

ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY II

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NEPAL FORESTRY OUTLOOK STUDY

by

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**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC**

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Foreword

The Food and Agriculture Organization of the United Nations (FAO) is conducting the Forestry Sector Outlook Study (FSOS) to visualize how the global forestry sector will likely evolve in 2020. As a member country of the United Nations, Nepal is contributing to the FSOS. This report is the output of the study.

The roles of forests are changing their focus from wood production towards broader social, environmental, economic and cultural contexts. Corresponding with change in the forest landscape, forestry stakeholders have also changed significantly whilst their range of interests has expanded and diversified. Forestry stakeholders are now recognized to include forest dependent communities, forest-based industrial societies, sophisticated global carbon market investors and a vast array of parties and individuals in between. Demand of forests for goods and services significantly differs between these diverse stakeholders.

The forestry sector is a subset of the whole political and socio-economic systems. The future of forest and forestry in Nepal will be greatly reliant on how these systems will likely evolve in the country. In the current situation, probably political and institutional changes will be the most important and uncertain drivers influencing economic changes. The Interim Constitution (2007) of Nepal has visualized the shape of new Nepal. The constitution has clearly stated that New Nepal will be republican, federal, prosperous and inclusive. However, the restructuring of the state will be decided by the Constitutional Assembly (CA) and institutionalized by formulating the fully-fledged constitution. To adopt these macro level policies, Nepal is undergoing state restructuring processes which will have huge implications in forest and forestry.

This outlook study report has been prepared through consultative and interactive processes from grass root to policy level stakeholders. This report analyzes the current status of forest and forestry of Nepal, identifies key drivers of change, develops probable scenarios for the future, provides strategies and priorities to reform the forestry sector and reveals the outlook for 2020. Through comprehensive analysis, the report offers a guiding framework for reforming forestry policies and reinventing forestry sector institutions to adopt and institutionalize internal and external change. The Ministry of Forests and Soil Conservation (MFSC) is committed to implementing the recommended strategies and priorities which will facilitate the enhancement of sustainable forestry in Nepal.

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INFORMATION NOTE ON THE ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

The Asia-Pacific Forestry Sector Outlook Study (APFSOS) is a wide-ranging initiative to gather information on, and examine, the evolution of key forestry issues as well as to review important trends in forests and forestry. The main purpose of the study is to provide a better understanding of the changing relationships between society and forests and thus to facilitate timely policy reviews and reforms in national forest sectors. The specific objectives are to:

1. Identify emerging socio-economic changes impacting on forest and forestry
2. Analyze probable scenarios for forestry developments to 2020
3. Identify priorities and strategies to address emerging opportunities and challenges

The first APFSOS was completed in 1998, with an outlook horizon to 2010. During its twenty-first session, held in Dehradun, India, in April 2006, the Asia-Pacific Forestry Commission (APFC) resolved to update the outlook extending the horizon to 2020. The study commenced in October 2006 and is expected to be completed by September 2009.

The study has been coordinated by the Food and Agriculture Organization of the United Nations (FAO), through its regional office in Bangkok and its headquarters in Rome, and implemented in close partnership with APFC member countries with support from a number of international and regional agencies. The Asian Development Bank (ADB), the International Tropical Timber Organization (ITTO), and the United Kingdom's Department for International Development (DFID) provided substantial financial support to implement the study. Partnerships with the Asia-Pacific Association of Forest Research Institutes (APAFRI) and the Secretariat of the Pacific Community (SPC) supported the organizing and implementing of national focal points' workshops and other activities, which have been crucial to the success of this initiative. The contributions of many other individuals and institutions are gratefully acknowledged in the main APFSOS report.

Working papers have been contributed or commissioned on a wide range of topics. These fall under the following categories: country profiles, sub-regional studies and thematic studies. Working papers have been prepared by individual authors or groups of authors and represent their personal views and perspectives; therefore, opinions expressed do not necessarily reflect the views of their employers, the governments of the APFC member countries or of FAO. Material from these working papers has been extracted and combined with information from a wide range of additional sources to produce the main regional outlook report.

Working papers are moderately edited for style and clarity and are formatted to provide a measure of uniformity, but otherwise remain the work of the authors. Copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained from:

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EXECUTIVE SUMMARY

Background, objectives and methods of study

The aims of this study were to determine the current status and key issues of the forestry sector, identify driving forces which will impact forest and forestry of Nepal, develop probable scenarios for the future and insight on Nepal's forest and forestry and how it will evolve till 2020.

To achieve the stipulated objectives, a drafting team of government professionals and civil society was formed. A two-day national stakeholder workshop was organized in Khatmandu in May 2007 to explore forestry related issues of Nepal and formulate the probable scenario for the future. Various field studies were conducted to understand ground reality and validate forestry data. Secondary data were obtained from available policies, plans and legal and regulatory instruments, and published and unpublished forest and forestry literature. The draft report was widely circulated to FAO experts, government officials, concerned INGOs working in Nepal and forestry related civil societies for their invaluable comments and suggestions. Suggestions received from all the reviewers were incorporated to refine and make the final shape of the report.

Current status

Covering an area of 147,181 square kilometers, Nepal is located in between China and India. The country's altitude ranges from 70 m above sea level in the south to 8848m at the summit of Mount Everest. Nepal experiences a wide range of climates, ranging from sub-tropical in the lowlands to the arctic climate in the high mountains. It harbors a total population of 23.15 million with 2.24% annual growth rate. About 86% of the total population lives in the rural areas.

Status of forest cover

The last National Forest Inventory (NFI) was carried out in the early nineties in Nepal. According to that inventory, forest and shrub together cover about 5.83 million ha, which is 39.6% of the total land area of the country. The rate of forest area decrease was 1.7% per annum during 1978/79 to 1994, whereas the rate of forest and shrub depletion was 0.5% per annum during the same period. Since then an NFI has not been done to update data on forest cover change. However, the recent studies from 20 Terai districts revealed that the rate of forest cover change was at an annual rate of 0.06% during 1990/91 to 2000/2001. Macro level studies and visual interpretations revealed that Nepal's forest coverage and condition is significantly improving due to the Community Forestry (CF) intervention.

Growing stock

There are 35 major forest types and 118 ecosystems found in Nepal. In terms of growing stocks *Shorea robusta*, *Quercus* spp, *Terminalia alata*, *Pinus roxburghii*, *Abies spectabilis*, *Rhododendron* spp, *Alnus nepalensis*, *Schima wallichii*, *Tsuga dumosa* are the major tree species. Based on the last NFI, total stem volume (over bark) of reachable forests is 388 million cubic metres and the total biomass of stems, branches and leaves is 429 million tonnes (air dry). For the whole country, the projection of total volume and biomass is estimated at 759 million cubic metres and 873 million tonnes respectively. The mean stem volume (over bark) of Nepal is 178 cubic metre/ha, the mean stem volume up to 10 cm top is 131 cubic metres/ha and the average number of stems per hectare is 408.

State of management of forests

National forest and private forest are the broad categories of forest on the basis of land ownership. But no data are available about the extent of private forest. On the basis of management objectives and management rights, Government forests have been further categorized under Government-managed forest, community forest, leasehold forest, religious forest, protected forest and forest under the protected areas systems. Community based forestry is the second largest forest management regime after the government managed forest. In this approach government forests have been handed over to the local communities for their autonomous management and use. More than 19000 community based forest user groups are managing about 25% of the total national forest area. This participatory forestry has become a successful model for forming the capital (natural, human, financial and physical) and reforming forest governance.

Forestry sector contribution

Nepal is dominated by an agrarian society. Forestry is an integral part of agriculture and rural livelihoods and fuel wood is the principal source of rural energy. Non-wood forest products (NWFPs) have become the source of income for the rural poor, medicine for primary health care and revenue for the government. Out of the total tourists visiting Nepal about 45% visit protected areas. Although the forestry sector has a significant role in the economic development of the country, no comprehensive study has been done yet on the contribution of the forestry sector to the Gross Domestic Product (GDP). As a result, the contribution of the forestry sector has been underestimated and it has a low policy profile in Nepal. FAO has estimated that Nepal's forestry sector contributed 3.5% to the GDP of the country in 2000 and 4.4% for the period 1990 to 2000. But it is estimated that the forestry sector alone contributes 15% to the GDP of the country.

Wood products

The main traded wood products are logs, sawn timber, poles, posts and fuel wood. Wood removal refers to the amount of round wood, sawn timber and wood fuel sold by the Department of Forests (DoF), The Timber Corporation of Nepal (TCN), the Forest Product Development Board (FPDB) and Community Forest User Groups (FUGs). Round wood removal statistics ranges from 24.36 000 cubic metres in 1992/93 to 80.54 000 m³ in 2002/03. Similarly, the figure for fuelwood was 20.79 000 m³ in 2005/06 up from 178.13 m³ in 1992/93. The amount of wood and fuel wood consumed per annum in the country is estimated at 2.2 million m³ and 11,623 million kg. In 2001, the total production of industrial round wood and fuel wood was 0.15 million m³ and 0.95 million m³ respectively. Similarly, the consumption of industrial round wood and fuel wood was 0.1 million m³ and 0.92 million m³ respectively

Wood fuel

Biomass is the major source of energy in Nepal. Wood fuel alone contributes about 85% of the total energy in the residential sector and the rest comes from other sources of energy. Annual consumption of biomass resources has increased by about 2.4% since the last decade. Consumption of commercial forms of energy is annually increasing by about 10%. On the whole, about 0.48 percent of the total gross energy production in the country is produced from renewable sources. The share of petroleum products is less than 10% of the total energy consumption. Though the country is rich in water resources, only about 1% of the economic potential of hydro power is harnessed so far. The contribution of electricity from the central grid system is around 2%. Industrial and commercial sectors use even less than 1% of their energy consumption derived from woodfuel resources. The effective price of LPG is quite

low. Fuelwood becomes cheapest once it is available free of cost or less than NRs4 per kilogram.

Biodiversity

Nepal is rich in biodiversity. From the perspective of species diversity in wild habitats, Nepal occupies 26th position and 11th position on the global and continental scales respectively. Nepal possesses over 2.7 percent of the world's flowering plants, 5 percent of bryophytes, 3 percent of pteridophytes, 9.3 percent of the world's bird species and 4.5 percent of the world's mammal species. About 19.7 percent (28,999 km²) of the total area of the country is under the protected area system to conserve the representative biodiversity and outstanding landscape of the country.

Impact of climate change

The country has limited information regarding the impacts of climate change on economic growth, development, resource conservation and basic livelihood. The average warming of annual temperature in Nepal was 0.06⁰C during 1977-1994. Warming in high altitudes can lead to glacial melt and retreat. This can alter the rainfall pattern, hydrological cycle and availability of water resources resulting in increased flooding or depletion of water resources. Nepal has experienced weather related extreme events such as excessive rainfall, longer drought periods, landslides and floods. This situation has created problem in irrigation and water supply systems. It is estimated that climate change in the Nepalese context would have negative impacts on agriculture, forestry and biodiversity.

Policies, legislations and institutions

The Master Plan for Forestry Sector (MPFS, 1989), periodic plans, fiscal policies, forest and forestry laws and regulations are the policy guidelines and legal instruments facilitating sustainable forest management (SFM) in Nepal. The Ministry of Forests and Soil Conservation (MFSC) is the apex institution to create an enabling environment for the conservation and sustainable management of forest resources. There are five departments under the Ministry.

With the advent of community based forestry, Community Based Forest User Groups (CBFUGs) became effective and powerful institutions for the conservation and management of national forests. As of May 2008, there were 19000 CBFUGs over the country under different forest management models managing about 25% of the country's total forest area. The role of the private sector in the forestry sector is only confined to the marketing of forest products and advocacy for better policy formulation.

Drivers of change

A host of factors are collectively impacting upon the forestry sector, triggering planned and unplanned changes. The sustainability of forest products and services depends on a number of factors that may bring about changes in the forestry sector of Nepal by 2020. Some of the key drivers impacting directly and indirectly on forestry are described below.

Political and institutional environment

The forestry sector is a sub system under the whole range of political, socio-economic and ecological systems. In the current situation of Nepal, political and institutional changes will be the most important and uncertain drivers influencing social and economic systems. Political instability and conflicts always accelerate deforestation and forest encroachment in Nepal. Democratic governance and a pluralistic institutional environment bring all

stakeholders together for formulating national and sectoral policies. The State is undergoing restructuring processes. The future of forests and forestry of Nepal will be greatly reliant upon how governing systems likely evolve in the country.

Demographic change

Demographic changes include population growth, migration patterns and internally displaced population in Nepal. The total population of the country is 23.15 million with a 2.25% annual growth rate. By 2020, Nepal's population will be about 34 million, an increase of over 11 million. Nepal's population structure reveals that the dependent population (children and aging people) is higher. Although the correlation between demographic change and forest/forestry is complex, population growth, urbanization, migration and the dependent population have great implications on land and resource use systems. In Nepal one youth from every four households travels abroad (mostly in Gulf countries). As a result, the availability of labor for agriculture and forestry tends to decline.

Economic changes

Nepal is among the poorest and least developed countries in the world where 31% of its population is still living below the poverty line. The economic well being of Nepal is very closely bound to its natural resources – arable land, water, forested areas, and protected areas. Rapid economic growth demands poverty alleviation. Economic growth is creating pressures on demand for forestland for infrastructural development and forest products to meet the increased need. Economic growth creates better opportunities to invest in forestry development. Demands for a diverse array of products and services from different segments of society will continue to be the most important challenge facing the forestry sector. As per capita incomes increase, demands for raw materials including minerals, wood etc will have important impacts on forests.

Societal changes

Fundamentally, Nepal is an agrarian society. Forest and forestry are integral parts of the agricultural based economy. However, the present trend shows that Nepal is gradually shifting toward a mixed (forest dependent, agrarian, industrial and postindustrial) society. The urban middle class will increase with attendant changes in demand for forest products and services. While demands for recreational and other environmental services by the urban middle class increase, pressure to meet the basic needs of the poor are heightening resource use conflicts.

Globalization

Globalization has created opportunities for free movement of capital, labor, information and technologies beyond political boundaries. As a result, the world has become a global village with political, economic and ecological interdependency among countries. Remittances have turned into a key source of national income in Nepal. In 2007, 16.7% of the total GDP was shared by remittances. The impact of globalization on forests has been significant in that local value chains are being replaced by global value chains. To date Nepal exports only NWFPs but there is the possibility of selling surplus wood abroad from community forests and other forestry models.

Ecological and environmental concerns

Increasing concern about environmental initiatives at local, national and global levels will be a major driver impacting forests and forestry. The protected area network of Nepal is providing a wide range of environmental services, in particular conservation of biological diversity, soil and watershed conservation, and clean air. Deforestation, degradation and

desertification, climate change, natural disasters, invasive species and loss of bio-diversity are of serious environmental concern in Nepal.

Technological change

Technological change can be a means to improve forest productivity and thereby income from the forestry sector. Improved technologies in the forestry sector can be adopted for scientific forest management in the country. But the adoption of technology calls for adequate financial and material resources, appropriate institutional frameworks and trained human resources. In order to develop and disseminate technology in the forestry sector, the Research and Extension sectors should be strong and effective. However, the investment of the government on forestry Research and Extension sector is very low as compared to other sectors.

Scenario for the future

A feudalistic state structure, social, gender and ethnic exclusion and lack of good governance are the root causes of the problems in the governance of Nepal. As a result, national, regional and ethnic conflicts are emerging. Development of the country is far behind for competing in the twenty first century. In this context, Nepal is demanding political, social and economic transformations through state restructuring processes. The Interim Constitution 2007 has visualized the shape of New Nepal. The constitution has clearly stated that New Nepal will be republican, federal, prosperous and inclusive. However, the restructuring of the state will be decided by the Constitutional Assembly (CA) and institutionalized by formulating a fully-fledged constitution. The election of the CA was successfully accomplished in April 10, 2008. The objective of the CA is to formulate the new constitution within the two and half year timeframe. The CA is one of the means and bench marks to manage conflicts and move the country ahead. The CA encompasses diverse castes, ethnicities, and gender and minority groups. The Nepal Communist Party (Maoist) has become the largest party in the CA and won about 33% of the seats.

As earlier mentioned, the forestry sector is a subset of the range of political and socio-economic systems. The future of forest and forestry in Nepal will be greatly reliant upon how these systems will likely evolve in the country. In the current situation, political and institutional changes will be the most important and uncertain drivers influencing economic changes. Based on this argument, the following three scenarios have been developed to look at the likely impacts on forest and forestry in Nepal.

A new Nepal scenario

In the new Nepal scenario, the political deadlock of the country will be removed and political stability will be gained. As a result, there will be improved understanding of the importance of forests, more resources to invest in forest management, improved ability to bring about technological development, greater appreciation of environmental values and better protection of biodiversity, watersheds, etc. In a way this could in the long term result in a reversal of forest loss and degradation.

Stalemate and muddling-through scenario

In the second scenario uncertainty will be prolonged and the country will remain at a cross-road without any direction to proceed. In the stipulated scenario, development of forest and forestry will slow down. Due to weakening public and community institutions of the forestry sector, uncertainty will continue and the goal of sustainable forest management will not be achieved. Eventually, livelihoods of forest dependent communities will be negatively impacted.

Breakdown of peace processes and intensifying of conflict scenario

In the third scenario persistent disagreements remain among key players of the country, which results in collapse of the present arrangements and revival of conflicts. Poverty will be intensified and pressure on common resources like forest will be substantially increased. Deforestation and forest area encroachment will be sped up. As a result, various environmental consequences such as drought, flash flood, desertification, water scarcity, soil erosion etc will appear in the fragile mountain landscape. Agricultural productivity will be decreased and hunger will be increased.

However, we anticipate that Nepal's political situation will go ahead according to the road map given by the Nepali people on how to build a new Nepal through establishing permanent peace and an inclusive governance system, and accelerating economic development. As a result, pressure on forests will be decreased and the goal of sustainable forest management will be gained by 2020. But many structural, institutional and policies reforms are needed in the forestry sector to cope with national and international changes.

Strategies and priorities: reform agenda for the forestry sector

The roles of forests are changing their focus from wood production towards an orientation around broader social, environmental, economic and cultural contexts. Forestry stakeholders have also changed significantly whilst their range of interests has expanded and diversified. Forestry stakeholders are now recognized to include forest dependent communities, forest based industrial societies, sophisticated global carbon market investors and a vast array of parties and individuals in between. The demand on forests for goods and services significantly differs between these diverse stakeholders.

Nepal needs political, economic and social transformations to move the country ahead. Nepal's political system is rapidly changing. The first meeting of the CA declared Nepal as a republican country. More than 240 years of monarchical rule has been rooted out. To adopt macro level policies, Nepal is undergoing state restructuring processes which will have huge implications for forest and forestry.

Community based forestry regimes have brought great change in restoring denuded landscape and created opportunities to produce diverse forest products and services for the wider stakeholders ranging from local to international communities. In these contexts, the following strategies and priorities have been identified for reforming the forestry sector of Nepal to address international and national changes:

1. Restructuring of the forestry sector to cope with federalism
2. Reinventing and transforming forestry institutions
3. Policy and legal reforms
4. Valuation of forestry contributions
5. Formulating and adopting standards for sustainable forest management
6. Linking community based forestry and the protected area system with carbon credit mechanisms
7. Forestry governance: making it inclusive, transparent and responsive
8. Globalization: enhancing the forestry sector for comparative advantages
9. Linking forestry with poverty alleviation
10. Balancing economic development and environmental conservation
11. Forestry research and development
12. Watershed conservation and integrated development
13. Conservation, domestication, sustainable harvesting, processing and marketing of NWFPs
14. Landscape level conservation

15. Alternative energy

State of forest and forestry: outlook for 2020

The Government of Nepal has a policy to maintain 40% of the land with forests. Community based forestry systems have become successful to restore denuded landscapes. As a result, forest areas and conditions have been enhanced in the middle mountains of Nepal. The country is gradually transforming from an agrarian society to a mixed society. The political process is gaining momentum and approaching stability. Due to the implementation of stipulated strategies and priorities, the forestry sector will achieve its policy objectives and targets effectively and efficiently.

Pressure on forests will be decreased due to increasing urbanization, economic growth and strengthened forestry institutions. Community based forestry will be perpetuated to contribute to poverty alleviation and sustainable forest management. Watershed management will be shifted from the micro level to the basin approach. The conservation approach will be transformed from site- to the landscape level. The forestry sector will generate more employment opportunities and contribute to reducing poverty. Forestry institutions and policies will become more inclusive, democratic and transparent.

Wood production from government managed forest is expected to decrease due to reduction in area by the end of 2020. Demand for wood products will be higher and create higher pressure. However, demand will be fulfilled through the sustainable management of community, collaborative and private forests. Wood as a source of energy per capita will decrease, whereas timber and log demand is expected to increase. Use of primary forms of wood products will be replaced by secondary forms such as plywood, board, composite beams, charcoal etc. Most of the trade of wood products will be under the market system and commercialization. NWFPs will have major role in reducing rural poverty and earning foreign income through export of Himalayan herbs.

1. INTRODUCTION

Background

Nepal is a small mountainous country surrounded by China to the north and India to the south, east and west (Figure 1). Nepal covers total land area of 147,181 square kilometers. In altitude, it ranges from 70 m above sea level in the southeastern Terai, to 8848m at the summit of Mount Everest, the highest point on the surface of the earth (CBS, 2002). With its varied topography and elevation, Nepal experiences a wide range of climates, ranging from sub-tropical in the lowlands to the arctic climate in the high mountains. The average annual rainfall ranges from 250 to 4500 mm (HMG/ADB/FINNIDA, 1988). It harbors a total population of 23.15 million with 2.24% annual growth rate (CBS, 2002). About 86% of the total population lives in the rural areas. The per capita GNP of the country in 1997 and 2005 was US\$ 220 (CBS, 2002) and US\$322 respectively (MoF, 2006).

Forest and shrubs together cover about 5.83 million ha which is 39.6% of the total land area of the country (DFRS, 1999). The per capita forest area is 0.27 ha. The forest area has decreased at an annual rate of 1.7%, whereas forest and shrubs together decreased at an annual rate of 0.5% during the period of 1978/79 to 1994. Recent studies in 20 Terai districts revealed that forest cover has decreased at an annual rate of 0.06% from the period of 1990/91 to 2000/2001 (DoF, 2005). Total stem volume (over bark) of reachable forests of Nepal is 388 million cubic meters and the total biomass of stems, branches and leaves is 429 million tonnes (air dry). The mean stem volume (over bark) of Nepal is 178 cubic metres/ha and the average number of stems per hectare is 408. The main tree species in terms of proportion of total stem volume are Sal (*Shorea robusta*) with 28.2% of total volume followed by Oak (*Quercus spp*) with 9.3%, Asna (*Terminalia tomentosa*) with 7.6%, Chir Pine (*Pinus roxburghii*) with 6.3%, Talis Patra (*Abies spectabilis*) with 4.4%, Laligurans (*Rhododendron spp*) with 4.2% and Utis (*Alnus nepalensis*) with 2.9% (DFRS, 1999).

Forestry is an extensive land use system in Nepal. The forest and trees provide a vast array of goods and services to human beings. Forest and tree resources provide the basic commodities such as fuel wood, timber and fodder and serve important ecological functions such as biodiversity conservation, erosion control, and carbon dioxide consumption. Agriculture is the mainstay of the economy in the country as agriculture and forestry contribute 39% to the total gross domestic product of the country. Nearly two-thirds of the country's total population depends on agriculture for sustaining their livelihoods. Out of 9.9 million economically active populations over 10 years of age, about 6.5 million are engaged in agriculture and forestry (CBS, 2002).

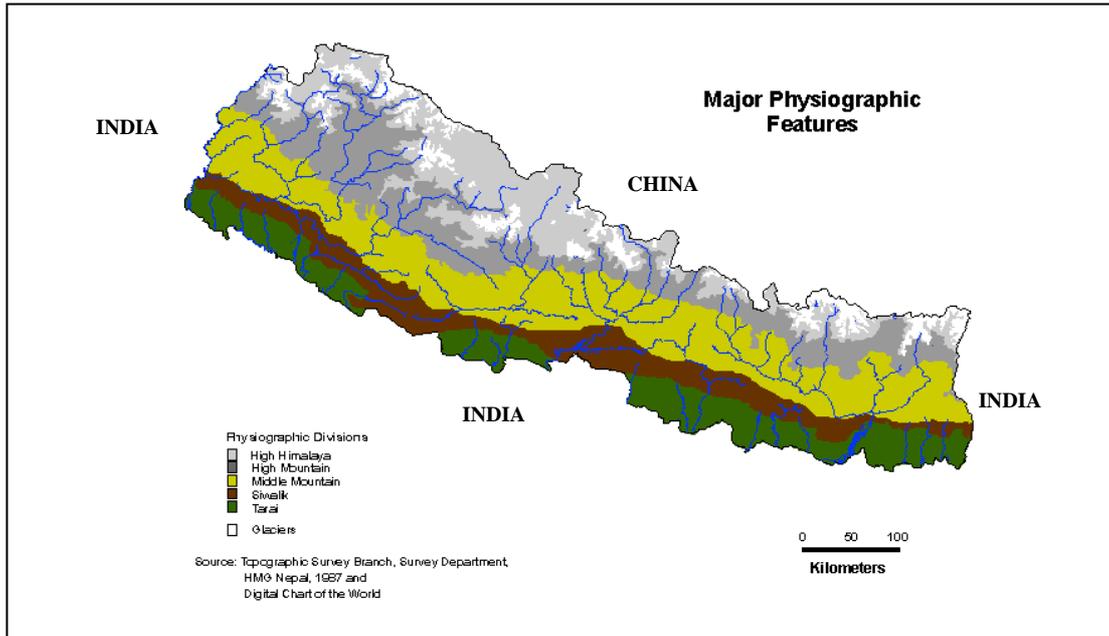


Figure 1. Map of Nepal showing major physiographic regions

Scope and coverage

The report provides an understanding of the state of forests and forestry in the country and trends therein. Moreover, it provides information on the probable forestry situation of Nepal in 2020. Sincere and genuine efforts from a group of professionals have been made to prepare this report within a short time frame. The study has made every effort to pinpoint the forestry situation in the country, which can be a basis for any future courses of action.

The information provided in this plan is based primarily on available information and data. A National Workshop, consultations and limited field visits were also made to validate the secondary information available for the study. There was limited time and budget for the study; therefore, it may lack in-depth analysis of certain issues. An intensive and detailed study will demand fairly long duration and more resources to provide realistic scenarios. The study analyzed the available data on different aspects; however, due to many inconsistencies in the available data, it was unable to make certain references in some cases.

Key questions/issues covered in the report

Forests in Nepal thrive in the most complex set up of action and interaction among various actors, the most prominent being the formal bureaucracy or the government system on the one hand and users, their networks (federations), NGOs, civil societies and local government bodies on the other. Forestry is a dynamic system. Therefore, issues and problems in the sector are changing over time.

The major issues covered in this report are forest cover change in the country; total growing stock and its composition; forest management regimes; wood product removal; energy use; biodiversity; soil and water conservation; the policy and institutional framework; research, training and extension etc.

Methodology

According to FAO's request dated 24 October 2006, the Ministry of Forests and Soil Conservation (MFSC) of the Government of Nepal (GoN) initiated the task of preparing a report on "the future of Nepal's forests: outlook for 2020". The MFSC formed an 8 member drafting committee under the leadership of Dr. Uday R. Sharma, Joint Secretary of the MFSC to prepare the Forestry Outlook Study Report of Nepal on 14 March 2007. The composition of the drafting team is presented in Annex 1.

The core group of the drafting team was involved in writing up the draft report. The study is primarily based on desk reviews of available secondary information, workshops, consultation meetings and limited field visits. Secondary data were obtained from available policies, plans and legal and regulatory instruments, and published and unpublished literature regarding forests and forestry in Nepal and other concerned offices.

In consultation with Dr. CTS Nair of FAO, the team decided to organize a national workshop on "The Future of Nepal's Forests: Outlook for 2020" in Khatmandu, Nepal. Accordingly, the workshop was organized on 14-15 May, 2007 in Khatmandu with the participation of individuals from diverse sectors of the society including government, non-government, private and civil society sectors. Altogether 8 papers were presented and comments and suggestions were made on the papers. Three group sessions were conducted during the workshop in order to build a base on the probable scenarios of the forests and forestry in 2020. Papers presented at the workshop are presented in Annex 2.

Due to the time constraint, extensive field verification could not be made in order to crosscheck the information obtained from secondary sources. However, necessary information, particularly on current issues of the forestry sector of Nepal was discussed with forestry professionals. Similarly, limited field visits were made in order to understand the issues at the field level and also to verify the information obtained from secondary sources.

The draft report was presented at the meeting of the drafting team and also to senior officials at the MFSC for review. After incorporating comments and suggestions on the report from team members, reviewers and from the workshop, the report was refined to its final shape.

Structure of the report

According to the Terms of Reference (ToR), this report consists of five chapters. The first chapter is an introduction to the study which provides a country background, a brief account of the forestry sector in Nepal, scope and coverage of the study, key issues covered in the report and methodology followed to complete this study. Chapter two provides information on the current state of forests and the forestry sector such as forest cover status, growing stock, wood product statistics, energy statistics, policy and institutional framework etc. Chapter three sheds light on the drivers of change in the forestry sector. Chapter four discusses the probable scenarios and their implications. Chapter five provides an overview of the state of forests and forestry in 2020.

2. CURRENT STATE OF FORESTS AND FORESTRY IN NEPAL

Forests, land, water and minerals are the principal natural resources of Nepal. Forestry is an extensive land use system in Nepal. Forests together with shrubland cover 39.6% of the total land area of Nepal (DFRS, 1999). The forest types of Nepal vary from sub-tropical forest to alpine meadows in the high Himal. Nepal's forest is legally categorized into national forests and private forests. The national forest includes government-managed forest, protected forest, community forest, leasehold forest and religious forest. The ownership and control of the national forest lies with the government and that of private forest with the owner of the forest. For community forest and leasehold forest, only usufruct rights are given to the users.

There are 35 major forest types and 118 ecosystems in Nepal. The major tree species in terms of growing stocks are *Shorea robusta*, *Quercus* spp, *Terminalia alata*, *Pinus roxburghii*, *Abies spectabilis*, *Rhododendron* spp, *Alnus nepalensis*, *Schima wallichii*, and *Tsuga dumosa*, Nepal is divided into five ecological regions and the Mid-mountain region has the highest percentage of forest coverage (33%) followed by the High mountains, Siwaliks, Terai and High himal region respectively.

Trends in forest resources

Recent figures estimated 39.6% forest coverage which was down from 42.7% in 1978. Notwithstanding the greater role of forest resources in the economic development of the country, forests are being depleted due to various reasons. High population growth, unmanaged settlement, unemployment, encroachment, grazing and forest fire are some of the underlying causes for the depletion of forest resources. As a result, the forest area has decreased at an annual rate of 1.7%, whereas forest and shrub together decreased at an annual rate of 0.5% during the period of 1978/79 to 1994. Recent studies in 20 Terai districts revealed that forest cover decreased at an annual rate of 0.06% from the period of 1990/91 to 2000/2001 (DoF, 2005a). Deforestation and degradation are a serious concern in many countries around the world and also in Nepal. As a result, the forest cover of around 60% in the 1960s had shrunk to 29% in the 1990s. Nepal lost 570,000 hectares of natural forests in 27 years between 1964 and 1991 (Adhikari, 2002), out of which 380,000 hectares were converted to agricultural land.

Forest cover status

Table 1 presents national data on forest cover of three different time periods in Nepal. It is clear from the Table that forest area has decreased to 39.6% in 1994 from 42.7% in 1978. There have been no national forest inventories since 1994, so data on forest cover are solely based on 1994. However, the real picture of the forest resources in the country could be very different from the present one. The Department of Forests carried out a forest cover change study of 20 Terai districts in 2004. Similarly, some district forest inventories and the Trees Outside Forest Inventory at district level have been carried out by the DFRS.

Table 1. Forest cover status of Nepal

Cover type	Unit	Years		
		1978*	1986**	1994***
Forest	Area (000ha)	5616.8	5504.0	4268.0
	Percentage	38.0	37.4	29.0
Shrub	Area (000ha)	689.9	706.0	1560.0
	Percentage	4.7	4.8	10.6
Total	Area (000ha)	6306.7	6210.0	5828.0
	Percentage	42.7	42.2	39.6

Source: *HMG/ADB/FINNIDA, 1988; ** HMG/ADB/FINNIDA, 1988; ***DFRS, 1999.

Terai forest statistics

Of the total forest area, about 1.4 million hectares of forests are found in the Terai, Inner Terai and Churia region, out of which 0.55 million hectares are in the plains (FORESC, 1993). The recent study shows that forest in the 20 Terai districts including protected areas cover around 1.39 million hectares (DoF, 2005a). The productive forests in these regions have a significant role not only in the economic development of the country, but also in sustaining rural livelihoods. Table 2 provides information on the forest statistics of 20 Terai districts.

Table 2. Forest cover statistics of 20 Terai districts of Nepal

Years	Forest & shrub (in 000 ha)
1990/91	1398.912
2000/01	1390.091
Total change	-8.821
Change/year	-0.8821
Percentage change/year	-0.06%

Source: DoF, 2005a

FAO statistics on forest cover of Nepal

FAO has been carrying out Global Forest Resource Assessment in its member countries at five year intervals. Table 3 provides forest cover statistics of Nepal reported to FAO in the course of preparing the country report on Global Forest Resource Assessment 2000 and 2005.

Table 3. Forest cover statistics of Nepal

Cover type	Unit	Year	
		2000*	2005**
Forest	Area (000ha)	3900	3636
	Percentage	26.5%	24.7%
Shrub	Area (000ha)	1753	1897
	Percentage	11.9%	12.9%
Total	Area (000ha)	5653	5533
	Percentage	38.4%	37.6%

Source: *FAO, 2001; **FAO 2006.

Total growing stock

Information on 'Growing Stock' is essential to understand the dynamics of forest stands, their productive capacity and to manage their use within the limits of sustainability defined by their dynamics of growth.

Total stem volume (over bark) of reachable forests of Nepal is 388 million cubic metres and the total biomass of stems, branches and leaves is 429 million tonnes (air dry). For the whole country, the projection of total volume and biomass is estimated at 759 million cubic metres and 873 million tonnes respectively. The mean stem volume (over bark) of Nepal is 178 cubic metres/ha, the mean stem volume up to 10 cm top is 131 cubic metres/ha and the average number of stems per hectare is 408 (DFRS, 1999). Total growing stock figures of forests in Nepal are presented in Table 4.

Table 4. Total growing stock of forests in Nepal (in million cubic metres)

Development regions	Years		
	1978	1986	1994*
FWDR	103.0	102.0	71.9
MWDR	206.9	204.0	71.1
WDR	67.9	64.0	43.8
CDR	91.5	85.0	89.8
EDR	67.9	64.0	110.9
Total	537.2	519.0	387.5
Physiographic regions			
Terai	NA	48	NA
Siwaliks	NA	118	NA
Mid mountain	NA	104	NA
High mountain	NA	225	NA
High himal	NA	24	NA
Total	NA	519	NA

*Total growing stock of reachable forest only

Sources : HMG/ADB/FINNIDA, 1988; DFRS, 1999; WECS, 1988

FWDR : Far Western Development Region

MWDR : Mid Western Development Region

WDR : Western Development Region

CDR : Central Development Region

EDR : Eastern Development Region

Forest cover change

Table 5 provides information on forest cover change per year in Nepal in different time series. The highest rate of change was during 1986-1994 and the lowest in 1991-2001. However, the forest cover change during 1991-2001 covers only the data of 20 Terai Districts of Nepal.

Table 5. Forest cover change data in different time series

Cover type	Area in 000 ha				
	Year				
	1978-1986	1986-1994	1978-1994	1994-2005	1991-2001*
Forest cover change	-112.8	-1236.0	-1348.8	-632.0	-8.821
Shrubland change	16.1	854.0	870.1	337.0	
Total	-96.7	-382.0	-478.7	-295.0	
Change/ year	-12.1	-47.8	-29.9	-26.8	-0.8821
Change/year in %	-0.2%	-0.8%	-0.5%	-0.5%	-0.06%

*Forest cover change in 20 Terai districts only.

Regional distribution of forest

The forests of Nepal were categorized according to Development region and Physiographic region in 1978 and 1986. However, in the national forest inventory (NFI) of 1994, forests were classified on the basis of Development regions only (Table 6). In 1978 and 1986, the Mid-Western Development Region (MWDR) had the highest percentage of forests and the Western Development Region (WDR) had the lowest. The data of the 1994 national forest inventory revealed that the Eastern Development Region (EDR) had the highest percentage of forests and the Western Development Region had the lowest. On the basis of physiographic region, the Mid-mountain had the highest percentage of forests and the High Himal had the lowest in 1978 and 1986.

Table 6. Distribution of forests according to development and physiographic regions in different time series

Development regions	Year				
	1978*	1986*	1994**	2000***	2005***
FWDR	18%	18%	17%	17%	17%
MWDR	29%	30%	21%	21%	21%
WDR	16%	16%	12%	12%	12%
CDR	20%	19%	24%	24%	24%
EDR	17%	17%	26%	26%	26%
Physiographic regions					
Terai	10%	8%	NA	NA	NA
Siwaliks	26%	26%	NA	NA	NA
Mid mountain	32%	33%	NA	NA	NA
High mountain	29%	30%	NA	NA	NA
High Himal	3%	3%	NA	NA	NA

Sources: * HMG/ADB/FINNIDA, 1988; **DFRS, 1999; ***Figures are assumed to be equal to 1994.

Growing stock distribution

Regarding growing stock, the first inventory on a national level took place in the 1960s. Inventory results were presented for the Terai and adjoining regions in 1967 and for the Hills in 1973. The latest national forest inventory was completed in 1994 and the report was published in 1999. The mean stem volume up to 10 cm top was 85 and 131 cubic metres/ha in the 1960s and 1994 respectively (Table 7). Comparing the mean growing stock figures of the two inventory results, there was an extra 46 cubic metres/ha in 1994 than in the 1960s.

Based on the NFI results of 1994, Far-western Development Region (FWDR) had the highest mean stem volume (150 cubic metres/ha) and the Mid-western Development Region had the lowest (113 cubic metres/ha). Growing stock figures according to physiographic regions are available for 1986 only. In the 1986, the High Himal had the highest mean stem volume (155 cubic metres/ha) and Mid-mountain had the lowest (59 cubic metres/ha).

Table 7. Growing stock distribution in different time series (in cubic metres/ha)

Development regions	Year					
	1964*	1978**	1986**	1994*	2000***	2005***
FWDR	94.0	104.1	104.0	150.0	NA	NA
MWDR	88.0	125.6	125.0	113.0	NA	NA
WDR	71.0	73.5	72.0	117.0	NA	NA
CDR	77.0	82.8	83.0	122.0	NA	NA
EDR	96.0	71.6	71.0	147.0	NA	NA
Average	85.0	91.5	91.0	131.0	96.0	96.0
Physiographic regions						
Terai	NA	NA	108.0	NA	NA	NA
Siwaliks	NA	NA	82.0	NA	NA	NA
Mid mountain	NA	NA	59.0	NA	NA	NA
High mountain	NA	NA	138.0	NA	NA	NA
High Himal	NA	NA	155.0	NA	NA	NA
Average	NA	NA	108.0	NA	NA	NA

Sources: *DFRS, 1999; ** HMG/ADB/FINNIDA, 1988; *** Assumed to be equal to 1986.

Growing stock composition by species

Information on the composition of growing stock is very important to understand the dynamics of forest composition and forest biodiversity. The 1994 NFI provided information on the relative percentage of growing stock by tree species. Based only on the share of growing stock of the tree species, the relative ranking (first being the highest share in growing stock) of the ten most common tree species are presented in Table 8. Comparison of growing stock composition of five tree species between the first inventory of the 1960s and NFI 1994 is also presented in Table 8. It can be revealed from the table that the share of growing stock of all the five species of the 1960s inventory had decreased in NFI 1994.

Table 8. Growing stock composition by tree species

Scientific name	Common name	Local name	Share in GS of 1960s (%)	Share in GS of 1994 (%)
<i>Shorea robusta</i>	Sal	Sal, Sakhuwa	31	28.2
<i>Quercus spp</i>	Oak	Khasru	n.a.	9.3
<i>Terminalia alata</i>	Indian laurel	Asna, Saj	8.2	7.6
<i>Pinus roxburghii</i>	Chir pine	Khote salla	6.9	6.3
<i>Abies spectabilis</i>	Silver fir	Talis patra	9.5	4.4
<i>Rhododendron spp</i>	Rhododendron	Lali gurans	n.a.	4.3
<i>Alnus nepalensis</i>	Alder	Uttis	n.a.	2.9
<i>Schima wallichii</i>		Chilaune	n.a.	2
<i>Tsuga dumosa</i>	Hemlock	Thingure sall	2.4	1.9
<i>Adina cordifolia</i>		Karma, Haldu	n.a.	1.8

Source: DFRS, 1999.

Forest ownership

The forest inventory reports have not categorized the forest on the basis of ownership status. Therefore, it is difficult to categorize the forest area of the country into private, public and other unspecified categories. All the forest and shrub area presented in the inventory report comes under the public ownership category.

Government-managed forest, private forest, community forest, leasehold forest, religious forest and protected forest have been recognized under the prevailing laws. Furthermore, there is a major role for each category of forest in the context of Nepal. Though the past forest inventory reports have not classified the forest on the basis of ownership, data on different management regimes are presented here on the basis of available reports and databases (Table 9).

Table 9. Forest area under different ownership status

Category	Subcategory	Unit	Area
National Forest	Government-managed forest*	000 ha	3902.27*
	Community Forest**	000 ha	1200
	Leasehold Forest***	000 ha	14.73
	Religious Forest+	000 ha	0.543
	Protected Forest@	000 ha	711
Private Forest	Private Forest#	000 ha	2.3

Sources: **DoF, 2007a; ***LFLP, 2007; @HMG/MFSC, 2002; #DoF, 2005b.

*The area of government managed forest has been calculated by subtracting all categories of forests from the total forest area of Nepal according to the NFI data, including shrub land.

Community forestry is the second largest forest management regime after the government managed forest under the national forest category. The Forest Act 1993 provided special provision in handing over the national forest to local communities through community forest user groups which recently managed more than one quarter of the total national forest in a sustainable manner. More than 14,000 forest user groups are involved in the management of community forest and nearly 40% of the total population benefits. The forest area located in the geologically very sensitive Siwalik region extending from east to west is assumed to be protected forest but this has not yet been declared officially. The Master Plan for the Forestry Sector (MPFS, 1988), Agricultural Perspective Plan (1995) and district forestry sector plan have suggested low intensity forest management and protective measures for the Siwalik forest. Private forest is still found in scattered and linear form within the farmland which is difficult to categorize as forest under the technical definition. The government of Nepal has given high priority to the Leasehold Forestry Programme as an important livelihood strategy for many rural poor, landless and marginalized households of the hilly region.

Extent of production forests

Nepal harbors productive forest in the plains of the Terai and Inner-Terai. The most important species in commercial terms are Sal (*Shorea robusta*) and its associates. Besides, some riverine type of forest is potential forest for commercial management. According to the recent NFI figure, the proportion of Sal (*Shorea robusta*) in the whole country is 28% by volume (DFRS, 1999). Nearly 300,000 ha of forests of 18 Terai and Inner Terai districts have been identified as production forests in Operational Forest Management Plan (OFMPs). It is estimated that about 1.2 million cubic meters of fuelwood and 0.9 million cubic metres of timber will be produced that could generate employment for about 4.8 million people and approximately NRs6000 million revenue to the national treasury (Pokharel and Amatya, 2001).

State of forest management

Management of forestland on a commercial scale has never been a successful story although it was started more than 40 years in Nepal. The first NFI was carried out with the sole intention of commercial harvesting of the forests so that financial returns could be made possible. Realizing that no significant efforts were made towards the introduction of silvicultural practices to improve the status and condition of forests, the Master Plan for the Forestry Sector, 1989 felt the need for scientific forest management in the Terai. On this basis, the new Forest Act 1993 and Forest Regulations 1995 were introduced and emphasized scientific forest management for government forests. Furthermore, OFMPs were prepared for Bara and Rautahat districts with the financial and technical assistance of the Finnish government. The MFSC has approved fourteen OFMPs for the management of about 930,000 ha of forest in the Terai and Inner-Terai regions. The OFMPs have been implemented for over five years. However no noteworthy activity under the OFMPs has been expedited yet because of resource constraints and the negative activities carried out by various stakeholders. The OFMP has categorized the Terai and Inner-Terai forests into three forest management regimes: production forest, protection forest and potential community forest.

Community forestry in the Hills has been a success story in Nepal. It has been proved that the Hill forests have been recovering rapidly with the present community forestry management approach. However, biophysical and social conditions of the Terai and Inner-Terai regions of Nepal vary considerably. The Hill forests are isolated and devoid of external interventions; the social composition of the users is almost homogeneous. However the Terai forests are highly valuable and easily accessible too. In addition, the social composition in the Terai is extremely diverse and the interests of the users are also conflicting. Furthermore, the inhabitants residing close to the Terai forests are mostly recent dwellers, the majority having recently migrated from the Hills. Few have land ownership. Many are land-less and

encroachers of the forests. The government's present definition of 'users' as the residents of a nearby area from the forest (HMGN, 1995), accepting the squatters as the managers (users) of the forests, has raised a prominent ethical question in the case of the Terai forests.

In 2000, the GoN introduced a new concept of forest management for the Terai and Inner-Terai regions. According to this concept, contiguous large blocks of forests of the Terai and Inner-Terai (including the Siwaliks) will be delineated, gazetted and managed as national forests. A collaborative forest management system will be applied to improve forests and the biodiversity of the region. Management of the Terai and Inner-Terai forests will be conducted through the participation of the local people. The committee, to be established around forest area for this reason, would receive forest products free of cost. In addition, local governments like the District Development Committee (DDC) and Village Development Committee (VDC) are entitled to share at least one fourth of the revenue generated from the sale of forest products. Prior to this, all the revenue generated from the government-managed forests used to be collected for the government's treasury. The government promulgated Collaborative Forest Management Guidelines in 2004.

The first Amendment of the Forest Act 1961 in 1977 introduced the concept of leasing degraded parts of a national forest to any person or institution. However, no action was taken until the formulation of the MPFC, which recognized leasehold forests as one of the five types of forest. However, the MPFC conceived of leasing only to individuals, cooperatives, institutions or commercial firms for commercial purposes rather than addressing the poverty issue by leasing to poor households (Yadav and Dhakal, 2000). The Forest Act 1993 and Regulations in 1995 outlined the process of leasing any forest land to individuals, communities, institutions or commercial firms. The Forest Act 1993 outlined that any national forest can be handed over as leasehold forests for the following objectives:

- To produce raw materials for forest-based industries
- To increase production of forest products and to sell or utilize them through establishment of plantations
- To operate the tourism industry in a way that it helps conservation and development of forests
- To conduct agro-forestry practices in a way that they help conservation and development of forests
- To operate farms for production of insects, butterflies and wildlife in a way that helps conservation and development of forests

Leasehold forestry (LF) for the poor came into implementation in 1991, only after the initiation of the Hill Leasehold Forestry and Forage Development Project (HLFFDP), which was financially supported by the International Fund for Agricultural Development (IFAD). The programme was initially launched in the four hill districts and was extended later to 10 districts. The programme was completed in 2003. However, the GoN has decided to continue due to its significant role in poverty reduction and rehabilitation of degraded forest lands. At present, the programme has been launched in 26 districts of Nepal (mostly hill districts and also including some Inner-Terai districts like Chitwan, Makwanpur and Dang). The programme is instrumental in improving the livelihoods of the many landless and poor people in the Midhills and Inner Terai region of Nepal.

The scarcity of forest products and the price increase of forest products in markets and adjoining areas, have led to an increase in tree cultivation in the Terai (Kanel, 1995). The perceived shortage of trees and forest products has also changed the attitude of rural people towards tree planting which has increased tree cover in many private farms of eastern and Central Nepal. The Terai Forestry Programme during the 1980s also helped raise interest

among the people of the Terai. The prevailing laws have also given emphasis to the promotion of private forestry programmes in the country.

The Department of Forest Research and Survey started to assess tree cultivation outside forests since 2004/05 and three districts have been completed covering single Terai districts from each development region. A national level assessment of Trees Outside Forests (TOF) will be completed through analyzing the survey data of five districts by the end of 2008/09. As identified during preliminary observation, rural, urban and roadside/canal strata have been considered while assessing the TOF assessment. The rural stratum was further divided into three regions based on the distance from the natural forest stand particularly to understand the effect of natural forest on TOF status. Trees were counted from different locally defined land-use categories such as agricultural land (irrigated/upland), village settlement, homegarden, public open land and farm boundary.

The result from the TOF assessment in Morang district showed about 15 numbers of stems equivalent to 2.5 cubic meters of stem volume on a per hectare basis which is even less than 2% of the per hectare growing stock of natural forests of the same district. Per hectare total biomass is about 2.9 tonnes indicating a biomass expansion factor equal to about 1.16 including all parts of the tree (i.e. stem, branch and leaf). The rural stratum has more than 80% of the total stem number whereas the same stratum occupies only about 58% of the total stem volume and 55% of the total TOF area. The urban area is rich in terms of stem density stocking level among all three strata and the rural stratum is relatively poor in this regard.

Dalbergia sissoo dominates the species composition by about 35% of the total stem distribution within the selected TOF area in the district. Other dominating trees in the TOF areas are *Albizia indica*, *Melia azaderach*, *Saraca indica* and *Michelia champaca* respectively. Based on primary use of the trees, nearly half of the total trees are useful for timber and furniture purpose. Fruits, industrial raw materials, ornamentals and fuel are the major uses of the trees found in the selected TOF areas.

Religious forests are usually around the temples in Nepal. Temple protection and management boards usually have authorities to manage the forests in whatever way they can. Most of these forests in Nepal have no management and are maintained as protected forests. Trees are usually not felled in such forests. Many can bring substantial benefits to the temple authorities, if they are scientifically managed. However, such management authorities lack technical know-how on scientific forest management practices.

Contribution of the forestry sector to the national economy

The forestry sector has a significant role in the economic development of the country. However, a comprehensive study on the contribution of the forestry sector to the GDP has not yet been carried out, but needs to be done. By the end of the Ninth Five-year Plan (1997-2002) agriculture together with the forestry and fisheries sectors had a 39.3% contribution to the national GDP (NPC, 2002) whereas the figure was 34.9% by the end of the Tenth Five-Year Plan (2002-2007) (NPC, 2007). It is estimated that the forestry sector alone has a 15% contribution to the national GDP (HMG, 2000). On the other hand, FAO has estimated that the forestry sector contributed 3.5% to the national GDP in 2000 and 4.4% for the period of 1990 to 2000 (FAO, 2004). The forestry sector of the whole Asian continent had 1% and 1.2% contribution to the GDP in 2000 and the period 1990-2000 respectively. Table 10 provides statistics on revenue generation from the forestry sector in Nepal.

Table 10 shows that revenue from the forestry sector has been decreasing for the last six years. This may be for two major reasons: i) forest products consumed inside the community forest do not come into national accounting; ii) the protected area network attracts most of the

tourists and is also a major source of revenue generation. Due to the conflict in the country in the past years, the number of tourists has decreased and so has revenue.

Table 10. Revenues from the forestry sector for the last six years (in million NRs)

Products	Timber and fuel	NWFP	Protected areas ^f	Total
2000/01 ^a	395.2	13.9	134.1	543.2
2001/2002 ^b	358.6	12.6	71.2	442.4
2002/2003 ^c	487.5	67.4	60.8	615.7
2003/04 ^d	567.1	44.3	78.4	689.8
2004/05 ^e	358.2	77.8	55.8	491.8
2005/06 ^g	258.9	44.2	NA	303.1

Sources: a: DoF, 2002; b: DoF, 2003; c: DoF, 2004; d: DoF, 2005c; e: DoF, 2006; f: DNPWC, 2004; f: DNPWC, 2005; g: DoF, 2007b.

Forest health and vitality

Fire, insects, diseases and encroachment are some of the major factors affecting the health and vitality of the forest in Nepal. The information on such factors is crucial to minimize their effect on forest quality.

Every year wildfires destroy considerable forest resources in Nepal. Such destruction includes both timber and NWFPs. Although quantitative information is not available, forest fires are definitely degrading biological diversity in Nepal's forests. In addition, fires cause soil erosion and induce floods and landslides due to the destruction of the natural vegetation. Occasionally, embers from forest fires also cause fires in nearby villages, especially in the Terai region where the roofs are made of thatched grass. Many villages are burned every year with loss of lives, cattle and other property. There is no organisation for fighting forest fires in Nepal. The Department of Forests does not possess any special unit or team to deal with the problem of forest fire, including fire fighting or management. None of the 75 district forest offices, with a number of graduate foresters and forestry technicians, has either the capacity or capability for preventing or fighting forest fires. It is probable that these offices under-report forest fire incidences and subsequent damage. Unless forest fire surveillance and monitoring are carried out by satellite imagery it will be difficult to make a good assessment of forest fire numbers, area burned and damage. Prescribed fire is not used in Nepal to prevent forest fires.

Pine needles are collected for cattle bedding. Similarly, forest litter in the hills is collected and mixed with cattle dung for composting. During the fire season, Nepal Radio and Nepal Television broadcast old clips on forest fire prevention and fire fighting.

To date, there are no data available on insect/pest damage to forests in Nepal except some data for *Sissoo* (*Dalbergia sissoo*). Of the total *Sissoo* area of 49,401 ha in 24 districts in Nepal, only 1,222 ha are the natural stand. A survey revealed that only 6.4 and 9.2 percent of the total *Sissoo* population are dead and dying respectively (DFRS, 2000).

Encroachment status

Forest encroachment is identified as one of the main causes of deforestation in Nepal. The continuous vicious cycle of forest encroachment has been identified as the main obstacle for sustainable forest development in the Terai, inner Terai and Churia forests of Nepal. According to a study based on the result of national forest inventories, between 1964 and 1991, Nepal lost 0.57 million ha of forest area (Adhikari, 2002), out of which 0.38 million ha of forests had been converted into agricultural land. The remaining 0.19 million ha had been

used for various infrastructure development purposes such as roads, urban development, irrigation canals, and to establish educational institutions.

Table 11 provides information on encroachment status in Nepal till 2002. It is clear from the table that more forest area is encroached in the Far-western Development Region and less in the Mid-western Development Region. The total encroached forest area is 70,256 ha and the encroached forest area per household is 0.72 ha.

Several efforts were made in the past to evacuate the encroachers from the forest area. Policy and legal instruments were enacted, institutions were strengthened, awareness was generated and human resources were mobilized in order to tackle the problem of forest encroachment in the country. However, poverty, lack of economic opportunities for people residing near forests, weak institutional and administrative arrangements, and lack of political commitments are some of the factors responsible for the continuation of encroachment in the country.

Table 11. Status of encroachment in 24 Terai and Siwalik districts of Nepal

Development regions	Total forest area (ha)	Encroached forest area (ha)	Encroached forest area (%)	hh involved in encroachment (no.)	Encroached area/hh (ha)
FWDR	288200	29516	10.24%	36394	0.81
MWDR	613355	4036	0.66%	7672	0.53
WDR	198500	13367	6.73%	22593	0.59
CDR	680460	8705	1.28%	17182	0.51
EDR	362561	14632	4.04%	13209	1.11
Total	2143076	70256	3.28%	97050	0.72

Source: Adhikari, 2002.

Wood and wood products

The main traded wood products are logs, sawn timber, poles, posts and fuel wood. The sustained supply of wood products (mainly timber and fuel wood) for household and industrial purposes has been the main task of forest management in Nepal. Wood products are being used for different purposes depending on consumer demand specifications. Supply of these products obtained from the forests also governs the potential expansion of wood based industries. These products are normally obtained from government-managed forests, community and private forests, and trees grown on farmlands. Authentic and reliable information regarding wood production in the country is not available and data provided are official records, which do not cover the amount transacted through parallel economy. Most of the fuel wood used in rural areas by households that comes from government managed and protection forests is not recorded at all.

Wood removal status

Wood removal refers to the amount of round wood, sawn timber and wood fuel sold by the Department of Forests, The Timber Corporation of Nepal, Forest Product Development Board and community forest user groups. It does not mean the harvested figure of wood removal from the forests. Table 12 provides information on wood removal status from fiscal year 1990/91 to 2005/06.

Table 12. Wood removal status in Nepal

Years	Roundwood (000 m ³)	Wood fuel (000 m ³)
1990/91 ^a	27.75	90.88
1991/92 ^a	35.79	58.15
1992/93 ^b	24.36	178.13
1994/95 ^c	32.83	93.00
1995/96 ^c	55.59	144.47
1996/97 ^c	52.98	109.48
1997/98 ^d	39.42	40.84
1998/99 ^e	46.30	43.84
1999/2000 ^e	49.71	29.85
2000/01 ^e	76.56	69.30
2001/2002 ^f	53.90	41.29
2002/2003 ^g	80.54	63.13
2003/04 ^h	76.64	57.00
2004/05 ⁱ	60.62	40.95
2005/06 ^j	26.21	20.79

Sources: a: MoF, 1992; b: DoF, 1994; c: HMGN/FINNIDA, 1998; d: DoF, 1999; e: DoF, 2002; f: DoF, 2003; g: DoF, 2004; h: DoF, 2005; i: DoF, 2006; j: DoF, 2007b

Production and consumption of wood

The amount of wood and fuel wood consumed in the country per annum is estimated at 2.2 million m³ and 11,623 million kg. In 2001, the total production of industrial round wood and fuel wood was 0.15 million m³ and 0.95 million m³ respectively. Similarly, the consumption of industrial round wood and fuel wood was 0.1 million m³ and 0.92 million m³ respectively (MoF, 2001). The value of forest product imports in Nepal for 2000 was estimated at US\$3 million (FAO, 2004). The production and consumption figures of different wood products are presented in Table 13.

Table 13. Production and consumption of different wood products in Nepal

Products	Production	Imports	Exports	Consumption
Industrial round wood	152,676 m ³	NA	NA	100,044 m ³
Sawn wood	240 m ³ *	NA	NA	585 m ³
Fuelwood	954,035 m ³	NA	NA	923,161 m ³
Wood-based panels	NA	NA	NA	NA
Plywood	16,720 m ²	NA	NA	NA
Strawboard	1,035 tonnes	NA	NA	NA
Pulp for paper	NA	NA	NA	NA
Paper	17,079 tonnes	NA	NA	NA
Paperboard	NA	NA	NA	NA

* By TCN only .

Sources: Shrestha, 2002; MoF, 2001 and MICS, 2000/01.

Sustainable wood supply assessment

It is argued that the current level of forest productivity is much lower than its potential (Kafle, 2000; Kanel, 2000 and Sowerwine, 1994). The productive forests in the lowland regions have a significant role not only in the economic development of the country, but also in sustaining rural livelihoods. The Current Annual Increment (CAI) of the forests in Nepal is estimated as 0.6 to 1.2 cubic meters per hectare, which is well below the theoretical potential. It is also argued that the present CAI can be increased five to six times if productive forests are managed scientifically. Assuming the forest area of Terai region as productive forest with average productivity of 6 m³/ha, total sustainable production from the Terai forest will be 8.34 million m³ per year. Similarly, a total of 13.31 million m³ per year can be produced

sustainably from the hill and mountain forest if the average productivity of such forest is assumed to be 3 m³/ha (Table 14).

Table 14. Sustainable production from the forest in Nepal

Forest category	Area (million ha)	Productivity (m ³ /ha/year)	Total sustainable production (million m ³ /year)
Potential production forest	1.39	6	8.34
Hills and mountain forest	4.43	3	13.31
Total	5.82		21.65

Forest-based industries

Commercial exploitation of the Nepalese forests began in 1924 to supply railway sleepers to India, however, the first mechanised wood-based industry in the country started in 1938 with the establishment of a match factory followed by a plywood factory in 1943. The Timber Corporation of Nepal and the Fuel wood Corporation were established in the public sector in the early 1960s. A host of private sawmills, and a couple of Katha factories and many furniture factories were also established during this period.

The National Forestry Plan, 1976 envisaged the proper development of forests and forest based industries. As a result a fuel wood and timber sales plan was prepared and the Forest Products Development Board (FPDB) was established to institutionalise the harvesting and distribution of forest products. Only processed or semi-processed wood products were allowed to be exported so that local saw mills could operate at full capacity. As a result, the wood-based industry expanded with the establishment of new sawmills and a wood seasoning plant. By the early 1980s, there were 150 sawmills.

The MPFS in 1988 also gave emphasis to forest-based industries. One of the long term objectives set by the MPFS is to contribute to the growth of local and national economies by managing forest resources and forest-based industries, and creating opportunities for income generation and employment. It identified the development of forest-based industries as one of the six major programmes of the plan.

Forest-based industries in Nepal use both wood and non-wood products. Wooden handicrafts, furniture, hand-made paper production, plywood and parquet are the industries that use wood products. Some enterprises, such as rosin and turpentine, herbal medicine, Sal seed oil and cane furniture production use NWFPs. Most of these industries have been established in the Terai and Siwalik region. A total of 478 forest-based industries have been established so far in Nepal. Of the total, 463 are wood-based and 15 are non-wood-based industries (FRISP, 1998). There are about 46 veneer mills in the Terai region, which export their products mainly to India. There is one bamboo-based factory in Nepal that produces export quality bamboo products.

Table 15. Number of forest-based industries in Nepal

Category	Number
Wood-based	463
Non-wood based	15
Total	478

Source: FRISP, 1998.

Trade of forest products

The main traded wood products are logs, sawn timber, poles, posts and fuel wood. Government-managed forest, community forest, private forest and trees grown on farmland are the main source for these products. The main agencies involved in the harvesting and primary sale of these products are the District Forest Offices (DFO), the Timber Corporation of Nepal (TCN), District Forest Products Supply Committees (DFSPCs), the Forest Products Development Board (FPDB), Village and District Development Committees, CFUGs and private forest owners. The method of sale adopted by the DFO and the FPDB is a public auction whereas the TCN sells directly as well as by public auction. The buyers are mainly sawmills, fuel wood-using industries such as brick kilns, timber merchants and wood-based industries (plywood, veneer and Katha factories). Timber depots are scattered all over the country, mostly in urban areas for the retail of timber and fuel wood to meet the demands of urban consumers. There are two organisations, namely the Forest Products Dealer and Forest Based Industries Association and Nepal Forest Industrial Association, which take up issues with the government concerning the supply of raw materials to industry as well as issues concerning the trade in forest products. The export of logs and sawn timber is prohibited but veneer slices are allowed. NWFPs are also harvested and traded in Nepal. Basically, high value NWFPs have high transaction volume in the markets from which local people are fetching good earnings. Some wood products are also imported from other countries for consumption.

Wood as a source of energy

Energy consumption is one of the indicators for the living standard of people and the development status of the area of concern. Recently the ratio of energy mix has also been taken as a development indicator of the economic region. Generally, least- and underdeveloped countries are heavily dependent on biomass resources whereas developing and developed countries are dependent on advanced forms of energy such as fossil fuel, renewable and nuclear resources.

Extent of wood energy use

Biomass is the major source of energy in Nepal. Fuel wood alone contributes more than three fourths of the total energy system of the country. Table 16 and Figure 2 show the energy scenario of the country for 2004/05. Petro products supply less than 10% of the total energy consumption. Though the country is rich in water resources, only about 1% of the economic potential of hydro power has been harnessed so far. The contribution of electricity from the central grid system is around 2%.

Table 16. Energy scenario of the country in the year 2004/05

Fuel type	Energy (million GJ)	Share
Fuelwood	287.0	78.1%
Agricultural waste	14.0	3.8%
Animal waste	21.2	5.8%
Petroleum products	30.1	8.2%
Coal	6.5	1.8%
Electricity	6.7	1.8%
Alternative energy	2.0	0.5%
Total	367.3	100.0%

Source: WECS, 2006.

In Nepal, biogas, solar and microhydro resources are primarily considered as sources of alternative energy and their growth percentage is highest among all forms. Annual consumption of biomass resources has increased by about 2.4% from the last decade.

Consumption of commercial forms of energy (fossil fuels and central grid electricity) is increasing by about 10% annually. It is interesting that alternative energy consumption is increasing by more than 50% annually but the absolute amount is still insignificant in relation to the total system.

Woodfuel use by sector

Fuel resources are used in different sectors for different purposes. The share of energy consumption in different sectors is given in Table 17. Biomass resources including woodfuel are mostly used in the residential sector and a nominal amount is used in commercial and industrial sectors. Woodfuel alone contributes about 85% of the total energy in the residential sector and the remainder comes from other sources of energy. Industrial and commercial sectors use even less than 1% of their energy consumption derived from woodfuel resources. It is important to note here that the industrial sector still uses large amounts of agricultural waste particularly rice husks for boiler purposes.

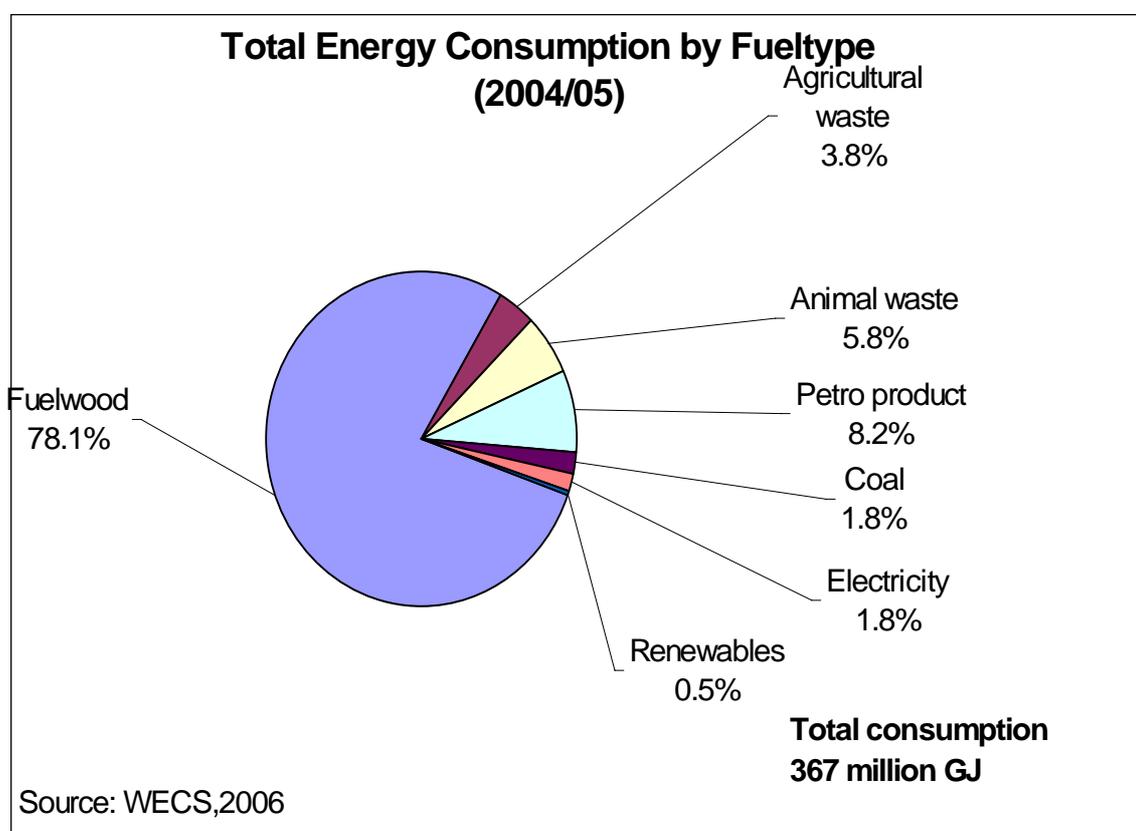


Figure 2. Total energy consumption by fuel type

Table 17. Share of energy consumption in different sectors

Sector	Energy use	Percentage	Sectoral share
Residential	284.13	99.0%	85.7%
Industrial	0.77	0.3%	0.2%
Commercial	2.04	0.7%	0.6%
Transport	0		
Agriculture	0		
Others	0		
Total	286.96	100.0%	78.1%

Source: WECS, 2006.

The share of energy consumption in different sectors of the economy is changing over time. The energy data of the last decade show a gradual increase in percentage share from the residential sector to other industrial and transport sectors. This is because the intensity of biomass and wood fuel energy consumption is decreasing due to the intervention of new technology and new energy forms.

Sources of woodfuel

Different places have different combinations of wood fuel sources. Forest is the major source of wood fuel in many parts of the world whereas some countries highly depend on TOF resources to meet their wood energy demand. In Nepal, the contribution of forests including all types of management regimes still dominates in total wood fuel supply. Other prominent land types for supplying wood fuel resources are scrubland, grassland, non-cultivated inclusion (NCI) and cultivated land. Table 18 gives the sources of wood fuel and their contribution to the total system.

Table 18. Sources of woodfuel and their contribution to the total system

Sources	Sustainable production (tonnes/ha/yr)	Contribution in %	
		1978	2003
Forest	2.1	73	59
Shrubland	0.69	4	17
Grassland	0.1	1	1
NCI	0.69	5	5
Cultivated land	3.5	17	18

Source: WECS, 2006.

It has been assumed that the sustainable production limit of forests, shrubland, grassland and NCI has been derived from their unmanaged regimes. The sustainable production of fuelwood from managed natural forests can be assumed to be at least double that of the unmanaged regime as suggested by the WECS report on fuel wood supply in Nepal. The MPFS 1988 also assumes a similar type of figure for both managed and unmanaged forests of Nepal.

Percentage share of different energy

Table 19 shows how the energy share has shifted over time. Some energy types increased and some decreased judging from the data of the last decade. The fuel wood share seems to be decreasing, about 3% during the decade. Even the share of commercial energy has not changed rapidly over the last decade. The overall growth of energy consumption is quite comparable to the economic growth of the country.

Table 19. Percentage share of different energy sources in different years

Energy source	Year			Annual growth (%)
	1995	2000	2005	
Fuel wood	81.4%	76.6%	78.1%	2.4%
Agricultural waste	3.7%	3.8%	3.8%	3.5%
Animal waste	6.1%	5.8%	5.8%	2.3%
Petroleum products	6.7%	9.1%	8.2%	5.7%
Coal	1.0%	3.2%	1.8%	12.8%
Electricity	1.0%	1.3%	1.8%	13.6%
Alternative energy	0.1%	0.3%	0.5%	51.3%
Total	100.0%	100.0%	100.0%	3.0%

Source: WECS, 2006.

Economics of wood energy use

Table 20 compares the market price, efficiency and effective price of the major fuel types used for cooking purpose in Nepal. The effective price of LPG is quite low even less than about NRs400 for a single unit of GJ energy. Fuelwood only becomes cheapest once it is available free of cost or less than NRs4 per kilogram.

Table 20. Market price, efficiency and effective price of major fuel types in Nepal

Energy type	Natural unit	Market price (Rs/unit)	Market price (NRs/GJ)	Efficiency (%)	Effective price (NRs/GJ)
Fuel wood	Kgs	5-8	375.00	20	1875.00
LPG	Cylinder	950	1319.44	90	1466.05
Electricity	Unit	7.5	2142.86	95	2255.64
Kerosene	Litre	50	1162.79	60	1937.98

Source: WECS, 2006.

More than 17 million tonnes of fuel wood are consumed annually in Nepal, out of which less than 1% is commercialized. The rest is collected by the users free of cost from forests or their own cultivated land.

Non-wood forest products

Non-wood forest products (NWFPs) play an important role in the rural and national economic development of Nepal. They are also a component of the livelihood strategy of local people mainly in remote areas of the country. In the Fiscal Year 2005/06, the NWFP sector generated NRs.67.38 million as revenue (DoF, 2007b). Of the many NWFPs identified, only limited species are traded commercially in Nepal. The MPFS identified seven minor forest products in the country, namely medicinal and aromatic plants, lokta paper, pine resin, sal seed, katha, sabai grass, and bamboo and canes (HMG/ADB/FINNIDA, 1988).

Major NWFPs and their significance to the economies

NWFPs have tremendous potential for contributing to the national as well as local economy, subsistence health needs and improved natural resource management, leading to the conservation of ecosystems and bio-diversity of an area (Subedi, 1997). The value of trade to the national economy is considerable, running into millions of dollars annually. Revenue from traded NWFPs was approximately 11 and 14 percent of the total of the forestry sector for the fiscal years 2004/05 and 2005/06 respectively. It has also been reported that there was an upward trend in government revenue from the NWFP sector between 1980 and 1989 (Edwards, 1996). NWFPs are being increasingly recognized for their role in rural livelihoods, biodiversity conservation and export values. The NWFP market is expanding, and this is an opportunity and challenge for the more sustainable, efficient and equitable use of NWFP resources; but unsustainable harvesting, inequitable benefit distribution and overall economic inefficiencies are problems (Ojha, 2000).

Management of NWFPs

Nepal has been trying to achieve sustainable development through conservation and sustainable use of the natural resources. NWFPs include all biological materials, other than timber, fodder and phalloids (Hammet, 1993). Recently, there has been increasing awareness of the importance of NWFPs in Nepal due to their major role in sustaining the livelihoods of people. Sustainable management of NWFPs is important because of their value as a perennial

source of subsistence income and as a means of conserving biodiversity. Little attention has been given to the biological, socio-economic and conservation importance of NWFP resources in Nepal (HMG/MFSC, 2002).

A national-level Herbs and NWFP Coordination Committee was formed under the chairmanship of the Minister of Forests and Soil Conservation in 2002. The 13-member committee aims to formulate appropriate policies for the overall development of the NWFP sector (Sharma et al., 2004). The committee has placed 30 NWFP species on its priority list and 12 species for research and cultivation. Similarly, the GoN promulgated a Herbs and NWFP Development Policy in 2004. In-situ conservation of NWFPs is basically done in protected areas and forests. The Department of Forests and Department of National Parks and Wildlife Conservation are responsible for the conservation and management of NWFPs in their natural habitat. Seven Herbal Farms and two Botanical Gardens of the Department of Plant Resources have been conserving important medicinal plants found in respective areas (Sharma et al., 2004).

NWFP supply assessment

The amount and value of NWFPs in different fiscal years are presented in Table 21.

Table 21. Amount and value of different NWFPs in different years

Years	Resin (kgs)	Taxus (kgs)	Daphne (kgs)	Argeli (kgs)	Katha (kgs)	Other MAPS (NRs)	Other NWFP (NRs)	Total (million NRs)
2000/01 ^a								13.93
2001/2002 ^b	6071.4	507.2		147.2	22.9	12592022.3	19322101.3	63.30
2002/2003 ^c	1774.4	285.4	144.6	11.3	1198.3	27905703.3	18501482.4	67.37
2003/04 ^d	3836.2	78.5	134.8	10.1	658.4	15985202.7	6975226.7	51.11
2004/05 ^e	1888.1	160.2	179.8	55.3	3066.0	13551200.8	13823979.4	77.84
2005/06 ^f	4091.7	7.5	110.0	14.0	16.2	16987046.2	10714390.0	44.21

Sources: a: DoF, 2002; b: DoF, 2003; c: DoF, 2004; d: DoF, 2005c; e: DoF, 2006; f: DoF, 2007b.

The above supply statistics indicate what has been found in the official records under the MFSC. However, many NWFPs have been collected by a large number of rural people without any royalties which does not come under any official records of the government. This phenomenon has been reported as one of the serious problems in the sustainable management, utilization and conservation of NWFP resources in Nepal.

Service functions of forests

Tree and forest resources provide a vast array of goods and services. Forestry is an integral part of the farming system in Nepal. Forests provide a number of services such as education, recreation, research and other social, religious and spiritual needs. Forests play an important role in ecotourism, particularly in protected areas, for both local as well as foreign tourists. Forests are considered ideal locations for spiritual pursuits.

In cities and towns, urban and recreation forestry is becoming popular with the passage of time. Roadside and avenue plantations are being developed in cities, which not only help in absorbing pollutants emitted by vehicles but also in beautifying the scenery. Forests of urban centres are used by individuals and families for picnics, outings for recreation during weekends and holidays. Plantation campaigns are being carried out on special occasions such as "Forest Festival", "Forester's Day", "World Environment Day" etc.

A total of 3,75,398 tourists visited Nepal in 2005 which was 2.6% higher compared to the previous year. Based on six years of data, more than 40% visited protected areas in Nepal. The details of the tourist status for the past five years is presented in Table 22.

Table 22. Status of tourists visiting protected areas in Nepal

Fiscal year	Total number of tourists arriving in Nepal	Total number of tourists visiting PAs in Nepal	Percentage of tourists visiting PAs in Nepal
2000/01	463646	161020	34.73
2001/02	361237	124108	34.36
2002/03	275468	110340	40.06
2003/04	338132	172290	50.95
2004/05	385297	154716	40.15
2005/06	375398	165304	44.03
Average : 40.71			

Source: DNPWC, 2007.

Forests also offer an excellent opportunity for eco-tourism. Nepalese forests harbor a wide range of flora and fauna which provide immense scope for nature and adventure tourism. The development of eco-tourism also offers opportunities for development of the local economy and developing stakes for local people in the preservation of natural resources. Chitwan National Park and Sagarmatha National Park are listed as World Heritage Sites. As a result, many foreign tourists visit these National Parks each year. Similarly, Annapurna Conservation Area Project is well aware of these eco-tourism activities.

Urban forestry

Although the concept of urban forestry is relatively new, certain practices and disciplines that make up the field of urban forestry have long been established (Andresen, 1978). The concept of urban forestry in Nepal is also relatively new. However, the growing of trees and plants around the homestead is an age-old practice. Similarly, attempts have been made in the past to beautify roads through plantation in Nepal. It is believed that Nepal's first road side plantation is along the Janakpur to Jaleshwar highway. Similarly, Khatmandu Metropolis, Hetauda and Itahari municipalities have also carried out road side plantation works that have added amenity value to the residents.

In Nepal, the total length of road extent is 15,905 km and there are 65 districts with road connections (Anon, 2002). There is a great possibility for establishing road side plantations with appropriate tree species. Similarly, barren public lands and waste land can be used to develop urban parks. Developing avenue plantations and urban parks will provide amenity values to residents and visitors as well and at the same time will help maintain the environment of the city.

Soil conservation and watershed management

Soil, water and forests are the principal natural resources of Nepal. Agriculture is the primary source of livelihood for Nepalese people. The natural resources have great potential in Nepal not only for sustaining the livelihoods of local people, but also in contributing to the national economy. However, the sustainability of these resources is a major concern for Nepal. It is challenged by watershed degradation in general and soil erosion in particular. Soil erosion is the inherent characteristic of Nepal's physioclimatic and socio-economic conditions. The increasing population of Nepal has been exerting tremendous pressure on the watershed ecosystem and resources, especially on land and water. Cultivation of marginal hill slopes to meet the increasing demand for food and shelter for the ever increasing population is the general practice in Nepal which has further exacerbated the watershed condition. More than 6000 rivers and rivulets, forming numerous watersheds of various sizes ranging from big basins to micro-watersheds,

intersect the physiographic regions of Nepal. Intensive monsoon rainfall that occurs within a short span of time causes heavy soil erosion in the mountains. It is reported that Nepal loses 240 million tonnes of fertile topsoil annually as soil erosion. Moreover, the productivity of the land is decreasing by 1% every year due to soil erosion. According to Shrestha et al., 1983, the watershed condition of Nepal is presented in Figure 3.

In order to address the critical situation of watershed degradation, specifically soil erosion, the GoN has been implementing Soil Conservation and Watershed Management (SCWM) activities through the Department of Soil Conservation and Watershed Management (DSCWM) since its establishment in 1974. The ultimate goal of SCWM as advocated by the DSCWM is to help people practice better land husbandry and water use as well as to implement other conservation activities. The strategy for SCWM is to implement all the means of conservation which will reduce pressures on the environment, reducing demands for fuel, fodder and food and other natural resources which will help to improve land productivity. At present the DSCWM is providing SCWM services to 55 out of the 75 districts of Nepal. But the service delivery and area coverage is still inadequate as SCWM activities have been implemented mainly in prioritized sub-watersheds of each district for five years in order to use scarce resources effectively as well as efficiently and get visible effects/impacts.

The physiographical, geological and climatic variation and diversity depicts a disparity in degradation problems and demand appropriate to SCWM activities to combat degradation. It has been appreciated that local communities are actively participating in SCWM activities and benefiting from them. Though SCWM primarily aims to conserve soil and water resources, successful interventions indicate that it should be an integral part of rural development in Nepal.

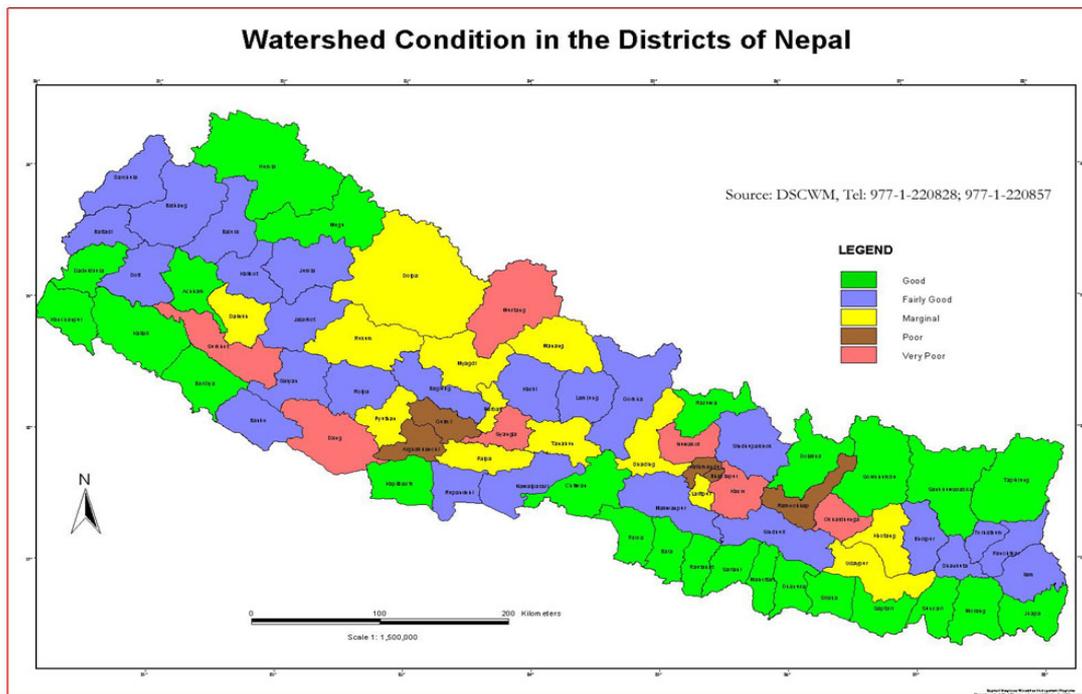


Figure 3. Watershed conditions in the districts of Nepal

Average watershed condition	Number of Districts
Good	25
Fairly good	25
Marginal	13
Poor	5
Very poor	7

Conservation of biodiversity

Biodiversity is the mainstay of the Nepalese economy and of the well being of its people. In Chapter 13 of Agenda 21, mountains are considered as important sources for biological diversity, and storehouses of biological diversity and endangered species (Shengji and Sharma, 1998). The major threats to Nepal's biodiversity are lack of sensitivity and awareness of the general public and inefficient management of natural resources. Root causes of threat to species loss are weak administrative planning and management capacity, inadequate data and information management, high incidence of poverty, and low level of public information and participation (HMG/MFSC, 2002). Conservation of biodiversity with the active participation of concerned stakeholders for improving the socio-economic and cultural conditions of the local communities is essential. Understanding forest resilience and maintaining biodiversity are vital for the sustainable use of forests (HMG/MFSC, 2002).

Nepal possesses over 2.7 percent of the world's flowering plants, 5 percent of bryophytes, 3 percent of pteridophytes, 9.3 percent of the world's bird species and 4.5 percent of the world's mammal species (DNPWC, 2005). Of 118 types of ecosystems identified so far, 52 and 38 are found in the Mid-hills and High Mountain areas respectively (MOPE, 2004). Of them, 240 species of lower plants and 246 species of higher plants are endemic to Nepal. From the perspective of species diversity in wild habitats, Nepal occupies 26th position and 11th position in global and continental ranks respectively (MFSC, 2006). Eight species of fish, 29 species of butterflies, 9 species of amphibians, 108 species of spiders, 2 species of birds and one species of mammal are endemic to Nepal. However, 11 species of birds and 3 species of mammals are believed to be extinct due to habitat destruction and/or alteration (MOPE, 2004).

Of the total species recorded so far, 8 species of plants are listed in the CITES Appendices II and III respectively and the government has given protection status to 18 plants under the Forest Act 1993. Furthermore, the government has protected 26 species of mammals, 9 species of birds and 3 species of reptiles under the National Parks and Wildlife Conservation Act, 1973. All the protected mammals except the striped hyena, birds excluding the common crane, and reptiles are included in the CITES Appendices (MOPE, 2004).

Nepal has declared 9 national parks, 3 wildlife reserves, 3 conservation areas, 11 buffer zones, and 1 hunting reserve to conserve the unique biodiversity (Table 23 and Figure 4). About 19.7 percent (28,999 km²) of the total area of the country, representing all ecological zones (Terai, Mid-Hills, High Mountains and High Himalayas) is under the protected area system.

Table 23. Protected areas of Nepal

Protected areas (year of establishment)	Established year	Area in km ²
National Park (NP)		
Chitwan NP	1973	932
Bardia NP	1984	968
Shivapuri NP	2002	144
Khaptad NP	1984	225
Makalu Barun NP	1991	1500
Sagarmatha NP	1976	1148
Langtang NP	1976	1710
Shey Phoksundo NP	1984	3555
Rara NP	1976	106
Sub-total NP		10,288
Wildlife Reserve (WR)		
Koshi Tappu WR	1976	175
Parsa WR	1984	499
Suklaphanta WR	1976	305
Sub-total WR		979
Hunting Reserve (HR)		
Dhorpatan HR	1987	1325
Sub-total HR		1325
Conservation Area (CA)		
Kanchenjunga CA	1997	2035
Manaslu CA	1998	1663
Annapurna CA	1992	7629
Sub-total CA		11,327
Buffer Zone		
Chitwan NP	1996	750
Bardia NP	1996	328
Makalu Barun NP	1999	830
Langtang NP	1998	420
Shey Phoksundo NP	1998	1349
Sagarmatha NP	2002	275
Rara NP	2006	198
Khaptad NP	2006	216
Koshi Tappu WR	2004	173
Parsa WR	2005	298.17
Suklaphanta WR	2004	243.5
Sub-total Buffer Zone		5079.67
Total Area Protected		28,998.67

Source: DNPWC, 2007.

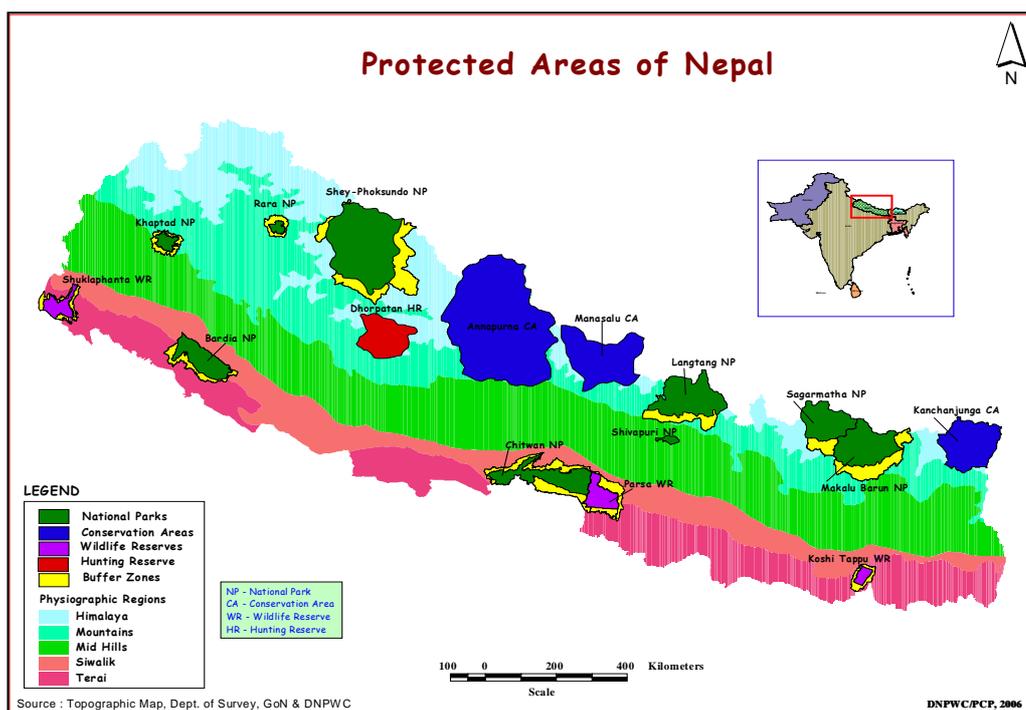


Figure 4. Protected areas of Nepal

Forests and climate change

The country has limited information regarding the impacts of climate change on economic growth, development, resource conservation and basic livelihood. The average warming of annual temperature in Nepal was 0.06°C during 1977-1994. Warming in high altitude can lead to glacial melt and retreat. This can alter the rainfall pattern and hydrological cycle and consequently availability of water resources resulting in increased flooding or depletion of water resources. Nepal has experienced extreme weather related events such as excessive rainfall, longer drought period, landslides and floods; they have increased both in terms of magnitude and frequency. This situation has resulted in creating problems in irrigation and water supply systems. It is estimated that climate change in the Nepalese context will have negative impacts on agriculture, forestry and biodiversity though increasing temperature may improve agricultural productivity in some places.

The most critical impacts from climate change can be expected on water resources through a number of ways such as water induced disasters, hydropower development, irrigation and drinking water supply. Climate change can also be a poverty issue for Nepal since the most vulnerable people are the poor, landless and marginalized people who depend on natural resources and forestry, agriculture and fisheries for their livelihood (HMG/N, 2004, Regmi and Adhikari, 2007, Jianchu et al 2007).

Forests are the principal natural resources of Nepal. Most people use forest products for firewood, food, fodder, timber and medicines. Extensive utilization of and increasing demands for forest products have led to dwindling of forest resource both in area and quality. Further, global warming may cause forest damage, changes in composition, extinction of species etc. The consequences of this situation could affect directly not only the environment of Nepal, but also the lives of the population. Out of the 39 vegetation zones categorized by the Holdridge model, Nepal has 15 types under the existing (CO_2) condition.

Preservation and conservation of forests to help reduce emissions and the implementation of reforestation and afforestation activities to enhance carbon sinks are possible options in the forestry sector. Mitigation option development and assessment have followed the findings of GHG emission inventory studies undertaken in Land-use, Land-use Change and Forestry and Agriculture sectors. They are aimed at reducing carbon emissions and increasing carbon sequestration in Nepalese forests. Three scenarios, short-term (2010), mid term (2020) and long term (2030) have been developed to examine the potential carbon sequestration and response option. To implement appropriate and effective responses to climate change, the following are the priorities for Nepal (MOPE, 2004):

- Improved technology to reduce fuel wood consumption
- Rehabilitating degraded lands through afforestation and reforestation
- Promote sustainable forest management in leasehold and community forests, particularly in the middle hills and the Siwaliks
- Increasing CO₂ uptake from the atmosphere (by converting low productive land into grassland and range lands)
- Promote habitat management for protected wild animals and plants with a particular focus on buffer zone development and management
- Explore opportunities for carbon trading both at domestic and international levels
- Develop an accounting framework for measuring potential changes in forest biomass stocks

These options together with their financial and economic implications need to be carefully examined to establish the GHG abatement potentials.

Policy and institutional framework

The GoN has included regulatory enforcement for sustained supply of forest products in the country in its various policies, acts and regulations. In this connection, the first formal policy and administration (then known as *Ban Jaanch Adda*) was started in 1925 in Nepal (Pokharel, 1998). The recent legal classification of the forests in Nepal is presented in table 24.

Table 24. Legal classification of forests in Nepal

National class	Definition
National Forest	All forests excluding private forest within the kingdom of Nepal, whether marked and unmarked with forest boundaries and the terms shall also include waste or uncultivated lands or unregistered lands surrounded by the forest or situated near the adjoining forest as well as paths, ponds, lakes, rivers or streams and riverine lands within the forest.
Government managed forest	A national forest to be managed by His Majesty's Government
Protected Forest	A national forest declared by His Majesty's Government as the protected forest considering it to be of special environmental, scientific or cultural importance.
Community Forest	A national forest handed over to a user group for its development, conservation and utilization for the collective interest.
Leasehold Forest	A national forest handed over to any institution established on the prevailing laws, industry based on forest products or community for the purposes of conservation and development of forest.
Religious Forest	A national forest handed over to any religious body, group or community for its development, conservation and utilization.
Private Forest	A forest planted, nurtured or conserved in any private land owned by an individual pursuant to prevailing law.

Source: HMGN, 1995.

The forests of Nepal can also be classified according to their function, density, type.

Trends in forest policies and legislation

The evolutionary trend of forest policy and legislation in Nepal is dealt with under the separate heading of policy and legislation. The trends in forest policies and legislation in Nepal are presented in Annex 3 in chronological order.

Forest policy

The major forest related policies of Nepal are as follows:

National Forestry Plan, 1976

The first forest policy in Nepal came into effect in 1976 as the National Forestry Plan. This plan envisaged the proper development of forest and forest industries, giving emphasis on making the country self-reliant in daily needs such as fuelwood and timber. Furthermore, it laid emphasis on providing fuelwood and timber to local people at prime cost in a systematic manner, on restricting export of forest products only in processed or semi-processed form, and on providing raw materials to wood based industries on a competitive basis, discouraging any monopolistic trends (HMGN/ADB/FINNIDA, 1988b). The plan laid down as objectives for forest management the restoration of natural balance, economic mobilization, practice of scientific management, development of technology and promotion of public cooperation (HMGN/ADB/FINNIDA, 1988a).

Periodic plans

The concept of planned development in Nepal began in 1956 when the first five-year plan was launched. It laid emphasis on forest conservation principally through large-scale afforestation. The traditional notion of command-and-control under a powerful forest administration predominated during this period. During the course of planned development, the fifth five-year plan (1975-1980) put greater stress on the contribution of forests to the economic, social and industrial development of the country. This period is considered as landmark in the history of forest development in Nepal since the first National Forestry Plan, 1976 and Panchayat Forest and Panchayat Protected Forest Rules, 1978 came into effect during it.

In the sixth five-year plan (1980-1985), the need for people's participation in the conservation and management of forest resources was emphasized. In addition, Hill Community Forestry Development Projects in 29 hill districts and Terai Community Forestry Projects in 14 Terai districts were launched in this period.

The main policies of the seventh five year plan (1985-1990) were to supply the needs of daily life, including fuelwood, timber, fodder and grass, to carry out afforestation on a large scale, and to protect afforested areas, all by encouraging maximum people's participation in afforestation programmes. The plan's working policies indicate a reforestation target of 175,000 ha, of which 65,000 ha are to be undertaken by the public sector and 110,000 ha by the private. Research priorities for planting fast growing saplings, for protecting land and watersheds economically and for promoting agroforestry were also mentioned in the plan. The MPFS was also prepared during this period.

The main objectives of the eighth five-year plan (1992/93-1996/97) were: i) to stabilise the supply of timber, fuelwood, fodder and other forestry products necessary for day to day lives, ii) to increase the productivity of forests to ensure the supply of raw materials to forest-based industries that contribute to the national economy and iii) to increase income and generate

employment opportunities in the forestry sector for underprivileged families. In order to achieve the above objectives, the following policies were adopted in the eighth five-year plan:

- i) Public participation will be intensified through the implementation of private forestry, leasehold forestry and user group-based community forestry programmes
- ii) Deprived sections of the society will be given preference when land is allocated for leasehold forestry so that their opportunities for employment are increased
- iii) The private sector will be encouraged to sell forestry products
- iv) The development of industrial forestry will be emphasized in appropriate areas

The main objective of the ninth five-year plan (1997-2002) was poverty alleviation by providing economic opportunities for poor people and encouraging their participation in development activities. The main objectives of the ninth five-year plan for the forestry sector were:

- i) Mobilize, conserve and manage forest resources to reduce the gap between demand and supply
- ii) Create income generating and employment opportunities for poor and marginal families
- iii) Mobilize local people to enhance productivity
- iv) Adopt proper land use practices

The following policies have been adopted in the ninth five-year plan in order to achieve the above objectives:

- i) Local users will be encouraged in their efforts to fulfill their daily needs for timber, fuel wood, fodder and other forest products
- ii) Support for poverty alleviation will be provided by promoting and establishing participatory forest management and by implementing community-based development activities
- iii) The management, marketing, industrial development, processing and export of herbs and forest products will be supported
- iv) The private sector will be encouraged by providing the opportunity for the commercial management of government-owned forests in potential areas

The tenth five-year plan (2002-2007) also emphasizes the greater role of forest resources in reducing poverty through various forest development activities. The main objectives of the tenth five-year plan for the forestry sector are as follows:

- i) Conservation and management of forests, soil and watersheds and biodiversity, development of forest-based enterprises in order to ensure sustained supply of forest products and maintain the environmental balance
- ii) Poverty reduction through generation of income and employment generation from various forestry development activities with the active participation of local people
- iii) Skill development, awareness generation and technical support for the promotion of private forestry

The following policies have been adopted in the tenth five-year plan in order to achieve the above objectives:

- i) A forest encroachment control policy will be formulated in order to attain balance between the natural environment and development
- ii) Priorities will be given to increase revenue from the forestry sector through sustained use of forests and establishment of enterprises based on agroforestry

- iii) Priorities will be given to integrated watershed management and agroforestry programmes in order to protect land and water in the Chure, Inner Terai and Terai regions
- iv) Priorities will be given for scientific management of national forests and supply of raw materials to forest-based industries. Collaborative forest management will be adopted in the Inner Terai with the active participation of all stakeholders. Activities related to agroforestry and NWFPs will be included in scientific forest management in order to generate income
- v) The government sector will act as a facilitator for the promotion of private forestry and forest-based enterprises

The three year interim plan (2007-2009) has also emphasized the role of the forestry sector in Nepal. The following policies have been adopted in the forestry sector in the interim plan:

- i) Legal and institutional reform
- ii) Poverty reduction through generation of income and employment generation from various forestry development activities with the active participation of local people
- iii) Ensure access of deprived segments of society for equitable distribution of forest products obtained through sustainable forest management including community forest management
- iv) 35% of the total income of the community forests will be invested in productive sectors that will focus on *Dalits*, ethnic groups, women and poor families

Master Plan for the Forestry Sector, 1989

The MPFS started in 1986 and a plan for a period of 21 years (1989-2010) was prepared by the GoN. The MPFS has served as the principal policy and planning framework for the forestry sector in Nepal. The long-term objectives of the MPFS are as follows:

- i) to meet people's basic needs for fuelwood, fodder, timber, and other forest products, and to contribute to food production through an effective interaction between forestry and farming practices
- ii) to protect land against degradation and other effects of ecological imbalance
- iii) to conserve ecosystems and genetic resources and
- iv) to contribute to the growth of local and national economies by developing forest management and forest-based industries and creating opportunities for income generation and employment

To meet these objectives, six primary and six supportive development programmes have been developed. The community and private forestry programme has remained one of the six major programmes which aim at the development and management of forest resources through the active participation of individual people and communities to meet their basic needs.

National Conservation Strategy (NCS), 1988

The National Conservation Strategy (NCS) was prepared in 1988 as a national follow up response to the global World Conservation Strategy adopted in 1980. The NCS viewed the natural environment system in a holistic way where wise use, protection, preservation and restoration are identified as the four key elements of the underlying strategy. The following four objectives are stated in the NCS:

- i) Satisfy the basic material, spiritual and cultural needs of the people of Nepal for both present and future generations
- ii) Ensure the sustainable use of Nepal's land and renewable resources

- iii) Preserve the biological diversity of Nepal in order to maintain and improve the variety of yields and the quality of crops and livestock, and to maintain the variety of wild species, both plant and animal and
- iv) Maintain essential ecological and life-support systems, such as soil regeneration, nutrient recycling and the protection and cleansing of water and air

The NCS proposed a Conservation Action Agenda and four 'Vanguard Programmes', one each for the mountains, hills, inner Terai and Terai. The activities proposed in the Vanguard Programmes for the Terai regions are: fisheries and livestock farming, agroforestry, women's role in conservation, community biogas, agricultural development and leasehold forest management.

Nepal Environmental Policy and Action Plan (NEPAP), 1993

NEPAP was formulated in 1993 as a further refinement of the NCS. NEPAP identified major sectoral areas where a natural resource (land, forest and rangeland, water) was one of them. Degradation of the country's natural resources and declining soil fertility were identified as the principal national environmental problems. NEPAP proposed the following policies for forest and rangeland management:

- i) Improve forest management by implementing the findings of the MPFS
- ii) Encourage community participation in forest management
- iii) Improve rangeland management
- iv) Encourage greater private sector involvement in managing national forests
- v) Raise awareness of the importance of forest conservation
- vi) Minimize adverse environmental impacts of forest related projects and
- vii) Promote research and development of alternative energy sources to reduce dependence on biomass sources

Agriculture Perspective Plan (APP), 1995

The APP was prepared in 1995 for a period of 20 years. The principal objective of the plan is to resolving the poverty problem lies in raising agricultural production through improved factor productivity. Strategies have been developed to achieve higher economic growth through improved productivity in agriculture and to encourage farmers to commercialize farming operations on environmentally more robust lands in order to relieve pressure on a limited natural resource base.

In the Prioritized Productivity Package (PPP) of the APP, a number of key priorities are stated. Accordingly, there are four priority inputs (irrigation, fertilizer, technology, roads and power), four priority outputs (livestock, high value crops, agribusiness, forestry), three targeted areas of focus for impact (poverty reduction and food security, environment, regional balance), and a number of policy interventions, institutional arrangements, and investment decisions.

Forestry has been considered as one of the four priority outputs in the APP. Within the forestry sector, the following four top priorities are stated in the APP:

- i) Community forestry in the hills and mountains
- ii) Commercial management of forests in the Terai
- iii) Private and leasehold forestry and
- iv) Training, research and development

In addition, promotion of intercropping with medicinal herbs and other cash crops for providing economic benefits and generating off-farm employment to the rural poor is also mentioned in the APP.

Revised Forestry Sector Policy 2000

This policy provides explicit options for managing the forests of the Terai, Churia and Inner Terai regions of the country. It has also given recognition to the APP, MPFS, and NEPAP. The long-term objectives of the Forestry Sector Policy, 2000 are:

- i) to meet people's basic needs for fuel wood, fodder, timber, and other forest products on a sustained basis
- ii) to contribute to food production through an effective interaction between forestry and farming practices
- iii) to protect land against degradation and other effects of ecological imbalance
- iv) to conserve ecosystems and genetic resources and
- v) to contribute to the growth of local and national economies and thereby to improve the quality of life of the people by managing land and forest resources, developing forest-based industries, and by creating opportunities for income generation and employment

One of the short-term objectives of the policy is to provide opportunities for forestry resource management under the community, private and leasehold forestry programmes as well as the biodiversity conservation programmes provided for in the new forestry legislation.

The GoN has formulated the following policy guidelines for the legal, institutional, and operational development of the forestry sector:

Land-use planning

Land use planning will be introduced in order to enhance the productivity of the resource base and for striking a balance between the conservation and the sustainable use of natural resources. For this purpose, conversion of forest, shrub and grassland into cultivation areas will be forbidden.

Conservation of biodiversity, ecosystems, and genetic resources

In order to conserve forests, soil, water and biodiversity while at the same time meeting the basic needs of the people on a sustainable basis, land and forest resources will be managed and utilised according to their ecological status. A landscape planning approach to managing biological diversity on an ecosystem basis will be initiated.

Production and utilization

The forestry resources of Nepal will be managed and utilized in a manner which gives priority to the production of products which best meets the needs of the people. Forests in the mountains will be managed with user participation whereas forests in the Terai and Siwaliks of high economic and national importance will be managed and utilised by implementing management plans and by strictly following the plans' prescriptions. The supply of forest products will be intensified by promoting tree planting on farms and commercial plantations.

Social aspects of land and forestry resources

Emphasis will be given to integrated farming for strengthening soil conservation and watershed management, for research, extension, and agroforestry, and for other activities related to the forestry sector.

The role of the private sector

Establishment of private forests, herbal farms, and wildlife ranching on private land will be encouraged. Parastatals will be required to compete with private enterprises on an equal footing, and they will be required to pay market prices for forest products.

Investment in the forestry sector

The forestry sector will be recognized as one of the priority sectors for planning and investment. Joint ventures with the private sector to implement commercial forestry operations in suitable forests of the Terai will be encouraged.

Legislation

The Interim Constitution of Nepal, 2007

The Interim Constitution of Nepal, 2007 envisaged people as the source of power through decentralization. The constitution under the chapter of Liabilities, Directive Principles and Policies of the State stipulates various liabilities, principles and policies, which are fundamental to the governance of the state. Article 35 (4) of this chapter requires the state to pursue the policy of mobilizing the nation's natural resources and heritage in a useful and profitable manner suitable to national welfare. Similarly, Article 35(5) of the same chapter also proclaims: 'The state shall give priority to the protection of the environment and also to the prevention of its further damage due to physical development activities by increasing the awareness of the general public about environmental cleanliness, and the state shall also make arrangements for the special protection of rare wildlife, the forests and the vegetation' (GoN, 2007a).

Private Forests Nationalization Act 1957

Before the enactment of the Private Forests Nationalization Act 1957, a traditional forest management system existed in Nepal, where the state exercised little control over the forest use and private and communal ownership was formally recognized. With a smaller population and a large forest resource base, the supply of forest products was plentiful relative to demand (Wallace, 1987). Forest land was being converted into farmland since there was no state control over forest use. In 1957, the Private Forests Nationalization Act placed ownership of all forests in the GoN (Wallace, 1987). Local people reacted negatively and the government was also unprepared to undertake the technical and administrative responsibilities of forest ownership. As a result of inadequate government control and adverse local reaction to nationalization, Nepal's forests effectively were converted from common property to an open access resource. With the increase in population and needs for forest produce, the forests, particularly those in the hills, were put under heavy pressure and so were those in the Terai as well (HMGN/ADB/FINNIDA, 1988a).

Forest Act, 1961

To face escalating problems with the management of forest resources, the GoN enacted the Forest Act 1961 to regulate forest use, which was the first comprehensive forest legislation in Nepal's history. It was an attempt to institute better management of the forest by simply prohibiting destructive activities (Wallace, 1987).

The Forest Protection Special Act, 1967

The Forest Protection Special Act was promulgated in 1967; it prohibited damaging or removing forest products without official permission (HMGN, 1995). This act aimed at controlling massive destruction of Terai forests for railway construction and other development works in India (HMGN/ADB/FINNIDA, 1988a) but this has not had much effect on the forests (Wallace, 1987).

Forest Products Sales and Distribution Rule, 1971

The Forest and Forest Protection Special Acts were made more operational through the Forest Products Sales and Distribution Rule passed in 1971. This rule established a system of permits and prices for forest products (HMGN, 1995) but it did not work effectively because people had to extract forest produce against the rules to satisfy their basic needs (HMGN/ADB/FINNIDA, 1988a). Recognizing the legitimacy of basic human needs, the GoN formulated a decentralization policy to mobilize local resources for sustained development. Enactment of the Panchayat Forest and Panchayat Protected Forest Rules of 1978 were examples of this principle, where provisions of handing over patches of national forests to local political units were made.

Panchayat Forest and Panchayat Protected Forest Rules, 1978

The Panchayat Forest and Panchayat Protected Forest Rules of 1978 allowed communities to manage barren or degraded lands for forest production. These rules needed improvement before they could effectively promote community forestry in the spirit of decentralization.

Forest Act, 1993

With the guidance of the MPFS 1988 and lessons learnt from the past, the Forest Act 1993 came into effect after the Forest Regulation was approved in 1995. The Forest Act of 1993 broadly classified the forests of Nepal into two categories: Private Forest and National Forest. The national forest is further categorized into the following types (HMGN, 1995):

- Government-managed forest: a national forest to be managed by the GoN
- Protected forest: a national forest considered to be of special environmental, scientific or cultural importance
- Community forest: a national forest handed over to a user group for its development, conservation and utilization for the collective interest
- Leasehold forest: a national forest leased to any institution, industry based on forest products or community established under prevailing laws
- Religious forest: a national forest handed over to any religious body, group or community for its development, conservation and utilization

Private forest means a forest planted, nurtured or conserved in any private land owned by an individual pursuant to prevailing laws.

Forest Regulation, 1995

The Forest Regulation was enacted only in 1995 to support and simplify the provisions mentioned in the Forest Act, 1993.

Local Self Governance Act (LSGA), 1998

Article 34 (2) of the Interim Constitution of Nepal, 2007 provides a basic framework for decentralization. The preamble of the Local Self Governance Act, 1998 stipulates that participation of the entire people, including various ethnic tribes, indigenous people, deprived sections and those who are socially and economically challenged, is necessary for the institutionalization of development, allotment and mobilization of resources, social equality, and balanced and equitable distribution of the fruits of development.

According to Section 28 of this Act, the powers and functions of a Village Development Committee are divided into 11 broad areas of which 'Forest and Environment' is one of them. The powers and functions under 'Forest and Environment' are as follows:

- to launch afforestation programmes in fallow lands, hill slopes and public lands
- to prepare and implement programmes for the conservation and development of forests, vegetation, biodiversity, soil erosion and
- to formulate and implement various programmes for environmental conservation

Section 58 (d and e) of the Act provides the VDC with the right to sell dried timber, fuel wood, twigs, branches, bushes, grass and straw within the VDC area for income generation. Section 68 (1, c and d) stipulates that the property of a VDC includes forests granted by the prevailing laws and the GoN, and natural heritage of the VDC, respectively.

According to Section 96 of this Act, the powers and functions of a municipality are divided into 10 broad areas of which 'Water Resources, Environment and Sanitation' is one of them. The power and function related to forestry under 'Water Resources, Environment and Sanitation' is mentioned in Section 96 (c, 5) that deals with the forests, vegetation and other natural resources within the municipality area.

According to Section 189 of this Act, the powers and functions of a DDC are divided into 16 broad areas of which 'Forest and Environment' is one of them. In connection with 'Forest and Environment', the DDC is required to develop a plan for the conservation of forests, vegetation, biological diversity and soil and implement it or cause it to be implemented, and protection and promotion of the environment. In accordance with Section 202 of the Act, DDCs must select those projects which can contribute to the protection of the environment and which may have maximum participation of the local people and labour. Section 215 (2) of the Act empowers the DDC to levy taxes on wool, resin, herbs, slate and sand, and animal products such as bone, horn, wing, leather etc., except those items prohibited pursuant to the prevailing law. Section 218 empowers the DDC to sell sand, boulders, stones and driftwood lying within its boundary.

Recent policy changes

According to local and national needs, the changing situation of the country and international commitments, the GoN has formulated policies to suit the needs of the people. Some of the noteworthy policies formulated by the GoN after 2000 are:

- Revised Forest Policy, 2000
- Leasehold Forestry Policy, 2002
- Nepal Biodiversity Strategy, 2002
- National Wetland Policy, 2003
- Herbs and NTFP Development Policy, 2004
- Terai Arca Landscape Strategy 2004-2014

- Sacred Himalayan Landscape Strategy 2006-2016
- Gender and Social Inclusion Strategy in the Forestry Sector 2004-2019

Institutional arrangements

The following institutions are involved in macro-policy making and programming in the forestry sector of Nepal:

1. The Parliamentary Committee on Natural Resource oversees the actions of the government in initiating measures for the conservation of natural resources in the country
2. The Environmental Protection Council chaired by the Prime Minister provides guidance regarding formulation as well as implementation of environmental policies
3. The National Development Council chaired by the Prime Minister gives directives to the NPC on various development issues
4. The National Planning Commission prepares a periodic development plan for the country and guides the sectoral forestry policy through its Agriculture and Forestry Division
5. The Ministry of Forests and Soil Conservation is responsible for formulating and implementing policies, plans and programmes related to forest resources

Role of public sectors

The Ministry of Forests and Soil Conservation is the apex body for the implementation of forestry sector policy and programmes in Nepal. The institutional framework consists of central, regional and local level offices. The organizational structure of the MFSC is presented in Annex 4. The direct employment figures in the forestry sector of Nepal are given in Table 25.

The MFSC and its departments with different divisions constitute the central level body of forestry sector organization. The regional offices represent the ministry at the regional level while the district level offices represent the concerned departments in the districts.

At present, there are altogether 74 DFOs representing the DoF throughout the nation. Under the DFOs, there are altogether 92 Ilaka Forest Offices and 696 Range Posts. According to the DoF sources, more than 7,000 personnel (two thirds being Foresters) under the DoF are involved in protection and management of the forest resources of the country. Similarly, 55 District Soil Conservation Offices represent the DSCWM with 656 staff members.

The Department of National Parks and Wildlife Conservation (DNPWC) represents a vast network within the protected area system (PAS). Out of the 27 PAS units (9 National Parks, 3 Wildlife Reserves, 1 Hunting Reserve, 3 Conservation Areas and 11 Buffer Zones), 25 units are managed directly by the DNPWC while 2 Conservation Areas namely Annapurna and Manaslu are managed by the National Trust for Nature Conservation (NTNC). The responsibility of the protection of the 11 PAS units has been given to the Nepalese army. More than 4,500 Nepalese army personnel are involved in the protection of these 11 protected areas.

The Department of Plant Resources (DPR) is represented by 7 District Plant Resource Offices. There are no district-level offices that represent the Department of Forest Research and Survey (DFRS). However there are 5 Field Units one in each of the five development regions of the country representing the DFRS.

Table 25. Direct employment in the forestry sector

Office	Total	Percentage
Ministry of Forests and Soil Conservation	78	0.5%
Department of Forests	7641	51.6%
Department of Plant Resources	349	2.4%
Department of National Parks and Wildlife Conservation	1010	6.8%
Department of Soil Conservation and Watershed Mgmt.	741	5.0%
Department of Forest Research and Survey	104	0.7%
The Timber Corporation of Nepal	443	3.0%
Forest Product Development Board	240	1.6%
Herbs Production and Processing Company Limited	193	1.3%
Army in National Parks and Wildlife Reserve	4000	27.0%
Total	14,799	100.0%

Source: Respective Official Records.

Role of private sectors

The role of private sectors has been greatly emphasized in the recent forestry policy documents of the government. However, their role in the forestry sector is limited. Private sectors are involved in marketing of forest products including NWFPs and the establishment of some forest-based industries.

There are many small scale forest based enterprises operated by private entrepreneurs in the country. However, the role of the private sector in the forestry sector is only confined to the marketing of forest products and advocacy for better policy formulation. Some private sector associations actively involved in the forestry sector of Nepal are:

- Nepal Rosin Association
- Nepal Herbs and Herbal Products Association
- Nepal Forests Products Entrepreneurs Association
- Nepal Chamber of Commerce
- Nepal Katha Mill Association
- Federation of Nepalese Chamber of Commerce and Industry
- Handicraft Association of Nepal
- Bamboo and Rattan Society of Nepal

Role of civil society and NGO sectors

The role of civil societies and NGOs in the forestry sector of Nepal has been increasing these days. With the advent of community forestry in Nepal, federations and user group networks have been established. Such federations are strongly involved in advocacy campaigns in the forestry sector. Community forestry has been the main strategy of the GoN in the forestry sector since its inception during the late 1970s (Kanel, 2004). Although the concept of community and social forestry emerged only in the late 1970s (Gilmour and Fisher, 1991), it gained momentum only after the enactment of the Forest Act, 1993 and Forest Regulations, 1995. As of September 2007, about 1.2 million hectares of forest land have been handed over to more than 14,500 Forest User Groups (FUGs) for management (DoF, 2007). In the beginning, the programme was focused in the Mid-hill regions of the country in order to conserve the degraded sites through afforestation programmes. Later on it was also replicated in the lowland region of Nepal. It is estimated that 61% of the forest area has been identified as potential community forests, forests which could be handed over to user groups for management (Tamrakar and Nelson, 1991). Being a pioneer country in launching community forestry programmes, the modality has been replicated in many other countries and is gaining popularity.

Many NGOs in the different parts of the country are implementing forestry-related programmes and activities. The GoN formulated a policy for handing over management of National Parks and Wildlife Reserves to NGOs and civil societies in 2004. Similarly, the budget speech of this Fiscal Year (2007/08) has made provisions for the management of five block forests in the Terai region for leasehold forestry purposes and five blocks for commercial purposes (MoF, 2007). The government has also recognized the role of civil society and NGOs in formulating policies as well. Table 26 provides information related to the I/NGOs, academic institutions, bilateral projects and private sector working in the fields of forestry and the environment.

Table 26. A. Organizations working in the field of forestry and the environment

SN	Name of organization	Address (city)	Roles and responsibilities
A. Universities/national research institutes (national staff)			Research and education
	Institute of Forestry, Tribhuvan University (IOF)	Pokhara, Nepal	
	School of Human and Natural Resource Management (SchHNRM), Kathmandu University	Dhulikhel, Nepal	
	School of Environment and Management Studies (SchEMS), Pokhara University	Kathmandu, Nepal	
	Nepal Academy of Science and Technology (NAST)	Kathmandu, Nepal	

B. Bilateral donor agencies (national staff/counterpart officers and/or expatriates)

	Livelihood and Forestry Programme (LFP) of DFID	Kathmandu, Nepal	Support in forestry development activities
	Biodiversity Sector Programme-Siwalik Terai (BISEP-ST) of SNV	Kathmandu, Nepal	
	Nepal Swiss Community Forestry Project (NSCFP) of SDC	Kathmandu, Nepal	
	Terai Arc Landscape (TAL) Western Terai Landscape Building	Kathmandu, Nepal	
	Programme (WTLBP) Participatory Conservation	Kathmandu, Nepal	
	Programme (PCP) of UNDP USAID	Kathmandu, Nepal	

C. International organizations (national focal points and/or expatriates)

	World Conservation Union (IUCN)	Kathmandu, Nepal	Support in forestry development activities
	World Wildlife Fund (WWF)	Kathmandu, Nepal	
	International Centre for Integrated Mountain Development (ICIMOD)	Kathmandu, Nepal	
	United Nation's Development Programme (UNDP)	Kathmandu, Nepal	
	Food and Agriculture Organizations (FAO)	Kathmandu, Nepal	
	CARE-Nepal	Kathmandu, Nepal	
	Asian Network for Small-scale Agriculture and Bio-resources (ANSAB)	Kathmandu, Nepal	
	Action-Aid Nepal	Kathmandu, Nepal	
	Global Forest Resource Assessment, (GFRA) FAO	Rome, Italy	
	Asia Pacific Forestry Commission United Nations Forum on Forests	Bangkok, Thailand	
	International Union of Forestry Research	New York, USA	

	Organizations (IUFRO)	
	International Network for Bamboo and Rattan (INBAR)	Beijing, China
	Convention on Biological Diversity (CBD)	Vienna, Austria
	International Tropical Timber Organization (ITTO)	Japan
	Central for International Forestry Research (CIFOR)	Bogor, Indonesia

D. Private sector

D.1. Profit organizations (companies, industry associations, user groups, etc.) (national staff)

	Dabur-Nepal Forest Products Development Board The Timber Corporation of Nepal (TCN) Herbs Production and Processing Company Limited (HPPCL) Federation of Community Forest User Groups Nepal (FECOFUN) Nepalese Federation of Forest Resource User Groups (NEFUG) Nepal Forest Products Entrepreneurs' Association (NFPEA) Collaborative Forest Users Association (CFUA)	Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal	Advocacy, policy lobbying, profit maximization
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D.2. Non-profit/governmental organizations (NPO/NGO) (national staff and/or expatriates)

	Nepal Foresters' Association (NFA) Nepal Forum for Environment Journalists (NEFEJ) Forest Action-Nepal Rangers' Association of Nepal (RAN) Local Initiatives for Biodiversity Research and Development (LIBIRD)	Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Kathmandu, Nepal Pokhara, Nepal	Advocacy and Networking, Professional growth
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Research and education in the forestry sector

Nepal has a long tradition of forestry research. The Forest Resource Survey Office was established in 1963. The Department of Forest Research and Survey, established in 1999, is the only mandated public agency to carry out forestry research and survey activities in Nepal. The major objectives of the Department are:

- To develop and disseminate appropriate technologies related to forestry
- To carry out national and district level forest inventory and update forestry statistics
- To develop and maintain the National Library and Information Centre for forestry and allied sciences.

The recent thrusts of the forestry research in Nepal are as follows:

1. Assessment of the forestry sector contribution in the national economy
2. Socioeconomic studies of forestry development activities
3. Support to community forestry user groups, leasehold forestry user groups, private tree growers,

4. Nursery and plantation management
5. Propagation, management and utilization of bamboo and rattan
6. Tree crop interaction in farmland
7. Technology development for optimizing forest products from natural forests
8. Soil and plant analysis
9. Forest resources inventory and management plan
10. Assessment of Trees Outside Forests (TOF)
11. Biometric studies
12. Economic utilization of forest products
13. Forest policy research
14. Forest classification and mapping

In addition to the DFRS, other Departments under the Ministry of Forests and Soil Conservation and some INGOs, NGOs are carrying out case-specific forestry research activities in the country. The Institute of Forestry and Institute of Agriculture and Animal Sciences under Tribhuvan University, Kathmandu University are also involved in forestry and environment related research and education.

The DFRS has completed many forestry related research and survey activities since its establishment some of the important achievements are:

- Technology transfer to farmers on nursery, plantation and forest management
- National forest inventory during 1960s and 1990s completed and forest resource information updated
- Recommended suitable models of agroforestry for farmers
- Completed forest soil survey of several districts
- Provided technical support to the District Forest Offices and CFUGs
- Published more than 300 publications of different categories
- *Sissoo* die-back survey

Research links between the DFRS, other forestry research institutions and universities are virtually non-existent and much research is of limited usefulness to field problems. Even when useful results are found they are seldom extended to and applied in the field. The research function needs to be strengthened by need-based research to increase productivity and move from deficit to surplus in forest products. The keys to this lie in increasing: (a) the research function (create senior posts, adopt research findings etc.); (b) the qualification and continuity of research staff; and (c) links with other research activities.

Key issues in the forestry sector

Peace and stability are the pre-conditions for development of the country. The forestry sector is one of the major sectors that can contribute to the socio-economic development of the country. However, there are many issues to be tackled in the forestry sector of Nepal to attain sustainable development in the forestry sector. Population and poverty are the two main causes of destructive pressure on forests. The depleting forest cover calls for urgent care in planning a strategy to rehabilitate the forests and meet genuine human needs. Some of the major issues of the forestry sector of Nepal are explained in Table 27.

Table 27. Major issues in the forestry sector of Nepal

Category of the issue	Description
Policy issue	Country has no long term national land use policy Handing over of government forest area for other purposes
Legal institutional issue	Restructuring of the forestry sector
Socio-economic issue	Underestimation of the forestry sector contribution to the national economy Heavy dependence of poor people on forest resources Low return on investment from the forestry sector
Technical/HRM issue	Limited human resources Poor and weak forest research activities Poor and weak database system on forest resources
Environmental issue	Payment for Environmental Services (PES) is not considered (Biodiversity conservation, Carbon sequestration, Soil and watershed conservation etc.).
Management issue	Unsustainable harvesting and collection of NWFP resources Conflict in the management of Terai, Churia and Inner Terai forest The Operational Forest Management Plan has not been implemented

3. THE DRIVERS OF CHANGE IN THE FORESTRY SECTOR OF NEPAL

The forests are the most important and versatile renewable natural resources of Nepal, providing a wide range of economic, social, and environmental benefits and services simultaneously. The demand for forest products and services is high and will continue to grow in the future. However, the sustainability of the forest products and services depends on a number of factors that may bring about changes in the forestry sector of Nepal by 2020. These drivers of change include demographic changes (population growth, migration patterns, internally displaced population), economic pressures (economic growth, poverty, forest management and harvesting, fuelwood energy, NWFPs, eco-tourism), ecological pressures (deforestation and forest degradation, land degradation and desertification, climate change, natural disasters, invasive species, bio-diversity conservation) and socio-political pressures (societal transitions, decentralization and devolution, community based forest management, people's preferences and demands, governance issues, policy reforms and institutional changes).

Demographic changes

Demographic changes include the population growth, migration patterns and internally displaced population in Nepal.

The total population of the country is 23.15 million with 2.25 percent annual growth rate (CBS 2001). Population projections for Nepal (2001 – 2021) indicate that 11.02 million people will be added by 2021 (Figure 5).

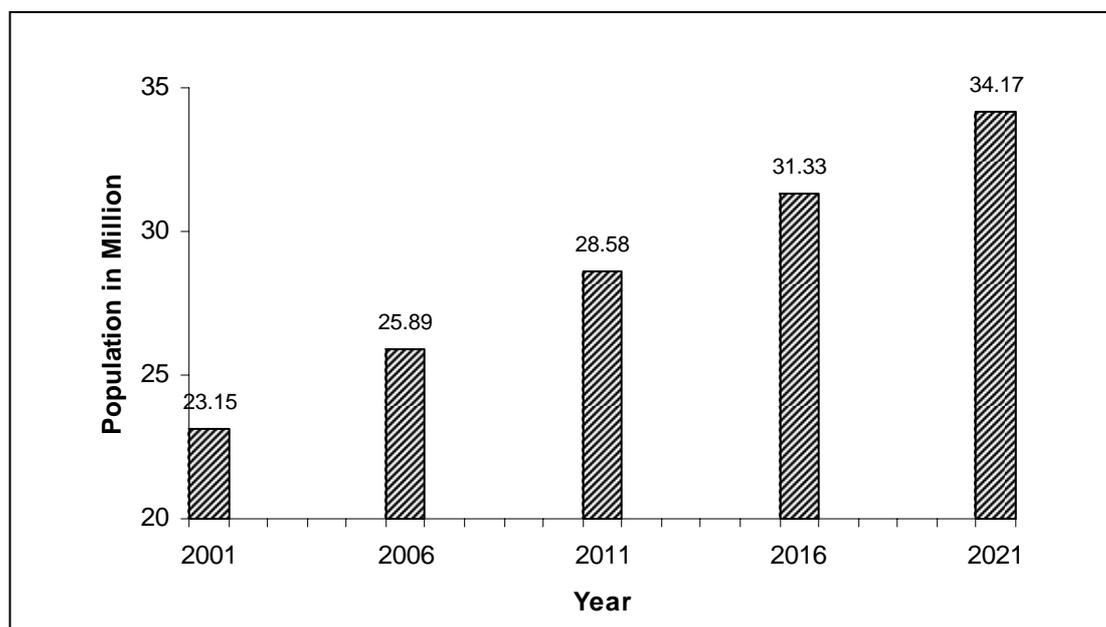


Figure 5. Population projections for Nepal (2001–2021)

Source: CBS, 2003.

The majority of the people (over 86% of the total population) reside in the rural areas. The rural population is one of the fundamental driving forces influencing the environmental resource base of Nepal (ADB and ICIMOD, 2006). Population and economic growth over the years have increased the demand for food, forest products and space for human settlements and hence put pressure on the available natural resources.

As the rural populations depend highly on forest resources in fulfilling daily subsistence needs such as firewood, leaf litter and fodder; and the settlements of local communities are intermixed with patches of forests, pressure on forests is very high. The depletion of forest resources is likely to become more widespread and serious in view of the anticipated demographic changes, economic pressure and ecological pressure.

The links between population growth, resource use and environmental quality are too complex to permit straightforward generalization about direct causal relationships. However, rapid population growth has increased the number of poor people in the country, thus contributing to deforestation and consequently degradation of the environment. The impact of population growth on the forests will vary in time and space depending on the interaction of several other factors that will mitigate or exacerbate this impact. Such factors include the pattern of distribution of population and the level of economic development of the country.

The increase in human population is expected to result in considerable increase in demand for forest products. This factor, coupled with expansion of arable agriculture and adverse climatic conditions, as well as the ever increasing populations of livestock will contribute to forest depletion.

The distribution of population and the level of economic development are unequal throughout the country as population density is high in the Terai and middle mountain region and economic development is concentrated in urban areas. Internal migration from mountain areas to Terai, Bhabar and Churia regions started in the middle of the 20th century. Population distribution by development and physiographic region is presented in Table 28.

Table 28. Population by forests and agricultural area in development and physiographic regions of Nepal

Region	Year 2001			Remarks
	Population*	Forest area**	Agricultural land***	
FWDR	9.5%	18%	9.9%	
MWDR	13.0%	30%	13.9%	
WDR	19.7%	16%	21.3%	
CDR	34.7%	19%	30.8%	
EDR	23.1%	17%	24.1%	
Mountains	7.3%	33%	8.9%	
Hills	44.3%	33%	47.1%	
Terai	48.4%	34	44.0%	
Total	23151423		3364100 ha.	

Sources: *: CBS, 2002; **: HMG/ADB/FINNIDA, 1988; ***: NIDI, 2006.

According to Nepal Living Standard Survey II, the statistics on population migration in Nepal are given in Table 29.

Table 29. Summary of migration statistics in Nepal

Description	%
Migrant population	36.6
Female	50.1
Male	21.6
Migrants from rural areas (VDC)	81.5
Migrants from rural areas (Municipality)	5.8
Migrants from other countries	12.7
Reason of migration	
Family reason	75.2
Easier life style	11.6

Looking for job	6.8
Children away for home	4.8
Reason for being away from home	
For study	36.3
For work	18.7

Source: CBS 2004.

Due to natural disasters, human-induced circumstances and disasters, armed conflict and the violence and fear generated, persons and families are forcefully displaced from their homes or places of their habitual residence and thus they are time and again required to face such situations that force them to reside in other parts of the country. Owing to armed conflict in the past, more than 13,000 people were killed and the problem of internal displacement has become even more complicated. In order to materialize the interests of all Nepali people to maintain permanent peace in the country, there is a need to prioritize the problems of persons and families having been forcibly displaced because of, *inter alia*, violent conflict. The fact is that internally displaced persons are compelled to spend traumatic lives and at the same time various new problems are, owing to the pressure of displaced persons, arising even in places where they are spending their new lives (GoN, 2007b). The GoN formulated National Policies on Internally Displaced Persons in 2007. There are no official statistics on internally displaced persons in Nepal.

Socio-political pressures

Societal transitions

- Progressive trend to construct social structure due to a decade long movement
- Process on restructure of the state and systems
- Social stratification has at times obstructed the participatory environment especially hindering participatory decision-making within government and community organizations
- Benefit sharing has not been equitable. The rural poor, who are more dependent on forest for livelihoods, suffer because of inequality
- Key changes include burgeoning middle classes and demands for social equity

Overall trends

- Dependence on wood and wood products is high to fulfill basic needs
- Stronger community involvement
- Devolution/decentralization of forest management responsibilities
- Increased awareness for biodiversity conservation
- Increased demand for outdoor recreation
- Demands for social equity
- Demands for better governance
- Increased focus to reduce poverty through the forestry sector

Economic pressures

Economic pressures include economic growth, poverty, forest management and harvesting, forests as a source of energy, NWFPs, and eco-tourism as services of forests.

Nepal is among the poorest and least developed countries in the world with 31% of its population living below the poverty line. The Nepal Living Standard Survey, 2004 showed increasing gaps between the rich and poor, and also between rural and urban areas. The urban areas recorded a higher rate of decline in poverty, while the rural areas experienced a lower rate of decline in poverty. Agriculture is the mainstay of the economy, providing a livelihood for three-fourths of the population. Industrial activity mainly involves the processing of agricultural produce including jute, sugarcane, tobacco, and grain. A decade long conflict has led to a decrease in tourism, a key source of foreign exchange. Nepal has considerable scope for exploiting its potential in hydropower and tourism, areas of recent foreign investment interest. CBS (2004) indicated that remittance transfer has played an important role in poverty reduction. Prospects for foreign trade or investment in other sectors are poor, however, because of the small size of the economy, its technological backwardness, its remoteness, its landlocked geographic location, its civil strife, and its susceptibility to natural disaster. After the restoration of peace in 2006 the country's tourism industry has shown a positive growth rate. It is now becoming one of the main revenue earners for the country.

Nepal has been experiencing a low rate of economic growth. Economic growth has not improved substantially over time to overtake population growth. As the current population growth is 2.25 percent per annum, the gain achieved by development activities has been overshadowed by growing population. Little over half (58.2%) of the population of working age was reported to be economically active in 2001. The Population Census 2001 reported that 53.1 percent of the population of 10 years of age and over is employed (NPC, 2007). The remaining population is either under-employed or unemployed. Thus, a significant part of the population is dependent on the land for sustenance, mainly through various agricultural activities. In line with the increase in the population, heavy pressure on the land and forest

resources has been experienced to the extent that the unsustainable use of land and forest resource base is now a major concern.

The preliminary estimates of per capita GDP and per capita GNP in terms of the US dollar are 315 and 322 at the current rate respectively for the year 2005/2006. Thirty one percent of the population is below the absolute poverty line (NPC, 2007). By the end of the Ninth Five-year Plan (1997-2002) agriculture together with the forestry and fisheries sectors had a 39.3% contribution to the Gross Domestic Product (GDP) of the country (NPC, 2002) whereas the figure declined to 34.9% by the end of the Tenth Five-Year Plan (2002-2007) (NPC, 2007). It is estimated that the forestry sector of Nepal contributed 3.5% to the GDP of the country in 2000 and 4.4% for the period of 1990 to 2000 (FAO, 2004). The general economic trends including for the industrial and service sectors are presented in Table 30.

The economic well being of Nepal is very closely bound to its natural resources. Although only comprising some 21% of the land area, agricultural land is the major determinant of economic activities and the nation's socio-political identity, according to the Nepal Human Development Report, 1998 (NSAC, 1998). Agriculture contributes over 50% of household income, provides employment for about 80% of the population, and has a significant influence on the manufacturing and export sectors of the economy. Tourism is the second most important source of foreign exchange for Nepal, after agriculture, and approximately 45% of tourists coming to Nepal visit protected areas, generating substantial revenue. Tourism will remain central to the economic sustainability of the protected area system and the protection of biodiversity (HMG/MFSC 2002). Sustainable forestry initiatives provide substantial livelihood support to the rural poor.

Table 30. The GDP growth rate by economic sectors in Nepal (GDP at constant prices)

Economic sector	Fiscal year				
	2001/02	2002/03	2003/04	2004/05	2005/06
Agriculture and Forests	3.01	3.32	4.72	3.45	0.99
Industry	-5.32	0.04	2.15	2.62	2.00
Electricity, Gas & Water	11.37	19.04	4.07	3.07	3.64
Construction	6.41	2.10	-0.35	2.90	7.30
Hotel & Restaurant	-18.23	2.01	12.74	-5.41	6.00
Transport, Communication & Storage	8.37	5.20	7.49	1.98	4.35
Other community, social & individual services	-8.62	4.40	13.43	-3.38	7.48

Source: GoN, 2007c.

NWFPs are one of the most potential sectors for rural livelihood enhancement and poverty alleviation in the country. About 800 species are used locally to provide medicines, food, oils, fibres, dyes, tannins, gums, resins, incense, building materials and agricultural implements (Subedi, 2000). There are 100 commonly traded NWFPs of which 21 species have high transaction. Approximately 470,000 households are involved in commercial NWF collection and poor people's involvement is even higher (Olsen 1998). Medicinal and aromatic plants (MAPS) and other minor forest products are one of the main programme areas for forestry sector development. MAPs have huge economic potential especially in the mountains (Olsen and Larsen 2003).

Forests provide a number of services to the people such as education, recreation, research and other social, religious and spiritual needs. Forests play an important role in ecotourism, particularly in protected areas, for both local as well as foreign tourists. Forests are considered ideal locations for spiritual pursuits. Destination points need more support to maintain these sites in their original state.

Ecological pressures

Ecological pressures include deforestation and forest degradation, land degradation and desertification, climate change, natural disasters, invasive species and bio-diversity conservation.

Deforestation (changing forests into other land use) and forest degradation (deteriorating quality of forests) are among the major problems and of serious concern in Nepal. Various reports suggest that deforestation and forest degradation in the middle hills were common for hundreds of years and the rate of deforestation is neither rapid nor of recent origin. However, forest degradation is continuing in the Hills. In the Terai and Siwaliks deforestation is widespread due to government resettlement programs in the past and current illegal clearing of forests for agriculture. In general, the main causes of deforestation are agricultural production, need for firewood, forage for livestock as well as local unemployment and insufficient management by the government. There are also other reasons which include political instability, politician's attitudes, forest fire, shifting cultivation, natural processes, forest rewards, attitude of individuals, donors' roles and government policy (Joshi et al. 2000).

To cope with deforestation and forest degradation, the MPFS and periodic plans have put forward many strategies and programmes. Of these programs, community forestry has been very successful and is rapidly spreading in the hills. However, the momentum is slow in the Terai region due to lack of clarity regarding the rights of distant users in the share of management and benefit sharing.

Land degradation is identified as one of the major environmental problems in Nepal requiring urgent action while desertification has been noticed in geologically and ecologically vulnerable ecosystems. About 28.24 percent of the total land (about 3.2 million ha) is under the process of desertification. Of the total forest area of the Terai districts about 1.3 million ha are degraded. The situation of pastureland is even worse and high mountain pasturelands (about 79 percent) are adversely affected by uncontrolled transhumance grazers because of the rapidly deteriorating effectiveness of traditional systems of management (MoEST, 2006).

Table 31. Types of land degradation in Nepal

Types of degradation	Area in million ha	Percentage of total area
Water erosion	6.68	45.5
Wind erosion	0.59	4.0
Chemical deterioration	0.25	1.7
Physical deterioration	0.20	1.3

Source: MoEST, 2006.

Table 32. Land area under degradation

SN	Land-use category	Degraded area (million ha)	Total land area (million ha)	Land degradation (%)
1	Poorly managed forest	2.10	5.828	36.03
2	Poorly managed sloppy terraces	0.290	2.969	10.00
3	Degraded rangeland/open land	0.647	1.75	37.00
4	Areas damaged by floods and landslides (1984 to 2003)	0.106	11.551	0.72
5	Forest encroachment	0.119	5.828	2.04
Total		3.262	11.551	28.24

Source: MoEST, 2006.

Table 33. Lands under rehabilitation

Lands under rehabilitation	Area in ha	Remarks
Rehabilitation of degraded crop land	5176	Annually rehabilitated
Rehabilitation of degraded rangeland	900	Annually rehabilitated
Rehabilitation of degraded forest	12992	Annually rehabilitated

Source: MoEST, 2006.

The environment and ecosystems are increasingly more disrupted and degraded by human activities. Landslides, topsoil erosion and associated nutrient loss, siltation, acidity and salinization are the pronounced forms of land degradation in some parts of Nepal. Although, land degradation control measures are in place, and natural resource management with people's participation has been institutionalized by empowering the community users, the area of degraded lands has increased over the years and restoration of degraded lands is far behind in comparison to its expansion.

Nepal has not enacted specific laws to deal with matters relating to desertification. However, a number of legislations focus on the conservation, management and sustainable use of natural resources. These legal instruments to some extent have been contributing to facilitating and enhancing the efforts being made at both governmental and non-governmental levels to conserve soil and water and combat desertification.

Natural disasters take place mainly because of two factors:

- Natural factors such as topographical and geological characteristics, variable climatic conditions and torrential rains during the monsoon season; water-induced disasters like soil erosion, landslides, debris flows and floods
- Anthropogenic factors such as deforestation, inappropriate land use such as farming on steep slopes, overgrazing and shifting cultivation and high dependency on natural resources for subsistence living aggravate the occurrence of landslides and soil erosion

As a result, Nepal is facing loss of land, lives and properties every year. The overall impact of natural disasters varies and land destroyed by landslides and floods has declined since 2000 compared to previous years (MoEST 2006).

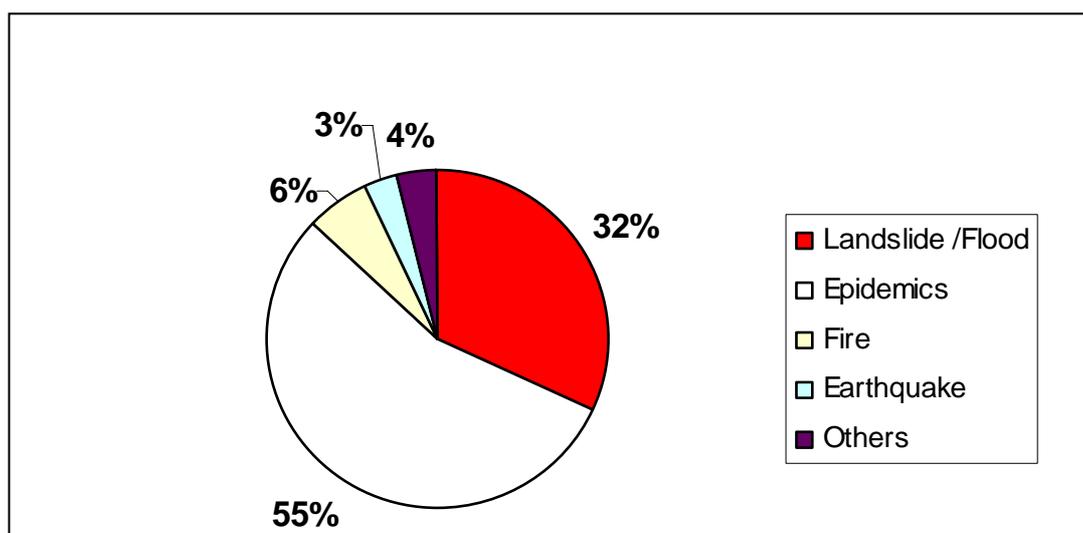


Figure 6. Loss of life due to disasters in Nepal (1986-2005). From left to right epidemics (55%), fire (6%), earthquake (3%), others (4%), landslides/floods (32%)

Source: Ministry of Home Affairs, 2004.

Table 34. Landslide and flood disaster scenario in Nepal (1983 to 2005)

Particulars	Total	Average/year
Fatal casualties (no.)	7071	307
Livestock loss (no.)	46782	2034
Houses destroyed (no.)	151352	6580
Loss of land (ha)	96147	4180
Affected families (no.)	494764	21511
Estimated loss of properties (Nrs.million)	14736	4180

Source: Ministry of Home Affairs, 2004.

About 19.7 percent (28,999 km²) of the total area of the country, representing all ecological zones (Terai, Mid-Hills, High Mountains and High Himalayas) is under the protected area system. Nepal has so far 9 national parks, 3 wildlife reserves, 3 conservation areas, and 1 hunting reserve to conserve wild biodiversity. In order to improve relations with local communities and to provide them opportunities to own their parks/reserves, the government has declared buffer zones for 8 national parks and 3 wildlife reserves (DNPWC, 2007).

Future energy demand

Biomass is the major source of energy in Nepal. Biogas, solar and microhydropower resources are primarily considered as the sources of alternative energy and their growth percentage is highest among all. Annual consumption of biomass resources has increased by about 2.4% since the last decade. Consumption of commercial forms of energy (fossil fuels and central grid electricity) is increasing by about 10% annually. It is interesting that alternative energy consumption is increasing by more than 50% annually but the absolute amount is still insignificant in relation to the total system.

Per capita consumption of energy is 393.153 Kilo Oil Equivalent (KOE) and that of agricultural energy use is estimated at 55.4 KOE/ha/year. Of the total annual energy consumed, only 0.56 percent of residential uses are produced from renewable sources. On the whole, about 0.48 percent of the total gross energy production in the country is produced from renewable sources (MoEST, 2006).

The share of energy consumption in different sectors of the economy is changing over time. The energy data of the last decade show a gradual increase in percentage share from the residential sector to other industrial and transport sectors. This is because the intensity of the biomass and woodfuel energy consumption is decreasing due to the intervention of new technology and new energy forms.

Different places have different combinations of woodfuel sources. Forest is the major source of woodfuel in many parts of the world whereas some countries highly depend on trees outside forest resources to meet their energy wood energy demand. In Nepal, the contribution of forests including all types of management regimes still dominates in total woodfuel supply. Other prominent land uses for supplying woodfuel resources are shrubland, grassland, non-cultivated inclusion and cultivated land. The overall growth of the energy consumption is quite similar to the economic growth of the country.

Technological changes

With the advancement in technology, Nepal's forestry sector has also been affected. Technological change can be a means to improve forest productivity and thereby income from the forestry sector. The improved technologies in the forestry sector can be adopted for scientific forest management in the country. But the adoption of technology calls for adequate financial and material resources, appropriate institutional frameworks and trained human resources. In order to develop and disseminate technology in the forestry sector, the Research

and Extension sectors should be strong and effective. However, the investment of the government in forestry Research and Extension sectors is very low compared to other sectors. The tenth five-year plan (2002-2007) has invested only 2% of the total forestry budget for research and extension purposes.

Nepal can utilize and adopt technological advancement in scientific forest management, NWFP processing, biofuel production, forest-based industry establishment, developing and promoting fuel efficient devices, ensuring environmental sustainability etc. While adopting technology in the forestry sectors, indigenous knowledge at the local level also needs to be considered.

Environmental concerns

Nepal has been closely working with international communities since 1950s and has signed about two dozen various international processes and conventions. Table 35 highlights different Conventions/Charters ratified by Nepal.

Table 35. List of international conventions and charters signed by Nepal

Name of Convention	Venue	Ratified	Ratified by Nepal	Focal Point
Plant Protection Agreement for Asia and the Pacific Region	Italy	12 Aug 1965	12 Aug 1965	-
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Washington DC, USA	1 July 1975	16 Sep 1975	DNPWR
Convention on Wetlands	Ramsar, Iran	21 Dec 1975	17 Apr 1988	DNPWR
Regional Convention on Aquaculture Network for Asia and the Pacific Region	Bangkok, Thailand	4 Jan 1990	11 Nov 1990	-
Convention on Biological Diversity (CBD)	Nairobi, Kenya	29 Dec 1993	21 Feb 1994	MFSC
Convention on Acute Drought and Desertification	Paris, France	26 Dec 1996	13 Jan 1997	MOPE
Convention on Conservation of World Cultural and Natural Heritage	Paris, France	17 Dec 1975	20 Sep 1978	-
International Timber Trade Organization (ITTO)	Tokyo, Japan	-	1983	DoF
Regional Remote Sensing Programme	Bangkok, Thailand	-	-	DFRS
UN Convention to Combat Desertification	Rio de Janeiro, Brazil		Jan 1997	MoEST
UN Framework Convention on Climate Change	Rio de Janeiro, Brazil		Jul 1994	MoEST

The focal points for these conventions/charters are scattered among many governmental organizations. However, affiliation with the international process has brought a few changes in national policy. In the field of forestry, the most important impact in policy is seen in the field of biodiversity conservation. In response to the CBD ratification by the government, the MFSC has awarded biodiversity top priority. The government has developed a national biodiversity strategy and implementation plan. Similarly, Nepal being a state party for CITES

has a strong influence in policy formulation. Accordingly, the DNPWC and DoF are regarded as the management authorities for fauna and flora respectively. The Natural History Museum and Department of Plant Resources are regarded as the scientific authority for fauna and flora respectively.

International trade of forest products

Trading on an informal basis has existed between Nepal and its neighbours to the north and south for centuries. Because of an open border with India, considerable quantities of timber, fuelwood, NWFPs (including sand and gravel) and food grain are exported informally, sometimes illegally. During the 19th century, Nepal's forest was seen as a source of considerable revenue, and official policy led to the export of large volumes of valuable hardwood species to India. The export of logs and sawn timber is prohibited but veneer slices are allowed. There is a moratorium on the harvest of green trees for business purposes. Therefore, only fallen trees and those available during silvicultural operations are marked, felled and brought to forest depots. Nepal is a consumer member country of the International Tropical Timber Organization (ITTO). Nepal imports certain amounts of particleboard and finished furniture from abroad. Nepal is also a member of the South Asian Association for Regional Cooperation (SAARC), World Trade Organization (WTO) and BIMs-TEC.

4. PROBABLE SCENARIOS AND THEIR IMPLICATIONS

A feudalistic state structure, social, gender and ethnic exclusion and lack of good governance are the root causes of the problems in the governance of Nepal. As a result, national, regional and ethnic conflicts are emerging. Development of the country is far behind for competing in the twenty first century. In this context, Nepal is demanding political, social and economic transformations through state restructuring processes.

The Interim Constitution 2007 has visualized the shape of New Nepal. The constitution has clearly stated that New Nepal will be republican, federal, prosperous and inclusive. However, the restructuring of the state will be decided by a Constitutional Assembly (CA) and institutionalized by formulating fully-fledged constitution.

Election of the CA was successfully accomplished on April 10, 2008. The objective of the CA is to formulate the new constitution within the two and half year timeframe. The CA is seen as one of the means and bench marks to manage internal conflict and move the country ahead. The CA has been formed by representing diverse castes, ethnic groups, and gender and minority groups. The Nepal Communist Party (Maoist) has become the largest party in the CA and has won about 33% of the seats.

The forestry sector is a subset of the whole political and socio-economic systems. The future of forest and forestry of Nepal will be greatly reliant on how these systems will likely evolve in the country. In the current situation, probably political and institutional changes will be the most important and uncertain drivers influencing even economic changes. Based on this argument the following three scenarios have been developed to look at the likely impacts on forest and forestry of Nepal.

Broad scenario

A New Nepal scenario

In a New Nepal scenario, the political deadlock of the country will be removed and political stability will be gained. Consensus is built by all the key players to chart a new path of development through a process of dialogue and accommodation establishing a highly democratic participatory approach to governance. This will imply significant improvement in the economic situation, rapid growth of income, declining poverty, improvement in tourism, and so forth. Correspondingly the various institutions (public sector, private sector, community organizations, etc.) will also tend to be robust working in close collaboration.

This positive development will entail improved understanding of the importance of forests, more resources available to invest in forest management, improved ability to bring about technological development, greater appreciation of environmental values and consequent better protection of biodiversity, watersheds, etc. In a way this could in the long term result in a reversal of forest loss and degradation.

Increased income to local communities from tourism will encourage better protection of critical sites by local communities. Nepal will be able to take advantage of the growing markets in emerging economies (like China and India) and significantly benefit from growth in tourism. Growing markets for some of the unique medicinal plants will encourage improved conservation, systematic management including domestication and the emergence of a vibrant processing sector enhancing income for local communities.

Stalemate and muddling through scenario

In this scenario uncertainty (in a way representing the present situation) will be prolonged and the country will remain at a cross-road without any direction to proceed. This scenario will persist if key political parties do not achieve consensus in crucial national agendas during the formulation of the new constitution. In this situation, tourism and industrial development will be diminished. Public and private institutions will be weakened. Donor communities will start to terminate their support. Economic growth will be negatively affected. As a result, poverty and the intensity of poverty in the country will be further exacerbated.

Political instability is always the key reason for forest devastation in Nepal. Experiences and studies have revealed that deforestation, forest encroachment and illegal activities are higher in periods of political turmoil. In the stipulated scenario, the development of forest and forestry will slow down. Due to weakening public and community institutions of the forestry sector uncertainty, will continue and the goal of sustainable forest management will not be achieved. Eventually, the livelihoods of forest dependent communities will be negatively impacted.

Breaking down of peace processes and intensifying of conflict scenario

In this scenario importunate disagreements remain key national issues, which results in collapse of the present arrangements and revival of conflicts. This scenario will be possible when the CA does not achieve its intended goal. In addition, if Maoist combatants¹ are not managed then the conflict cannot be resolved.

Further, Nepali society is composed of diverse ethnicity and castes. However, regional and ethnic issues are emerging in Nepal due to imbalance in power structure and resource allocation, and social and regional exclusions. If these issues are not addressed during state restructuring process, no long lasting peace will be achieved in Nepal.

If this scenario continues in Nepal, the country will move towards becoming a failed state. Moreover, the situation will accelerate civil war and result in human catastrophe. All the development initiatives will fail and public and private institutions will become defunct and collapse.

Poverty will be intensified and pressure on common resource like forest will be substantially increased. Deforestation and forest area encroachment will accelerate. As a result, various environmental consequences such as drought, flash floods, desertification, water scarcity, soil erosion etc will be manifested in the fragile mountain landscape. Agricultural productivity will decrease and hunger will be increased. Donor communities related to the forestry sector will withdraw and forestry development will decline. Corruption in the forestry sector is likely to increase due to the collapsing governing system.

However, no national and international communities have such an extreme negative scenario. We anticipate that Nepal's political situation will proceed according to the road map given by the Nepali people for building permanent peace and accelerating economic development.

Specific scenario

Although the stipulated broad scenarios have multiplier impacts, the national stakeholder workshop selected societal transition, institutional development and energy requirements as

¹ About 20000 Maoist combatants have been kept in cantonments under the supervision of the United Nations (UN) according to the comprehensive peace accord. After the election of the CA they should be integrated in the government security system.

the specific scenarios to analyse their likely impacts on forest and forestry. They are briefly described hereunder.

Societal transition and its impacts on forests and forestry

The present structure of the society in Nepal can broadly be divided into urban and rural societies. Rural society is completely based on agriculture and forest resources for its livelihood and economy whereas urban society is mostly based on commercial and industrial activities. The proportion of urban and rural society is about 15% and 85% at present which is continuously changing over time and urban society is expected to reach more than 25% of the total population by the end of 2020. This change will have impacts on land use and consumption of forest products.

The present trend shows that Nepal will have a mixed (forest dependent, agrarian, industrial and postindustrial) society. The forest dependent society is slowly decreasing at the moment and the proportion of its population may be minimal by around 2020. On the other hand, the urban, industrial and service dependent societies may increase.

It is very difficult to identify the forest dependent population because no such information is found in present national statistics. However, it is reasonable to assume that the primary forest dependent population and agrarian society will decline by about 20% by the end of 2020 whereas industrial and commercial dependent populations will increase, especially in urban areas.

Population is the major determinant to affect the forestry status in many developing countries and so is the case with Nepal. A good correlation exists between population and natural resources including forests. Per capita forest is about 0.27 ha at the national level at present which is insufficient to meet the national demand on a sustainable basis. The present growth rate of the population (2.25% per annum) has been assumed to be the same for 2020 as well. If the trend continues, the per capita forest area in 2020 will decline to 0.16 ha. A total of 6.8 million ha of forest area is required to meet the present per capita forest area figure (0.2 ha) in 2020. Therefore huge pressure is expected on the forest resources in Nepal.

Three basic strategies can be adopted to reduce the expected pressure on forest resources from the increased population: (i) by reducing the present consumption level; (ii) demand should be fulfilled by supplying alternative sources of construction and energy; (iii) increasing the productive capacity of forest through sustainable forest management.

The household (HH) is the basic unit of measurement in many economic activities including consumption of forest products. The Central Bureau of Statistics (CBS) of Nepal also considers the household as the unit of sample survey for agricultural census, population census etc. HH size in Nepal is also changing over time. Present HH size is about 5.5 which is about 25% less the 1950s census. It is expected to decrease at the level of 5 by the end of 2020. Reduction in family size will have positive effects on the forest situation through reduction in consumption of forest products if other things remain constant.

Institutional scenarios and their impacts on forests and forestry

Although various institutional reforms will be necessary in the forestry sector to adapt to the changes during state restructuring processes, public sector institutions, community based forestry organizations, other civil societies and the private sector will have influential roles in the forestry sector.

The government needs to redefine and reallocate various levels of institutions. Public institutions and local user groups will also be very effective in sustainable forest management.

Private institutions will become more effective in leasehold and commercial forestry activities by 2020.

The role of I/NGOs and civil societies in forest conservation and management will be important for advocacy and awareness generation activities. According to the policy of the government, involvement of NGOs and civil societies will be further increased to manage protected areas.

Energy and its impact on forests and forestry

Per capita energy consumption is about 15 GJ in Nepal which is very low even among developing countries. Total energy consumption is increasing by about 3.2% per annum and the contribution of biomass energy is about 86%; the rest of the energy comes from fossil fuels, hydroelectricity and renewable sources. Per capita biomass consumption is expected to decrease by about 15% at least by the end of 2020. The forest area will continuously come under great pressure to meet the biomass energy demand especially in rural areas. Forest supply capacity will continuously decline until some interventions are made in energy technology and forest management.

The contribution of alternative energy resources, particularly biogas, micro hydropower, biomass briquettes etc. will increase significantly. The efficiency of energy use devices and energy technology will be improved to a considerable level. This will reduce the huge pressure on forest and tree resources for energy purposes.

Use of improved cooking stoves (ICS) in the residential sector will increase by about 25% by 2020. This means that 25% of traditional cooking stoves will be replaced by ICS. The energy efficiency of the ICS is about 15% higher than traditional stoves. There are still large numbers of biomass based traditional cooking and heating technology in the commercial, institutional and industrial sectors. About 25% of this technology will be replaced by efficient and advanced devices by the end of 2020.

There are considerable numbers of biogas plants all over the country which have been increasing by about 10% per annum in the last decade. About 500 000 household-sized biogas plants are expected to be established by the end of 2020. A family sized biogas plant substitutes about 3 tonnes of fuelwood in a year. This technology is going to reduce pressure on forest resources to a considerable extent.

Recently introduced briquette technology is also very conducive to reducing pressure on the forestry sector. Both woody and nonwoody biomass residues are being used to prepare biomass briquettes, especially for use in the urban sector where energy resources are fully commercialized. There are no official statistics on how many biomass briquettes are being produced annually. It can be assumed that about 25% of the total biomass consumption in the urban sector will be through biomass briquettes by 2020.

Solar power technology including solar water heating and photovoltaic technology is rapidly increasing (more than any other energy technology development). A huge amount of fuelwood and other biomass resources are being used for water heating purposes in rural and urban residential, commercial and business activities and industrial activities. Solar water heating technology is helping to reduce the amount of fuelwood and biomass resources being exploited especially in urban residential and commercial sectors.

Energy pricing is one of the major driving forces in energy consumption. The expected increase in commercial energy price will put pressure on forest areas for fuelwood and biomass resources which are collected either free of charge or at nominal prices in all rural areas of the country.

Although biomass energy will still predominate, the overall share of biomass energy will decrease considerably by around 2020. Wind energy is not feasible in the case of Nepal. In future, most forest resources will be managed on the principle of sustainable forest management under community, collaborative and leasehold forest management models. As a result, the production and productivity of national forest will increase. In addition, private forestry will be enhanced commercially by the end of 2020.

5. STRATEGIES AND PRIORITIES TO REFORM THE FORESTRY SECTOR

Nepal is demanding political, economic and social transformations to build New Nepal. The Interim Constitution 2007 has clearly visualized the shape of new Nepal. To adopt macro level policies, Nepal is undergoing state restructuring processes which will have huge implications on forests and forestry.

Community based forestry regimes have brought great change in restoring denuded landscape and created opportunities to produce diverse forest products and services for stakeholders ranging from local to international communities. In these contexts, the following strategies and priorities have been identified for reforming the forestry sector of Nepal to address and institutionalize international and national changes.

Strategies	Priorities
Restructuring of the forestry sector to cope with federalism	<ul style="list-style-type: none"> ➤ Reviewing of existing forestry policies, organizational setting and management models ➤ Determining the authorities, responsibilities and rights of national forest management, and benefit sharing mechanisms among central, federal and local governments ➤ Identifying linkages among community based forestry institutions, local and federal governments
Reinventing and transforming forestry institutions	<ul style="list-style-type: none"> ➤ Forestry institutions in Nepal include government forestry agencies, forest and forestry based private sectors, community based forestry organizations, forestry donor communities and concerned civil societies ➤ These institutions should re-invent and transform to meet new priorities and shifting demands and make them more democratic, inclusive and effective. Institutional transformation is a dynamic and continuous process in any learning organization. Reinventions are needed in the following dimensions to address internal and external changes: <ul style="list-style-type: none"> ○ Redefining the core values and principles of forestry institutions according to the changing context ○ Redefining the roles of forestry institutions ○ Re-allocating the functions that reflect the values ○ Structural reform of forestry organizations to enable them to undertake various functions ○ Planning and developing human resources according to institutional demand ○ Privatization of public enterprises such as the Timber Corporation of Nepal (TCN), Forest Product Development Board (FPDB) and Herbal Production and Processing Company Limited (HPPCL) ○ Setting sectoral and cross sectoral coordinating mechanisms
Policy and legal reforms	<ul style="list-style-type: none"> ➤ Forestry policies and legislations have to be changed to institutionalize internal and external changes ➤ Creating an enabling policy environment is essential to involve the private sector and other stakeholders in sustainable forest management, biodiversity conservation, sustainable forest use and equitable benefit sharing mechanisms ➤ Review and reform of conflicting sectoral and cross sectoral policies and regulations

<p>Valuation of forestry contribution</p>	<ul style="list-style-type: none"> ➤ Forests provide goods and services which are very important to the sustainable livelihoods of people. In recent years, there have been considerable discussions about payment of environmental services (PES). These contributions have not been captured yet due to the lack of methodological frameworks and mechanisms. The contribution of the forestry sector should be taken into account to unveil its importance to the national economy. In this regard the following initiatives should be undertaken: Development of a methodological framework and mechanisms to understand the contribution of forest products to the national GDP; conducting research to determine environmental service sectors and developing conceptual and methodological guidelines for their economic valuation
<p>Formulate and adopt standards for SFM</p>	<ul style="list-style-type: none"> ➤ Reviewing of existing forestry models ➤ Developing and adopting context based forest management systems for sustainable forest management ➤ Formulating standards for sustainable forest management ➤ Implementing them in forest management and monitoring systems
<p>Linking community based forestry and protected areas systems with carbon credit mechanisms</p>	<ul style="list-style-type: none"> ➤ Macro and micro level studies have revealed that carbon stock is significantly increased in community managed forests and protected areas due to the natural regeneration of forest species. However, these forestry systems do not meet the provisions of the Clean Development Mechanism (CDM) of the Kyoto Protocol to employ economic incentives due to the mitigation of climate change through absorption and sequestration of carbon ➤ However, “Reducing Emissions from Deforestation and Forest Degradation (REDD)” is one of the policy dialogues and proposals under the UNFCCC and Kyoto Protocol to address the avoiding of deforestation and degradation through forest regeneration. But the effectiveness of REDD will depend on resolving a number of technical and institutional issues for making forest conservation more economically viable ➤ Nepal has to work out how community based forestry and protected systems have contributed to reducing deforestation and land degradation ➤ Determining the impact of climate change on forests, formulating climate change mitigation and adaptation policies and plans for the forestry sector
<p>Forestry governance: Making it inclusive, transparent and responsive</p>	<ul style="list-style-type: none"> ➤ Making the community based forestry system more inclusive ➤ Setting mechanisms for democratic and participatory policy formulation ➤ Enhancing transparency and responsive governance in forestry institutions ➤ Formulating standards to measure good governance in forestry sector organizations

<p>Globalization: Enhancing the forestry sector for comparative advantages</p>	<ul style="list-style-type: none"> ➤ The impact of globalization on forests and forestry has been significant in that increasingly, local value chains are being replaced by global value chains. As sub-regional, regional and global economic cooperation and trade agreements are worked out, trade in forest products is expected to increase substantially. Those with access to improved technologies and linked to global value chains may gain in the process ➤ However, countries like Nepal operating within local value chains may face stiff competition. In this context, Nepal should start biodiversity registration, product standardization, certification and eco-labeling to get comparative advantages from forest products
<p>Linking forestry with poverty alleviation</p>	<p>One of the policy objectives of the forestry sector is to contribute to poverty alleviation through sustainable forest management. To achieve the objectives the following strategies and priorities should be addressed:</p> <ul style="list-style-type: none"> ➤ The forestry sector should be accorded high priority and the GoN should increase annual budget allocation for forestry sector programs ➤ Re modeling leasehold forestry and making it pro poor ➤ The focus should be on pro-poor community based forestry ➤ Increasing the productivity of forest land through product diversification ➤ Active management of community forests ➤ Establishment of forest based entrepreneurs ➤ Sustainable harvesting of NWFPs, domestication, processing and marketing ➤ Linking forestry with the carbon market mechanism
<p>Balancing economic development and environmental conservation</p>	<ul style="list-style-type: none"> ➤ Forest land is continuously changing in other land use due to the increased demand on forest land for infrastructure development. In this situation, national land use policies and guidelines should be developed along the principles of sustainable development ➤ Part of the benefits/revenue generated from the development programmes should be shared to mitigate environmental impacts made by the development innovations; watersheds and their resources should be conserved
<p>Forestry research and development</p>	<ul style="list-style-type: none"> ➤ Forestry research is a key tool to develop technologies for sustainable forest management; analyze forestry sector policies and provide data for forestry planning and policy formulation processes. However, forestry research is currently low priority. The following agenda has been recommended to reform forestry research: <ul style="list-style-type: none"> ○ Reviewing of existing forestry research modalities ○ Reinventing forestry research organizations to make them more effective ○ Establishing coordinated research mechanism among sectoral and cross sectoral research institutions for identifying research issues, conducting research activities and disseminating research results

<p>Watershed conservation and integrated development</p>	<ul style="list-style-type: none"> ➤ Developing a basin approach conservation policy to link up between upstream and downstream dimensions ➤ Linking watershed management with poverty alleviation through conserving and mobilizing watershed resources such as water, forest, land and human resources
<p>Conservation, domestication, sustainable harvesting, processing and marketing of NWFPs</p>	<ul style="list-style-type: none"> ➤ Developing conservation and harvesting guidelines of key species of NWFPs ➤ Technological development for domestication of NWFP species ➤ Establishing NWFP based enterprise development ➤ Linking NWFPs with market mechanisms
<p>Landscape level conservation</p>	<ul style="list-style-type: none"> ➤ Landscape level planning for biodiversity conservation and enhancing the livelihoods of local communities ➤ Reducing human wildlife conflict through formulating appropriate policy measures ➤ Linking biodiversity conservation and poverty alleviation
<p>Alternative energy</p>	<ul style="list-style-type: none"> ➤ Hydropower and solar energy are important alternative energy sources for Nepal. Accelerating hydropower production is the best approach to fulfill the energy needed for domestic and industrial purposes ➤ Bio-fuels are seen as alternatives to replace fossil fuels in the context of climate change mitigation. There has been rapid growth in investment in bio-fuel refining capacity and production of feed stocks in the Asia-Pacific region. Plantation of oil production crops such as Jatropha in degraded forestlands, Oil palm etc has been initiated in many countries ➤ In this situation Nepal has to learn experiences from these countries and formulate country based policy for producing bio-fuel energy

6. STATE OF FORESTS AND FORESTRY IN 2020

Forest resources in the next two decades

The GoN has planned to maintain 40% of its land to be covered by forest. As indicated in the Tenth Five Year Plan, the existing forest area will not be converted or handed over to any other land use except for the national priority development project. However, this target seems to be very difficult to achieve because forest coverage is continuously decreasing over time. The DFRS (1999) has reported 39.6% forest coverage in the country. The GoN reported 38% forest and shrubland coverage in the Global Forest Resource Assessment Country Report Nepal (FAO, 2000). Similarly, 37.6% of the forest area of Nepal was reported to FAO for the Global Forest Resource Assessment 2005 Report (FAO, 2006). This indicates about 1.24% annual loss of forest coverage during the last 10 years. At the same time, the Department of Forest conducted a survey of the 20 Terai districts of Nepal using remote sensing data according to which forest cover change was even less than 0.1% during the period of 1991 to 2001.

Many efforts are being made towards the conservation and sustainable utilization of forest products. Even in the worst case situation, forest coverage of Nepal is expected to be at the level of 37% of the landmass by the end of 2020. About 75% of the forest in the Mid hills and mountains and 15% of the Terai forest will be managed directly by local forest user groups. All the community forest areas in the Terai region will come under the production forest category.

More than 19% of the land cover is already occupied by the protection land category. It includes national parks, wildlife reserves, conservation areas and buffer zones. A huge debate is taking place on whether to increase the existing protected areas in the country. Some locals and experts are demanding to change the protection category of the forest into a general forest category because people are suffering from insufficient forest product supply due to strict rules and regulations. On the other hand, some government officials and experts suggest including more natural areas under the protection category because such ecosystems are not represented yet, especially the mid hill ecosystem.

Sustainable forest area

Community and collaborative forests are being managed under the principle of sustainable forest management. Such forests are handed over to local users once the management plans ensure the sustainable utilization of the resources as approved by the forestry authorities. Therefore, all the areas of community and collaborative forest will come under the sustainable forest management regime by the end of 2020.

Government managed forest will still be difficult to manage under the principle of sustainability because of huge pressure from surrounding and outside localities to meet the increased demand for forest products.

Growing stock, increment and annual harvest of wood

Due to the expected increase in the productivity of community and collaborative forest through intensive and active management intervention, growing stock will be somewhat similar to the present in 2020. The MPFS (1988) has estimated the annual increment of existing unmanaged forest to be equal to about 5-6 m³/ha which is expected to be double the volume in the managed forest categories of the country. It is therefore reasonable to expect growing stock of about 225 m³/ha by the end of 2020. Per hectare growing stock in the Terai forest can be estimated to be about one and half times more than the national average.

Annual harvest of wood from all community and collaborative forest will be according to the management plan of the forest approved by the District Forest Offices. Similarly, wood harvest from leasehold forests and religious forest will also be guided directly by the approved management plan. However, it is difficult to estimate wood removal from private forest areas. The contribution from government managed forest in annual wood collection will decrease to a considerable level because large areas of national forest will be handed over and managed by other forest management regimes.

Annual wood removal from all categories of forests is expected to increase in 2020 due to increased forest productivity through intensive and active forest management practices under the principle of sustainable forest management.

Wood and wood products

Demand for wood products will be far higher than the production level. The higher demand of wood products will be supplied mostly from community, collaborative and private forest. Production from government managed forest is expected to decrease due to reduction in area by the end of 2020. The higher demand for wood products will still create heavy pressure especially in government managed forests. Wood as a source of energy in per capita terms will be reduced whereas timber and log demand is expected to increase in all residential, industrial, and commercial sectors of the economy. Use of primary forms of wood products will be replaced by secondary forms such as plywood, boards, composite beams, charcoal etc. Most of the trade of wood products will be commercial and in markets.

Non-wood forest products

The NWFP based industry has been showing signs of growth in Nepal despite armed conflicts in the past. The numbers of traders and industries are increasing each year. NWFPs can provide new opportunities to increase national income as well as the incomes of common farmers manyfold. The growth of many pharmaceutical and agro-based industries, especially in developed countries, is an assuring sign that NWFPs are going to be more valuable in the future. Favorable policies and environment for new investments in this sector are needed in order to benefit from the developing world-wide demands for NWFPs and associated products.

Soil conservation and watershed management

Soil conservation and watershed management will shift from micro watershed management to the basin approach for the integrated management of water, land and forest resources. Programmes and activities in this sector will be broadly guided by the Water Resources Strategy, National Water Plan and Eleventh Interim Plan (2007-2009) and sectoral plan of the MFSC. People's participation in integrated soil conservation and watershed management activities will increase by 2020.

Protected area management

To date about 20% of country's area is under the protected areas network to conserve biodiversity, which is well above the global threshold level. The conservation approach will be transformed from a site based approach to landscape level conservation to conserve the ecological integrity of the country and enhance the livelihoods of local communities through conservation, sustainable use and equitable sharing of benefits. It is envisaged that local people's participation in conservation and management of protected areas will increase by 2020. Mid hill ecosystems will be represented in the protected areas network by 2020.

Forestry policy and institutions

Forestry institutions and policies will be transformed to make them more inclusive, democratic, transparent, accountable and responsive. The role of the government will be minimal and private sector and civil societies will be attracted to forestry development activities. The voices and concerns of every segment of society will be considered while formulating forestry related policies in the country.

Wood as a source of energy

Biomass resources will still be dominant sources of energy. The forest area will continuously come under great pressure to meet biomass energy demand, especially in rural areas. The supply capacity of the forest will continuously decrease until some interventions are made in energy technology and forest management. Traditional cooking and heating technology in commercial, institutional and industrial sectors will be replaced by efficient and advanced devices by the end of 2020. It is envisaged that alternative energy will replace biomass energy by 2020.

Income and employment from the forestry sector

The forestry sector will generate employment and income through various forestry development activities. Direct employment in the forestry sector will be increased twofold by the end of 2020, assuming that community forest user groups employ forestry technicians to support them in forestry development activities.

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Annex 1. Composition of the drafting team

Name	Affiliated Organization	Position in Team
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Mr. Buddhi Sagar Paudel	Department of National Parks and Wildlife Conservation	Member
Mr. Deepak Kumar Kharal	Nepal Foresters' Association	Member
Mr. Gopi Paudel	Natural and Organizational Resource Management Services	Member

Annex 2. List of papers presented at the national workshop

Authors	Name of the Paper
Mr. Deepak K. Kharal and Mr. Bishwa N. Oli	Status and Issues of Forestry Sector in Nepal
Dr. Uday R. Sharma, Dr. Jagannath Joshi and Mr. Chiranjewee Khadka	The Drivers of Change in Forestry Sector in Nepal
Mr. Pem N. Kandel	Effects of forest certification for sustainable community forestry in Nepal
Mr. Balram Kandel	Forest cover change analysis of the Terai districts
Mr. Shiv Raj Bhatta	Protected Areas Management in Nepal: A shifting Paradigm
Dr. Jagannath Joshi	Initiatives in Soil Conservation and Watershed Management (SCWM) in Nepal
Mr. Pem N. Kandel, Gopi P. Paudel and Ms. Hima Uprety	Existing policy concern and institutional framework in forestry sector, Nepal
Dr. C.T.S. Nair	The Asia-pacific forestry sector outlook study: approach to scenario analysis

Annex 3. Chronology of forestry policy development in Nepal

Year	Event	Effect	
(Autocratic era)	1925	Establishment of <i>Ban Jaanch Adda</i>	<ul style="list-style-type: none"> • First formal policy and administration
	1946 -1950	<ol style="list-style-type: none"> 1. Allocation of national forest to the Rana family members as 'Birta land'; 2. Clearance of the Terai forest along the border with India for the purpose of settlement; and 3. Indigenous management system (group efforts) and traditional forest management (Talukdar) practice in the hills 	<ol style="list-style-type: none"> 1. Conversion of forest to agriculture land 2. Revenue generation 3.1 Protection of forest land 3.2 Fulfillment of basic needs for fuelwood, fodder and construction wood
(Post Rev. Era)	1957	Private Forest Nationalization Act	<ul style="list-style-type: none"> • Indiscriminate cutting of forests • Conversion of private forest into farm land in the Terai plains
(Panchayat era)	1961	Forest Act	<ul style="list-style-type: none"> • Categorization of forest • Forestry official empowered
	1967	Forest Conservation Act (Special Management Act)	<ul style="list-style-type: none"> • Judicial power to forestry officials • Law enforcement power reinforced
	1971	Forest Products Sales and Distribution Rules	<ul style="list-style-type: none"> • Simplify the forest products sale mechanism
	1973	National Parks and Wildlife Conservation Act	<ul style="list-style-type: none"> • Categorization of Protected Areas • Management of Protected Areas
	1974	National Parks and Wildlife Conservation Regulations	<ul style="list-style-type: none"> • Provision of Hunting Licenses • Management of Protected Areas
	1976	National Forestry Plan	<ul style="list-style-type: none"> • Recognition of people's participation in forest management • Concept of village 'Panchayat Forest'
	1977	<i>Amendment of Forest Act 1961</i>	Provision of 'Panchayat Forest' and 'Panchayat Protected Forest'
	1978	Panchayat Forest and Panchayat Protected Forest Regulation	<ul style="list-style-type: none"> • Handing over of national forest to village Panchayat (elected village body) • Formal recognition of rights of local people for forest management
	1982	Decentralization Act	<ul style="list-style-type: none"> • Authority to District and Village Panchayats • Promotion of User's Committee concept
	1982	Soil and Watershed Conservation Act	<ul style="list-style-type: none"> • Management of Protected Watersheds
	1982	King Mahendra Trust for Nature Conservation Act	<ul style="list-style-type: none"> • Management of Conservation Areas
	1984	Private Forestry Rules	<ul style="list-style-type: none"> • Promotion of Private Forests
	1987	Revision of PF and PPF Regulation 1978	Earning from 'Panchayat Forest' and 'Panchayat Protected Forest' channeled back to the concerned Panchayats
	1988	National Conservation Strategy	<ul style="list-style-type: none"> • Conservation strategy of the country
	1989	Master Plan for the Forestry Sector	<ul style="list-style-type: none"> • Initiation of programme-approach in the forestry sector • Provision of user's committees for forest management • Detail planning and vision developed for each aspects of forestry development
(Democratic era)	1993	Forest Act	<ul style="list-style-type: none"> • Extent of quasi-judicial authority of forestry officials reduced • FUG empowered for forest management • Act oriented towards people-based management

1993	Nepal Environment and Policy Action Plan	<ul style="list-style-type: none"> • Policies related to environmental sectors developed
1995	<i>Forest Regulations</i>	<ul style="list-style-type: none"> • Legalization of the process of Community Forestry • Process of Community forestry outlined • Forestry staff's role changed from custodial to facilitation
1995	<i>Agriculture Perspective Plan</i>	<ul style="list-style-type: none"> • Long term plan of agriculture sector developed
1999	Revision of Forest Act, 1993	<ul style="list-style-type: none"> • Control mechanism for violation of Operational Plan by FUGC member developed • Provision for spending the FUG fund in various developmental activities
2000	1. Revision of CF Directives, 1994 2. Revision of MPFS, 1988	<ol style="list-style-type: none"> 1. Provision for compulsory inclusion of growing stock of CF and annual allowable cut in Operational Plan 2. Collaborative management of national forests on the basis of landscape planning approach
2002	Revised Forest Policy	<ul style="list-style-type: none"> • Management of degraded and open forest areas in the Terai and Inner-Terai regions
2002	Leasehold Forestry Policy	<ul style="list-style-type: none"> • Provision of basis for the handing over of national forests to the private sector in the form of leasehold forests
2002	Nepal Biodiversity Strategy	<ul style="list-style-type: none"> • Strategies developed to conserve Nepal's Biodiversity
2002	Leasehold Forest Policy	<ul style="list-style-type: none"> • Simplified the process of handing over Leasehold Forests • Criteria developed for handing over Leasehold Forests
2003	National Wetland Policy	<ul style="list-style-type: none"> • Categorization of wetlands for better management
2004	Herbs and NTFP Development Policy	<ul style="list-style-type: none"> • Provisions for conservation, management and utilization of NTFPs

Annex 4. Organizational structure of the MFSC

