USAID | NEPAL
FROM THE AMERICAN PEOPLE

An Assessment of Climate Change, Forests, and Biodiversity in Nepal

Bijay Kumar Singh, Local Consultant

Patrick Smith, PhD, USAID/EGAT Global Climate Change Team

With support and contributions from
Netra Sharma (Sapkota), CTO for the SAGUN Program, USAID/Nepal

January 2009

This assessment was produced for review by the United States Agency for International Development. It was prepared by Bijaya Singh, Local Consultant and Patrick Smith, PhD, USAID/EGAT/Global Climate Change Team.

An Assessment of Climate Change, Forests, and Biodiversity in Nepal

Bijay Kumar Singh, Local Consultant

Patrick Smith, PhD, USAID/EGAT Global Climate Change Team

With support and contributions from
Netra Sharma (Sapkota), CTO for the SAGUN Program, USAID/Nepal

DISCLAIMER
The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Acknowledgements

The study team would like to thank USAID/Nepal for giving us the opportunity to carry out this "Assessment of Climate Change, Forests and Biodiversity in Nepal". We would like to express thanks to Dr. Bill Patterson, Mr. John Q. Adams Jr., Mr. Jaya Paul Shrestha, and the other professional staff at both USAID and the US Embassy who kindly provided cooperation and logistic support for this study. Special thanks go to Mr. Netra Sharma (Sapkota), Cognizant Technical Officer of USAID/Nepal's SAGUN Program, for his wholehearted support and contribution for the study and accompanying us during field visits to Dhading and Chitwan.

We would also like to thank the following people for generously providing information crucial to the study: Joint Secretary Dr. Krishna C. Paudel and Under Secretary Dr. Jagadish C. Baral of the Ministry of Forest and Soil Conservation, Joint Secretary Mr. Purushotam Ghimire and Environmental Section Chief Mr. Batu Krishna Uprety of the Ministry of Environment, Science and Technology, Mr. Raju Laudary of AEPC, Mr. Brian Peniston of The Mountain Institute, Mr. Vijay Prasad Singh of UNDP, Dr. Maksha Ram Maharjan of CARE Nepal, Mr. Peter Branney and Mr. Ramu Subedi of the LFP, Ms. Clare Shakya and Mr. Simon Lukas of DFID/Nepal, Mr. Anil Manandhar, Mr. Ghana Gurung, Mr. Santosh Nepal and their colleagues at WWF Nepal, Ms. Elisabeth von Carpeller and Ms. Yamuna Ghale of SDC, Dr. Eklabya Sharma and Dr. Arun Bhakta Shrestha of ICIMOD, Mr. Siddhartha Bajracharya of NTNC, Mr. Nogendra Sapkota of ADB, Ms. Subarna Rai of SNV/Nepal, Mr. Ghan Shyam Pandey and Mr. Bhola Bhattarai of FECOFUN, Mr. Ganga Ram Singh and Mr. Purna Kunwar from the Terai Arc Landscape Program, Mr. Rishi Bastakoti and his team members at RIMS Dhading, and Editor Mr. Andrew Steele. Finally, we would like to thank all of the participants of our consultation meeting at the Shangrila Hotel in Kathmandu for their valuable input.

Bijay Kumar Singh, Local Consultant
Patrick Smith, Ph.D. USAID/EGAT Global Climate Change Team

Abbreviations and Acronyms

ACAP	Annapurna Conservation Area Project
ACOFUN	Association of Collaborative Forest Users in Nepal
ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Center
ANSAB	Asia Network for Small Scale Agricultural Bio-resources
BISEP-ST	Biodiversity Sector Program for Siwaliks and Terai
BPP	Biodiversity Profile of the Terai and Siwaliks Physiographic Zones
^{0}C	Degrees Centigrade
CA	Constituent Assembly
CAS	Country Assessment Strategy
CATHALAC	Water Center for the Humid Tropics and Latin America and the Caribbean
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CDM	Clean Development Mechanism
CF	Community Forest
CFDP	Community Forestry Development Program
CFM	Collaborative Forest Management
CFUG	Community Forest User Group
CLACC	Capacity Strengthening in the Least Developed Countries for Adaptation to Climate Change
CO_2	Carbon Dioxide
COP	Chief of Party
CPA	Comprehensive Peace Agreement
CTO	Cognizant Technical Officer
DANIDA	Danish International Development Assistance
DCHA	The Bureau of Democracy, Conflict and Human Assistance
DDC	District Development Committee
DFID	Department for International Development UK
DFRS	Department of Forest Research and Survey
DNPWC	Department of National Parks and Wildlife Conservation
EGAT	Economic Growth, Agriculture and Trade
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization
FECOFUN	Federation of Community Forest Users in Nepal
FRIS	Forest Resource Information System Project
GCC	Global Climate Change
GDP	Gross Domestic Product
GEF	Global Environment Facility
Gg	Giga-gram
GIS	Geographic Information System
GJ	Giga Joule
GON	Government of Nepal
ICIMOD	International Center for Integrated Mountain Development
IEE	Initial Environment Examination
IFAD	International Fund for Agriculture Development
INGO	International Non-Governmental Agency
IPCC	International Panel on Climate Change
IPR	Intellectual Property Rights
ITTO	International Tropical Timber Organization
IUCN	World Conservation Union
LFP	Livelihoods and Forestry Program
LFLP	Leasehold Forestry and Livestock Program
LRMP	Land Resource Mapping Project
MAP	Medicinal and Aromatic Plant
MFSC	Ministry of Forest and Soil Conservation

MIS	Management Information System
MLD	Ministry of Local Development
MEST	Ministry of Environment, Science and Technology
MPE	Ministry of Population and Environment (the former name of MEST)
MOU	Memorandum of Understanding
MPFS	Master Plan for Forestry Sector
NAPA	National Adaptation Program of Action
NARC	National Agricultural Research Centre
NBCC	National Biodiversity Coordination Committee
NBS	Nepal Biodiversity Strategy
NBSIP	Nepal Biodiversity Strategy Implementation Plan
NBU	National Biodiversity Unit
NCSA	National Capacity Needs Self-Assessment
NGO	Non-Governmental Organization
NFI	National Forest Inventory
NFUG	National Forest User Groups
NP	National Park
NPWC	National Park and Wildlife Conservation
NRM	Natural Resource Management
NTNC	National Trust for Nature Conservation
NTFP	Non-Timber Forest Product
PEA	Project Executing Agency
PES	Payment for Environmental Services
PIA	Project Implementation Agency
RDMA	Regional Development Mission for Asia
REDD	Reducing Emissions from Deforestation and Degradation
RIMS	Resource Inventory and Management Society, Nepal
SAGUN	Strengthened Actions for Governance in Utilization of Natural Resources
SDC	Swiss Development Cooperation
SERVIR	A high-tech satellite visualization system that monitors the environment of Central America
SFM	Sustainable Forest Management
SLUSR	Sustainable Land Use Systems Research
SNV	Dutch Development Agency
SPA	Seven Party Alliance
TAL	Terai Area Landscape
TMI	The Mountain Institute
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Program
UNDP	United Nations Development Program
UNFCCC	United National Framework Convention on Climate Change
USAID	United States Agency for International Development
USFS	United States Forestry Service
USG	United States Government
VDC	Village Development Committee
WECS	Water and Energy Commission Secretariat
WTLCP	Western Terai Landscape Complex Project
WUPAP	Western Upland Poverty Alleviation Project
WWF	World Wildlife Fund

Table of Contents

Abbreviations and Acronyms ii

Table of Contents iv

List of Tables v

Executive Summary vi

CHAPTER I - INTRODUCTION 1

CHAPTER II – A REVIEW OF FOREST MANAGEMENT 7

CHAPTER III – A REVIEW OF BIODIVERSITY 20

CHAPTER IV – A REVIEW OF CLIMATE CHANGE 27

CHAPTER V – CONCEPTUAL BUILDING BLOCKS 33

CHAPTER VI – SAGUN II 35

CHAPTER VI – OTHER USAID/NEPAL OPPORTUNITIES 44

References 48

Appendix 1 River Corridors in Nepal 52

LIST OF TABLES

Table 1: Physiographic zone showing population and land area coverage 2
Table 2: Changes in the distribution of population by ecological region 3
Table 3: Changes in population density per km^2 by ecological region 3
Table 4: Forest area of Nepal 1985/86 8
Table 5: Changes in forest areas 1978/79-1994/95 8
Table 6: Land-use patterns in Nepal 9
Table 7: Distribution of households by sources of fuel used for cooking 9
Table 8: Ecosystems identified by Dobremez (1970) 20
Table 9: Summary of climatic conditions in Nepal 27
Table 10: Summary of SAGUN II activity design 43
Table 11: Summary of other USAID/Nepal opportunities 52

Executive Summary

This assessment looks at the issues of climate change, forest, and biodiversity in Nepal. It first provides an analysis of each issue and goes on to propose and prioritize options for action that could be used in future USAID/Nepal initiatives. Although the main focus of this study was forest ecosystems and the biodiversity they contain, these are closely linked to climate change issues which are reflected in this analysis. The recommendations presented here build on the strengths of previous programs while also challenging USAID/Nepal to explore the integration of climate change dimensions into current and future programs.

Community forestry in Nepal has undergone three distinct stages of development. First generation community forestry involved the forming and setting up of user groups. The second generation involved making those groups more effective through the improvement of governance, the provision of basic livelihood benefits, and improved technical forest management. The SAGUN initiative focused largely on second generation issues. Third generation issues are just emerging, but appear to involve using established and well functioning user groups to access other revenue streams and to provide services outside their communities. Third generation activities also focus on building up networks of user groups for joint landscape or watershed level actions. While we recommend continued work on second generation issues which have yet to be consolidated and fully rolled out, USAID should also invest in piloting third generation community forestry projects.

USAID faces the question of where it should conduct its forestry/biodiversity activities. Under SAGUN these were disbursed across a number of districts in Nepal chosen because of the historical legacies of previous programs and because of decisions to support particular conservation areas. We suggest that any new activity start with a clear rationale for the choice of project locations – this could be a dispersed approach that targets biodiversity hotspots and threatened ecosystems wherever they occur, or it could be a consolidated landscape approach organized around a river corridor or other ecological unit, such as the Churia hills. We do not attempt to resolve that question here, but instead recommend that the required update to the FAA 118/119 Analysis include much more detailed biodiversity and watershed information to facilitate the decision. Therefore the recommended activities in this assessment are largely neutral with regard to location.

The main recommendation of this report is that the SAGUN approach should be continued under a SAGUN II program which includes greater focus on biodiversity and climate change issues and which pilots third generation issues like carbon finance and payments for watershed services. Using Democracy and Governance (DG) funds, SAGUN II would also extend the lessons and practices in good governance to non-forestry sectors and to VDC/DDC decision making.

The continued use of DG funds is recommended for several reasons. Firstly, since USAID environment funds are currently used solely for biodiversity initiatives, it would not be appropriate to use such funds to increase the capacity of irrigation groups or to strengthen VDC/DDC decision making. Secondly, SAGUN demonstrated that by beginning with a natural resource focus, it was easy to establish good practices and then extend them to other more sensitive or more visible sectors. In addition, there are cases from the SAGUN program where communities spontaneously applied the public audit methods used for natural resource studies to school management committees. In other cases communities demanded that VDC officials do a public audit; they then compared development expenditure to their livelihood and well-being rankings to demonstrate that government funds were not helping the poor. Thirdly, a community forest group organized an election forum to which they invited Constituent Assembly Election candidates and asked them how they would address forest issues if elected. These examples demonstrate how SAGUN generated grassroots demands for accountability and taught practical methods to create more transparency and equity in decision making. As Nepal moves into a period of political change, it is essential that top-down support for local government is complemented by grassroots bottom-up advocacy and accountability. SAGUN II would be the ideal platform for supporting a grassroots process driven by issues of great concern to rural people. In fact SAGUN began the process of modeling the type of issues based advocacy that is not linked to particular political parties or ethnic/religious identities. Continuing this type of development could help to bring more productive political discourse to Nepal.

In detailing the components of a possible SAGUN II, it helps to organize them by generations of community forestry. As explained above, second generation issues relate to improved functioning of a user group in terms of governance, livelihoods, and forest management. Third generation issues involve looking beyond particular user groups to larger societal benefits.

1) SAGUN II would have the following second generation components:

- Consolidate and further spread good governance and livelihoods activities to community forestry groups
- Promote livelihoods activities that are linked to biodiversity conservation
- Demonstrate forest management techniques that increase forest productivity, biodiversity conservation, and climate resiliency
- Incorporate biodiversity into community forestry by targeting biodiversity areas and helping communities practice a threats-based approach to biodiversity conservation
- Establish clear climate change project objectives and incorporate standard USAID climate change indicators
- Support national forest user federations, national policy development, and capacity building of GON Ministries and the Department of Forests

SAGUN II would also pilot the following third generation community forestry initiatives:

- Forest carbon projects in community forests
- Payments for watershed services from hydropower, irrigation, and/or municipal users
- Alternative energy carbon projects to reduce the pressure on forests

2) Using DG funds, the program would extend good governance practices beyond the forest sector to other groups at DDC/VDC levels

In addition to SAGUN II, USAID/Nepal can help to address environmental and climate change issues through other initiatives. As a minimum, the Mission should become more engaged in GON and donor climate change meetings and processes in order to seek out possible areas of coordination and to make sure that USAID's programs are recognized in those forums. Some other specific activities USAID/Nepal could pursue include:

- Mainstream consideration of climate change impacts into the USAID health program by, for example, encouraging the creation of maps showing how climate change will affect disease distributions
- Design future agriculture activities to specifically promote practices that build agricultural resiliency to climate change impacts such as the increased variability in water availability
- Commission a study on the cumulative ecosystem impacts of building large road networks or constructing multiple hydropower projects on the same river
- Work with other USAID missions in the region to sponsor the creation of a Himalayan SERVIR hub that would provide a one-stop-shop for geographic information and decision support tools to increase preparedness for natural disasters, forecast weather, and host land use change information
- Create a USAID/Nepal clean energy strategy to identify priorities and opportunities that could use current funding or be the basis for requesting future funding

In summary, this assessment lays out a clear path forward for USAID programming in biodiversity, forestry, and climate change. While some questions remain, such as a geographic focus, it is clear that building on previous USAID accomplishments by adding cutting edge innovations would lead to a successful strategy.

1. CHAPTER I - INTRODUCTION

Assessment Objectives

This assessment deals with the issues of climate change, forest, and biodiversity in Nepal. It sets out to provide current information about each issue and, in so doing, to highlight significant gaps and needs. It goes on to present recommendations for ways in which USAID can build on previous program initiatives and integrate climate change dimensions into its current and future programs.

Methodology

Assessment Team

The assessment team was headed by Patrick Smith, a climate change specialist in USAID/Washington's Economic Growth, Agriculture, and Trade (EGAT) Bureau. Patrick is the Agency lead in the area of Land-Use, Forestry, and Biodiversity as it relates to climate change issues. Patrick has lived in Nepal for 13 years.

Bijay Kumar Singh is an independent consultant with extensive experience in the forest sector in Nepal. He was hired as a specialist to bring local expertise and understanding to the assessment, particularly in the identification of the GON's processes and priorities.

This analysis was prepared by the assessment team and overseen by Netra Sapkota, CTO and manager of USAID/Nepal's forest sector and biodiversity programs. Mr. Sapkota accompanied the team in the field, provided useful supporting documentation, participated in many of the interviews, and helped to ensure that this analysis meets the needs of USAID/Nepal.

Review of secondary information

The Team conducted a comprehensive review of relevant literature and documents related to forestry, biodiversity and climate change in Nepal. This included GON analyses, strategy and policy documents, documents prepared by NGOs, donors, and multilateral institutions, and strategic documents and studies commissioned by USAID. A full list can be found in the references section of this report.

Interviews

The Team met with key stakeholders (GON officials and staff, representatives from leading NGOs, donors, local communities in USAID project areas, USAID's implementing partners etc.) both in Kathmandu and in the field. Interviewees were asked to explain their own programs and identify priority needs for Nepal within the areas of biodiversity, forestry, and climate change. Most of the interviews were conducted one-on-one, except for a half day focus group discussion which brought together 19 individuals, mostly from INGOs.

Field Visit

From October 25 to 27, 2008 the assessment team visited Dhading and Chitwan districts and held meetings with office staff and beneficiaries from community forest user groups, buffer zone user committees, officials from Chitwan WWF and staff of the Dhading office of the Resource Inventory and Management Society (RIMS) Nepal. The discussions focused on the ways that the SAGUN program is piloting biodiversity registration by forest user groups, biodiversity conservation in community forests and buffer zones, forest management, and alternative energy (including biogas) and its effect/impact on forests.

Presentation

On October 2, 2008, the Team presented its findings and a tentative outline of the report to USAID Kathmandu. This led to useful discussions with senior management and professional staff about the issues highlighted in the report.

Country Overview

Nepal has an area of 147,181 km^2 and is rich in biodiversity. The country can be broadly divided into three ecological zones with high mountains representing 43% of its land area, 30% mid-hills and 27% plains. This plain region (including the Churia hills) is known as the Terai (Land Resource Mapping Project, 1986). The total population of the country is 23 million with 7.3% living in the high mountains, 44.2% in the mid-hills, and 48.5% in the Terai (CBS, 2001). The average length of the country is 885 km from east to west and the width varies from 145 km to 241 km, with a mean of 193 km north to south. The country is located between latitude 26^{0}22' and 30^{0}27' N and longitude 80^{0}40' and 88^{0}12' E.

Table 1: Physiographic zone showing population and land area coverage

Ecological zone	Population %	Approximate % of land area	Altitude (meters)	Climate
Terai	48.5	27	60 - 1000 m	Tropical, sub-tropical and hot monsoon
Mid-hills	44.2	30	1000-3000 m	Cool temperate monsoon and warm temperate monsoon
High mountains	7.3	43	3000-5000 m	Alpine, sub-alpine & tundra
Total	100	100		

Source: CBS, 2001; LRMP, 1986

Table 2 shows that in 1971, the Terai contained 37.6% of Nepal's total population, a proportion which increased to 48.4% in 2001 i.e. a 10.8% increase in three decades. In other words, the Terai's population increased by 28.72%. By contrast, the proportion of the population in the mid-hills and high mountains decreased, a trend partly cause by migration from the hills to the plains. This has increased pressures on the Terai's natural resources such as forests, land and water for agriculture, food production, timber for house construction, and fodder and the grazing of animals. The conversion of forest areas into agriculture land is the main reason for the deforestation of the Terai.

Table 2: Changes in the distribution of population by ecological region

Ecological Zone	1971	1981	1991	2001
Total Population	***11,555,987***	***15,022,839***	***18,491,097***	***23,151,423***
Terai	37.6%	43.6%	46.7%	48.4%
Mid-hills	52.5%	47.7%	45.5%	44.3%
High mountains	9.9%	8.7%	7.8%	7.3%
Total	**100%**	**100%**	**100%**	**100%**

Source: CBS Population Monograph Vol. 1, 2003

Table 3 shows population density per square kilometer, with the changes in each ten year period shown in brackets. The rate of population density change is much higher in the Terai than mid-hills and mountains.

Table 3: Changes in population density per km^2 as per ecological region

Ecological Zone	Census Year			
	1971	**1981**	**1991**	**2001**
Terai	128	193 (51%)	254 (32%)	330 (30%)
Mid-hills	99	117 (18%)	137 (17%)	167 (22%)
High mountains	22	25 (14%)	28 (12%)	33 (18%)
Total	**79**	**102 (29%)**	**126 (24%)**	**157 (25%)**
NB Changes in population density percent in each 10-year period is given in brackets				

Source: CBS Population Monograph Volume II, 2003

Key pointers to the impact of population on the status and management of natural resources in Nepal

Terai

- Terai forests are disappearing rapidly due to the government's settlement policy in the Chitwan valley, Jhapa, Sarlahi and other areas. Illegal settlers backed by political parties have also encroached on a huge amount of forest area.
- There is a high demand for house construction, firewood and food in from migrant populations.
- Valuable river forests (containing mainly khair (*Acacia catechu*)) have been lost due to the demand for timber by a new factory. These forests have not been replanted.
- The remaining national forests have deteriorated due to over-exploitation for firewood, timber and grazing. Frequent fires and the illegal cutting of valuable timber for export have added to the problem.

- Infrastructure projects such as the East-West Highway, electricity lines, irrigation canals, along with the construction of army/police/Maoist camps, schools, colleges, training centers, temples, and government offices have also encroached on a large amount of forest land. This can be clearly seen along the East-West Highway and its adjoining areas.

- Migrant populations have settled along the East-West Highway and/or close to forest resources in the corridors between the settlements of traditional indigenous peoples and the forests. Some of these newer settlements have claimed control over forest resources, bypassing the rights of traditional forest users. These conflicts are complicated by the fact that some migrant populations actually migrated a long time ago and are essentially long-established local forest users as well.

- Large Semal trees (*Bombox ceiba*) have been felled on the private lands of the Terai causing the loss of nesting places and habitat for vultures and wild honey bees.

- The deforestation and degradation of forest in the Terai threatens valuable tree species like *Dalbergia latifolia* (Satisal) and *Pterocarpus marsupium* (Vijaysal). Loss of habitat and the fragmentation of national forests into small patches have reduced the wildlife numbers in protected areas.

Mid-hills

- The increasing population of the mid-hills has forced cultivation of marginal and steep slopes, resulting in increased erosion and landslides. This in turn leads to loss of life and damage to agricultural land, roads, and irrigation systems.

- Increased flooding and the heavy loads of silt in flood water from the mid-hills have caused a widening of river banks in the Terai along with erosion and loss of agricultural land.

- Heavy loads of silt in flood water reduce the life of hydroelectricity dams, and have a negative impact on lakes, and irrigation canals.

- Other problems in the mid-hills include the overexploitation or unsustainable harvesting of aromatic and non-timber forest products (NTFPs), habitat loss, the encroachment of forest areas, forest fires, and slash and burn practices.

High Mountains

- Population pressure in the high mountains forces the cultivation of marginal and steep slopes resulting in the destruction of the habitats of high value medicinal and aromatic plants and wildlife.

- There is also overexploitation or unsustainable harvesting of aromatic and NTFPs and habitat loss.

Political context

After many years of armed insurgency which disrupted development activities, government functioning, economic processes, and the peace and security of the Nepali people, a fragile peace and democracy have come to Nepal. As described in USAID/Nepal's Democracy and Governance Report (2008), "Beginning in late 2005 the "Seven Party Alliance (SPA), led by Nepali Congress (NC) and the Communist Party of Nepal-Maoist (CPN-M) formed a fragile but ultimately successful alliance against King Gyanendra and the monarchy. In April 2006, a 19-day "people's movement" (*Jana Andolan II*) generated widespread mobilization against royal rule and for the return to democracy. This was followed by the eruption of discontent in the Terai, which symbolized the growing importance of Madeshi political actors in Nepalese politics."

The November 2006 Comprehensive Peace Agreement (CPA) between the SPA and the Maoists served as the basis for an interim power sharing agreement which brought the Maoists into the government and gave them seats in the interim legislature. It also formally concluded the armed struggle between the Maoists and the government. The CPA also provided the roadmap for a political process, including the election of a Constituent Assembly (CA), leading to the writing of a new constitution. The election for the CA was successfully held in April 2008. The Maoists won the majority of CA seats (about 38% of a total of 601) and formed a Maoist led coalition government with the Communist Party of Nepal – Unified Marxist-Leninist (CPN-UML) and a number of smaller parties. The Nepali Congress party became the main opposition. The political and social situation is much improved compared to 2005 in the mid-hills, the high mountains and far-east and far-west Terai. However, about two dozen small parties have continued an armed struggle in the eastern and central Terai districts even after the constituent assembly election. The integration of the Maoist People's Liberation Army (PLA) and the Nepalese Army (NA) is still a critical issue" *(USAID/Nepal DG Assessment Report, 2008).*

As of the end of 2008, the Maoist-led government has formed a three-member panel to start dialogue with the armed groups of the central and eastern Terai.

Impact of the political context on natural resource management

- Most of the forest destruction currently visible occurred during the political unrest, when the security situation was volatile.
- Though the assessment of destruction in the forestry sector during the insurgency period (1996-2005) has not yet been completed, preliminary indicators show that a decreased army presence in forest areas opened the way for hunters and poachers. About 123 rhinos were poached for horn and skin during the insurgency, mainly in Chitwan National Park and Bardia National Park. Similarly, a large number of tigers were killed inside protected areas for skin and bones.
- Both NA and PLA camps were officially established in many forests (including community forests).
- Taking advantage of the volatile situation in the country, illegal encroachers intentionally settled inside forests occupying thousands of hectares of forest area particularly in the far-west region of the Terai.
- Hundreds of government offices including forest offices, security camps in protected areas and other facilities were destroyed during the insurgency. Most have not been reconstructed, directly affecting the conservation of forests and protected areas.
- In the Terai, firearms belonging to armed forest guards were deposited to the national police so that they would not be taken by the insurgents. These have not yet been returned. Forest guards are unable to tackle armed timber poachers so the smuggling of valuable timber from the forests in the Terai continues.

- During the insurgency period, the mobility of government agencies and INGOs was largely limited to district headquarters. The ensuing lack of forest patrols gave a free reign to poachers and smugglers.

- Although community forest user groups were often not able to patrol their own forests, they were generally respected by Maoist and government security forces. This meant that they were able to continue some forest management activities during the conflict. This experience shows the importance of community-based approaches in times of insecurity and conflict.

- The Department of Forests has declared that forest area (mainly) in the Mid-West and Far-West Terai is rapidly disappearing due to the organized encroachment of hill-migrants, freed bonded laborers and landless peoples. Although there is no exact data, it is estimated that about two hundred thousand hectares (200,000 hectares) of forest has been encroached within a decade in this area.

2. CHAPTER II – A REVIEW OF FOREST MANAGEMENT

Sustainable Forest Management

The concept of sustainability is key in the environmental field. The World Commission on Environment and Development defines it as follows: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (World Commission, 1987). In 1992, the International Tropical Timber Organization (ITTO) defined sustainable forest management (SFM) as, "*The process of managing permanent forest land to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment.*" Similarly, ITTO (1999) further elaborated the definition of sustainable forest management as "*a set of objectives activities and outcomes consistent with maintaining or improving the forest's ecological integrity and contributing to people's well-being both now and in the future.*" The second ITTO definition of SFM stipulates two conditions: (i) ecosystem integrity is maintained or enhanced, and (ii) the well-being of people is maintained or enhanced. In the forestry sector, sustained yield management implies continuous or periodic production of forest products by a working unit for the purpose of achieving, at the earliest practicable time, an approximate balance between growth and use. This is generally applied to commercial timber resources and is also applicable to water, grass, wildlife and the other renewable resources of the forest (Gulati, 1981). Sustainability has several dimensions—ecological, economic, social and cultural—and should be regarded as a dynamic concept. Indicators of sustainable development should take into account these dynamic aspects. Unacceptable risks in areas such as soil productivity, water quality and availability, biological diversity, pollution and energy sources should be defined for each ecological zone (Sustainable Land Use Systems Research, 1990).

However, in the Nepali context, sustainable forest management and use of forest resources requires an appreciation of and support for the participation of people directly dependent on forest resources (Lynch 1998). This includes: (i) recognizing and calling on local knowledge, skills and experience in natural resource management, (ii) understanding the interests and motives of people directly dependent on natural resources, (iii) relating general environmental concerns to specific local contexts, (iv) helping to identify and strengthen local institutional capacity; and (v) challenging and revising inaccurate assumptions about the nature and causes of local environmental problems (Lynch 1998).

Nepal's forest resources and land use

Nepal has a very diverse flora with 35 forest types, as classified by Stainton (1972). These forest types are categorized into 10 major groups namely: (i) tropical, (ii) sub-tropical broadleaved, (iii) sub-tropical conifer, (iv) lower temperate broad-leaved, (v) upper temperate broadleaved, (vi) upper temperate mixed broadleaved, (vii) temperate coniferous, (viii) sub-alpine, (ix) alpine and (x) alpine scrub forest. In addition, there are some patches of plantation forest.

A detailed mapping of land resources for the entire country was carried out by the Land Resource Mapping Project (LRMP, 1984) which estimated the total area covered by forests and shrubs to be 6.22 million hectares (about 42%) (Table 4). It shows that 31.68% of forest area was in the Terai and Churia hills, 35.59% in the mid-hills and 32.73% in the high mountains. No forest resource mapping or forest area calculation has been carried out since the LRMP so no comparison can be made with the situation today. The land-use map produced by LRMP still forms the basis for all sectoral assessments carried out in the country.

Table 4: Forest Area of Nepal 1985/86

Ecological Zone	Area of Nepal (000, ha)	Forest land		Shrubland		Total Forest		% of total
		Area (000 ha)	Percent within ecoregion	Area (000 ha)	Percent within ecoregion	Area (000 ha)	Percent within eco-region	
Terai (including Churia hills)	3996	1913	47.87	59	1.48	1972	49.35	31.68
Mid-hills	4443	1811	40.76	404	9.09	2215	49.85	35.59
High mountains	6309	1794	28.44	243	3.85	2037	32.29	32.73
Total	**14748**	**5518**	**37.42**	**706**	**4.79**	**6224**	**42.20**	**100.00**

Source: MPFS, 1988 based on land use (1985-86)

According to a 1999 Department of Forest Research and Survey (DFRS) report, forest area as of 1994/95 was estimated to be 4268.8 thousand hectares, which is about 29% of the total territory of the country. The forest cover in 1978/79 was about 5616.8 thousand hectares, covering about 39% of the total territory of Nepal (LRMP, 1986). This difference can be attributed to deforestation, which amounts to 1.7% annually between 1978/79 and 1994/95 (Table 5). A total of 1348 thousand square hectares of forest land, i.e. more than 9% of the total forest cover, was converted to other land-use/land cover categories. During this period, shrubland doubled from 689.9 thousand hectares (4.7%) to 1559.2 thousand hectares (10.6%). Combining both forests and shrublands (woody vegetation) together, about 29 thousand hectares of woody vegetation was converted into non-woody vegetation annually. This is a clear indication that forest resources have been subjected to exploitation beyond their sustainable growth.

Table 5: Changes in Forest Areas 1978/79-1994/95

Vegetation types	Area in 1978/79 (000 ha)	Area in 1994/95 (000 ha)	Annual rate of change
Forest	5616.8	4268.8	-1.7%
Shrub	689.9	1559.2	5.2%
Total	6306.7	5828	-0.5%

Source: Forest Resources of Nepal (1987-1998), Publication No. 74, 1999, DFRS, Ktm and LRMP, 1986.
NB Eco-region differentiated data is not available for comparison.

The National Forest Inventory (NFI, 1999) shows that Nepal had a forest area of 5.8 million hectares (40% forest cover) that consisted of 4.2 million hectares (29%) of forest and 1.8 million hectares (10.8%) of shrubland. The midhills had about 48% of the forest area, the plains (Terai) had about 25%, and the remaining 27% of the forest occurred in the high mountains.

The Food and Agriculture Organization's (FAO) Global Forest Assessment (2005), based on national data sources and satellite images clearly show the forest area in Nepal decreasing between 1990 and 2005. The intensity of forest degradation is higher in nationally managed forests than in forests managed in oth-

er ways. Evidence strongly suggests that if forest management is transferred to local communities, degradation and deforestation is substantially reduced. However, it is also argued that while the health of many community forests has improved in many places, the health of adjacent forests has deteriorated. Since there is no comprehensive forest inventory for the mid-hills due to the decade long insurgency, we only have estimates for recent changes in forest cover.

Land-use patterns (Table 6) show that forest currently accounts for 29.0 percent of land use and that shrub-land/degraded forest accounts for 10.6%. Forest continues to be Nepal's largest natural resource in terms of coverage. However, forest areas – which accounted for 45% of land use in 1966, have declined considerably, and shrub-lands have doubled in size from 4.8% in the mid-1980s to 10.6% in the mid-1990s. The annual average deforestation rate is estimated to be 1.7% overall with 2.3% in the hills and 1.3% in the Terai (Forest Resource Information System Project, 1999). Similarly, growing stocks of forest have declined from 522 million m^3 in the mid-1980s to 387.5 million m^3 in 1999, i.e. a decline of 134.5 million m^3 over a 19 year period or 7 million m^3 per year. There is a great potential for converting shrub-lands/degraded lands into well-stocked forests and sequestering large quantities of carbon from the trees.

Table 6: Land-use Pattern of Nepal

	Land-use type	**Area (,000 ha)**	**Percent**
1	Cultivated land	2968	20.2
2	Non-cultivated land	998	6.8
3	Forest	4269	29.0
4	Shrubland/degraded forest	1559	10.6
5	Grassland	1745	11.8
6	Others	3179	21.6
	Total	14718	100

Source: UNEP, 2001.
NB Eco-region differentiated data is not available for comparison.

The analysis of deforestation and degradation shows that the pressure is highest in the Terai region. Currently nearly 80,000 hectares of forests in the Terai are being encroached for agriculture and settlements. The extent of forest encroachment in the hills and mountains has not yet been studied. Similarly, forests in the Terai and in the mountains are under high pressure to meet the daily needs of local communities for fuel-wood and fodder for their livestock.

Fuel consumption

Overall, 77% of households in Nepal still depend on solid fuel for cooking and heating with the largest percentage of this group using wood from gathered from forests and private land. The smoke released by burning solid fuels such as wood, charcoal and dung is one of the major causes of carbon emissions. Uncontrolled fuel-wood collection is one of the major reasons for forest degradation.

Table 7: Distribution of households by fuel used for cooking

Ecological Zone	**Major sources of fuel for cooking in Nepal (Percent)**						
	Wood	**Kerosene**	**LPG**	**Biogas**	**Cow dung**	**Other**	**Total # of households**
Mountain	95.5	3.2	0.4	0.1	0.7	0.2	285,229
Hills	72.3	16.0	8.9	1.9	0.1	0.8	1,950,822
Terai	55.6	12.8	7.7	1.7	21.5	0.7	1,938,477

Source: Population Census 2001

The annual per capita fuel-wood consumption in the hills is about 640 kg whereas it is 479 kg per person per year in the Terai. The per capita timber consumption was estimated at 0.07 m^3 per year in 1985 and was found to have increased to 0.11 m^3 per year by 2000. Based on this, national timber demand is estimated to be about 2.5 million m^3 per year (MEST, Initial National Communication UNFCC, 2004).

Fuel-wood and agriculture residues are cheap and readily available in rural communities so the dependency on these for cooking is likely to remain the same, at least in the coming twenty to thirty years. Briquettes and biogas, however, may be able to reduce this dependency if promoted through project interventions. Without large subsidies, the poor cannot afford to set up biogas plants nor do they have sufficient numbers of cattle to produce the dung required to run them. There are some limitations associated with biogas in the high hills and mountains due to the cold climate. Bio-briquettes, on the other hand, are cheap and may have great potential in all of the ecological regions.

Livelihoods and forests

The Millennium Ecosystem Assessment (2003) defines ecosystem services as benefits people obtain from ecosystems. They are categorized as follows:

Provisioning services: products obtained from the ecosystem such as food, fresh water, fuel-wood, fiber, biochemicals, and genetic resources;

Regulating services: benefits obtained from the regulation of ecosystem processes such as climate regulation, water regulation, water purification, land degradation and disease detoxification;

Cultural services: non-material benefits obtained from ecosystems: recreational, spiritual, religious, symbolic, educational, and other non-material benefits;

Supporting services: services necessary for the production of all other ecosystem services e.g. soil formation, nutrient cycling and primary production.

Livelihood sources from forests

Eco-region	Major livelihood sources from forest
Terai	Collection of NTFPs, timber and firewood from forests; cultivation of NTFPs in the forest and public land particularly in community and leasehold forests; semi-processing and processing of timber and NTFPs; specific forest and livelihood programs in buffer zones, community and leasehold forests.
Mid-hills	Community and leasehold forestry; collection, semi-processing and trading of NTFPs; support for agricultural production; fodder and grazing for livestock; specific forest and livelihood programs in buffer zones, community forests and leasehold forests.
High mountains	Collection of high value NTFPs primarily from natural stock in forests and on common land; cultivation of high value NTFPs in leasehold and community forests; semi-processing, and trading of NTFPs; support for agricultural production; fodder and grazing for livestock-keeping.

Forest management in the three eco-regions

Terai and the Churia Hills

Community Forests

At present, community forests in the Terai are protected – this means that fallen trees are collected from the forest but little else is done in terms of forest management. The fertile plains of the Terai give these community forests great potential for productivity that has not yet been harnessed. Accordingly, almost all of the community forests in the Terai are under-stocked. Although some silvicultural activities like singling, thinning, and weeding have started in small areas, horizontal and vertical space management are needed to increase forest production per unit area. Such space management would help communities to optimize the benefits from both timber and NTFPs.

Community forestry in the Terai is often controversial. Unlike the mid-hills where a relatively small number of users are managing a relatively small area of forest, most forests in the Terai are large. The government would prefer these to be managed as blocks. In addition to this, communities that depend on forest resources may live close to or far away from the forest itself and are many in number. This means that community forestry as practiced in the hills, while successful in some Terai forests, needs to be reviewed and perhaps modified before being applied to large areas of forest.

Collaborative Forest Management (CFM)

The CFM model is being used for large areas of forest in the plains of the Terai, and, as with community forests, these areas are protected but not managed. The use of horizontal and vertical space management systems could at least double the production and benefits per unit for both timber and NTFPs. The size of these areas means that there are large numbers of households, a huge quantity of forest products and large CFM budgets to be managed. This presents a number of challenges relating to good governance and the equitable distribution of forest products and benefits to forest users.

Leasehold Forests

The Ministry of Forests and Soil Conservation and the Department of Forests are not interested in leasing areas of forest to the timber industry or to poor households in the Terai. As a result very few forest areas in the Terai have been leased to local communities.

Protected Areas

The Koshi Tappu Wildlife Reserve, the Parsa Wildlife Reserve, Chitwan National Park, Bardia National Park, the Suklaphanta Wildlife Reserve and their buffer zone forests are managed as protected areas. With the exception of the Koshi Tappu Wildlife Reserve, all are managed under the landscape strategy for flagship meta-mammal species. These protected areas are not without problems, not least the question of sustainable funding. Problems with invasive species, habitat management, the poaching of rhinos and tigers, rampaging elephants, and damage caused by wildlife are also key issues.

Churia Hill Forests

The ecosystem of the Churia hills is fragile and sensitive to change. The large-scale destruction of forests and degradation of the land has turned the area into naked shrub-land. The Churia Hill forests are classified as common land by the Department of Forests (Hardin, 1968). At one time, the Churia Hills had a natural stock of different varieties of bamboo, and river beds were covered with riverine species such as Khair *(Acacia catechu)*, Sissoo *(Dalbergia sissoo)* and others which served as speed breakers during the rainy season and caught soil particles coming into the river.

The bamboo has been plundered by the local people and due to heavy siltation, the riverian forests have become riverbeds due to the widening of river banks. There is also a problem with over-grazing, over-exploitation of forests for timber and firewood and over-collection of stones from the hills and river-

beds. Without urgent action from the Department of Forests and cooperation of local communities, the area faces certain desertification in coming years.

The conservation and management of the Churia Hill forests should be based on the watershed doctrine of maintaining both trees and dense shrubs for soil conservation purposes. The return of bamboo in the gorges and the return of the riverine forests of Khair and Sissoo would be a clear indicator of sustainable forest management in the area. In order to achieve this, which will in turn provide protection to areas downstream, grazing and the collection of timber and fuel-wood need to be greatly reduced. For this purpose, initiatives should be taken to declare the Churia Hills a conservation area.

Private Forests

A few small patches of forest are managed privately in the Terai.

Mid-hills

Community Forests

Community forestry is the primary forestry program in the mid-hills. It focuses on protection and regeneration and has proved to be a success. Conversely, non-community forests administered by District Forest Offices have become degraded due to open public access (Hardin, 1968).

Most of the existing community-accessible forests in the mid-hills would benefit from the community forest approach. In order to increase production and benefits per unit area, horizontal and vertical space management systems need to be introduced. In addition, all the forests should also maintain both trees and dense undergrowth to help soil conservation.

There is scope for forests in the mid-hills to be divided into watershed or sub-watershed basin areas which would enable communities to sell watershed protection services (a type of Payment for Ecosystem Services or PES) particularly in the areas upstream from hydropower dams. Services include irrigation and drinking water provision for Village Development Committees (VDCs) and District Development Committees (DDCs). This would bring additional economic benefits to the community forest users.

Leasehold Forests

Leasehold forestry for the poor is another effective program in the both the mid-hill and high mountain ecoregions. It is only available for people living below the poverty line. Poor households are leased small areas (up to one hectare) of forest for a maximum of 40 years. In the mid-hills, the focus of the programming is income generation through the keeping of livestock. Leasehold forestry has been successful at reforesting degraded areas and generating forest products and income for the poor.

Although conceptually sound, leasehold forestry programs are difficult to implement especially in remote areas. For leasehold forestry services to be delivered effectively there needs to be better coordination between the local government, communities, NGOs and forestry/livestock experts. Most of the leasehold groups are made up of the poorest and most marginalized households who are largely dependent on labor for their livelihoods due to high levels of illiteracy. The betterment of these downtrodden people in far remote areas is a priority for the government, but successful interventions require an integrated approach.

Protected areas

Khaptad National Park, Shivpuri National Park, Dhorpatan Hunting Reserve and their buffer zones are the only protected areas in the mid-hill region and represent only a small percentage of the protected areas of the Terai and high mountains. The number of tourists visiting these areas is negligible and poses little threat to ecosystems.

Private forests

There are very few private forest areas in the mid-hills although the number of fodder trees on private land outside forest areas is relatively high.

High Mountains

Community forests with non-timber forest products (NTFPs)

Community forests in the mountain region are rich in high value NTFPs and/or medicinal and aromatic plants (MAPs). At the time of writing, the potential for NTFPs and MAPs has only been harnessed in a few community forests. For the locals, the forests also provide fuel wood essential for cooking and heating during the winter.

There is also scope for community forest user groups to be organized at watershed or sub-watershed level and provide watershed services for small and large hydroelectricity projects.

Rangelands and pasture lands

There are large areas of land (including swamp) in the high Himal which are used as rangeland/pasture land during the rainy season. In the winter season, most of these rangelands are covered with snow. The high mountain rangelands are home to a number of high value medicinal and aromatic plants including Yarshagumba which fetches NRs 200,000 to 300,000 per kilo in the market. Most of these rangelands are located a one to three day walk from the nearest settlement. The rights of use for such areas are not currently clear. They are managed neither by the government nor by a private agency.

Leasehold forests

Leasehold forestry programs for the poor in high mountain districts have been set up with the financial support of the International Fund for Agriculture Development (IFAD). The lead implementing agency is the Ministry of Local Development (MLD) with partner organizations including the Department of Forests, the Department of Livestock Services, the Department of Agriculture, and the Department of Women's Development. The focus is on income generation through NTFPs/MAPs. Projects have been running for the last 11 years in 11 high mountain districts which suffer from perpetual food shortage. By July 2008, a total of 287 leasehold groups had been formed by a total of 5028 households with 5395 hectares of forest land being managed under the leasehold forestry program (Leasehold Forestry and Livestock Program, 2008).

Merging existing local development programs with needs assessed forestry, agriculture, livestock, micro-enterprise and NTFPs programs has had positive impacts on local communities. Service delivery and income diversification continue to be major challenges due to the remoteness and inaccessibility of these areas.

Protected areas

Rara National Park, Shey Phoksundo National Park, Langtang National Park, Sagarmatha National Park, Makalu Barun National park, the Annapurna Conservation Area, the Kanchnajunga Conservation Area, the Manaslu Conservation Area and their buffer zones represent the protected areas in this region. Some of these areas such as Sagarmatha National Park and the Annapurna Conservation Area play host to high numbers of foreign tourists. National Parks, wildlife reserves and hunting reserves are regarded as "core protected areas" and are managed by wardens and their staff. The area is left largely untouched except for a few small interventions such as the construction of artificial waterholes, the maintenance of grasslands by tree felling and the removal of exotic invasive weed species.

The Annapurna Conservation area is managed by a national NGO - the National Trust for Nature Conservation (NTNC) - along with the active involvement of local communities. The Kanchenjunga and Manaslu Conservation Areas are managed solely by local communities. Similarly, the buffer zone forests of these protected areas are conserved and managed by community forest user groups under the technical supervision of the Chief Warden. Local communities collect grasses for thatching from the parks and reserves. Harvesting of fuel-wood, timber and grasses is allowed to a limited extent within the conservation areas but is limited to the local people living within the buffer zone. These forest products cannot be

sold outside the buffer zone area. Each of these protected areas has periodic (five year) and annual plans along with an annual budget, all of which are approved by the relevant government authority.

A summary of forest management systems by eco-region

Management System	Terai	Mid-hills	High Mountains
Community forest	Unclear modes of operation and does not cover all users. Productive land but not properly managed.	Mostly successful - CFs protected but not scientifically managed.	Only partially successful due to large geographical area. Excellent potential for sustainable NTFPs.
Leasehold forest	Limited to a few districts. Benefits poor communities.	Good programs exist for land improvement and for poor households but difficulty in delivering services in remote areas.	Good program to help poor households to harness NTFPs but difficulty in delivering services in remote areas.
Collaborative forest management (CFM)	Good program for addressing issues of all users but not well managed.	There is no CFM program in the mid-hills.	There is no CFM program in the high mountains.
Protected areas	Two managed national parks and three managed wildlife reserves.	Two managed national parks and one managed hunting reserve.	Five managed national parks and three managed conservation areas.
Private forest	1404 hectares of privately owned Sissoo and Eucalyptus plantations	662 hectares of private forest.	Negligible private forest area (24 hectares).

Source: CFDP MIS Database, 2000 mentioned in NBS, 2002.

Legal and institutional framework for forests

Forestry sector policy, strategy and regulations are drawn from the following documents:

Master Plan for Forestry Sector (1989)
National Conservation Strategy (1988)
Agriculture Perspective Plan (1995)
Nepal Environmental Policy and Action Plan (1993)
Nepal Environmental Policy and Action Plan II (1998)
Nepal Biodiversity Strategy (2002)
Herbs and Non-Timber Forest Product Development Policy (2004)
Leasehold Forestry Policy (2002)
Nepal Wetland Policy (2003)
Forest Act (1993)
National Park and Wildlife Conservation Act (1973)

In addition, some of the provisions of the Environment Protection Act (1997) and the Local Self-Governance Act (1999) are related to the forestry sector. Implementation, however, continues to be problematic. None of the provisions of the Leasehold Forestry Policy (2002) have been included in the national legal framework and of the remaining documents, only the Nepal Biodiversity Strategy has an agreed implementation plan (dating from 2006). Although there are legal provisions relating to protected areas, there is no explicit national policy or strategy. Occasional meetings are held with India and China to discuss landscape level management of mega-mammals but there is no memorandum of understanding

(MOU) between Nepal and its neighbors in this regard, nor is there a national strategy on transboundary landscape management.

GON priorities for the forest sector

The Government of Nepal's priorities for the forest sector are presented below as expressed in the Master Plan for the Forestry Sector, the Tenth Five Year Plan, and the Interim Three Year Plan.

The six priority sector programs of the Master Plan for Forestry Sector
(MPFS) (1989) are:
(i) community and private forestry,
(ii) national and leasehold forestry,
(iii) medicinal and aromatic plants,
(iv) forest-based industries,
(v) soil conservation and watershed management, and
(vi) nature conservation.

Priorities for forestry sector programs in the Tenth Five-Year Plan (2002-2007) were:
(i) community and private forestry,
(ii) poverty alleviation through national and leasehold forestry,
(iii) national forest working schemes implementation program,
(iv) NTFPs/MAPs development program,
(v) upland Churia watershed management and other Siwalik conservation programs, and
(vi) program monitoring and evaluation.

Priorities for the forestry sector in the Interim Three-Year Plan (2007-2010) are:
(i) community and private forestry programs,
(ii) national and leasehold forestry programs,
(iii) genetic/species/ecological and biodiversity conservation, biosafety and research,
(iv) NTFP/MAP management program,
(v) Soil and watershed management program
(vi) forest research and extension program,
(vii) human resource development program,
(vii) collection and supply of forest products from national forests,
(viii) forest certification,
(ix) a pilot program for livelihoods for marginalized households, and
(x) infrastructure repair and development.

Major issues in forest management

Sustainable forest management:
There is no systematic or coordinated approach to the management of forests in any of the three ecological regions and, as a result, forest production and benefits per unit area are very low. Sustainable forest management with a focus on NTFPs/MAPs has the potential to provide extensive benefits for communities if undertaken on a commercially viable scale. In addition to the above, there is a lack of national policy/strategy on land-use planning at national, regional, district and local levels.

Initiatives to add value to NTFPs are currently very limited with most NTFPs being exported to India unprocessed. Despite the potential for organic NTFP production and export, certification is difficult and expensive and it is difficult to guarantee a steady supply of quality processed NTFPs.

Payment for ecosystem services (PES)

At the time of writing, provisions for PES schemes have not made their way into the statute books. Of the money spent by tourists in the protected areas, only the entry fees go directly to the forestry sector. Consequently, the contribution of the forestry sector to GDP is seen as being very low. In addition to this, despite the fact that the forestry sector is crucial in helping to ensure a reasonable lifespan for hydro-power dams, its contribution is not recognized and there are no incentives for forest conservation and management from hydroelectricity producers. The forestry sector also contributes to the agriculture and livestock sector by supplying leaf litter for manuring, leaves and grass for fodder, and grazing ground for livestock in the hills and mountains. This is not accounted for in the GDP. It is high time to review the national criteria for assessing the contribution of the forestry sector to the GDP.

Carbon credit schemes are a new concept for the forestry sector in Nepal and the institutional and human resource capacity necessary to prepare documents on Reducing Emissions, Deforestation and Degradation (REDD) does not currently exist, making it difficult to obtain international funding. Another new initiative - forest certification – means that many of Nepal's forestry products must now be certified before they can be exported.

Forest encroachment and degradation in the Terai
The current forestry sector policy/administration is unable to reverse the trend of forest loss in the Terai, Churia hills and Inner-Terai areas. Cross-party political commitment and the support of local administration along with a stronger forestry sector are urgently needed in order to curb and control existing forest encroachment and degradation.

Wetland conservation in forest areas
A large number of natural wetlands are located in forest areas (for example in Kailali district). Although the wetlands are rich in biodiversity, the Forest Department does not have the human resource or institutional capacity to manage these effectively.

Governance and social equity
Social equity is a great concern for poor and marginalized households, women and dalits all over the country. Community forestry and collaborative forestry management figure prominently in this concern, both in terms of access to and control over forest resources. Lessons pertaining to this can be learned from the SAGUN Project, although social equity initiatives have been mostly limited to CFUGs in project areas.

Far-distant user issues in the Terai:
The issue of far-distant users is a controversial one in Terai forest management. All the forests in the Terai are located in the northern parts of districts whereas major population centers are mostly to the south. Many community forests are controlled by communities who migrated from the hills and live close to the forests, mostly along the periphery of the East-West Highway. The far-distant users are not able to obtain forest products nor do they participate in forest management decisions. Although the government has piloted CFM schemes in a few Terai districts, giving access to and control over forest resources to far-distant users, there is still the need for dialogue to resolve a number of outstanding issues.

Alternative Energy
Alternative energy is not well-integrated in forestry sector programs despite its potential for positive impact. Mechanisms to promote public-private partnerships are needed if alternative energy interventions are to succeed in the future.

A summary of gaps/issues in sustainable forest management by eco-region

	Eco-region	Gaps/issues related to sustainable forest management
1	Terai including Churia hills	Organized forest encroachment by the landless, freed-bonded laborers and hill migrants is very prevalent, particularly in the forests of the far- and mid-west Terai. Issues of far-distant users have not been adequately addressed in community forests. Forest land is fertile and its productive potential has not been harnessed. All kinds of for-

		ests are understocked. Land and people are badly affected by flooding and siltation caused by the deforestation/ degradation of the Churia hills. Forest governance is the major issue in the forestry sector.
2	Mid-hills	Most of the forested areas are community forests but they are not sustainably managed. Community forestry's contribution to poverty alleviation is still questionable.
3	High mountains	There is enormous potential for the development of high value NTFPs which has not been properly harnessed. NTFPs are not properly managed in community and leasehold forests.

Agencies involved in forest management in Nepal

	Government Agencies	**Main responsibility**
1	Ministry of Forest and Soil Conservation	To formulate forest policies and strategies
2	Department of Forests	Mainly responsible for the conservation, management and utilization of forests and forest products through its district and field level organizations.
3	Department of Forest Resources and Surveys	To undertake research on forest management and also to carry out surveys to estimate forest area and growing stocks.
4	Department of National Parks and Wildlife Conservation	Supports the conservation and management of community forests in buffer zones and other protected areas.
5	Department of Soil Conservation and Watershed Management	To conserve and manage forests in watershed areas.
	Projects	
6	Biodiversity Sector Program for Siwaliks and Terai (BISEP-ST)	Funded by SNV of the Netherlands, this project supports the conservation and management of forests in eight Terai districts. The Project has promoted CFM systems for large areas of forest in the Terai.
7	Livelihoods and Forestry Program	Funded by the UK's DFID, this project implements forestry management programs in 15 districts; three in the Terai, four in the eastern Koshi hills, three in the western hill districts and five in the mid-western hill districts. Interventions focus on improving the livelihoods of poor households through forest management.
8	Swiss Development Cooperation (SDC)	SDC implements community forestry programs in the hilly districts of Dolakha, Ramechhap and Okhaldhunga.
9	Leasehold Forestry and Livestock Program	Provides funding for the implementation of forest management programs to poor households in 22 hilly districts in collaboration with the Forest Department and the Department of Livestock Services. It helps to manage degraded forests and invigorate natural regeneration as well as working to improve the variety of grasses for livestock.
10	Western Upland Poverty Alleviation Project (WUPAP)	Funded by IFAD, the project implements leasehold forestry projects in 11 remote districts located in mid-west and far-west regions. It encourages the production of NTFPs/MAPs in high mountain forests.
11	Terail Area Landscape (TAL)	Provides funding for the conservation & management of forests using the landscape corridor concept of wildlife conservation.
12	Western Terai Landscape Project (WTLCP)	Provides funding for the conservation & management of forest in the Western Terai landscape.
	International Agencies	
13	CARE Nepal (SAGUN Program)	Supports the preparation of district forestry sector plans; supports advocacy and good governance initiatives for community forests with funding from USAID/Nepal.

14	WWF Nepal	Provides funding and also implements biodiversity projects which directly and indirectly support forest management initiatives.
15	ICIMOD	Organizes international workshops to enable countries to share experiences. Provides policy formulation support services.
16	ANSAB	Supports the management of forests focusing on NTFPs/MAPs.

	Local NGOs	
18	Nepal Foresters Association	Advocates for the conservation and management of forests across Nepal
19	Nepal Forum of Environmental Journalists (NEFEJ)	Advocates for the conservation of forests and against deforestation with *Aankhi Jhyal* – a TV & radio program, and the publication of reports and journals.
20	Forestry Institutes	Train human resources for the forestry sector and undertake research into forest management
	CBOs and Federations	
21	Federation of Community Forest Users in Nepal (FECOFUN)	Advocates for the rights and welfare of community forest user groups.
22	NEFUG	Advocates for the rights and welfare of community forest user groups and other forest-related groups
23	ACOFUN	Advocates for the rights and welfare of collaborative forest management groups in Terai
24	Community Forest User Groups	Manage community forests
25	Leasehold Groups	Manage leasehold forests
26	Collaborative Forest Management Groups	Manage large areas of forest in the Terai
27	Buffer Zone Groups	Manage buffer zone forests

3. CHAPTER III – A REVIEW OF BIODIVERSITY

Biodiversity

Biodiversity means the richness and variety of living beings from all sources including, *inter alia,* terrestrial, marine and freshwater ecosystems, and the ecological complexes of which they are part. It includes diversity within species, between species and of ecosystems. Biological diversity is the total variety of life on earth. It encompasses the total number, variety, and variability of life forms, levels and combinations existing within the living world.

Species diversity refers to the frequency and variety of species (wild or domesticated) within a geographical area.

Ecosystem diversity comprises the variety of habitats, the dynamic complexes of plant, animal and micro-organism communities and their non-living environment, which interact as a functional unit, and their change over time.

Genetic diversity refers to the variation of genes and/or genomes within living organisms, that is, the genetic differences between populations of a single species and between individuals within a population. In other words, this covers distinct populations of the same species such as the hundreds of traditional rice varieties in Nepal.

Source: Nepal Biodiversity Strategy, 2002.

Biodiversity in Nepal

Although Nepal occupies only 0.03% of the total surface of the earth, it has nearly 4.5% of the world's species of mammals and 9% of its birds (MPE, 2001). The immense bio-climatic diversity in Nepal supports more than 35 forest types (Stainton, 1972). They are home to 5833 species of flowering plants, 185 species of mammals, 847 species of birds, 645 species of butterflies and 170 species of fishes and other animals. Presently 26 species of mammals, 9 species of birds and 3 species of reptiles are officially declared as endangered species and are being protected by Nepali laws (NPWC Act, 1973 and NPWC Regulation, 1974).

Floral and faunal species are conserved both in protected and non-protected areas. So far, about 20% of the total land area of Nepal has been designated as protected (national parks, wildlife reserves, conservation areas, hunting reserves and buffer zones). Nepal is one of the richest countries in the world in terms of biodiversity due to its unique geographical position and altitudinal variation from 60m to 8848m, all within a short distance.

Table 8: Ecosystems identified by Dobremez (1970)

Physiographic zone	Total number of ecosystems	Number of ecosystems in protected areas	% of ecosystems in protected area
Terai	10	10	100.00
Churia Hills	13	5	38.46
Mid-hills	52	33	63.46
Highlands	38	30	78.95
Other	5	2	40.00
Total	118	80	67.80

Source: Modified from BPP (1995) by Maskey 1996

Nepal signed the Convention on Biological Diversity (CBD) on 12 June 1992. The Convention was ratified by parliament on 15 September 1993. Nepal deposited the articles of ratification on 23 November 1993 and became a Party on 21 February 1994 in accordance with the provision of the Convention (MFSC, 2006). For the implementation of CBD commitments, the Government of Nepal has specifically prepared and approved the Nepal Biodiversity Strategy (NBS, 2002) and the Nepal Biodiversity Strategy Implementation Plan (NBSIP, 2006). In addition, the development of a Water Resource Strategy (2002), a National Wetland Strategy (2003), a National Action Program to Combat Desertification (2004), a Human Rights Action Plan (2004) and the formation of a National Bio-safety Coordination Committee are some of the key actions resulting from this membership.

The legal and institutional framework for biodiversity

The legal framework set up to implement biodiversity provisions in Nepal is shown below:

	Major Acts Related to Biodiversity Conservation
1	Aquatic Animals Protection Act 1961
2	National Parks and Wildlife Conservation Act 1973
3	Plant Protection Act 1977
4	Tourism Act 1977
5	Soil and Watershed Conservation Act 1982
6	Nature Conservation Trust Act 1982
7	Seed Act 1989
8	Pesticide Act 1992
9	Forest Act 1993
10	Environmental Protection Act 1996
11	Livestock Health and Livestock Service Act 1998
12	Electricity Act 1993
13	Water Resource Act 1993
14	Local Self Governance Act 1999
	Regulations
1	National Parks and Wildlife Conservation Regulations 1974
2	Forest Regulations 1995
3	Environment Protection Regulations 1997
4	Buffer Zone Regulations 1996

The institutions responsible for implementing biodiversity conservation in Nepal are the National Biodiversity Coordination Committee (along with five thematic sub-committees) and the National Biodiversity Unit. The Government of Nepal has designated the Ministry of Forest and Soil Conservation as the focal point for biodiversity conservation. Nepal has already submitted its Third National Report to the CBD. The fourth National Report is under preparation.

> The National Biodiversity Coordination Committee (NBCC), chaired by the Minister of Forests and Soil Conservation, is the apex body for coordination, policy formulation and overall guidance for the successful implementation of biodiversity conservation in Nepal. There are five Thematic Sub-Committees: (i) Forest biodiversity including protected areas, (ii) Agricultural biodiversity, (iii) Sustainable use of biological resources, (iv) Genetic resources and (v) Biosafety. The main objective of the sub-committees is to provide technical advice to the NBCC, the Project Executing Agency (PEA) and the Project Implementing Agency (PIA). The National Biodiversity Unit (NBU) was formed under the Environment Division of the MFSC and manages the implementation process of directions and policies provided by the NBCC and according to the NBS and the NBSIP.

Despite these coordination bodies, Nepal does have some institutional weaknesses. The National Capacity Needs Self-Assessment (NCSA, 2008) identified that there is no legislation related to (i) the acquisition of genetic resources and benefit sharing, (ii) the acquisition of traditional knowledge, farmers' innovations and benefit sharing, (iii) the prevention of invasive alien species, or (iv) the implementation of the 2007

bio-safety framework. Similarly, there is lack of policy, strategy, plan and program for the sustainable management of rangeland and there is no policy or legislation to deal with issues of Intellectual Property Rights.

Major threats to biodiversity in Nepal

Nepal's Biodiversity Action Plan (2000) divided the major threats to biodiversity into three key areas, namely:

1. Socioeconomic causes: a) poverty and population growth, b) over-exploitation of bio-resources and, c) lack of awareness amongst populations.
2. Ecological causes: a) habitat loss and deforestation, b) the increasing damage caused by landslides and soil erosion during the rainy season, c) the effects of toxic substances and other pollutants, d) frequent forest fires, e) overgrazing in the forests, and f) invasive species: (*Mikania micrantha, Eupatorium adenophorum, Lantana camera, Cassia toda, Amaranthus viridis).*
3. Illegal trade – the hunting and poaching of valuable mammals and tree species.

This was expanded on in Nepal's 2002 Biodiversity Strategy document which lists six major threats:

1. Low level of public awareness and participation in biodiversity issues,
2. Increasing population numbers and prevailing poverty,
3. Weak institutional, administrative, planning and management capacities,
4. A lack of integrated land and water use planning,
5. Inadequate data and information management,
6. Inadequate policies and strategies for biodiversity conservation.

Further threats to biodiversity in Nepal were listed in USAID's 118/119 Assessment of Forestry and Biodiversity (2006):

1. Habitat loss/conversion of natural habitats,
2. Overexploitation and illegal exploitation of tropical forests and biological resources,
3. The on-going armed insurgency,
4. The ineffective integration or mainstreaming of tropical forest and biodiversity conservation goals and objectives in into development programs.

The table below summarizes key threats to biodiversity by eco-region:

	Eco-region	**Threats in Biodiversity**
1	Terai and Churia hills	• High rate of organized forest encroachment by the landless, freed bonded laborers and hill-migrants. • Over-exploitation of forest resources. • Increasing populations in forest areas and prevailing poverty. • Wetlands are neither conserved nor managed. • High rates of poaching of large mammals including rhino and tiger
2	Mid-hills	• Increasing populations in forest areas and prevailing poverty. • Limited diversity of ecosystems in protected areas. • Ecosystems and valuable species are under threat outside the protected areas. • The biodiversity of the connecting river corridors between the protected areas in the high mountains and the Terai are not protected and/or managed.
3	High mountains	• Over-exploitation of forest resources including high value NTFPs/MAPs outside protected areas.

GON biodiversity conservation priorities

The Nepal Biodiversity Strategy Implementation Plan (NBSIP, 2006-2010) lists the government's priorities for biodiversity (new priorities unless otherwise noted):

1. Forest biodiversity conservation through community participation (outside protected areas).
2. A national mountain policy and research network.
3. Integrated wetland management.
4. Phulchoki-Changragiri Biodiversity Conservation Program.
5. Poverty reduction through biodiversity conservation (on-going priority).
6. Rhododendron conservation program in the Tinjure-Milke-Jaljale areas of Eastern Nepal (on-going priority).
7. Species conservation and habitat management (in protected areas) (on-going priority).
8. Landscape level biodiversity conservation (on-going priority).
9. Agro-biodiversity conservation through community participation.
10. Integrated rangeland management.
11. Establishment of the Kangchenjunga tri-national peace park.
12. Institutionalization of biodiversity conservation in Nepal (on-going priority).
13. Conservation and management of pollinators for sustainable agriculture through an ecosystem approach.

Major issues in biodiversity conservation

Institutional capacity for the conservation of threatened species and spaces (ecosystems) in protected areas
Some of Nepal's flagship threatened species are not well-conserved in its protected areas. For example, some 123 one-horned rhinos were illegally killed inside protected areas from 1997 to 2004. Similarly, poaching has le

d to a considerable decrease in the number of Royal Bengal tigers in protected areas despite the deployment of the Nepal Army for the animal's protection.

Conservation of threatened species and ecosystems outside protected areas
Agricultural biodiversity, animal biodiversity, rangeland biodiversity, and aquatic biodiversity in non-protected areas is also under threat.

Participatory biodiversity registration and monitoring including indigenous knowledge
There is a lot of indigenous knowledge on biodiversity conservation but since this is neither registered nor monitored, it is difficult to obtain.

Resource inventories and monitoring in protected areas
Detailed information about the quantity and status of resources in both protected and non-protected areas does not currently exist as no comprehensive inventory has been taken. Similarly no comprehensive monitoring mechanism exists, although a number of threatened mega-fauna species (rhino, tiger, elephant, and antelope) are monitored on a regular basis.

Biodiversity trafficking
Despite government control mechanisms and heavy legal penalties, the trafficking of some threatened species and their body-parts (particularly one-horned rhino and tiger populations) continues, putting these species at great risk.

Linking biodiversity conservation to livelihoods
Conservation in low-revenue generating protected areas which are less popular with tourists (Rara, Dhorpatan, Khaptad, Shey-Phoksundo etc), is difficult to sustain. To add to this, the lack of a legal mechanism to compensate buffer zone communities for the loss of livestock, property or crops caused by local wildlife, may encourage poaching.

Biodiversity-based ecotourism
Chitwan National Park and the Baghmara community forests are a good example of biodiversity-based ecotourism in Nepal. Thousands of domestic and foreign tourists flock to Chitwan every year to see the park's one-horned rhino population. The Chandragiri hills and Kulekhani hydroelectricity dam, Rara National Park of Mugu district, Shey Phoksundo National Park of Dolpa district and Khaptad National Park of Doti and Bajhang district are rich in biodiversity and scenic views but the number of visitors to those areas is much lower than for Chitwan National Park and the Annapurna Conservation Area (ACAP). In the 2005/06 fiscal year, 54,449 tourists visited Chitwan and 36,000 tourists visited ACAP, but only 28 tourists visited Rara, 119 Shey-Phoksundo, and only one tourist visited Khaptad (DNPWC, 2006).

Biodiversity governance/local autonomy, community rights and equity
There is currently no system of biodiversity governance in the country and the autonomous rights of local communities regarding issues of biodiversity have not been secured. These include issues of community rights and equitable benefit sharing.

Wetland biodiversity
Hundreds of important wetlands are administered under the Department of Forests but there is both a lack of institutional capacity and a dearth of knowledge and experience which prevent the Department from dealing effectively with biodiversity issues. As a case in point, hundreds of natural wetlands are located inside the forests of Kailali district but only one of them is explicitly managed: Ghoda Ghodi Tal - a Ramsar Site of international significance.

River Corridors
Many river corridors connecting two or more protected areas are rich in ecosystem diversity and species biodiversity. The concept of river corridor management is new for Nepal and a lack of data makes it difficult to develop conservation projects/programs for these areas. Examples of river corridors in Nepal are: the Trishuli River Corridor linking Langtang National Park and Chitwan National Park; Chitwan National Park in turn, is linked to the Annapurna Conservation Area by the Seti and Kali Gandaki river corridors.

Trans-boundary biodiversity strategy
A couple of trans-boundary meetings with India and China have taken place to discuss the conservation of meta-flagship species like rhinos, tigers, and elephants. At the time of writing, however, no national trans-boundary strategy for biodiversity exists nor have MOUs been signed by Nepal and its neighbors.

Key issues in biodiversity by eco-region.

	Eco-region	Key Issues
1	Terai and Churia hills	Trans-boundary issues - no national policy and strategy No protection of wetland biodiversity outside protected areas The protection of high value species such as rhinos and tigers is a big challenge for the park authorities and local communities. No compensation mechanism exists for the families of the many people killed each year in elephant attacks. The conservation of biodiversity in the fragile ecosystems of the Churia hills poses a great challenge. Over-grazing in forest areas and frequent forest fires pose significant problems for biodiversity conservation The control of alien invasive species in Chitwan National Park and the Koshi Tappu Wildlife Reserve is another serious challenge.
2	Mid-hills	There are no biodiversity conservation systems in place in the river corridors connecting protected areas in the Terai and high mountains. Biodiversity-based ecotourism is providing potential livelihoods benefits to people in mid- and far western regions.
3	High mountains	Despite the great potential of biodiversity-based ecotourism in Rara, Khaptad and Shey Phoksundo National Parks, this has not be realized.

Agencies working in biodiversity conservation in Nepal

	Agency	Role in biodiversity conservation
1	Ministry of Forest and Soil Conservation	Focal Ministry for the Convention on Biological Diversity (CBD) in Nepal
2	Ministry of Agriculture and Cooperatives	Responsible for the conservation of agriculture and livestock diversity
3	Ministry of Environment, Science and Technology	Responsible for preserving natural and cultural environments
4	Department of National Parks and Wildlife Conservation	Responsible for the conservation of biodiversity in protected areas
5	Department of Forests	Responsible for protecting biodiversity in forests which fall outside protected areas
6	Department of Agriculture	Responsible for the conservation of agricultural biodiversity
7	Department of Livestock Services	Responsible for the conservation of livestock biodiversity
8	Nepal Agricultural Research Council	Carries out research agricultural and livestock research
9	Nepal Academy of Science and Technology	Carries out chemical screening (bio-prospecting) of some medicinal plants, mostly conifers
10	National Trust for Nature Conservation	Supports the conservation and management of protected areas
11	World Wildlife Fund	Carries out biodiversity research and provides biodiversity policy and planning support in addition to implementation assistance
12	The World Conservation Un-	Carries out research in biodiversity conservation and supports pro-

	ion	gram implementation
13	International Center for Integrated Mountain Development (ICIMOD)	Active in the conservation of mountain biodiversity and trans-boundary ecological conservation
14	The Mountain Institute (TMI)	Works for the conservation of biodiversity in mountain regions
15	Forestry, agriculture and livestock related educational institutes	Carry out studies and research on biodiversity conservation
16	FECOFUN and other forest user groups	Work for the conservation of biodiversity in community forests
17	Leasehold forest groups	Work for the conservation of biodiversity in leasehold forests
18	NGOs: Nepal Foresters Association, Ecological Society of Nepal, Women in Environment Nepal, Save the Environment Foundation, Friends of the Wetlands of Nepal, Nepal Bird Conservation Forum and others	Directly involved in biodiversity conservation

4. CHAPTER IV – A REVIEW OF CLIMATE CHANGE

Climate and Climate Change

Climate is often defined as the weather, averaged over time (typically 30 years). **Climate change** refers to shifts in the mean state of the climate or in its variability, persisting for an extended period (decades or longer). Climate change may be due to natural changes or to persistent anthropogenic changes in the composition of the atmosphere or in land use (USAID, 2007). **Climate variability** refers to variations in the mean state of climate on all temporal and spatial scales beyond that of individual weather events. Examples of climate variability include extended droughts, floods, and high/low temperature conditions. Variability is a "function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity". The leading international scientific body on climate change, the International Panel on Climate Change (IPCC), defines **vulnerability** in terms of "the degree to which a system is susceptible to or unable to cope with adverse effects of climate change including climate variability and extremes". Vulnerability to the impacts of climate change is a function of exposure to climate conditions, sensitivity to those conditions, and capacity to adapt to the changes (USAID, 2007). **Adaptation** is defined as "adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, Third Assessment Report, 2001).

Nepal, along with 150 other nations, signed the United Nations Framework Convention on Climate Change (UNFCCC) at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. Nepal ratified the Convention on May 2, 1994 and it came into force in Nepal on July 31, 1994 (MEST, 2004).

Nepal's climate

The country is around 850 km long (east-west) and experiences a wide range of climate varying from sub-tropical to alpine. This is due to the varied elevations in the country, from 64 to 8850 meters above sea level within a span of less than 200 km.

Table 9: Summary of Climatic Conditions in Nepal

Ecological belt	Climate	Average annual precipitation (mm)	Mean annual temperature (^{0}C)
Mountains	Arctic/Alpine	snow/150-120	<10
Hills	Temperate	275-2300	10-20
Terai	Sub-tropical	1100-3000	20-25

Source: WECS, 2005

Nepal experiences heavy rains from June to September from the south-easterly monsoon, which account for 80% of total annual rainfall. Winter rains from November to January and pre-monsoon rains from April to May account for the remainder. Average annual rainfall in the country is about 1530 mm although there are sharp spatial and temporal variations. Nepal has more than 6000 rivers with a total average annual runoff of about 225 billion m^3. Current estimates show that only around 15 billion m^3 is being utilized for economic and social development (NCSA, 2008).

Temperature records from the last 30 years show that the average maximum temperature is increasing at an alarming rate. Shrestha et al (1999) took data from 49 weather stations across Nepal and found that the temperature increased by an average of 0.06 ^{0}C per year between 1977 and 2000. Increases are more pro-

nounced in the higher altitude regions of the country with smaller or zero increases documented in the plains. The highest levels of increase can be seen during the winter. The average temperature is rising by an average of 0.41 ^{0}C per decade, while seasonal temperatures during the pre-monsoon, monsoon and winter seasons have risen by 0.43 ^{0}C, 0.43 ^{0}C and 0.37 ^{0}C per decade respectively.

Nepal's Initial National Communication Report to the Chief of Party (COP) of UNFCCC (2004) states that global warming may cause ecosystem damage as species composition changes due to migration and die-off. The consequences of this situation could directly affect not only the environment of Nepal but also the lives of huge numbers of people. The report goes on to say that under existing (CO_2) conditions Nepal has 15 out of the 39 different types of vegetation zone categorized by the Holdrege model.

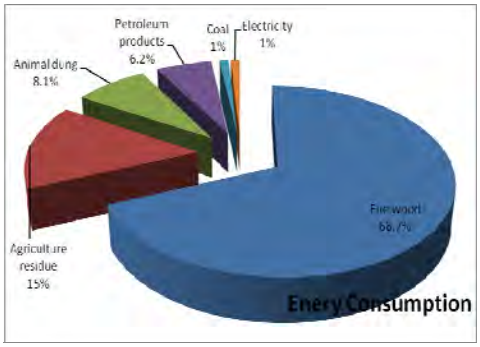
Glacial lake outburst flood (GLOF)

In Nepal there are 2315 glacial lakes of various sizes, the total area of which is 75 km^2 (ICIMOD/UNEP, 2001). The formation and growth of glacial lakes is a phenomenon closely related to de-glaciation in the mountains. Glacial lake outburst floods (GLOFs) are characterized by the sudden release of a huge amount of lake water, which rushes downstream in the form of dangerous flood waves. These flood waves devastate downstream communities, hydropower stations and other infrastructure. Nepal has experienced at least 25 GLOF events in the recent past (NCSA Stocktaking Climate Change, 2008). The Government of Nepal sees GLOFs as a threat to the development of water resources in the country.

Tsho Rolpa is the largest glacial lake in Nepal, occupying an area of 1.76 km^2. This lake was a cluster of small supra-glacier ponds in the late 1950s, which have since merged and expanded. Based on the rapid growth of the lake, the rapid degradation of the terminal and lateral moraines which are holding the lake water, the melting of fossil ice inside the moraines, the seepage of lake water from moraines and the rapid ice calving from the glacier terminus, there is a very high risk of GLOF. Tsho Rolpa is the only lake in the country where mitigation work has been carried out and an early warning system implemented (Rana, 2000; Shrestha, 2001). The other glacial lakes listed as dangerous are, Imja, Lower Barun and Thulagi Lakes. (ICIMOD/UNEP 2001) A total of 20 glacial lakes have been identified as being potentially dangerous, although there are gaps in field verification. There is ongoing discussion as to the most appropriate way to respond to this threat. Countries in the Andes have found ways to drain or otherwise reduce the risk from glacial lakes, so there is the potential to learn lessons that could be applied to Nepal. There is also the potential to pursue low cost measures that reduce the impact of a flood when it occurs. Communities could install diversion walls, plant tree barriers, and take other similar measures to protect their houses and fields. There have also been calls for GLOF early warning systems, although local communities would much prefer that the risk of flood actually be reduced.

Energy

The total energy consumption in Nepal in the year 1994/95 was estimated at about 285 million GJ. About 92% of energy consumption came from traditional energy sources and the remainder from commercial sources. A large amount of biomass (e.g. fuel wood, agricultural residue, and animal dung) is used as fuel for households, commercial establishments and industry. Some 12 million tons of fuel wood, 3.4 million tons of agricultural residue and 2.1 million tons of animal dung are estimated to have been burnt for fuel in 1994/95 (WECS, 1996).



Due to the increasing population, both traditional and commercial fuel use have been rapidly increasing over the last decades, resulting in higher CO_2 emissions.

CO_2 emissions from forest and grassland conversion

There is no reliable estimate for CO_2 emissions caused by deforestation and forest degradation in Nepal. However, the Initial National Communication Report to the COP of UNFCCC (2004) estimates that the total CO_2 emissions from land-use change and forestry in the base year 1994/95 were about 22,895 Gg out of which 14,372 Gg of carbon dioxide was sequestered due to biomass growth.

Biomass stock per hectare in Nepal's forests varies from 115 to 178 tons (WECS, 2001). In total, tree cutting accounts for about 14,006 kilotons of the biomass removed from forests and non-forest land. There is no commercial harvest. Forest land is generally changed into land suitable for cultivation by a two step process. First the forest is converted into shrub land, and then the shrub land is converted into agricultural land. The biomass found in shrub land after conversion is thought to be 16.1 tons per hectare (WECS, 2001) whereas the average biomass for cultivated land is thought to be 10 tons per hectare (IPCC, 1996).

Not all of the biomass removed from the forest is consumed as fuel-wood. The cutting of timber for local construction and development and the illegal cross-border trading of timber also account for 20% of the total biomass removed from forests (DFRS, 1993). During the period of 1978/79-1994/95, a total of 1.3 million hectares of forest was cleared (74 thousand hectares per year). In total 14 million tons of wood has been removed from forests, releasing more than 18,547 Gg of CO_2 into the atmosphere.

The legal and institutional framework for climate change

The Ministry of Environment, Science and Technology (MEST) is designated as the UNFCCC focal point despite its very limited capacity to coordinate, formulate and implement climate change related policies and programs.

Although there is no specific policy, strategy or law directly relating to climate change, several important policies, strategies and laws have been enacted to govern the overall management of natural resources and to address the environmental problems facing the country. The major national environmental policies include National Conservation Strategies (1988), the Nepal Environmental Policy and Action Plan (1993), the Sustainable Development Agenda (2003), the Tenth Plan (2002-2007) and the Three Year Interim Plan (2007-2010). The Interim Plan is the first to give priority to the implementation of the multilateral environmental agreements to which Nepal is a party and to recognize the benefits that Clean Development Mechanism (CDM) projects, renewable energy projects and community forestry projects will bring. The Plan also gives priority to maintaining the current 39.6% of forest cover in the country and modernizing the hydrology and meteorology departments to make them better able to carry out quantitative assessments of climate change, research, and development.

	Major Acts Related to Climate Change
1	Interim Constitution of Nepal 2006 (the "right to a clean environment")
2	Soil and Watershed Conservation Act 1982
3	Forest Act 1993
4	Environmental Protection Act 1996
5	Water Resource Act 1993
6	Industrial Enterprises Act 1992
7	Vehicle and Transport Management Act 1995
8	Local Self Governance Act 1999
	Regulations
1	Forest Regulations 1995
2	Environment Protection Regulations 1997
3	Vehicle and Transport Management Regulations 1997
4	Ozone Depletion Substance Consumption Regulation 2001
5	Local Self Governance Regulation1999

In the absence of a specific national policy, strategy and legal framework for climate change, Nepal is far behind in fulfilling its international commitments. Without national and sectoral policies, climate change does not figure in law and strategy documents and is effectively limited to a national dialogue in which only a few participate. Despite the fact that many communities are being directly affected by climate change, studies on its impact on local communities and ecosystems have not been carried out.

Government priorities for the effective implementation of UNFCCC

The Thematic Assessment on Climate from the National Capacity Needs Self-Assessment (NCSA, 2008) lists government priorities on climate change as:

(i) the formulation of climate change related policies including a national energy policy and a comprehensive environment policy,
(ii) the formulation of a national adaptation program for action to include the participation of all stakeholders,
(iii) improved scientific research and observation including an increase in the amount of research carried out on the impacts of climate change on forests and biodiversity,
(iv) sectoral capacity building to increase the number and size of CDM projects,
(v) the mitigation of greenhouse gas emissions by promoting community-based forestry and soil conservation programs,
(vi) mainstreaming climate change in national and sectoral policies and in environmental / natural resource management laws,
(vii) effective enforcement of environment related policies and laws for the management of climate change by establishing a climate change unit in all sectoral ministries and departments.

The Initial Communication report to the COP of the UNFCCC (2004) made the following recommendations for the forestry sector:

(i) adopt improved technology to reduce fuel wood consumption,
(ii) rehabilitate degraded land through afforestation and reforestation,
(iii) promote sustainable forest management in leasehold and community forests, particularly in the Churia Hills and mid-hills,
(iv) increase the CO_2 uptake from the atmosphere by converting unproductive land into grassland and range land,
(v) promote habitat management for protected animals and plants with particular focus on buffer zone development and management,
(vi) explore opportunities for carbon trading both at domestic and international levels, and develop an accounting framework for measuring potential challenges for forest biomass stocks,
(vii) adopt adaptation measures for the biodiversity sector such as the extensive planting of trees to capture CO_2,
(viii) identify/prioritize species that are not vulnerable to climate change,
(ix) reforest sensitive areas with drought, heat and flood tolerant species,
(x) enlarge current and create new protected areas,
(xi) develop regional plans to conserve the wildlife and resources outside protected areas,
(xii) focus on ecological research and monitoring.

Key issues in climate change

The issue of climate change has only recently begun to receive attention in Nepal. A series of consultations held at central and field level with government agencies, donors and non-government agencies, and the study of secondary data including the NCSA Climate Change Thematic Paper 2008 have identified the following key issues:

a. There is no comprehensive environmental policy or specific policy related to climate change.

b. There is little understanding of the links between climate change and poverty.
c. The present health policy does not address issues relating to climate change.
d. Sectoral policies have not yet recognized climate change as a challenge.
e. The current environment laws and sector specific laws do not adequately deal with actions and activities that can contribute to climate change.
f. There is no unified institutional framework for dealing with climate change and a lack of co-ordination, supervision and management mechanisms.
g. There is no institutional mechanism to regularly assess the impact of climate change on water resources, biodiversity, health and other sectors.
h. There is no CDM strategy or institutional understanding of CDM.
i. A lack of scientific research and technological development means that there is very limited support for policy development and mitigation and adaptation measures.
j. There is a very limited understanding of climate change and its impacts among both policy makers and the general population; there is no national program to inform the population about climate change.
k. The amount of available data on the environment is insufficient and important data gaps persist. Data is often scattered, heterogeneous and inaccessible. No particular institution is responsible for maintaining and updating environmental data and information. Knowledge management at both local and national levels is weak and data sharing processes are non-existent.
l. The Ministry of Environment, Science and Technology and the Ministry of Forest and Soil Conservation are both focal points for climate change issues but there is no mechanism to enable them to work together or share information.
m. There is a lack of appropriate institutional capacity and expertise for dealing with climate change.
n. There is a lack of funding for climate change related programs.

Key issues in climate change by eco-region

	Eco-region	Key gaps/issues related to climate change
1	Terai	Massive encroachment, deforestation and forest degradation in the Terai as communities use land for agriculture, settlement, and infrastructure development Flooding and inundation causes acute health problems during the rainy season The siltation of productive agriculture lands by rivers is starting to lead to desertification in some areas River-bed levels are rising The destruction of property and valuable infrastructure Poverty and landlessness are increasing due to river bank cutting and siltation Irregular rainfall and long periods of drought have a negative impact on agricultural production
2	Mid-hills	Massive soil erosion and landslides are causing the loss of productive lands. Massive siltation in the lakes and hydro dams is reducing the reservoir capacity of lakes and the lifespan of hydro dams. The loss of soil from agriculture land is reducing productivity.

		The loss of infrastructure and individual properties is very costly.
3	High mountains	There number of glacial lakes is increasing. There are increased threats of GLOFs. The snow layer has reduced in depth.

Agencies working in climate change in Nepal

Actors	Existing Capacity and Activities	Proposed Actions for USAID
Government Agencies		
Ministry of Environment, Science and Technology (MEST)	Focal point for climate change issues and actions; coordination with other agencies	Capacity enhancement and the institutionalization of climate change issues
Ministry of Forest and Soil Conservation (MFSC)	A member of the climate change network	
Department of Forests	None	
Department of Soil Conservation and Watershed Management	None	
Department of National Parks & Wildlife Conservation	None	
INGOs		
WWF Nepal	Works in the areas of community-based disaster risk management and natural resource management ; systematically links climate change issues to its projects	
ICIMOD	Works in disaster risk reduction, glacial lakes, and GLOFs and associated issues, climate change impact assessment and vulnerability mapping; has a useful GIS based information system	
IUCN Nepal	Works mainly in freshwater programs	
CARE Nepal	Works in the areas of community based disaster risk management and natural resource management; systematically links climate change issues to it's projects	
Central Department of Hydrology and Meteorology of the Tribhuvan University	Is engaged in research related to water and climate change which is mainly carried out by its research students; a member of climate change related organizations	
Practical Action Nepal	Works in the areas of community based risk reduction. Additional projects include reducing vulnerability to and the monitoring of indoor air pollution	
Nepal Water Conservation Foundation	Works in the areas of policy synthesis on climate and weather and implements freshwater climate change adaptation projects	
Clean Energy Nepal	Works in climate change advocacy and to develop climate change awareness in schools and colleges	
LI-BIRD Pokhara & Kathmandu	Works in the areas of climate change impact and natural disaster management	
Donors		
UNDP-GEF Kathmandu	Provides funding to carry out research on climate change, water and biodiversity conservation	
USAID and US Embassy	Provides funding to CARE Nepal and other agencies to carry out projects related to climate change	
Embassy of Denmark	Provides funding for UNDP's climate change work - particularly NAPA preparation	
UK/DFID	Provides funding for the preparation of NAPAs	
Finnish Embassy	Provides funding for adaptation projects and for establishing a national forest and carbon baseline for REDD	
World Bank	Provides funding for preparing REDD	

5. CHAPTER V – CONCEPTUAL BUILDING BLOCKS

This chapter sets out to provide the conceptual background USAID/Nepal needs in order to be able to design its programs effectively. It looks at the current state of community forestry in Nepal, new approaches to natural resource management, and options for how and where to focus new forestry/biodiversity/climate change activity. It also demonstrates how an update of the FAA 118/119 Analysis update could provide the information necessary to inform decisions about geographic focus.

Three generations of community forestry

There have been three distinct stages in the development of community forestry in Nepal. First generation community forestry involved the set up and formation of forest user groups. Second generation initiatives helped to make forest user groups more effective by improving governance processes, increasing the provision of basic livelihood benefits, and improving technical forest management. The SAGUN program focused very much on such second generation interventions. Third generation community forestry issues are just emerging, but seem to involve using established and well-functioning user groups to access other revenue streams and to provide services outside their own communities. Third generation activities also focus on building up networks of user groups for joint landscape or watershed level initiatives. While more work is needed on second generation issues in many community forests, USAID should also pursue opportunities for third generation community forest projects as pilot programs or demonstration activities.

Payments for Ecosystem Services (PES)

A major focus of third generation community forestry is revenue generation from payments for ecosystem services (PES). The central concept is that an ecosystem is managed by a forest user group in order to provide environmental services such as water supply, carbon sequestration, and biodiversity conservation. These services have value to people outside the immediate ecosystem so those people are willing to pay for the services once their value has been quantified and recognized. For example, water supply services involve maintaining the functioning of the watershed so that it generates a steady stream of water that is low in silt content, free of excessive chemicals, and that flows steadily without large floods and without drying up. While some such services can be hard to provide consistently, the practice of sound watershed management techniques can significantly improve the quantity and quality of a water supply. Improved watershed management incurs cost as it may require stopping land being used for agricultural production, the planting of trees, or the banning of fertilizers and pesticides. Downstream water users can provide payments which offset those costs and provide some additional revenue to the watershed managers. Carbon sequestration through the maintenance of forest cover and reforestation is another type of PES in which forest managers receive payments to cover the costs of growing and protecting trees. Central to the concept of PES is that, as in any market transaction, payments are linked to the quality and value of the services provided.

Approaches to choosing project sites for biodiversity conservation

Since USAID/Nepal's forestry funding is attributed to the biodiversity conservation earmark, any forestry activities have to demonstrate how their implementation will benefit the conservation of biodiversity. The SAGUN project met this criterion by working with groups inside the buffer zones around protected areas and by working to help groups monitor biodiversity in community forests. Under a new program, USAID could choose to consolidate its activities into one or more landscapes. Landscapes can be chosen and designed to link major protected areas through wildlife corridors, and to protect important ecosystems and biodiversity outside protected areas. Particularly in the mid-hills of Nepal where there are large human populations and few protected areas, the landscape approach may be the only way to conserve important biodiversity. While a landscape approach provides useful synergies and a higher concentration of benefits, one drawback is that each intervention in the landscape must be relevant to the community in which it is based. This means that targets for biodiversity conservation would be different for different areas in the landscape. An alternative or complimentary approach is to focus interventions on biodiversity hotspots and threatened ecosystem types.

One interesting concept for a landscape is to focus on a river corridor all the way from the Terai to the high mountains. For example, in the Narayani river system, the Trishuli River flows from Langtang National Park in the mountains to Chitwan National Park in the Inner Terai. The river goes through Dhading and Gorkha districts, areas where SAGUN focused many of its activities. Depending on funding and focus, the river corridor could be further extended to the Annapurna Conservation Area by incorporating the Seti River, the Kali Gandaki River or the Marsyandi River which ultimately meet in the Trishuli River. Another potential river corridor system is the Koshi in far-east Nepal. A tributary, the Tamur River, which begins in the Kanchenjunga Conservation Area, meets the Arun River and flows down into the Terai. USAID has also supported forest and buffer zone user groups in this part of the country. The final possible watershed is the Karnali River in the west of Nepal which has the advantage of serving a part of the country that is a priority region for the government as it is very remote and underdeveloped and suffers from chronic food deficits. Working on a river corridor program would involve trying to address steep-slope shifting cultivation, a practice engaged in by many marginalized groups. Such groups would then need to be engaged in alternative livelihoods which would be a very challenging task. The river corridor approach has not yet been tried in Nepal and choosing a river corridor to focus on would first require analysis and justification to demonstrate that it is indeed a viable and functioning landscape with biodiversity benefits. An additional benefit of a river corridor approach is that it highlights a very important climate issue – current and future water supply from glaciers and changing precipitation patterns. The project could use a river corridor focus as a platform for raising awareness about climate change vulnerabilities and adaptation options. A list of river corridors in Nepal is given in Appendix 1.

Another potential landscape is the Churia hills. Also called the Siwaliks, they are fragile and young, consisting of easily erodable soils. The hills are rich in biodiversity. Compared to other zones of Nepal, Churia ecosystems have the lowest representation in the protected area system (only 38% of the types of ecosystem found in Churia are protected). Due to large neighboring human populations in the Terai, there is increasing pressure on the Churia hills for forest products and animal grazing. Cycas trees are under threat in Makwanpur district, as are many species of bamboo which have been heavily over-harvested. Khair from the riverine forests is also disappearing. This forest degradation has increased flooding in the Terai and threatens the recharging of important ground water sources on which Terai agriculture, Nepal's breadbasket, depends. In addition, productive and fertile lands in the Terai are being rapidly converted into deserts by widening river banks due to the deforestation and deterioration of forests in the Churia hills (Singh, 2008). Given that the population actually living in the hills is limited and that much of the degradation is caused by distant users, improved Churia hills management will require innovative institutional arrangements for involving people living downstream in the management of upstream conservation and natural resources. This will require creating awareness in the Terai to help people understand the ecological connections between the Churia hills and the plains. A particular challenge to working in the Churia hills is the current political movement for a single Terai state that would not include the hills. If such a state were established, gaining local government support for upstream-downstream cooperation would be

very difficult. If USAID decided to work in the Churia hills at landscape level, the scope of the challenge would require all of its available resources.

Update of the FAA 118/119 Analysis

Conclusions about the most effective way to choose project locations have not been drawn by this assessment due to a lack of available information and data. This issue can be addressed as part of the required update of the USAID/Nepal FAA 118/119 Analysis. We suggest that in addition to the standard update, the 118/119 analysis should collect and review any additional information needed to make future programming decisions. EGAT's Biodiversity Team and Global Climate Change Team can provide help with the scope of work for the 118/119 Analysis. We suggest the update includes an appendix with an extended detailed analysis of biodiversity priorities and threats, broken down by ecozone (Mountains, mid-hills, Churia, plains). There should also be an appendix outlining PES opportunities in watershed areas, demonstrating how they overlap with biodiversity priorities. Suggestions for the content of these appendices can be found below:

Biodiversity Appendix
The current 118/119 analysis does not group biodiversity priorities and threats by ecological zone. This is a serious oversight given the highly diverse nature of Nepal's ecology. We think a new analysis is needed for each eco-zone with particular attention being given to the mid-hills. Given that USAID has supported community forests in the mid-hills and would like to continue working in that area, the work needs to be better targeted to biodiversity priorities such as hotspots, corridors and threatened ecosystems. The nationally and globally important biodiversity that remains in the mid-hills could be more effectively protected and regenerated. These ecosystems are also among the most threatened in Nepal because of the large-scale degradation and deforestation and because there are very few designated protected areas. This analysis should also provide more detailed biodiversity and ecosystem information for river corridors and other landscapes that USAID is considering for program activities.

PES Watershed Appendix
If the Mission is interested in investigating the potential for interventions focusing on payments for watershed services, we suggest that another appendix includes a map of watersheds which currently provide hydropower, irrigation, or municipal water supply and where such projects are proposed. The analysis could then describe any existing payments for watershed services arrangements as well as the potential for new arrangements. The discussion of potential interventions should include feasibility considerations such as the economic and political likelihood of the hydropower or irrigation projects actually being completed, and the underlying conflict issues which might make a PES system difficult to implement. Finally, this analysis should identify the locations where PES watershed opportunities overlap with biodiversity priorities.

6. CHAPTER VI – SAGUN II

The main recommendation of this analysis is that the SAGUN approach should be continued under a SAGUN II program which includes a greater focus on biodiversity and climate change issues and which pilots third generation community forestry interventions like carbon finance and payments for watershed services. Using Democracy & Governance funds, SAGUN II would also extend lessons and practices of good governance to non-forestry sectors.

Objectives

SAGUN II would have the following overriding objectives:

- To consolidate and extend the second generation governance and livelihoods benefits in existing and new buffer zones and community forest user groups

- To optimize community forest production and benefits per unit area
- To reduce the pressure on Nepal's forests and to conserve threatened ecosystems and species inside and outside protected areas
- To strengthen national forest policy to ensure continued support for community NRM rights
- To pilot third generation community forestry practices like PES
- To mitigate the negative effects of climate change and build adaptive capacity
- To bring good governance practices to non-forest community groups and VDC/DDC appointed/elected officials
- To build experience with issues-based advocacy as opposed to personality politics

Rationale

SAGUN has demonstrated how to bring improved governance to natural resource management through key practices like public audits, participatory wealth ranking, livelihood plans, livelihoods support, and governance education. This has proven to be an effective package not only for CFUGs but also for irrigation groups and hydropower groups. SAGUN inspired practices have even been used in VDC decision-making and applied to the setting of school budgets. Communities have recognized the value of such practices and are requesting similar support in new locations. SAGUN also supported the strengthening of national federations which have successfully brought local issues to national prominence, and helped to benefit local resource management throughout Nepal. At the same time, SAGUN provided training to forest users on improved forest management techniques and on biodiversity monitoring.

It makes sense to continue with these proven approaches and to monitor interventions closely for local sustainability. There are also many forest and buffer zone user groups that were not part of SAGUN who could benefit from SAGUN II. Although SAGUN began the process of addressing second generation community forestry issues, continued support is needed.

SAGUN II needs to set out clear and detailed biodiversity and climate change objectives and benefits. In order for such a project to succeed, the capacity of communities to monitor biodiversity needs to be strengthened; for example, the tracking of key indicator species is only currently carried out in some buffer zones. In SAGUN II these methods can be shared with GON staff and can be codified in community forestry guidelines, operational plans, and manuals. Biodiversity registration can provide a baseline against which to judge progress which can provide input into the operational plans for forests. In addition, there is the potential for forests to provide important water regulation services as climate change causes increasing water stress and variability. The project should also estimate carbon emission reductions and sequestration likely to occur as a result of its activities. Finally, the project should seek to pursue multiple approaches that reduce fuel wood usage and document this result with indicators, thus relieving pressures on forests and potentially reducing CO_2 emissions. Piloting carbon financing for forest user groups would be one way to address climate change and reduce the pressure on forests.

In this time of political transition, it is also essential to support forest user federations and the GON forest planning process to make sure community natural resource management rights are respected and that third generation community forestry issues like PES are supported by national policies. Part of this task is to support dialogue on ways to manage Terai forests in a participatory way, considering the issues of distant users and the strengths and weaknesses of community forestry, collaborative forest management, and leasehold forestry in the Terai.

It is logical to call on the strong base of well governed forest user groups to participate in third generation community forestry projects such as PES. At a time when the impacts of climate change and the need to mitigate climate change are becoming high priority issues, these third generation approaches provide an opportunity to demonstrate how addressing climate change can also bring economic development and natural resource conservation to Nepal.

If funds are available, SAGUN II will extend the lessons of good governance to non-forest sector decision making bodies. SAGUN was successful in addressing governance issues of transparency, accountability, inclusion and livelihoods with community forest user groups and these practices can be extended to other natural resource management groups such as soil conservation groups, water user groups, irrigation groups, school management committees, wetland management committees, and others. These methods can also be useful VDC and DDC budget processes. While there are many programs (including those funded by USAID) seeking to bring greater transparency and accountability to local government, these are usually designed to provide support and training to local government officials. The SAGUN II approach is different, as it would work with community groups to help them bring grassroots and civil society pressure on local government to improve its governance. In fact, without this grassroots pressure, the top-down governance reforms are unlikely to work. SAGUN II would also seek to expand the issues based advocacy approach, piloted by FECOFUN for the forest sector, to other sectors as an alternative to divisive, personality based politics.

Main Activities 1
Second Generation Community Forestry Components

Governance of community forestry

This activity would continue supporting key practices like public audits, participatory wealth ranking, livelihood plans, livelihoods support, and governance education. The project would continue to support user groups involved in SAGUN provided they are located in the target geographic area(s) of the new project. Leaders from those groups, as well as local FECOFUN leaders, would reach out to new forest management and buffer zone groups in order to ensure that 95% of all forest management groups in the target area benefit from the program. The project would also bring good governance practices to those forests in the target area managed by leasehold or CFM systems. Training should be conducted on governance and livelihoods methods for local government forestry and conservation staff so that they could understand and mainstream the practices. National trainings and seminars would be held for other NGOs and government employees to scale up the impact nationally. The project would conduct periodic follow-up interviews with participants to gauge how the training has impacted on their practices.

Livelihoods and forest conservation

Experience has shown that unless communities receive livelihoods benefits for doing so, they are unlikely to maintain forest conservation activities. Some of these improved livelihoods can also directly reduce pressures on the forest. Where appropriate, communities should focus on livelihoods support for the poor as identified through a participatory well-being ranking. Many of these livelihood approaches were begun by SAGUN and should be continued in SAGUN II. These could include:

1) Promoting ecotourism in under-visited protected areas and unique ecosystems (such as rhododendron forests). Implementing revenue sharing schemes and setting up local tourism businesses.
2) Supporting sustainable NTFP production and value-added processing in exchange for community commitment to biodiversity conservation.
3) Supporting alternative energy (biogas, solar, more efficient cooking stoves, and bio-briquettes) as a way of reducing the pressure on forests. Subsidies should be provided on a declining scale and based on the results of a participatory wealth ranking with the poorest households receiving a 100% subsidy.
4) Setting up revolving funds to pay for goats, chickens, buffalos, or cows and/or other income generating activities for poor households. Assisting with the set up of stall feeding systems and fodder provision strategies will help to reduce pressure on the forests.
5) Adopting the practice of leasehold forestry in community forests by allocating some community forest land to the poorest households.

Forest management techniques for forest productivity, biodiversity conservation, and climate resiliency

Most of the forests in Nepal are understocked due to a lack of effective space management. National and community forest areas tend to be either too dense or barren. There is the potential for doubling the per unit area production and benefits for community and national forests within a 5-10 year period for both timber and NTFPs. In addition to space management issues, in order for community forests to conserve biodiversity, specific ecosystem management approaches that support biodiversity need to be developed and disseminated. Finally, forest management which builds climate resiliency is needed to combat and mitigate the effects of climate change. In order to address these issues, the project would establish action research sites involving communities from each eco-region. The function of each research site would be to:

1) Demonstrate (and document) how to achieve optimal production in the different ecological zones by using horizontal and vertical space management.
2) Incorporate practices that benefit biodiversity, such as using mixed native species and preserving the structure of ecosystems.
3) Manage sites with a view towards potential climate change, favoring species or varieties of species that are better adapted to warmer temperatures and variable rainfall, and promoting cultural practices that minimize the impact of climate change (such as the need to control increased erosion, and to maximize soil moisture retention).
4) Capture accurate data on the carbon sequestration rates of native species for use in forest carbon projects.
5) Propose changes to the content of forest operational plans to include descriptions of how communities can achieve the objectives of optimizing productivity, conserving biodiversity, building adaptive capacity to climate change, and measuring carbon biomass.
6) Initiate a series of workshops and training activities to enable local people and national experts to share their knowledge so that best practice can be implemented on a wider scale.

Incorporating biodiversity conservation into community forestry

If community forestry activities are to be funded from biodiversity budgets, they need to better address the issue of biodiversity conservation. This would require the following components:

1) Try to target community forestry interventions in locations with significant biodiversity such as biodiversity hotspots, primary forests, biodiversity corridors, and the buffer zones of significant biodiversity areas. Doing this will require a detailed mid-hills assessment of biodiversity priorities. These targeted interventions may be complemented by support to forests which are not in hotspots, but which contribute to the overall integrity of a landscape.
2) Develop and implement systematic participatory biodiversity monitoring and registration that can easily be conducted at a low cost by local communities.
3) Use CFUGs to pilot a threats-based approach to biodiversity conservation in selected communities. This requires communities to identify key biodiversity targets, the threats to those targets, the actions that can be taken to reduce those threats, and the indicators for success in reducing those threats.
4) An additional element of the threats-based approach is to pilot the development and implementation of zoning practices within community forests. This helps to identify specific biodiversity targets for specific areas of forest.
5) Collect and collate all existing GIS data on ecosystems and biodiversity in Nepal and compile an online Atlas of Biodiversity. Fill in the gaps by consulting research publications and country experts. This, along with downscaled climate data, can be used to conduct a vulnerability analysis for biodiversity in Nepal. The recently completed report "Potential Impacts of Climate Change on Biodiversity" written by CATHALAC for the Central America region provides an excellent model. The report can be found at: http://www.teamservir.net/2008/09/potential-impacts-of-climate-change-on.html

6) Work with the GON and other donors to develop a national forest biodiversity monitoring and registration database. The database can then be populated with information collected by communities in USAID project areas.
(*NB: Given the lack of legislation on the rights to indigenous knowledge, it may be controversial to put indigenous knowledge into a government database, although it will certainly benefit communities who collect it for their own use.)*
7) Develop and implement silviculture and other techniques which can be used to maintain and enhance biodiversity targets.

Incorporating Climate Change Indicators and GCC Objectives

USAID now requires the use of Global Climate Change (GCC) indicators in order to attribute costs to the climate change earmark. Projects should also have explicit GCC objectives. EGAT's GCC Team can provide technical support on how to measure these indicators. The GGC indicators relevant to SAGUN II are listed below with the CO_2 indicators being particularly important.

- Quantity of greenhouse gas emissions, measured in metric tons of CO_2 equivalent, reduced or sequestered as a result of United States Government (USG) assistance in the energy and industrial sectors;
- Quantity of greenhouse gas emissions, measured in metric tons of CO_2 equivalent, reduced or sequestered as a result of USG assistance in the natural resource management, agriculture, and/or biodiversity sectors;
- Number of laws, policies, agreements, or regulations addressing climate change proposed, adopted, or implemented as a result of USG assistance;
- Number of people receiving USG supported training in global climate change topics including the framework of the convention on climate change, greenhouse gas inventories, mitigation, and adaptation analysis;
- Number of people with increased adaptive capacity to cope with impacts of climate variability and change as a result of USG assistance.

Strengthening national user federations, national policy development, and the GON's capacity for forest planning

Since Nepal is in political transition, it is important to make sure that the success achieved in community based natural resource management is codified and built upon. The current politics surrounding the design of a new federal system could have profound effects on the ability of communities to continue effective natural resource management. Of particular concern is how the Terai forest resources will be allocated and managed in the new system. This component of the project contains the following elements:

1) Continue to support FECOFUN, Himawanti and other federations in their bid to ensure that community rights to natural resources are safeguarded in both the constitutional and federal processes, and in any new government policies or regulations. The division of the country into federal states could generate conflict over natural resources which could be mitigated or resolved by such civil society groups.
2) Facilitate a policy level dialogue on management options for forest areas in the Terai. There have been conflicts in the past about whether to apply the community forest model, the collaborative forest management model, or the leasehold forest model. In reality, a combination of these approaches or perhaps a new hybrid model would work best. As a neutral facilitator, the project would formally and informally bring together key actors to find a resolution to the issue. Given the extreme political sensitivities, this may prove to be a significant challenge.
3) Build capacity in the GON for forest planning. Use Nepali experts to analyze the federal process and how it relates to the MPFS, which was prepared in 1988, approved in 1989, and is going to expire in 2011. The analysis should identify areas needing attention and development prior to the creation of a new MPFS. This should be a facilitated analysis, involving as many stakeholders as

possible in order to build awareness of forestry issues among a large constituency. If appropriate, USFS forest planning experts could be brought in to offer training on forest and protected area planning. Training materials should focus on the topics that the GON has identified as priorities and on topics in Nepal's existing forest sector plans which need a stronger focus. USFS can draw and build on similar training carried out in Liberia and the Democratic Republic of Congo. USFS experts should be ready to participate in the development of a new MPFS if requested to do so by the GON.

Main Activities II
Third Generation Community Forestry Components

PES1 - Forest carbon pilot projects

USG funds cannot currently be used for CDM projects under the Kyoto Protocol, but they can be used to support carbon projects in voluntary markets. In fact, voluntary markets are generally more flexible. There are several challenges in developing forest carbon projects here: To obtain carbon credit, a project usually has to demonstrate that it is providing "additional" carbon benefits to offset the investment. In the case of planting new trees, this is simple to demonstrate, but for projects which focus on the sustainable management of existing forest it is more difficult to prove. In addition, Nepal contains many forest types each of which has its own carbon biomass and set of accumulation rates; currently, there is very little available scientific data on carbon accumulation in natural regeneration - the primary method used in Nepal's community forests. Despite these challenges, several forest carbon projects have already begun in Nepal and the GON sees this as a priority area. USAID could support demonstration and pilot activities that would seek to overcome the above challenges, and thus open up a large new funding opportunity to Nepal's forest communities. A forest carbon project would contain the following components:

1) Aggregation (bundling) of the carbon from a number of community forests in the same area so as to provide a large enough amount of carbon to sell and so as to have economies of scale in terms of methodology and management.
2) For biodiversity funding, projects would need to target forests which have been identified as meeting biodiversity conservation objectives. For example, WWF is promoting Tiger Carbon, which seeks to restore riverine forests that are a crucial tiger habitat.
3) Research on carbon storage and accumulation rates in project forests. USAID partner RIMS already has useful data on this.
4) Development of carbon accounting methodology and a project design document.
5) Reaching a benefit sharing agreement with local communities.
6) Identifying potential buyers for carbon credits and making the sale.
7) Policy dialogue on carbon forest projects with the GON to ensure that policy is supportive of community efforts.
8) Coordination with other donors and NGOs attempting similar projects (WWF, DFID's LFP etc) in order to share data and lessons learned.

PES2 – Payments for Watershed Services

Many sectors in Nepal rely on a steady supply of clean water – agricultural users need it for irrigation, hydropower providers need it to generate electricity, and municipalities need it for household and industrial use. Supply depends on a well-functioning upstream ecosystem. Forests help to store and filter water, releasing it slowly over time. In Nepal, community forest user groups could be organized into watershed associations who could then develop plans to improve forest cover and land management in ways that enhance watershed functioning. They could then receive payments from downstream users. There have been a number of successful programs of this type in other countries – USAID supports a PES project in Vietnam implemented by Winrock International which not only generates local income, but has also led to the passing of a national PES law. A project in Nepal would have the following components:

1) Choose watersheds that meet biodiversity criteria and are in locations where water users are likely to be willing to pay for watershed protection services. Downstream users could include hydro-power systems, users of major irrigation systems, and municipalities. It is recommended that the updated FAA 118/119 Analysis include a section on priority watershed opportunities.
2) Organize CFUGs and other forestry sector groups (leasehold groups, soil conservation groups, private planting groups, etc.) in a watershed area into a watershed association. This association would conduct watershed mapping and resource identification, and assist in the identification of areas of the watershed which are sources of siltation and runoff or which are currently providing important soil and water protection.
3) Conduct analyses of climate change impacts on water flows in the watershed and design interventions to address the impacts.
4) Armed with this information, the community can interface with a downstream water user to negotiate payments for watershed protection and enhancement.
5) Communities would also be educated on their rights under the initial environmental examination (IEE) and environmental impact assessment (EIA) processes (i.e. to be consulted and, if necessary, compensated for impacts resulting from infrastructure development). This education process would need to be very clear on the difference between compensation for impacts and payments for watershed protection.
6) Support the development of a national policy on Payments for Ecosystem Services. This is urgently needed given the Government of Nepal's intention to develop numerous large- and small-scale hydropower projects.

Alternative energy carbon projects to reduce pressure on forests

In Nepal, 95.5% of households in the mountains, 72.3% of households in the mid-hills and 55.6% of households in the Terai use fuel-wood for cooking (CBS, 2001). Much of this wood comes from nearby forests. WWF Nepal has reduced pressure on forests near Chitwan National Park by creating a "biogas village" with 82 biogas plants providing poor households with fuel for cooking. The GON's Alternative Energy Promotion Center (AEPC) has obtained carbon finance through the CDM to subsidize large numbers of biogas plants and is finalizing a CDM carbon project to finance micro-hydropower plants. USAID could pursue a similar opportunity, through the voluntary market, to support alternative energy in locations where it will reduce pressure on forests. Given USAID's relatively small budget, this approach would be cost-effective, providing a relatively large number of households with alternative energy sources which in turn supports forest conservation objectives. The intervention would have the following components:

1) Aggregation (bundling) of the carbon from a number of communities in the same area so as to provide a large enough amount of carbon to sell.
2) Focus on biogas and micro-hydro projects and use carbon accounting methodologies that have already been produced and approved for Nepal by AEPC. Help to develop methodologies for bio-briquette, smokeless stove, and solar projects.
3) Demonstrate a more sustainable business-based approach by having communities take out bank loans (guaranteed by community collateral) to fund each alternative energy project. Use carbon finance to reduce the bank interest rates and to subsidize participation by poorer households. Surplus carbon income would go into a revolving fund for initiating new energy projects and for the maintenance of current ones.
4) Target poor and marginalized households who are often the last to benefit from alternative energy projects because they cannot raise the required matching funds. The project may have to provide a 100% subsidy to the poorest households.
5) Create income generating opportunities for the poor and marginalized, either by helping them establish alternative energy maintenance and construction businesses, or by helping to provide them with clean energy sources for other livelihoods activities (such as flour grinding) that require energy/fuel.

6) Biodiversity funding obliges projects to demonstrate a reduction in fuel wood harvesting in biodiverse forests by using a pre-determined indicator. In addition, in exchange for receiving alternative energy, communities would commit to undertake biodiversity conservation in their forests.
7) The development of a project design document and arranging for the sale of carbon credits.
8) Policy dialogue with the GON regarding alternative energy carbon projects to encourage their promotion and use in locations where they reduce pressure on native forests, and advocacy for the benefit sharing of carbon revenues with local communities.
9) Coordination with other donors and NGOs attempting similar projects in order to share data and lessons learned.
10) (Optional component) Starting a national awareness campaign to promote alternative energy as a way of reducing pressure on forests. Working with the GON to set a national strategy (with targets and measurable indicators) for reduced fuel wood use.

Main Activities III
Extending Good Governance beyond the Forest Sector

SAGUN II would take the practices of public audits, participatory wealth ranking, livelihood planning, livelihoods support, and governance education beyond the forest sector. Within the targeted geographic region, the project would work with soil conservation groups, water user groups, irrigation groups, school management committees, cooperative societies, and others to promote good governance. It would also work with local communities to demand that VDC and DDC appointed and elected officials follow these practices. SAGUN has demonstrated that this can work, and SAGUN II would expand those efforts significantly.

SAGUN, through its support for FECOFUN, helped communities identify the issues they care about and then ask political candidates to make commitments to address those issues in exchange for their vote. This took advocacy beyond party political or ethnic/religious focus towards a focus on issues of common concern to people dependent on the forest for their livelihoods. SAGUN II would consolidate this approach and expand it to other sectors such as health and education. Specific activities include:

1) Teach good governance practices to non-forest community groups such as soil conservation groups, water user groups, irrigation groups, school management committees, cooperative societies, and others. This process can involve local community forest group members in delivering outreach programs.
2) Expand good governance practices to VDC and DDC budgeting, planning, and implementation processes in order to insure greater transparency and development impact for marginalized groups and women. While many other donors are planning to support local government directly, this activity would bring the necessary oversight from local people into the process. Without civil society and grassroots pressure and accountability, the contributions from other donors and from other USAID governance programs will be less effective and possibly even damaging.
3) When local elections have been held, provide awareness raising, training and advocacy services to put pressure on local elected officials to adopt good governance practices.
4) Seek to continually strengthen grassroots level-national level links to provide opportunities for local communities to directly share their good governance practices and their issues of concern. This would put pressure on those further up the hierarchy to adopt similar governance practices and encourage them to be responsive to grassroots concerns.
5) Help national natural resource federations and local groups to develop and practice issue-based political advocacy as an alternative to personality-based politics. Create opportunities for sharing these approaches with other civil society sectors such as health and education. Provide training to civil society groups in conflict resolution and negotiation as an alternative to violence.

Table 10: Summary of SAGUN II activity design

Objectives	Activities	Outputs	Outcomes
• To consolidate and extend second generation governance and livelihoods benefits in existing and new buffer zone and community forest user groups • To optimize production and benefits per unit area from community forests • To reduce pressure on forests and conserve threatened ecosystems and species inside and outside protected areas. • To strengthen national forest policy to ensure continued support for community NRM rights • To pilot third generation community forestry projects such as PES • To mitigate climate change and build adaptive capacity • To bring good governance practices to other types of (non-forest) community groups and to VDC/DDC appointed and elected officials • To build experience with issues-based advocacy as opposed to personality based politics	• Support good governance and livelihoods activities in forest user groups • Use action research sites to develop, demonstrate, and disseminate forest management methods to optimize forest productivity, biodiversity conservation, and climate change resiliency • Choose project locations with biodiversity importance and promote the use of a threats-based approach by community forest users • Set climate change objectives and measure progress with GCC standard indicators • Support national forest federations, facilitate a process to resolve Terai forest management issues, and build capacity in Ministry and Department of Forests to prepare the next MPFS • Set up forest carbon pilot projects in community forests • Set up payments for watershed services projects in selected watersheds • Initiate dialogue on national PES policy • Implement alternative energy carbon projects to reduce pressure on forests • Share good governance practices with other grassroots user groups and encourage grassroots demands to have those practices applied to VDC/DDC decision making	• Forest user groups trained in good governance and livelihoods practices • Methods demonstrated help to optimize forest productivity, conserve biodiversity, and increase climate resiliency • Data collected on forest carbon storage and accumulation rates by different native tree species and ecosystems • Communities have developed and implemented threats-based biodiversity plans • Regular monitoring data collected for climate change indicators • Terai forest management seminar held • Ministry/Dept of Forests staff trained in forest sector planning • Forest carbon pilot projects established • Payments for watershed services systems established • Biogas and hydropower carbon projects implemented • Communities hold meetings with VDC/DDC officials to demand they follow specific good governance practices	• Misused funds recovered by user groups • Poorest community members receive financial support from user groups for livelihood activities • Community groups practice improved productivity, biodiversity, and climate resiliency practices in their forests • Measurable reduction in community-identified threats to biodiversity in their forests • CO_2 emissions reduced or sequestered through forest and energy projects • Individuals have increased adaptive capacity to climate change • FECOFUN and CFM agree on a path forward for Terai forest management • Key concepts from USAID training are included in the draft MPFS • Communities receive carbon finance payments/benefits • Communities receive watershed services payments/benefits • Biodiverse forest cover increases as a result of PES activities • Use of alternative energy causes a measurable reduction in fuel wood harvesting from forests • Poor households receive additional income as a result of alternative energy projects • GON drafts a policy on PES • Budget decisions taken by VDC/DDC officials change as a result of good governance practices

7. CHAPTER VI – OTHER USAID/NEPAL OPPORTUNITIES

In addition to SAGUN II, there are a number of other activities or actions for USAID to consider. All of these include aspects of climate change adaptation.

USAID's Adaptation Guidance Manual states, "Adaptations are actions taken to help communities and ecosystems moderate, cope with, or take advantage of actual or expected changes in climate conditions. Adaptation is about enabling people to manage the risks that arise from climate change. It is about investing in basic infrastructure and programs to protect us against the effects of climate change. Successful adaptation planning includes information for effective planning, infrastructure for climate proofing, insurance for social risk management and poverty reduction, and institutions for disaster risk management" (USAID, 2007).

USAID's approach emphasizes that adaptation is a cross-cutting issue (like gender) that should be mainstreamed into all development programs to the extent that those programs may be affected by climate change impacts. While not all of the ideas below are primarily concerned with adaptation, they all include one or more climate adaptation components. The ideas cover the health, agriculture, water, disaster prevention, and energy sectors. In addition to specific project activities, it is also important for USAID to become more engaged in donor and GON policy dialogue on climate change. All of these opportunities are described briefly below and all will require further elaboration if they are to be pursued.

Participation in GON policy dialogue on climate change
Other donor agencies and the GON are engaged in a number of climate change related processes that USAID should track and participate in wherever possible. The two most important are the developments related to Reducing Emissions from Deforestation and Degradation (REDD), and the National Adaptation Program of Action (NAPA). These two processes will be setting national policies and priorities related to the forest sector and will determine Nepal's response to climate change. Both processes will include assessments of donor funded climate change initiatives and how these could support government priorities. If nothing else, USAID needs to make sure that its ongoing programs receive recognition in these documents for the contribution they are making to addressing climate change in Nepal. These forums will also be important for donor coordination.

Climate change impacts on health
Increasing temperatures and changing precipitation patterns are leading to expanding ranges of mosquitoes that carry malaria, Japanese encephalitis, and other diseases. Although USAID/Nepal does not currently have malaria funding, it does sit on the advisory committee for the Global Fund in Nepal. USAID could advocate that funds be used to analyze the impact of climate change on disease distribution now and in the future, and to incorporate those analyses into planning and priority setting. Climate change may also be contributing to flooding and other natural disasters in Nepal which have obvious health consequences. As flooding becomes more common, USAID may wish to develop sanitation programs that help at-risk communities to be better prepared for water contamination problems. It would be wise for USAID/Nepal and DCHA to jointly prepare a strategy for responding to the health impacts of increased flooding. Finally, there are close links between health and nutrition and agriculture. As climate change affects agricultural production, problems related to nutrition may arise. There may be opportunities for joint nutrition/agriculture activities that are designed to promote adaptation to a changing climate.

Agricultural resilience to climate change:

As the Mission designs its next agriculture program, it is imperative that climate change impacts be considered and addressed. There is consensus that temperatures in Nepal are increasing, especially in the high mountains, and there also appear to be changes in precipitation patterns. Precipitation changes appear to include a higher incidence of extreme weather – rain comes in more intense deluges or not at all. It may also be the case that the Monsoon season overall is getting wetter and the dry season is getting drier. The timing and length of seasons may also be changing. It is recommended that USAID coordinate with DANIDA which is supporting the GON Department of Hydrology and Meteorology in its efforts to analyze historical weather patterns and calculate possible future changes. As part of designing follow-on agriculture projects, the Mission should commission a climate change vulnerability and adaptation analysis for the agricultural sector, with particular focus on those aspects which the Mission is considering supporting.

The USAID/EGAT Global Climate Change (GCC) Team has produced a guidance manual on this process and can provide assistance in carrying it out. Likely interventions identified by such an analysis could include:

1) Soil conservation practices that maintain ground cover to protect against erosion from heavy rains and that build up soil organic matter to hold moisture during dry periods.
2) Promotion of new crop varieties in areas where existing crops are vulnerable to changing temperature or precipitation.
3) Changes to pest and disease management practices which respond to new threats.
4) Improvements to irrigation systems in areas where water stress or precipitation changes are likely. This might also include the promotion of rainwater harvesting and storage ponds.
5) Provide support to the National Agricultural Research Center (NARC) to help it to identify and promote crop varieties that are more climate resilient and to identify cultural practices that support climate adaptation.
6) Conduct studies of how local farmers are already implementing adaptations to a changing climate. Dissemination of these learnings to others.

Cumulative impacts on ecosystems by major infrastructure

An area of biodiversity conservation largely neglected in Nepal is the impact of major infrastructure on ecosystems. The Mission could support a study of the possible cumulative biodiversity impacts of proposed hydropower and roads development in Nepal. The study would look at these issues in the context of current and anticipated climate change that may increase the environmental impacts of infrastructure projects and require the modification of infrastructure design and placement. There may also be opportunities to achieve useful adaptations (e.g. water storage and flow regulation) through certain infrastructure developments. Key questions for such a study to raise would be: How will river system dynamics be affected by multiple dams? Will a new East-West highway cause the deforestation of key forest areas? Are the cumulative impacts of roads and dams greater on certain types of threatened ecosystem and species? What effect will infrastructure development impacts combined with the impacts of climate change have on water availability?

While Nepal has clear policies for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for individual projects (Environment Protection Act 1996 and Environmental Protection Regulation, 1997), there is no provision for examining the combined impact of a range of projects. As far as we know, no such study has been carried out in Nepal. The USAID study would provide a detailed rationale for why and where such cumulative impacts assessments are needed, and it would outline the required content of such assessments. The process of report preparation should include reaching out to the respective ministries and departments with authority over roads and energy to obtain their constructive engagement. The World Bank, ADB, and other financiers would also need to be consulted. Once the study is completed, USAID should support advocacy and awareness raising and the dissemination of the study results. Lessons could be learned from USAID experience with community and NGO

advocacy in the Amazon region. USAID/EGAT staff are also involved in giving oversight on the environmental impacts of World Bank projects and should be consulted about the design of such activity. Components would include:

1) A review of the literature on the environmental and social impacts of multiple dams on one river system and the environmental and social impacts of road networks.
2) An analysis, with examples, of the possible impacts of planned infrastructure developments in Nepal. This analysis would contain the level of detail of an EIA but through specific local examples, would provide the rationale for why and where such types of systemic impact analyses should be done.
3) An analysis of the likely climate change impacts on planned developments and on how infrastructure impacts and climate change impacts may jointly affect Nepal's ecosystems.
4) Recommendations for a series of detailed impact analyses. This would prioritize the order in which infrastructure development reviews should be carried out and would describe the topics that such assessments should address.
5) Give the report a high profile public release and provide training to advocacy groups on how they can use the report and the IEE and EIA processes to achieve biodiversity conservation goals. Hold workshops and forums where government and civil society can discuss the issues.

A Himalayan SERVIR Hub for Disaster Preparedness and Response

USAID supported the creation of the first SERVIR, a regional geographic information center in Central America, which provides web-based decision making tools including real time forest fire tracking, weather forecasts, flood and landslide warnings, future climate change projections, and land use/land cover information. The second SERVIR hub is currently being set up in Africa. A Himalayan or South Asian hub would be an ideal next step and could be housed in Nepal. USAID/DCHA is already providing flood warning and weather forecast data through ICIMOD so it might be possible to simply expand that initiative. USAID/DCHA, USAID/Nepal, USAID/Bangladesh, USAID/India, and USAID/RDMA could jointly sponsor a SERVIR hub that would include not only weather and disaster information, but could also hold deforestation data and forest cover maps, wind maps for windpower development, maps of hydropower potential and plans, climate change predictions, historical weather information, and a great deal more. The strength of SERVIR is that it is a one-stop shop with an easy-to-use but very powerful graphical interface. We shared the concept of SERVIR with DFID in Kathmandu and they were very excited, so it might be possible to make it a multi-donor initiative that supports Nepal's National Adaptation Plan of Action (NAPA). Key contacts for SERVIR are Carrie Stokes and John Furlow at USAID/EGAT.

USAID/Nepal Clean Energy Strategy

The Mission should consider preparing a clean energy strategy that includes a comprehensive package of policy and field actions. Given Nepal's reliance on hydropower, the strategy should include discussion on how melting glaciers and changing monsoon patterns may affect energy production. Of particular interest would be identifying components of the strategy that could be implemented with other funding streams such as the water earmark, the biodiversity earmark or the micro-enterprise earmark. We suggest the plan be prepared with assistance from the EGAT/Energy Team and the EGAT/GCC Team. Although the Mission does not currently have energy funding, it would be wise to have a plan ready in case opportunities arise to obtain such funding.

Table 11: Summary of other USAID/Nepal opportunities

Objective	Activities	Outputs	Outcomes
Health: To adjust health programming so it considers and addresses climate change impacts	• Encourage the Global Fund to map current and future disease distributions in Nepal factoring in climate change • Prepare a USAID/Nepal strategy for responding to the health impacts of increased flooding	• Maps of the current and future distribution of climate sensitive diseases like malaria and Japanese encephalitis • A strategy for responding to the health impacts of floods	• Awareness raised among health practitioners about how they will need to adapt/modify their malaria programs • Adoption of improved sanitation practices during floods
Agriculture: To build resiliency against potential climate change impacts on agriculture	• Conduct an agricultural sector climate vulnerability and adaptation analysis • Design new agricultural activity to build resiliency to climate variability and change • Implement agricultural projects	• Farmers and extension workers trained in climate resilient agricultural techniques • A manual/guidebook on climate resilient agriculture in Nepal	• Farmers practicing agricultural techniques promoted by the project to provide adaptive benefits • Farmers growing crop varieties that are better adapted to changing climate conditions
Infrastructure: To raise awareness of the need to consider the cumulative ecological impacts of major infrastructure projects such as dams and roads	• Commission a study outlining the likely cumulative impacts of major infrastructure development on biodiversity and ecosystem function, taking into account concomitant climate change impacts • Disseminate report and help civil society engage with government to address concerns	• Infrastructure impacts study • Civil society trained in advocacy around the impacts of infrastructure on ecosystems • GON and civil society dialogue on addressing the cumulative impacts of infrastructure on ecosystems	• GON strategies and plans for major infrastructure projects incorporate an analysis of climate change impacts and opportunities • World Bank and ADB conduct studies of the cumulative impact of dams on major river corridors
Disasters: To provide regional geographic information and decision support tools for disaster preparedness, sustainable development, and biodiversity conservation	• Working with other regional USAID operating units, jointly set up a South Asia or Himalaya SERVIR hub equipped with regionally appropriate decision support tools	• Decision support tools are ready to use on the SERVIR site	• GON uses SERVIR to forecast weather and direct disaster response
Energy: To outline priorities for USAID/Nepal's future energy projects	• Create a clean energy strategy for USAID/Nepal	• Prioritized list of possible clean energy activities along with a funding strategy	• USAID/Nepal supports to implement clean energy activities

8. REFERENCES

BPP (1995) Biodiversity Profile of the Terai and Siwaliks Physiographic Zones. His Majesty's Government of Nepal/Government of the Netherlands. Technical Publication No. 12.

CARE Nepal (2007) SAGUN Annual Performance Report, submitted to the USAID, January 2007 - September 2007, Kathmandu, Nepal.

CARE Nepal (2007) SAGUN Annual Performance Report, submitted to the USAID, October 2005 - September 2006, , Kathmandu, Nepal

CARE Nepal (2008) Churia Area Program Strategy, Kathmandu, Nepal

CBS (2001) Central Bureau of Statistics, HMGN, Kathmandu, Nepal.

CLACC (2004) Capacity Strengthening in the Least Development Countries (LDCs) for Adaptation to Climate Change (CLACC Nepal, 2004), International Institute for Environment and Development, Bangladesh Center for Advance Studies (BCAS).

DANIDA (2008) Climate Change Screening of Danish Development Cooperation with Nepal, Kathmandu.

Development and Climate Change in Nepal: Focus on Water Resources and Hydropower (2003), *inter alia* other relevant documents were also reviewed for climate change. In forestry sector, the

DFRS (1993) Deforestation in the Terai (1978-1992), Department of Forest Research and Survey, Kathmandu, Nepal.

DFRS (1999) Forest Resources of Nepal (1987-1998),), Department of Forest Research and Survey, Kathmandu, Nepal.

DNPWC (2006) Annual Report (2005-2006), Department of National Parks and Wildlife conservation, Kathmandu, Nepal.

DNPWC (2007) Tiger Conservation Action Plan for Nepal 2008-2012), Department of National Parks and Wildlife conservation, Kathmandu, Nepal.

DNPWC (2008) Wildlife Nepal Newsletter (Rhino Count 2008), Year 18, Baishakh 2065 B.S. (April-May 2008), National Parks and Wildlife conservation, Kathmandu, Nepal.

Finnish Embassy (2008) Identification Mission of Finnish Support to Forest Sector Development in Nepal, Final Report.

FY 2007 Operational Plan and Budget of the USAID, Kathmandu, Nepal

Gulati, N. K. (1981) A Glossary of Forestry Terms. Dehra Dun, India.

Hardin, G. (1968) The Tragedy of Commons. *Science* 162: 1243-1248.

ICIMOD (2007) Climate Change and the Himalayas: More Vulnerable Mountain Livelihoods, Erratic Shits in Climate Change for the Region and the World, Kathmandu.

ICIMOD (2007) The Melting Himalayas: Regional Challenges and Local Impacts on Climate Change on Mountain Ecosystems and Livelihoods, Kathmandu, Technical Paper.

ICIMOD/UNEP (2001) Inventory of Glaciers, Glacier Lakes and Glacial Lake Outburst Floods, Monitoring and Early Warming System in the Hindu Kush-Himalayan Region. Kathmandu, Nepal, ICIMOD/UNEP: 247.

IDS (2006) Adapting to Climate Change: Challenges and Opportunities for the Development Communities, UK.

IPCC (1996) Report of the Twelfth Session, Mexico City, 11-13 September 1996.

ITTO (1992) Criteria for the Measurement of Sustainable Tropical Forest Management. International Tropical Timber Organization (ITTO), Japan. ITTO Policy Development Series No. 3.

ITTO (1999) Guidelines for Developing, Testing and Selecting Criteria and Indicators for the Sustainable Forest Management. International Tropical Timber Organization (ITTO), Japan. ITTO The Criteria and Indicator Toolbox Series No. 1.

LFLP (2008) Status of the Leasehold Forestry Groups, Leasehold Forestry and Livestock Program, Kathmandu.

LRMP (1986) Land Resource Mapping Project, Survey Department, HMGN and Kenting Earth Sciences, Kathmandu, Nepal.

Lynch, O. J. (1998) Law, Pluralism and the Promotion of Sustainable Community-based Forest Management, *UNASYLVA*, 194, 1998/3.

MEA (2003) "Ecosystems and Human Wellbeing: A Framework for Millennium Ecosystem Assessment". World Resource Institute, Washington, D.C.

MFSC (2006) Nepal Biodiversity Strategy Implementation Plan (2006-2010), Ministry of Forest and Soil Conservation/UNDP-GEF, Kathmandu, Nepal.
MFSC (2006) Nepal Third National Report to the Convention on Biological Diversity, HMGN/Ministry of Forest and Soil Conservation, March 2006.
MFSC (2007) Working Group Report of Forestry Sector Democratization (2007), Ministry of Forest and Soil Conservation, Kathmandu
MFSC (2008) The Forest Carbon Partnership Facility (FCPF) Readiness Plan Idea Note (R-PIN) Template, Ministry of Forest and Soil Conservation/UNDP-GEF, Kathmandu, Nepal.
MEST/World Bank/DHM & Winrock (2007) Identifying Priorities for Actions on Climate Change Adaptation in Nepal, Workshop Proceedings, Kathmandu, Nepal.
MPE (2004) Initial National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change, Ministry of Population and Environment, Kathmandu (presently Ministry of Environment, Science and Technology)
MPFS (1988) Master Plan for Forestry Sector: Main Report, Ministry of Forest and Soil Conservation, Kathmandu, Nepal
MPFS (2002) Terai, Churiya and Inner-Terai Forest Policy, Ministry of Forest and Soil Conservation, Kathmandu, Nepal
NBS (2002) Nepal Biodiversity Strategy, Ministry of Forest and Soil Conservation/UNDP-GEF, Kathmandu, Nepal.
NBSIP (2006) Nepal Biodiversity Strategy Implementation Plan, Ministry of Forest and Soil Conservation/UNDP-GEF, Kathmandu, Nepal.
NCSA (2008) Stocktaking Report on Climate Change, Prepared for the Ministry of Environment, Science and Technology and UNDP-GEF, Kathmandu, Nepal
NCSA (2008) Thematic Assessment Report on Climate Change (2008). Prepared for the Ministry of Environment, Science and Technology and UNDP-GEF, Kathmandu, Nepal
NCSA (2008) Thematic Profile of Biodiversity (2008) . Prepared for the Ministry of Environment, Science and Technology and UNDP-GEF, Kathmandu, Nepal
NPC (2002) Tenth Five Year Plan (2002-07), National Planning Commission, Kathmandu
NPC (2007) Interim Plan (2007-2010), National Planning Commission, Kathmandu
OECD (2003) Development and Climate Change in Nepal: Focus on Water Resources and Hydropower, Organization for Economic Cooperation and Development, France.
Rana B., Shrestha et. al. (2000) Hazard Assessment of the Tsho Rolpa Glacier Lake and Ongoing Remediation Measures. Journal of Geological Society: 22: 563-570
Shrestha, A. B. et.al (1999) Maximum Temperature Trends in the Himalaya and its Vicinity: Analysis Based on Temperature Records from Nepal for the Period 1971-94, Journal of Climate 12:2775-2787, Kathmandu.
Shrestha, A. B., Rana B. et.al (2001) Hazard Assessment and Remediation Work at Tsho Rolpa Glacier Lake, Rowlaling Himal, Nepal. Journal of Japanese Society of Civil Engineers 86:72-75.
Shrestha, A.B. and Shrestha M. L. (2005) Glacial Lake Outburst Floods and other Flash Floods in Nepal, Department of Hydrology and Meteorology, Kathmandu.
Singh, B. K. (2008) Inclusion/Exclusion of River-Affected People in Conservation and Management of Watershed and Natural Resources in Churia Hills. SIRF Report submitted to the SNV, Nepal.
SLUSR (1990) Sustainable Land Use Systems Research. Proceedings of an International Workshop held in New Delhi, India, 12-16 February 1990.
Stainton, J.D.A. (1972) Forests of Nepal. John Murray, London.
UNDP (2006) Millennium Development Goals: Needs Assessment for Nepal, Kathmandu.
UNEP (2001) State of the Environment of Nepal, United Nations Environment Programme, NORAD/MPE/HMG
USAID (2006) Conflict Over Natural Resource at the Community Level in Nepal Including its Relationship to Armed Conflict, AR, Inc.
USAID (2007) Adapting to Climate Variability and Change: A Guidance Manual for Development Planning. United States Agencies for International Development, USA.
USAID (2008) Nepal Democracy and Governance (DG) Assessment Report, USAID, Kathmandu.
USAID (2008) The Performance Monitoring Plan and program element indicators of the USAID
USAID Annual Reports of the USAID, Kathmandu
USAID/Nepal's Strategy Statement,
WECS (2001) Wood Energy Planning for Nepal, Water and Energy Commission Secretariat, HMG/ Nepal.

World Bank (2008) Forest Carbon Partnership Facility (FCPF) Consultations with Forest Dependent Indigenous Peoples and Other Forest Dwellers in Asia, Kathmandu.
World Bank (2008) Forest Sourcebook - Practical Guidance for Sustaining Forests in Development Cooperation - Innovative Marketing Arrangements: Payment for Environmental Services. New York, The International Bank for Reconstruction and Development./World Bank.
World Bank (2008) Nepal Strengthening Institutions and Management Systems for Enhanced Environmental Governance, Washington D.C.
World Commission on Environment and Development (1987). *Our Common Future*. Oxford University Press, Oxford.
WTLCP, 2005 Western Terai Landscape Complex Project - At a Glance, Kathmandu.
WWF Nepal & India, 2005. Critical Ecosystem: Ecosystem Profile of Eastern Himalayas Region.
WWF, 2000 Chitwan-Annapurna Linkage- Biodiversity Assessment and Conservation Planning. Kathmandu.
WWF, 2001 (Ecoregion-Based Conservation in the Eastern Himalaya: Identifying Important Areas for Biodiversity Conservation).
WWF, 2006 Mid-Term Evaluation Report of the Terai Arc Landscape, Kathmandu.

Appendix 1

Information on River Corridors in Nepal

The table below gives information on the river corridors in Nepal which have been classified as Candidate Priority Areas. The scores for biological importance and landscape integrity have been combined to give overall importance ranking for each area of between I and IV. Biological importance categories are: 1 = high, 2 = mid, 3 = low, 0 = unscored. For landscape integrity, the categories are: 1 = intact, 2 = relatively intact, 3 = degraded.

	Name of corridor	Category	Biodiversity significance	Threats to biodiversity	Agencies working in biodiversity conservation
1	Chitwan-Manaslu Link	Biological Importance Category -2 Landscape integrity-3, Importance Rank-IV	The corridor ranges from sub-tropical to temperate to alpine in terms of biodiversity. Altitude ranges from 200m - 2200m above sea level Important for migratory birds, and for the upward-downward movement of terrestrial and aquatic wildlife.	High population numbers create pressure for firewood, timber and NTFPs. Shifting cultivation patterns in the mid-hills. Increasing deforestation and degradation in the corridor due to increasing human interference including frequent forest fires & over-grazing. Increases in the amount of soil erosion and number of landslides.	WWF, BISEP-ST, Leasehold Forestry (in Chitwan), USAID, TAL, NTNC
2	Chitwan-Langtang Link (Trishuli river corridor)	Biological Importance Category -2, Landscape integrity-2, Importance Rank-IV	River and altitudinal corridor linking the protected areas of Chitwan and Langtang via the Trishuli river. Climate ranges from sub-tropical to temperate and alpine. Important for migratory birds, and the movement of wildlife.	Shifting cultivation patterns in the mid-hills. Increasing deforestation and degradation in the corridor due to increasing human interference including frequent forest fires & over-grazing. Increases in the amount of soil erosion and number of landslides.	WWF, BISEP-ST (SNV) Leasehold Forestry (in Chitwan), USAID, TAL, NTNC, CARE/SAGUN/RIMS
3	Kanchengunga-Makalu Barun-Sagarmatha Link	Biological Importance Category -1 Landscape integrity-1,	The Eastern High-Himal landscape corridor is a top priority for Nepal; linking large, high elevation protected areas from east to west. Important for the movement of high Himalayan wildlife species.	Shifting cultivation patterns in the mid-hills.	WWF,USAID, TMI,ICIMOD,IUCN

		Importance rank-I			
4	Jhapa-Morang-Ilam-Koshi Tappu Link	Biological Importance Category -2 Landscape integrity-3, Importance rank-IV	Linking the Chure-Terai corridor in Eastern Nepal where the fragile Chure and Terai ecosystems affect each other. Important for migratory birds, and the upward-downward movement of terrestrial and aquatic wildlife.	High population numbers lead to increased resource exploitation.	SNV, IUCN, CARE
5	Singalila-Ilam Link	Biological Importance Category -1, Landscape integrity-2, Importance rank-I	No available Information	No available Information	No available Information

6	Chitwan-Narayani-Kali Gandaki-Annapurna Link	Biological Importance Category -1, Landscape integrity-2, Importance rank-I	High priority river and altitudinal corridor linking the protected areas of the Chitwan National Park and the Annapurna Conservation Area in Central and Western Nepal; Host to the highest number of tourists - Chitwan for rhinos and tigers and Annapurna for the landscape. The Kali Gandaki river is the meeting point for vegetation found in both the eastern and western mid-hill regions. Altitude ranges from 200-2200m above see level Important for migratory birds, and the upward-downward movement of terrestrial and aquatic wildlife.	High population numbers create pressure for firewood, timber and NTFPs. Shifting cultivation patterns in the mid-hills. Increasing deforestation and degradation in the corridor due to increasing human interference including frequent forest fires & over-grazing. Increasing soil erosion and landslides.	WWF, USAID, SNV, NTNC, LI-BIRD, IFAD
7	Chitwan-Narayani-Marsyangdi-Annapurna Links	Biological Importance Category -2, Landscape integrity-1, Importance rank-III	River and altitudinal corridor connecting the protected areas of Chitwan National Park and the Annapurna Conservation Area. High levels of plant diversity linking sub-tropical to temperate and alpine biodiversity. Altitude ranges from 200-2200m above see level Important for migratory birds, and the upward-downward movement of terrestrial and aquatic wildlife.	High population numbers create pressure for firewood, timber and NTFPs. Shifting cultivation patterns in the mid-hills. Increasing deforestation and degradation in corridor due to increasing human interferences including frequent forest fire & over-grazing. Increasing soil erosion and landslides.	WWF & BISEP-ST (SNV) in Chitwan, Leasehold Forestry (in Chitwan and Lamjung)
8	Parsa-Makwanpur-Chandragadhi-Shivpuri-Langtang Links	Biological Importance Category -1, Landscape integrity-2, Importance rank-I	Hotspots for plant diversity; Linking three protected areas namely: Parsa Wildlife Reserve, Shivpuri National Park and Langtang National Park. Linking the sub-tropical Terai, to the mid-hills, the highly biodiversity rich zones of Chandragadhi and Langtang Himalaya represent both temperate and alpine bio-	High population numbers create pressure for firewood, timber and NTFPs Shifting cultivation patterns in the mid-hills Increasing deforestation and degradation in corridor due to increasing human interferences including frequent forest fire & over-grazing. Increasing soil erosion and landslides.	SNV, IFAD, WWF, USAID, NTNC, UNDP

			diversity. Altitude ranges from 200-2200m above see level		
9	Rolwaling Valley linking Langtang and Sagarmatha	Biological Importance Category -2, Landscape integrity-2, Importance rank-IV	High Himalayan biodiversity corridor linking Langtang in the Central Himalaya to Everest (Sagarmatha) in the Eastern Himalaya .	No information available	TMI
10	Mahabharat-Siwaliks-Koshi Tappu Links	Biological Importance Category -1, Landscape integrity-3, Importance rank-II	Habitat for migratory birds in Koshi Tappu - a Ramsar Site; Linking the Sub-tropical Terai-Churia hills (fragile ecosystem) and mid-hill ecosystems Linking wetlands via different river systems which ultimately meet in the Koshi rivers of Eastern Nepal. Important for migratory birds, and the upward-downward movement of terrestrial and aquatic wildlife.	High population numbers create pressure for firewood, timber and NTFPs. Increasing deforestation and degradation in corridor due to increasing human interferences including frequent forest fire & over-grazing. Increasing soil erosion and landslides.	No information
11	Bagmati-Chitwan-Bardia-Suklaphanta (TAL) Corridor	Biological Importance Category -1, Landscape integrity-3, Importance rank-1	Habitat for mega mammals in the Terai tropical zone and important corridors for one-horned rhinos, Royal Bengal tigers and elephants; It connects a total of 11 protected areas in Nepal and India. Includes three Ramsar sites and a World Heritage site. Important for migratory birds, and movement of terrestrial and aquatic wildlife from east to west.	Illegal wildlife poaching (rhino, tiger). High population numbers create pressure for firewood, timber and NTFPs Forest encroachment in far-western Nepal. Increasing deforestation and degradation in corridor due to increasing human interferences including frequent forest fire & over-grazing. Flooding and siltation in Bhabar and the Terai	WWF, USAID, SNV, UNDP/GEF, DFID, CARE, NTNC, LI-BIRD

U.S. Agency for International Development
USAID/Nepal
Bramha Cottage, Maharajgunj
Kathmandu, Nepal
Tel: +977-1-4007200 Fax: +977-1-4007285
nepal.usaid.gov Fax: (202) 216-3524
www.usaid.gov