et al. 2007, Science

Welcome

REDD Status in Nepal

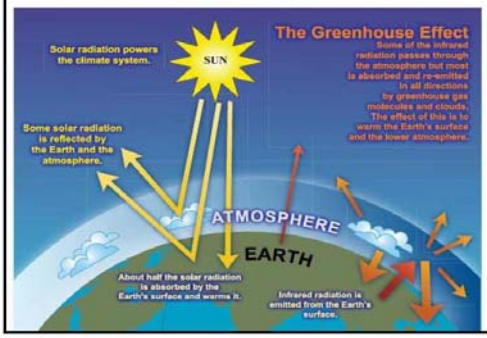
REDD-Forestry and Climate Change Cell

Ministry of Forest and Soil Conservation Nepal

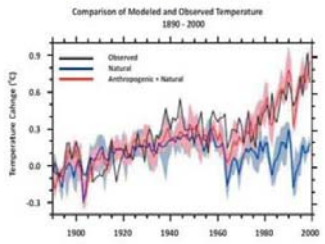
Outline

- Global warming
- Some Impact of Global Warming
- REDD Status in Nepal
- Opportunity and Challenges for REDD

Green House Gases Effect and Global Warming

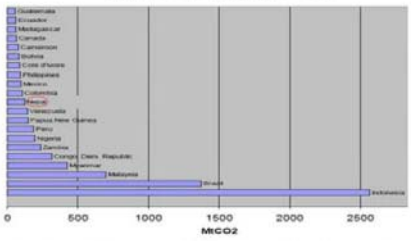


Global Warming



Global temperatures increased by 0.7ºC (1.3 ºF);

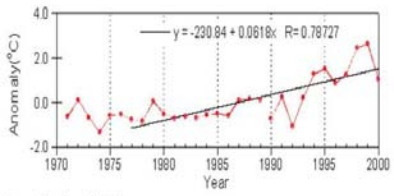
Land Use GHG Emissions - 2000



Nepal contributes very little in GHG emission, however impacts of Climate Change are serious

Temperature increase in Nepal

All-Nepal annual mean-maximum temperature trend for the period



Source: Shrestha et al., 1999

Climate Change

Increasing GHGs: Global Context

- In 20th Century Temperature increase by 0.7°C (1.3 °F)

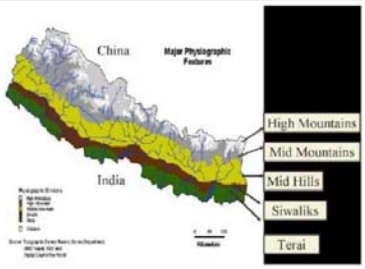
Nepale Context :

- Annual Temperature rise by 0.06^{0}C

Nepal in World

- Nepal occupies only **0.09%** of world land & Forest Area of Nepal: 5.5 million ha
- Altitude ranges from **60m to 8848m**
- **Two biogeographic realm**: Palaeoarctic and Indo-Malayan, &
- **2 Phyto geographical division**: Holarchtic in the North & Palaeoarctic in South

Physiographic Zone of Nepal

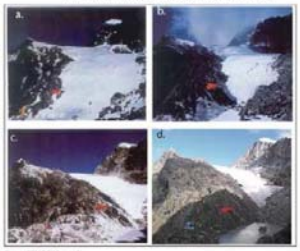


6 floristic transition regions :

- a) Central Asiatic in N,
- b) Sino-Japanese in E,
- c) Southeast Asia-Malasian SE
- d)Indian in S
- e) Sudano-Zambian in SW
- f)Irano-Turanin- W

So Nepal is rich in biodiversity

Impacts of warming on Himalayan Region



- **Impacts on Water Resources: Glaciers & Rainfall trend change**

Lake Dig Tsho (D) in the Langmoche valley and settlements (S): a) Hanging Langmoche Glacier, Dig Tsho, and outlet of the lake after 1985 GLOF; b) Gentle gradient of the lake outlet through the debris; c) Wide valley downstream; d) Nearest settlement (about 3 km downstream) in the Langmoche valley; e); f) Erosion from 1985 Dig Tsho GLOF at Thamo Teng village

Lake Imja Tsho and surrounding environment (Photo: 15 Oct 2006): a) Panoramic view of Lake Imja Tsho; b) Ice cliff at the snout of Imja Glacier; c) Hummocky pattern of moraine indicating dead ice underneath; d) Ice scarps at the glacier snout and icebergs on lake; e) Ice cliff at the terminal moraine; f) Dead ice and a small supraglacial pond; g) Many connected supraglacial ponds

Impact on Biodiversity :
Plants: Broad leaves, Conifers, NTFPs

Animals: Wildlife, Birds,

Others : Wetlands and other areas

Agriculture sector

Health Sectors

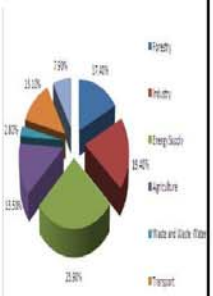
Therefore, Several Conventions are carried out

- 1972 First World Conference on Climate Change Stockholm
- 1992: Reo the Generio Conference was important because it became political Issue
- 1994: United Nations Frame Work Convention on Climate Change (UNFCCC) came in to force

- 1997: Kyoto Protocol (Come into force in 2005) and CDM is major functioning mechanism
- 2007: REDD (Bali Convention) supported by : Stern (2007) concluded that **reducing deforestation** is a highly **cost-effective** way to reduce emissions relatively quickly, as well as providing co-benefits.
- 2009: Copenhagen Accord also focus on REDD

Principle of REDD

- IPCC(2007) estimate that the forest sector contribute **17.4% of all GHG** from anthropogenic sources, most of this is from **D&D.**
- Forestry projects can help reduce GHG emissions to the atmosphere in **2 ways**: carbon **storage and carbon sequestration;**
- After the ocean the forest is largest storage of carbon



Status of DD & REDD in Nepal

Deforestation in Nepal:

- DFRS(1999) average annual deforestation rate :1.7 % during 1978/79 to 1994/95

Degradation status in Nepal:

Average annual degradation rate during 1978/79 to 1994/95 period was around 2 % in Terai

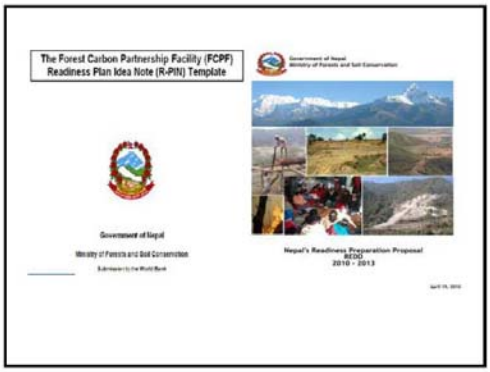
So, We decided to work with REDD

We have done some progress

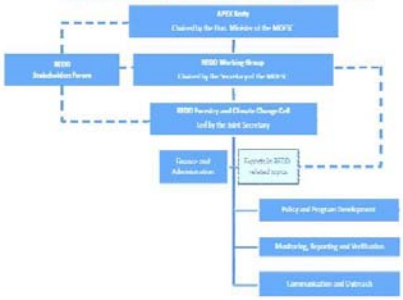
- •Policy Level
- •Institutional Level &
- •Piloting Level

Policy Level Progress

- **Readiness Pin Idea Note (R-PIN) Submission to the World Bank: 15 April, 2008**
- **Then became FCPF member country**
- Formulation of REDD Mechanisms: **January 26, 2009- to support the REDD**
- Readiness Preparation Proposal (R-PP) submitted to the World Bank, **19 April, 2010**
- **Formulation of REDD Interim Strategy: to be prepared within 2 months**



Institutional Arrangement



Apex Body

- Members: National Planning Commission, Ministry of Forest and Soil Conservation, Agriculture and Cooperative, Energy, Environment, Local development, Finance, Tourism & Civil Aviation, Land reform, Industry and Supply, Science and Technology, Water resource
- Function: to coordinate with top level and suggest to formulate the national REDD policy
- Meeting: every six month

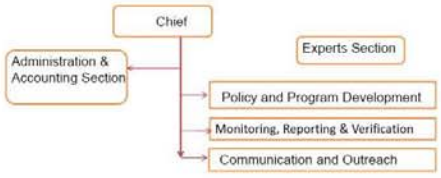
REDD Working Group

- Members: Secretary MFSC, Chief of REDD Cell, DG of Department of Forest & DFRS, 2 Representatives from INGO-SNV & LFP, 3 representatives from NGO-NIFIN, FECOFUN, Forest Action,
- Function : To support in formulation of policy REDD activities
- Meeting: Once in a month

Stakeholders Forum

- Function: To serve as the principal outreach and communication platform and is already operational.
- Members: related and interested stakeholders
- Meeting: Twice a year

REDD- Forestry and Climate Change Cell



Work as office under the Ministry of Forest and Soil Conservation to support in REDD activities

Piloting & some results

- Community Climate and Biodiversity Alliance :
- Carbon Measurement

Carbon Assessment Piloting

- Kyoto: Think Global, Act Local (K:TGAL): Manang, Ilam and Lalit pur (ICIMOD & others)

Annual variation in carbon stocks

CFUGs	Carbon mass (t C per ha)			Mean increment (t C per ha)
	Year 1	Year 2	Year 3	
Ilam	57.94	60.75	64.13	3.1
Lamatar	51.19	52.32	54	1.41
Manang	30.94	NA	33.19	1.13
Mean C storage rate of CFs				1.88

(Karki and Tewari , 2007)

Carbon Assessment Piloting...

- Design and Setting up of a Governance and Payment System for Nepal's Community Forest Management under REDD
- Reducing Poverty through REDD: Early Action (WWF)

  Awareness about the Adaptation & Mitigation
- Grass root level Capacity Building on REDD in Asia and the Pacific (RECOFTC/FECOFUN)
- Climate Change and REDD Awareness (LFP, NSCFP)

Opportunities

- New energy and concept to address DD
- Benefits
- REDD is prestige for Nation
- New jobs

7/7/2010 30

Opportunity

Gaps/Challenge

- The **data available** on DD : old, scanty and does not cover whole country- Necessary data
- **Capacity of stakeholders** : Central to local is limited- Capacity Building has been a major component of the R-PP and Interim Strategy.
- **Combating DD in Terai** is a real challenge- Piloting to address DD will be done in readiness period.

Strength for REDD in Nepal

- Nepal has long and most successful experience of Participatory Forestry(CF) to address DD.
- REDD strategy is aligned with National Development Strategy.
- REDD Pilotings on provide good lessons for readiness.
- Multi-stakeholders institutional mechanisms

Strength.....

- Benefit sharing mechanisms: easy in designing the mechanisms for REDD.
- Necessary changes can be made in legal and institutional aspect: as Nepal is preparing new constitution.
- Participation of various stakeholders such as IPs, Women, *Dalit*, Civil Society and FECOFUN has developed ownership on RPP and will involve greatly in implementation.

Role of Community Forests in CO_2 Sequestration, Biodiversity and Land Use Change

Project Reference: ARCP2009-10NSY-Gautam

Outline of the Presentation

Introduction and Biodiversity
-Dipesh Pyakurel

Land Use Change
-Man Bahadur Kshetri

Carbon Sequestration and Future Prospects
-Nawa Raj Khatiwada

Introduction and Biodiversity

Research Objectives

- To document tree species diversity in selected CFs,
- To map the land use change in selected CFUGs affected areas,
- To estimate carbon deposit in selected CFs, and
- To analyze the role of CF in CO_2 sequestration, biodiversity and land use change.

Community Forests

- Forest area handed over to local user groups for the conservation, sustainable use and management of forest and forest resources
- CF program emphasized the sustainable use of forest resources with the active participation of local communities, ensuring equitable sharing of benefits, social inclusion; and empowering the communities by developing sense of ownership (***innovative practices***).
- Successful in mid hill regions of Nepal.
- About 20.5 % of the Nepal's forest area has been handed over to more than 14,000 CFUGs involving 40% of Nepal's total households (June 2008).

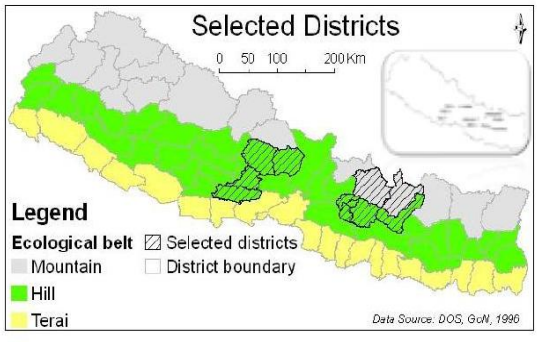
Community Forest Selection

Criteria

Forest Type:	*Schima wallichii-Castanopsis indica*
Ecological regions:	Mid Hills
Size of CF:	> 100 ha
CF status:	Good and Above

Selection Procedure

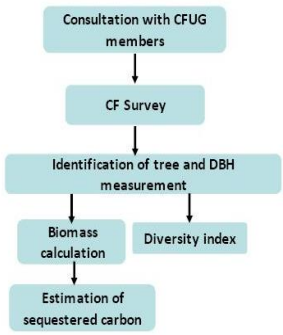
- Database of CF collected from Department of Forests
- Selection of CF based on above criteria
- Field verification
- Alteration of field on few cases



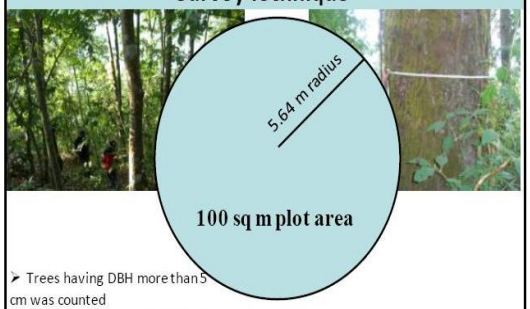
Details of Surveyed Community Forests

CF	VDC	District	Area (ha)
Kantheswora	*Madanpokhara*	*Palpa*	*104*
Ramche Bihare	Phaparthum	Syanja	224
Chisapani	*Rupakot*	*Kaski*	*233*
Sivanari	Baglungpani	Lamjung	181
Diyale Danda	Godavari	Lalitpur	123
Dulbu	Lapsifedi	Kathmandu	127
Thalpu	Panauti	Kavrepalanchowk	213
Seltap Mangalamai	Phulpingkot	Sindhupalchowk	147
Salme Sulke Mahavir	Thulopatal	Dolakha	176
Sulithumka	Pakarbas	Ramechhap	127

Methodology



Survey Technique



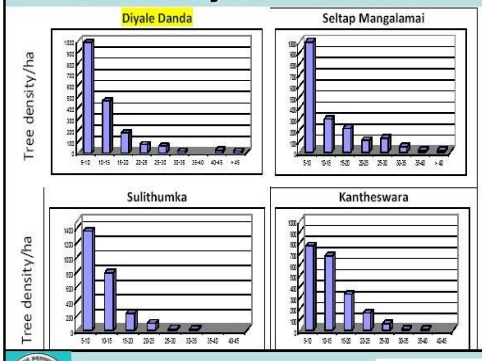
- Trees having DBH more than 5 cm was counted
- Plot was marked with GPS and permanent spray paint

Source: MacDicken, 1997 / Karky *et al.*, 2007

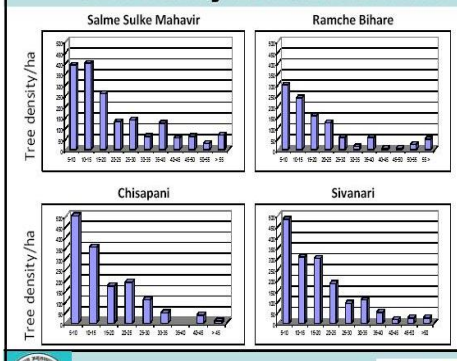
Calculating Tree Diversity

- Frequency and Density
- Dominance
- IVI
- Evenness
- Simpson's Diversity Index
- Basal area
- Biomass

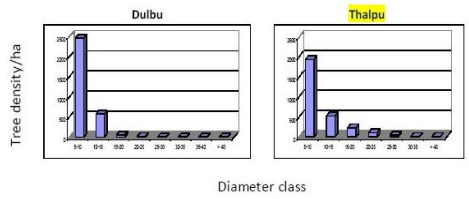
Tree Density and Diameter Class



Tree Density and Diameter Class



Tree Density and Diameter Class



CF Status

Community Forest	Number of Species	Density/ha	Basal Area, sq m/ha
Sulithumka	*11*	*2525*	*26.7*
Seltap Mangalamai	13	1875	32.8
Ramche Bihare	13	1050	58.1
Sivanari	14	1736	62.3
Kantheswara	17	2020	30.8
Dulbu	19	3167	29.3
Salme Surke Mahavir	*20*	*1723*	*96.2*
Chisapani	21	1490	35.2
Thalpu	22	2871	27.9
Diyale Danda	26	1785	28.2

Diversity Indices in CFs

CF	Shimpson's Diversity (D)	Evenness (E)
Sulithumka	0.82	0.76
Seltap Mangalamai	0.83	0.79
Ramche Bihare	0.83	0.79
Sivanari	0.75	0.67
Kantheswara	0.85	0.77
Dulbu	0.86	0.78
Salme Surke Mahavir	0.89	0.81
Chisapani	0.76	0.62
Thalpu	0.86	0.75
Diyale Danda	0.89	0.80

Threatened Plants of Surveyed CFs

CF	Species	
	Extinct from CF	In virtue of Extinction from CF
Kantheswara		Nepal Pepper (Timur)
Ramche Bihare	Satuwa, Champ	Chireeta (Chiraito)
Chisapani		
Sivanari	Sandan, Cane (Baet), Champ	Dar
Diyale Danda	Champ, Camphor (Kapur)	
Dulbu		Birch (Saur), Wintergreen (Dhasingre)
Thalpu	Silk Cotton Tree (Simal)	Champ, China berry (Bakainu)
Seltap Mangalamai	Oak (Banjh), Bay Berry (Kafal)	
Salme Surke Mahavir		Himalayan Yew (Lauth Salla), Walnut (Okhar), Bay Berry (Kafal), Himalayan Cherry (Paiyun)
Sulithumka		

Conclusion & Recommendation

- Monocropping practice is prevalent in most of the CFs. This has resulted the removal of economically less important tree species from CFs.
- Ramche Bihare, Sivanari, Salme Surke Mahavir and Chisapani CFs are in climax stage.
- Thulpu and Diyaledanda CF are well conserved amongst the surveyed CFs.
- Most of the CF are well managed.
- CF holds tremendous potentiality for cultivation of NTFPs/MAPs in its area, thereby helping to alleviate poverty and create employment generation opportunities at local level.
- This research has opened room for new interventions for researchers to analyze the role of CF in forest occupancy (increase or decrease) and land use change pattern; and its cumulative effect in gross domestic production (migration/cultivated land to barren land/ change in animal husbandry practices etc).
- Outcomes of the research might be useful for National level policy makers to develop/amend CF policy on landscape level.

Thank You !

Role of Community Forests in CO_2 Sequestration, Biodiversity and Land Use Change

Project Reference: ARCP2009-10NSY-Gautam

Introduction and Biodiversity
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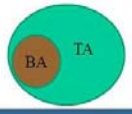
Carbon Sequestration and Future Prospects
- Nawa Raj Khatiwada

Estimating Carbon Deposit



Estimating Carbon Deposit

Methodology

- For calculating the above ground biomass(AB),

$$ln(W) = a + b\ ln\ DBH$$

Where, ln = Natural Log *W=Biomass in kilograms*
a= Intercept of W *b= Slope or regression coefficient*

Assumption

- For below ground biomass (BB), root : shoot ~ 0.125 (Karky et. al., 2007)
- Total Biomass = AB+BB
- Amount of carbon deposit (mass) = 50% of Biomass (Source: MacDicken, 1997)

Results

Vegetation Parameter and Carbon Deposit

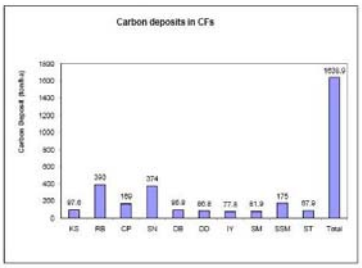
Community Forests	Area (ha)	Tree Density (ind./ha)	Basal Area (m2/ha)	Carbon Deposit (ton/ha)
Kantheswara (KS)	104	2020	30.8	97.6
Ramche Bihare (RB)	224	1050	58.1	393.0
Chisapani (CP)	233	1490	35.2	169.0
Sivnari (SN)	181	1736	62.3	374.0
Dulbu (DB)	123.5	3167	29.3	95.9

Results

Vegetation Parameter and Carbon Deposit

Community Forests	Area (ha)	Tree Density (ind./ha)	Basal Area (m2/ha)	Carbon Deposit (ton/ha)
Diyale Danda (DD)	127	1785	28.2	86.8
Indrayani Ka/Kha (IY)	213.4	2871	27.9	77.8
Seltap Mangalamai (SM)	147.15	1875	32.8	81.9
Salme Surke Mahabhir(SSM)	176	1723	96.2	175.0
Sulithumka (ST)	127	2525	26.7	87.9

Result: Total Carbon Deposit



Result

- The average carbon deposit in all the selected CF = 163.89 ton/ha
- Till July 10, 2009, there were 14,439 Community Forest Users Groups (CFUGs) with the total community forest area of 1,229,669 hectors and the total no of households involved were 1,659,775 (CFD/DoF 2009).
- The total carbon deposit in CF in Nepal = 201.53 million ton.

Carbon Deposit Data from Other Studies

Study	Carbon (ton/ha)	Location(Area)
Banskota et. al., 2007 *(including above and below ground biomass carbon)*	**60.91**	Lamatar(96 ha)
Banskota et. al., 2007	**32.03**	Manang(240ha)
Banskota et. al.,2007	**60.91**	Illam(383ha)
Shrestha, 2008 *(including above ground and below ground biomass carbon, SOC)*	Schima- Castanopsis= **44.43**	Mid Hills, Palpa
	Shroea=**101.66**	

Carbon Deposit Data from Other Studies

Study	Carbon (ton/ha)	Location
Dahal, 2009 (excluding herbs and litter)	Planted forest= **159.49**	Palpa
	Enriched forest= **133.65**	
	Naturally regenerated forests= **181.83**	
Oli and Shrestha, 2009 (excluding SOC)	**183.3937 million tonnes**	CF of Nepal
Jina et. al. (2008)	**125**	Temperate forest of the world
Dahal, 2007 (including above and below ground biomass carbon)	Pine forests= **116**	Kathmandu
	Mixed Broad leaf forests= **25.95**	

Further Research

- Estimation of the biomass carbon deposit in Terai and other development regions
- Estimation of soil carbon deposit
- More analysis, evidence and higher confidence on data
- Lobbying for CF on REDD framework
- Application for funding under various mechanisms
- Regional collaboration

Future Prospects

Future prospects

- Climate Investment Fund
- ADB and WB are actively working in the region
- Nepal is a recipient of Pilot Program fro Climate Resilience (PPCR)
- 1.5m US$ leading to 60m US$ Program
- Synergy with REDD and green sector
- Tremendeous opportunities for research, entrepreneurship, employment and involvement

Acknowledgement

CF User Groups
Department of Survey
Field Researchers
Dr. Chinta Mani Gautam
Ram Bahadur Kala
Dipesh Pyakurel
Man Bahadur Kshetri
Minakshi Rokka Chhetri

Thank You

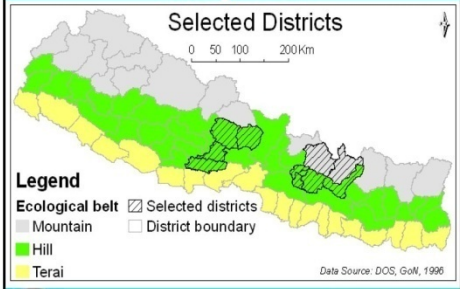
Community forests	Total CO2 (ton/ha)	Total CO2 (ton/ha)
Kantheswara (KS)	358.192	??
Ramche Bihare (RB)	1442.31	??
Chisapani (CP)	620.23	??
Sivnari (SN)	1372.58	??
Dulbu (DB)	351.953	??
Diyale Danda (DD)	318.556	??
Indrayani Ka/Kha (IY)	285.526	??
Seltap Mangalamai (SM)	300.573	??
Salme Surke Mahabhir (SSM)	642.25	??
Sulithumka (ST)	322.593	??

Land use Change in Community Forest (CF) 1988 - 2009

Man Bahadur Kshetri

Department of Geoinformatics
NDRI, Lalitpur
Nepal

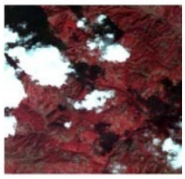
Study Area



Methodology

Data

- Satellite imageries
- Topographic maps
- Administrative boundary
- Settlements



Satellite Imageries

Landsat TM 1988

- Spatial Resolution: 30m
- Spectral Resolution: 7

ALOS AVNIR-2 2009

- Spatial Resolution: 10m
- Spectral Resolution: 4

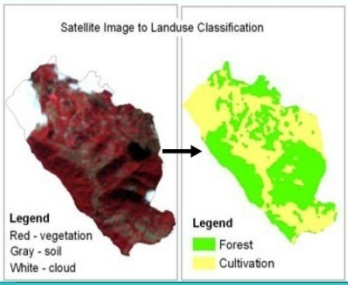
Methodology contd..

Methods

- Field survey & delineation of CF & its periphery on topo map

Satellite Image
↓
Subset Image (30m)
↓
Geometric Correction
↓
Image Interpretation
↓
Digital Image Classification
↓
Land cover/ Land use Map

Methodology contd..



Land use Change in CF & Peripheral contd..

Salme Surke Mahabhir CF, Thulopatal Dolakha

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	201.96	205.73	3.77	1.87
Forest	161.34	192.72	31.38	19.45
Shrub	34.97	0	-34.97	-100
Total	398.27	398.45	0.18	-

- Shrub to forest

Sulithumka CF, Pakarbas, Ramechhap

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	598.9	446.03	-152.87	-25.52
Forest	99.44	243.75	144.31	145.12
Shrub	53.18	61.75	8.57	16.11
Total	751.52	751.53	0.01	-

- Cultivated to forest & shrub

Land use Change in CF & Peripheral contd..

Seltap Mangalamai CF, Phulpingkot, Sindhupalchowk

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	236.42	425.19	188.77	79.84
Forest	419.72	311.5	-108.22	-25.78
Grassland	3.38	0	-3.38	-100
Shrub	81.27	3.79	-77.48	-95.34
Total	740.8	740.48	-0.32	-

- Exceptional case
- Declined due to landslide instead of anthropogenic reason

Thalpu CF, Panauti, Kavrepalanchowk

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	462.46	414.88	-47.58	-10.29
Forest	70.83	102.02	31.19	44.04
Shrub	4.93	21.32	16.39	332.45
Total	538.22	538.22	0	-

- Cultivated to forest & shrub

APN

Land use Change in CF & Peripheral contd..

Dhulbu CF, Lapsiphedi, Kathmandu

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	103.22	100	-3.22	-3.12
Forest	180.58	195.25	14.67	8.12
Shrub	11.44	0	-11.44	-100
Total	295.24	295.25	0.01	-

- Cultivated to forest
- Shrub to forest

Diyale Dada CF, Godawari, Lalitpur

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	23.63	8.28	-15.35	-64.96
Forest	201.08	209.38	8.3	4.13
Shrub	0	7.04	7.04	-
Total	224.71	224.7	0	-

- Cultivated to forest & shrub

APN

Land use Change in CF & Peripheral contd..

Shivanari CF, Baglungpani, Lamjung

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	81.23	60.35	-20.88	-25.7
Forest	239.02	259.89	20.87	8.73
Total	320.25	320.24	-0.01	-

- Cultivated to forest

Chisapani CF, Rupakot, Kaski

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	131.54	70.21	-61.33	-46.62
Forest	290.66	351.99	61.33	21.1
Total	422.2	422.2	0	-

- Cultivated to forest

APN

Land use Change in CF & Peripheral contd..

Ramche Bihare CF, Phaparthum, Syangja

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	364.27	354.98	-9.29	-2.55
Forest	340.23	352.37	12.14	3.57
Shrub	5.76	2.9	-2.86	-49.66
Total	710.26	710.25	-0.01	-

- Cultivated to forest
- Shrub to forest

Kantheswara CF, Madanpokhara, Palpa

Land use type	Area (ha) 1988	2009	Change	Change%
Cultivation	124.56	110.28	-14.28	-11.47
Forest	61.48	77.69	16.21	26.37
Shrub	16.94	15.02	-1.92	-11.35
Total	202.98	202.99	0.01	-

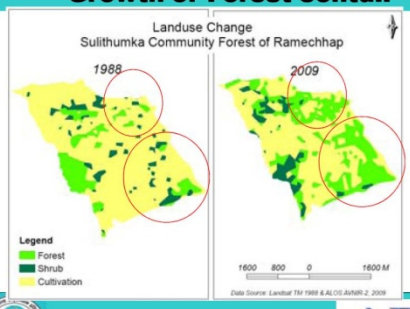
- Cultivated to forest
- Shrub to forest

APN

Growth of Forest

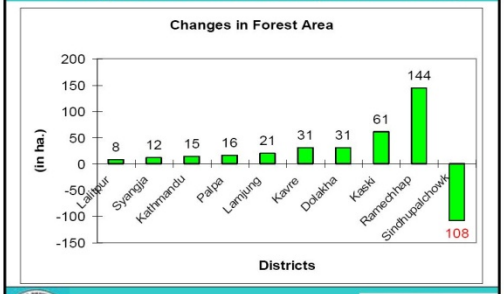
APN

Growth of Forest contd..

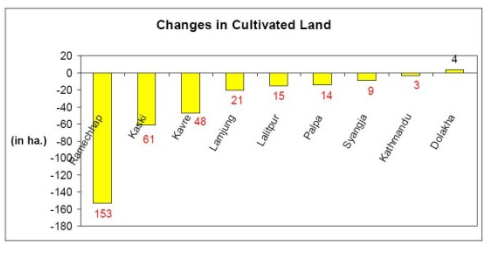


APN

Changes in Forest Area (1988 – 2009)



Changes in Cultivated Land (1988 – 2009)



Causes of Land use Change

Diminishing on Agricultural Land

- Intensive farming practices
- Foreign employment
- Education
- Migration (66 Hhs., Shivanari CF)

Increment on Forest Area

- Successful implementation and management of CF
- Plantation
- Conservation of economically potential plant species
- Migration

Conclusion

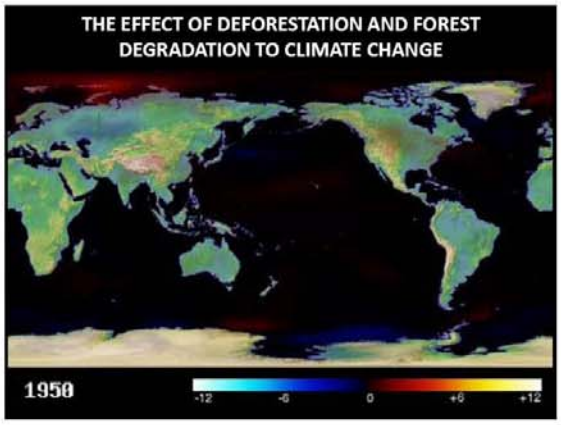
- Cultivated land to forest area in Ramechhap, Kavre, Kathmandu, Lalitpur, Lamjung, Kaski, Syangja & Palpa
- Cultivated to shrub land in Ramechhap, Kavre & Lalitpur
- Shrub to forest area in Dolakha, Kathmandu, Syangja & Palpa
- Forest area increased by about 5 to 145 %
- Average increment in forest 38 ha. & average annual growth rate about 2 ha.
- Cultivated land declined by about 3 to 65 %
- Average decline in cultivated land 36 ha. & average annual decline rate about 2 ha.

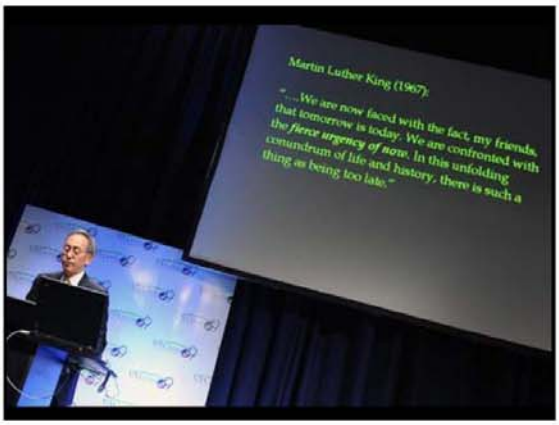
Conclusion Contd..

- High increment in forest area of Ramechhap, Kavre, Dolakha & Kaski
- High decline in cultivated land in Ramechhap, Kaski, Kavre and Lamjung
- Decline forest & shrub land in Sindhupalchowk due to landslide
- Successful implementation and management of CF is the important factor of increment of forest area
- Education, foreign employment, migration and intensive farming practices are the important factor to decline of cultivated land

Thank you !


Recent Developments on REDD and Forestry Sector in Indonesia: Challenge and Opportunities
DENDI MUHAMAD
INSTITUTE OF ECOLOGY
PADJADJARAN UNIVERSITY, INDONESIA
Knowledge Sharing Workshop on
Role of Community Forests (CFs) In CO_2 Sequestration, Biodiversity and Land Use Change


THE EFFECT OF DEFORESTATION AND FOREST DEGRADATION TO CLIMATE CHANGE
1950
-12
-6
0
+6
+12


Martin Luther King (1967):
"....We are now faced with the fact, my friends, that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history, there is such a thing as being too late."

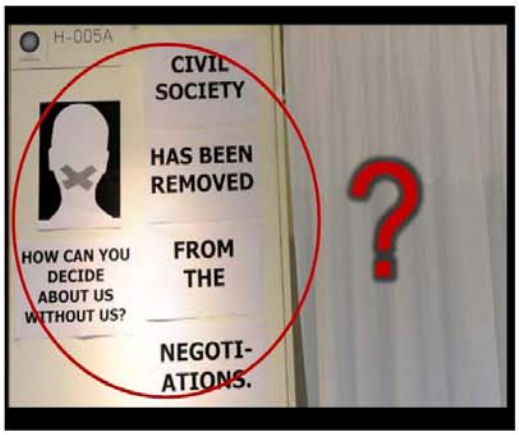

UNFCCC CoP-13 (Bali Action Plan)
-- R E D D --
UNFCCC CoP-15 Copenhagen


PRESIDENT
UNITED NATIONS


Brazilian and Bolivian Presidents
Danish Prime Minister as CoP Chair
French President and German Chancellor
British Prime Minister
COP15
COPENHAGEN


Chinese Premier
Russian President
South African President
US President and Conference Chair


Iranian President
LEBANON
Lebanese Prime Minister
SAUDI ARABIA
Saudi Minister of Petroleum and Natural Resources
UN Secretary General


H-005A
CIVIL SOCIETY
HAS BEEN REMOVED
FROM THE
NEGOTI-ATIONS.
HOW CAN YOU DECIDE ABOUT US WITHOUT US?
?

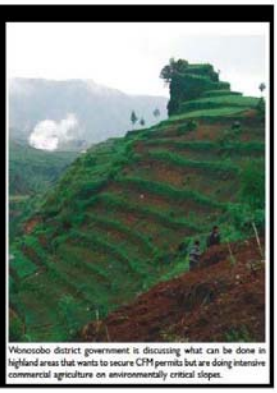

There has been a growing consensus in the world which states that 'rich' developed countries had to give compensation to 'poor' developing countries as their effort in reducing the green house emission.
One of the schemes of handing the compensation is using the REDD mechanism.
Rich countries pay your climate debt
actionaid


INDONESIA
CHALLENGE:
Indonesia's forest coverage is almost 90 million hectares and the third largest tropical forest in the world
Indonesia is the third biggest contributor in generating GHG in the world after United States and China.
On May 2009 Indonesia has became one of the first countries which produces REDD program national regulations.
In the G-20 Meeting in Pittsburgh on September 25 2009, Indonesia's President Susilo Bambang Yudhono has committed to reduce GHG emission from land use, land use change, and forestry (LULUCF) at the level of 26% in the year of 2020 from the level "business as usual", and at the level of 41% with the international help from developed countries.


Source: Matt Hansen
OPPORTUNITIES:
The total carbon market was valued at USD 136 billion in 2008.
The total historical value of REDD market up to mid-2009 is estimated at USD 41.6 million.
In 2008 and in the first half of 2009 the weighted average price of REDD credit was at USD 11.43/tCO2e and USD 9.43/tCO2e respectively
MODIS Analysis to Identify

BENEFIT:

Through REDD mechanism, Indonesia has a unique chance to gain more income, reducing the rate of deforestation and giving a real contribution in reducing the effect of global climate change plus poverty elevation.



Wonosobo district government is discussing what can be done in highland areas that wants to secure CFM permits but are doing intensive commercial agriculture on environmentally critical slopes.

Forestry Policy in Indonesia

- The legal basis and reference for forest management and conservation of natural resources in Indonesia is the government Law (*Undang-undang/UU*) No. 41 In 1999 on Forestry and No. 5 In 1990 concerning the Conservation of Biological Resources and Ecosystem
- The forestry legislation mandates that forest tenure is manage by the government, with due regard to indigenous people's rights and law, as long as the community is really exists and its existence is recognized, and does not conflicted with national interests.
- Management of Indonesia's forest area is consist of 'state-forest' (including indigenous community's forest and local community forests) with area size up to 70% of Indonesia's land area, and its authority is belong to the Indonesia's Department of Forestry .

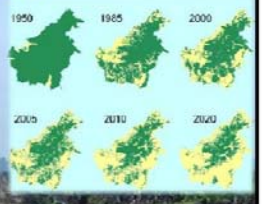
Governance in Indonesia:

Coordinate to handle:

Deforestation and Forest Degradation mainly caused by:
- increase of human population
- Decentralization
- economic growth and
- the development in other sectors such as agriculture, plantations, settlements, public works, etc

Deforestation and Forest Degradation in Indonesia

Mainly caused by:
- Commercial timber logging
- Forestry Industries
- Plantation (Palm oil, pulp, etc) Industries
- National debts
- Land use change for:
  - Agriculture
  - Transmigration and human resettlements
  - Mining
  - Land ownership conflict
  - Structure and infrastructure development (DAM, road)
  - Forest fire



- In period 1950 – 1985 rate of deforestation and forest degradation was estimated to reach up to 33 million Ha = area size of Vietnam or 914,000 ha/year.
- In period 1980 – 1990 rate of deforestation is around 0.8 % or 995,808 ha /year, and increase to be 1 % or 1,152,130 million ha /year.
- Forested land had been reduce from around 124.7 million Hectares on 1980 to become 109.7 million Hectares on 1995.
- It could be said that around 14.7 million Ha of forested area in Indonesia which is larger than Nepal had disappeared in period of 15 years

Regulation Framework to Handle the Challenge of REDD in Indonesia

2005-five policies priorities are enriched into eight priority policies, in line with the problems and challenges. The eight priority policies are:
(1) strengthening forest-based sustainable management;
(2) forest rehabilitation and improvement of watershed capacity;
(3) protection and forest preservation;
(4) conservation of natural resources and ecosystems;
(5) revitalization of forests and forestry products;
(6) empowerment of forest communities;
(7) climate change mitigation and adaptation in forestry sector;
(8) strengthening of forestry institutional arrangements.

Managing State Forests. A common feature of Perhutani programs was the involvement of communities to plant seedlings in return for allowing them to interplant with agricultural crops for 2–3 years before the canopy closes. The signboard outlines the technical specifications that communities should follow.

Regulation Framework to Handle the Challenge of REDD in Indonesia

- Indonesia's government Law (*Undang-undang/UU*) No. 41 In 1999 on Forestry and No. 26 In 2007 on Spatial Planning, Government Regulation (*Peraturan Pemerintah/PP*) No. 6 In 2007 and subsequent revision in *PP* No. 3 In 2008, has provided a framework and a solid legal basis in mitigation CC through REDD, including granting access to accommodate forest communities.
- Since 2000 by President Instruction (*Instruksi Presiden/INPRES*) No. 4 In 2005, Indonesia has conducted intensive illegal logging eradication program
- Fight against corruptions in all sectors as a priority (force major) by established the Corruption Eradication Commission (*Komisi Pemberantasan Korupsi/KPK*) and the High Court of Anti-Corruption (*Pengadilan Tinggi Anti Korupsi/PTAK*), which has successfully endorse the publication of Law No 25 In 2003 on Money Laundering

REDD in Indonesia

Should REDD be a national or project approach or a combination of both ?

- Effectiveness of REDD depends on the effectiveness in addressing drivers of DD, which in most cases require efforts across regions within the country/at the national level or even at regional/international level

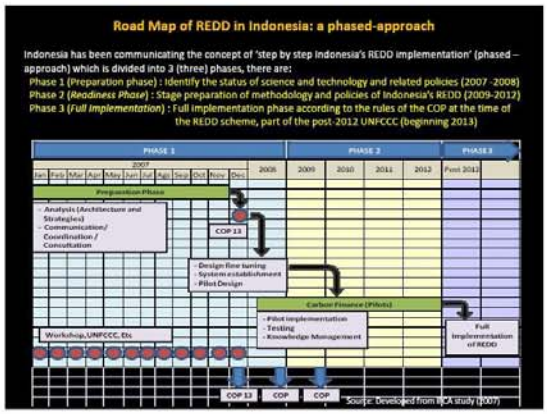
REDD should be 'National approach' with flexible implementation according to national circumstances (e.g. country position : Indonesia/national approach with sub national implementation, Brazil : national approach, EU : national approach, Columbia and some Latin American Countries : sub-national/project approach)

As part of its response to international processes and negotiations in the framework of COP 13 preparation, Indonesia conducting studies about the state of readiness in terms of methodology and policy aspects, then established *Indonesia Forest Climate Alliance* (IFCA) in July 2007 under the Ministry of Forestry

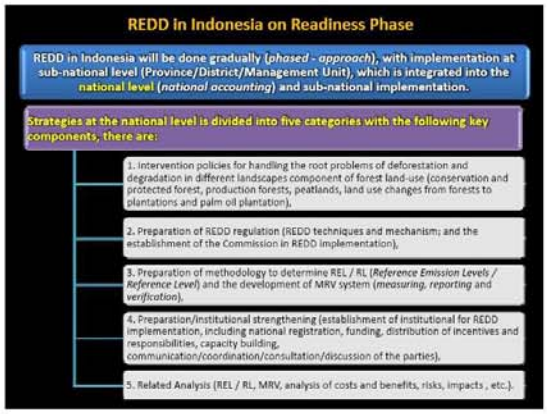
IFCA is an umbrella or a forum for communication/coordination of stakeholders related to REDD issues.

IFCA studies in 2007 has recommends several activities to be followed, there are:

- Developing the initial framework which had been designed by the IFCA;
- Continuing the consultation and technical analysis;
- Testing and implementing pilot projects in various conditions (which is based COP- 13 Decision on REDD called *Demonstration Activities*);
- Improving the capacity building at all levels;
- Creating a credible national framework to reduce emissions that can be internationally verified;
- Significant reduction in greenhouse gas emissions.


Road Map of REDD in Indonesia: a phased-approach
Indonesia has been communicating the concept of 'step by step Indonesia's REDD implementation' (phased – approach) which is divided into 3 (three) phases, there are:
Phase 1 (Preparation phase) : Identify the status of science and technology and related policies (2007 -2008)
Phase 2 (Readiness Phase) : Stage preparation of methodology and policies of Indonesia's REDD (2009-2012)
Phase 3 (Full implementation) : Full implementation phase according to the rules of the COP at the time of the REDD scheme, part of the post-2012 UNFCCC (beginning 2013)
PHASE 1
PHASE 2
PHASE 3
2007
2008
2009
2010
2011
2012
Post 2012
Preparation Phase
Analysis (Architecture and Strategies)
Communication/ Coordination / Consultation
COP 13
Design fine tuning
System establishment
Pilot Design
Carbon Finance (Pilots)
Pilot implementation
Testing
Knowledge Management
Workshop, UNFCCC, Etc
Full Implementation of REDD
COP 13
COP
COP
Source: Developed from IFCA study (2007)

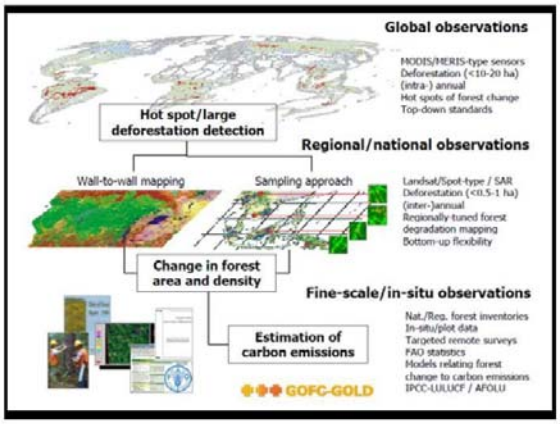

Strategy of REDD in Indonesia
Source: Developed from IFCA study (2007)


REDD in Indonesia on Readiness Phase
REDD in Indonesia will be done gradually (phased - approach), with implementation at sub-national level (Province/District/Management Unit), which is integrated into the national level (national accounting) and sub-national implementation.
Strategies at the national level is divided into five categories with the following key components, there are:
1. Intervention policies for handling the root problems of deforestation and degradation in different landscapes component of forest land-use (conservation and protected forest, production forests, peatlands, land use changes from forests to plantations and palm oil plantation),
2. Preparation of REDD regulation (REDD techniques and mechanism; and the establishment of the Commission in REDD implementation),
3. Preparation of methodology to determine REL / RL (Reference Emission Levels / Reference Level) and the development of MRV system (measuring, reporting and verification),
4. Preparation/institutional strengthening (establishment of institutional for REDD implementation, including national registration, funding, distribution of incentives and responsibilities, capacity building, communication/coordination/consultation/discussion of the parties),
5. Related Analysis (REL / RL, MRV, analysis of costs and benefits, risks, impacts , etc.).


Tim Multipihak. Transforming from an old forest management system to a new one evolves slowly. Changes first comes socially before they take effect on the landscape. The greatest value in getting together is to come up with a common understanding, even if agreement is slow to come.


REDD in Indonesia on Readiness Phase
Whereas in sub-national level, the strategy is divided into three categories with the following key components, there are:
1. Preparation of methodology to determine REL / RL (Reference Emission Levels / Reference Level) and development of MRV system (measuring, reporting and verifying),
2. Preparation/institutional strengthening (establishment / strengthening for the implementation of REDD, including the distribution of incentives and responsibilities, capacity building, communication / consultation / coordination / stakeholders meeting),
3. Development Demonstration Activities of REDD (DA-REDD) that represent various conditions of biological, social, and geographical conditions.
Up to this time Indonesia have been built a few DA-REDD, which is a collaboration between the Indonesian government with the Australian Government, the German Government, the Korean Government, ITTO, and TNC.


Women and upland resources. Women form a group to earn cash from helping tend the land of other villagers.


Global observations
MODIS/MERIS-type sensors
Deforestation (<10-20 ha)
(intra-) annual
Hot spots of forest change
Top-down standards
Hot spot/large deforestation detection
Regional/national observations
Wall-to-wall mapping
Sampling approach
Landsat/Spot-type / SAR
Deforestation (<0.5-1 ha)
(inter-)annual
Regionally-tuned forest degradation mapping
Bottom-up flexibility
Change in forest area and density
Fine-scale/in-situ observations
Nat./Reg. forest inventories
In-situ/plot data
Targeted remote surveys
FAO statistics
Models relating forest change to carbon emissions
IPCC-LULUCF / AFOLU
Estimation of carbon emissions
GOFC-GOLD


Important Notes:
REDD initiatives are more likely to succeed if they build on the interest of forest communities and indigenous people
More attention is needed to the balance of incentives, benefit, rights and political participation across levels of decision making, interest groups and administration
Incentives can include payment or other benefits for good practices, developing alternative livelihoods, formalizing land tenure and local resource right and intensifying productivity on non-forest lands.
The pressure to reduce deforestation needs to be spread across many levels to reduce the burden on forest communities.


THANK YOU SO MUCH FOR YOUR ATTENTION
don't stop your curiosity,
Don't stop yourself from learning...

Recent Development on REDD and Forestry Sector in Thailand

by

Dr. Qwannuedee Chotichanathawewong
Assistant President, Thailand Environment Institute

1

Topics for presentation

- CO_2 emissions from deforestation and forest degradation
- Critical Issues of deforestation and forest degradation in Thailand
- Forest Conservation Policy
- Recent Situations in Thailand
- Major Concerns of Thai stakeholders

2

Figures of CO_2 emissions from deforestation and forest degradation

- According to ONEP, greenhouse gas emission from land use change and forestry was the 2nd position of major emission sources in 2002.

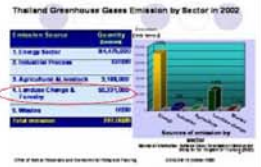


Figure 1. Emissions from Land Use Change & Forestry 2002

3

Projection of Thailand CO_2 emission

- There is also a projection of CO_2 emission from 1994 – 2000 that focuses on carbon sequestration. It is expected that forest conservation and reforestation would reduce the net emissions.

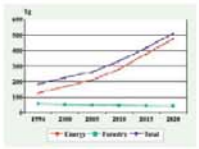


Figure 2. Projection of Thailand CO_2 emissions 1994 – 2020

4

Critical Issues of deforestation and forest degradation in Thailand

- Misunderstanding the definition of "Forest"
- Lack of data/information
- Financial Issue
- Land ownership arguments
- A lack of awareness of the implications of forest loss and climate change impacts amongst both communities and local authorities

5

Critical Issues of deforestation and forest degradation in Thailand

- Illegal Logging operations in order to sell them for building accommodation and use as fuel for cooking.
- Land settlement in reserved area or forest as well as agriculture activities without permission due to unclear definition of forest.
- Land use change from agriculture into industry without appropriate and efficient methods.
- Land ownership issue due to ambiguous land registration in protected or reserved area and permitted area.

6

Critical Issues of deforestation and forest degradation in Thailand

- Infrastructure such as dams, irrigations and road construction.
- Forest fires are another main cause of deforestation in relation to a slash and burn practice for land preparation.

Figure 3. a slash and burn practice

7

Critical Issues of deforestation and forest degradation in Thailand

- Finance the scheme : a market mechanism where carbon credits are bought and sold or public funding
- Less Local community participation : forest dwellers or ethnic people

8

Forest Conservation Policy

Restoring forest is the emergency matter for governmental, private and public section which approaches in limiting forest management policy:

1. Limitation of forestry area
2. Forestry resource conservation in relation to protection
3. Agricultural management for poor and local people in some areas
4. Management associated with preservation and economic corporate in order to create natural balance and sustain forest resources for the future

9

Forest monitoring and Forest inventories

- The Department of National Park, Wildlife and Plant Conservation (DNP) is responsible for resources assessment and monitoring within protected area.
- The Royal Forest Department is responsible for reserved forests outside.

10

Preparation to implement REDD for Thailand

- Thailand does not have an official policy on how to implement REDD.
- More consultation is required but presently Thai authorities are exploring the possibility of corporation with the World Bank's Forest Carbon Partnership Facility (FCPF).
- Thailand has represented its readiness proposal to the FCPF and the proposal was approved in March 2008. Thailand will join 36 other developing countries in exploring concepts to implement REDD.

11

Preparation to implement REDD for Thailand

- FCPF readiness proposal requires Thailand to come up with a national plan to address the drivers of deforestation and how to deal with it as well as a strategy to measure and report progress in halting deforestation.
- The first issue needed to be done is to clarify on what role of DNP and RFD will be responsible exactly as well as other departments who contributed to the major use conflict.

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Preparation to implement REDD for Thailand

- The National Economic and Social Development Board (NESDB) provides frameworks across forest and agriculture sectors as well as rural development.
- The 10th NESDP (2007 – 2011) sets a target of maintaining at least 33% of the total area under good forest cover, of which 18% should be protected area; the target for restoration of protected areas is set 464,000 ha.

13

5 major strategies created in the 10th NESDP

1. Human and social development emphasized on education and developing a learning-based society.
2. Strengthening the economic foundation of local communities.
3. Infrastructure development, capital market development and energy efficiency improvements.
4. Sustainable development through protection and sound management of the environment and natural resources.
5. Good governance for sustainable, long-term economic growth and development.

14

Recent Situations in Thailand

- Forest-dwelling indigenous people and other forest dwellers: officially recognized 10 ethnic minority groups as "Chao Khao" which literally means "hill tribes" or "people of the hills". These hill tribes are concentrated around 20 provinces in the Upper and Lower North and the Western regions of Thailand such as Karen. Many of them lack citizenship have restricted access to land and forest and therefore are sidelined from the development process.

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Recent Situations in Thailand

- Climate Change and People of Tribe: The court dismissed the case of 2 Karen ethnic people (Chao Khao) in Tak province of Thailand. They were excused of causing deforestation and climate change due to their shifting cultivation practices. They were fined approximately couple million baht. The court considered the case with shifting cultivated research believed that this kind of agriculture will not destroy and deteriorate forest, in stead, REDD never mentioned shifting cultivation cases forest degradation. However, REDD really concerns land use change issue due to intensive agriculture and land use change to industrial purposes. As a result, the change of land use will create less biodiversity, environmental pollution as well as human right of ethnic people.

16

Recent Situations in Thailand

- Viewpoint of REDD from local people who live with forest : REDD addresses global warming in the wrong spot.
- The solution of REDD should have addressed in a way of reducing quantity of greenhouse gases emissions from where they have been produced.

17

Recent Situations in Thailand

- According to JGSEE (the Joint Graduate School of Energy and Environment Study, they have launched in studying and collecting database of greenhouse gases emissions across all sector for ONEP.
- Urgent Plan: constructing knowledge management and updating database of greenhouse gas emissions.
- Database management and in-depth research will push Thailand into implementing REDD efficiently.
- Supportive Institutions: The Thailand Research Fund, ONEP

18

Major Concerns of Thai stakeholders

- Set up the suitable base year
- Government to communities, not developed gov. to developing gov.
- Keeping community forestry concept
- Not accept market mechanism but accept Fund concept
- Set rules for community to use benefit from forest

CDM Forestry Project

- **Definition of forestry under CDM project**
  - **Shading area of leaves should cover 30%**
  - **Hight of trees 3 meters**
  - **planting area 0.4 acers**
- **For Reforestation project it should be forestry in 1990**
- **For afforestation project it should not be forestry in 50 years ago**
- **Verification the amount of CERs every 5 yearso**

Thank you

Dr. Qwanruedee Chotichanathawewong

Qwan@tei.or.th

Recent Developments on REDD and Forestry sector in India

Dr. Puja Sawhney
Kathmandu, Nepal
28th June, 2010

Presentation Outline

I. Forest facts and figures in India
II. Forest Policies and Laws
III. REDD in India
IV. India's approach to REDD
V. Issues to be resolved for successful implementation of REDD
VI. Main challenges
VII. What REDD means to the Forest people in India
VIII. Prerequisite for successful implementation of REDD

2

Forests in India- Facts and Figures

- India covers 2.5% of the world's geographical area and is home to 1.8% of the world's forests.
- India is rich in flora and fauna with more than 45,500 flowering plants and 91,000 animal species found in 16 major forest types.
- India's forests meet nearly 40% of the country's energy needs and 30% of its fodder needs.
- The Indian forests are home to around 100 million people and provide sustenance to them with an additional 100 million dependent on them for their livelihood.

3

Forest and Tree cover of India in 2007

Class	Area (million ha)	% of Geographical Area (G.A.)
Forest Cover		
VDF	8.35	2.54
MDF	31.90	9.71
OF	28.84	8.77
Total Forest Cover	**69.09**	**21.02**
Tree Cover*	**9.28**	**2.82**
Total Forest & Tree Cover	**78.37**	**23.84**
Non-forest		
Scrub	4.15	1.26
Non-forest	255.49	77.72
Total G.A.	**328.73**	**100.00**

* Tree cover is defined as tree patches less than 1 ha with canopy density >10%.

Source: Forest Survey of India, 2009

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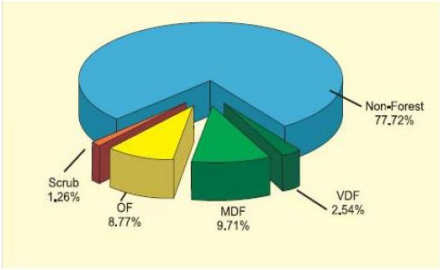
Forest Cover of India in 2007



Source: Forest Survey of India, 2009

5

Contribution as Forest Sink

- **Over the last two decades, progressive national forestry legislations and policies in India aimed at conservation and sustainable management of forest have transferred India's forests into a net sink of CO_2.**

Carbon stocks stored in India's forest & tree cover (in million tonnes)	1995	2005	Annual increment of Carbon Stock
	6,245	6,622	38 (equivalent to 138 million tonnes of CO_2)

Source: Forest Survey of India, 2009

6

Forest Policies and Laws

- Indian Forest Act, 1927
- Wildlife (Protection) Act, 1972 (amended in 2001 & 2002)
- Forest (Conservation) Act, 1980
- Biological Diversity Act, 2002

7

Forest Policies and Laws relevant to REDD and REDD+

- National Forest Policy, 1988
- JFM Resolution, 1990
- National Environment Policy, 2006
- Schedule Tribe and Other Traditional Forest Dwellers (Recognition of Forest Rights Act), 2006
- National Action Plan on Climate Change, 2008

8

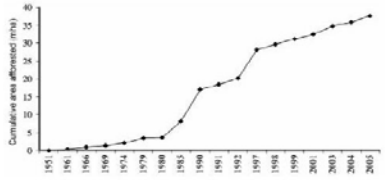
Afforestation and reforestation programmes

- India has a goal of bringing 1/3rd of its geographical area under forest and tree cover by 2012.
- India has been implementing an aggressive afforestation programme.
- The country initiated large-scale afforestation under the social forestry programme starting in the early 1980s.

9

Afforestation and reforestation programmes

- Afforestation and reforestation has been carried out under various programmes, namely social forestry initiated in the early 1980s, JFM in 1990, afforestation under the National afforestation and Eco-development Board programmes since 1992, and private farmers and industry initiated plantation forestry.



Source: Ravindranath , N.H. et al. 2006.Forest Conservation, afforestation and reforestation in India: Implications for forest carbon stocks.

10

REDD in India

- The mechanism of REDD has not yet been officially implemented in India, though there is considerable scope of its implementation, considering the extent of India's forest cover.

11

India's approach to REDD

- India advocates a comprehensive approach to REDD termed as a 'REDD plus' approach.
- India put forth the concept of 'Compensated Conservation' since Nairobi 2006 (COP 12).
- The Indian proposal on forest conservation/sustainable management of forests, and increment in forest cover as a *policy approach to enhance carbon stocks found place not only in the preamble but also in the operative part (paras 3 and 7) of the COP decision on REDD.*
- India with Costa Rica, China, Panama, Malaysia, Gabon, Ghana and the African countries demanded the inclusion of forest degradation, conservation of forest and/or increase in forest cover in the REDD draft text.

12

India's approach to REDD

- REDD projects should be accounted and conducted at the national and/or sub-national level.
- National circumstances while developing a framework for positive incentives comprising technological, methodological, monitoring, validation, and disbursement issues should be accommodated.
- Rewards for conservation.

13

India's approach to REDD

- The REDD financial mechanism should be market or fund-based (this however was not ascertained yet at this point of the decision text but was still discussed from time to time).
- India advocates a mechanism outside the purview of CDM, with a national level accounting for REDD.

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Unresolved issues in REDD+ implementation

- Who will benefit through REDD actually? The national government and, therefore, the forest departments or the forest communities
- It is difficult to imagine that the incentive from REDD will be passed on to the forest communities not withstanding the Forest Rights Act
- No mechanism to compensate the forest people whose land were taken away and diverted

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Challenges for REDD Implementation

- Corruption
- Problem of law and order
- Population pressure and agriculture requirements

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What REDD means to forest people in India

- Market or fund based financial mechanism like REDD may tend to act as a disincentive towards decentralization of forest governance
- Both the state and private sector actors will be tempted to stake their claims to such areas previously considered uneconomic, much to the disadvantage of the forest dependent communities
- Emergence of such a fund will neither result in the conservation of natural old growth forests or regeneration of forests nor facilitate improved life and livelihood of the forest people
- Commodification of the forests will be completed at the cost of its protectors

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Pre-requisites for success of REDD

- Old growth forests are safeguarded and biodiversity is not threatened
- The indigenous forest dwellers and local communities become a part of the entire process and have sufficient incentives to ensure that the projects are successful, often by ensuring a steady source of income.
- Funds are not utilized in setting up monoculture plantations which are also cash crops
- Effective mechanisms are developed to quantify reductions of emissions and assess the correct monetary value of a forest.

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Pre-requisites for success of REDD

- Sufficient funds, irrespective of whether it comes from national or international source are made available.
- Each stage of a REDD project, from approval to completion is transparent, and everyone connected with it is held strictly accountable.
- Changes in the Forest Act 1927 for effective support of forest policy.
- Capacity building of grassroots institutions to

19

Current Forest Initiatives

- Under the 'Green India Mission', the government aims to increase forested areas to 20 million hectares by 2020, reducing GHG emissions by 6.35%. Without the mission, GHG reductions would be 1.5 % less.
- Rs 44,000 crore has been allocated for the mission.

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Thank You!

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Annex 11: List of Photos of the workshop

Photo 1: Opening session

Photo 2: Keynote address by Dr. Shovakar Dhakal

Photo 3: Presentation by Mr. Dipesh Pyakurel

Photo 3: Presentation by Mr. Man Bahadur Kshetri

Photo 5: Floor discussion

Photo 6: Presentation by Dr. Qwanruedee Chotichanathawewong

Photo 7: Presentation by Mr. Dendi Muhamad

Photo 8: Presentation by Dr. Puja Sawheny

Photo 9: Panel discussion

Photo 10: Group photo of participants and organizers