



NEPAL
NATIONAL BIODIVERSITY STRATEGY AND
ACTION PLAN
2014-2020

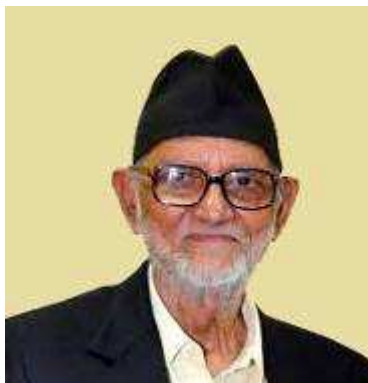
PREPARED BY
GOVERNMENT OF NEPAL
MINISTRY OF FORESTS AND SOIL CONSERVATION
SINGHADURBAR, KATHMANDU, NEPAL

JULY 2014



Government of Nepal

KATHMANDU
NEPAL



The Prime Minister

Message

Government of Nepal is committed to the conservation and sustainable utilization of biodiversity for the prosperity of its people and the nation. As Nepal is endowed with rich biological diversity, it has tremendous potential in reshaping people's livelihood and economic base of the country. Its conservation and management through relevant strategy is indispensable. The National Biodiversity Strategy and Action Plan (NBSAP) designed for the period 2014-2020 is aimed to provide a strategic framework for the conservation of Nepal's biodiversity.

The NBSAP envisions a conserved biodiversity contributing for sound and resilient ecosystems and national prosperity. This document has been revised from the earlier Nepal Biodiversity Strategy (2002) and Implementation Plan (2006-2010) after rigorous and extensive consultations engaging a wide range of stakeholders from national to community level.

The NBSAP embraces the commitment to fulfill the international obligation as signatory to the Convention on Biological Diversity. I am confident that this strategy will provide a firm basis for planning and sustainable management of biological diversity across all sector in the country.

Finally, I would like to appreciate the efforts made by Mr. Mahesh Acharya, Hon'ble Minister, Ministry of Forests and Soil Conservation (MoFSC) and Dr. Ganesh Raj Joshi, Secretary MoFSC and his team for the preparation of this document.

July 2014

Sushil Koirala

Government of Nepal
Ministry of Forests and Soil Conservation
Singha Durbar, Kathamandu



Foreword

Nepal strives to achieve sustainable economic growth through wise use of its natural resources. The Government of Nepal fully recognizes that the efforts to economic growth would only be sustainable if undertaken through sound environmental management. Accordingly, we are fully committed to managing the country's rich biological diversity as per the national need, and in the spirit of the Convention on Biological Diversity and other relevant multilateral environmental agreements to which Nepal is a Party. This National Biodiversity Strategy and Action Plan (NBSAP) is a key step forward towards achieving this goal.

We are proud to the achievements that the country has made in conserving its biodiversity during the past decades. Community based management of forests and agro-biological resources are some of the successful conservation models in the country, which also have direct positive contribution to poverty alleviation. Protected area is another sub-sector that has made impressive progress in biodiversity conservation in the last few decades. With over 23 percent of its land area under protection, Nepal now ranks second in Asia and one of the top 20 countries in the world for the percentage of its surface area that is protected. Population of some mega wildlife species, such as tiger and rhinoceros, have been continuously increasing during the past few years. However, some real threats and challenges are still with us.

I would like to take this opportunity to thank all our development and conservation partners for their support and local communities for their sincere efforts to conserve and sustainably use the country's biodiversity. We look forward to even stronger cooperation and collaboration among all the national and international stakeholders in implementing NBSAP. The Ministry of Forests and Soil Conservation (MoFSC) will leave no stone unturned in taking the lead in implementation of the strategies and priority actions included in this document.

I would like to thank Dr. Ganesh R. Joshi, Secretary MoFSC for coordinating the process of preparing NBSAP and reviewing it and his entire team and the then secretaries Mr. Keshav P. Bhattarai, Mr. Nabin K. Ghimire and Dr. Krishna C. Poudel for initiating the process.

July 2014

Mahesh Acharya
Minister



Acknowledgement

The unique geographic position and variations in altitude and climate have made Nepal as one of the storehouses of biological diversity in the world. The Government of Nepal is committed to conserve and use this important natural resource sustainably for the benefit of the country's present and future generations.

This National Biodiversity Strategy and Action Plan (NBSAP) is a key milestone in the conservation history of Nepal, following the Biodiversity Profiles of Nepal (1996) and Nepal Biodiversity Strategy (2002). It is also a testimony of Nepal's continued commitment towards fulfilling her international obligations. The document provides a comprehensive account of the country's biodiversity; identifies the threats to biodiversity; describes the key efforts, achievements and gaps in the management of biodiversity; presents strategic approaches, theme-specific strategies and associated priorities for actions; and outlines the implementation arrangement. The strategies and priority actions take into consideration of the national needs in terms of conservation, sustainable use of its components and equitable sharing of benefits. The strategy will be implemented in collaboration and partnership with all relevant stakeholders. I believe that the document like this will attract the attention of both national stakeholders as well as of the global community.

Several organizations and individuals, including government agencies, NGOs, members of local user groups, civil society organizations, farmers and individual experts, contributed in different ways to this strategy and action plan. I would appreciate the efforts and inputs of reviewers namely Mr. Batu K. Uprety, Dr. Ram P. Chaudhary, Dr. Bijay K. Singh, Mr. Bimal K. Baniya, Mr. Shyam Bajimaya, and Mr. Harihar Sigdel. I would like to thank Mr. Braj Kishor Yadav, Joint Secretary MoFSC for coordinating the process and his dedication and sincere efforts in finalizing this document; Mr. Ram P. Lamsal and Mr. Krishna P. Acharya, and Dr. Annapurna N. Das Joint Secretaries MoFSC and Mr. Bishwa N. Oli, Director General, Department of Forests for contributing to enrich the technical quality of this document. The support from IUCN Offices in Nepal, Thailand and Switzerland, especially from Dr. Yam Malla, Dr. Scott Perkin, Dr. Sonia Penamorenno and Dr. Thomas Greiber who provided valuable feedbacks to the draft and Mr. Hermes Huang for editing the document is highly appreciated. I would like to thank Mr. Santosh Nepal, WWF and Mr. Top Bahadur Khatri for their technical inputs and feedback in the process of finalization; and Sagar K. Rimal, Bodh R. Subedi, Govinda B. Shrestha, Madhu Ghimire, Rajendra Dhungana, Hem Raj Acharya and Kapil Khanal, for their dedication and hard work to complete this task in time. I would also like to express my great appreciation to the Kathmandu Forestry College team led by Dr. Ambika P. Gautam and members Dr. Bishu H. Pandit, Dr. Deep B. Swar, Dr. Krishna P. Poudel, Dr. Madhusudan Upadhyay, Mr. Narayan Belbase, Mr. Ram C. Khanal, Dr. Shreeram P. Neopane, Dr. Sushila C. Nepali and Mr. Tulshi B. Prajapati for supporting Ministry's initiation of preparing NBSAP.

Successful completion of this work would not have been possible without the support and cooperation of senior officials at this Ministry and the departments under it, and various other ministries, departments and offices. I would like to express my sincere appreciation to all of them. The Ministry is also thankful to all the agencies and individual experts who provided their valuable comments and suggestions.

Finally, I would like to express my sincere appreciation to the Global Environment Facility and United Nations Environment Programme for their financial support to prepare NBSAP.

July 2014

Ganesh Raj Joshi, PhD
Secretary

Acronyms and Abbreviations

ABS	Access and Benefit Sharing
ACA	Annapurna Conservation Area
ACOFUN	Association of Collaborative Forest Users Nepal
ADB	Asian Development Bank
ADS	Agriculture Development Strategy
AEPC	Alternative Energy Promotion Center
AnGR	Animal Genetic Resource
BCN	Bird Conservation Nepal
BZCF	Buffer Zone Community Forest
BZDC	Buffer Zone Development Council
CA	Conservation Area
CBD	Convention on Biological Diversity
CBO	Community Based Organisation
CBS	Central Bureau of Statistics
CDB	Central Department of Botany
CDM	Clean Development Mechanism
CEO	Communication, Extension and Outreach
C/FUG	Community/Forest User Group
CGIAR	Consultative Group on International Agricultural Research
CHM	Clearing House Mechanism
CIF	Climate Investment Funds
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNP	Chitwan National Park
COP	Conference of Parties
CSO	Civil Society Organisation
CSUWN	Conservation and Sustainable Use of Wetlands in Nepal
DADO	District Agriculture Development Office/Officer
DBCC	District Biodiversity Coordination Committee
DDC	District Development Committee
DFID	Department for International Development (UK)
DFO	District Forest Office/Officer
DFRS	Department of Forest Research and Survey
DFSCC	District Forestry Sector Coordination Committee
DLS	Department of Livestock Services
DNA	Deoxyribonucleic Acid
DNPWC	Department of National Parks and Wildlife Conservation
DOA	Department of Agriculture
DOF	Department of Forests
DOI	Department of Irrigation
DOR	Department of Roads
DPR	Department of Plant Resources
DSCO	District Soil Conservation Office
DSCWM	Department of Soil Conservation and Watershed Management
BED	Biodiversity and Environment Division

EFGDCC	Environment Friendly Governance District Coordination Committee
EFLGF	Environment Friendly Local Governance Framework
EFLGMCC	Environment Friendly Local Governance Municipal Coordination Committee
EFLGVCC	Environment Friendly Local Governance Village Coordination Committee
EIA	Environmental Impact Assessment
EPC	Environment Protection Council
FAO	Food and Agriculture Organization of the United Nations
FECOFUN	Federation of Community Forestry Users Nepal
FNCCI	Federation of Nepalese Chamber of Commerce and Industry
FRA	Forest Resource Assessment
FRISP	Forest Resource Information System Project
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GI	Geographical Indication
GIZ	The German Society for International Cooperation
GLOF	Glacial Lake Outburst Flood
GON	Government of Nepal
GSI	Gender and Social Inclusion
GTI	Global Taxonomic Initiative
I/NGO	International/ Nongovernment Organisation
IAS	Invasive Alien Species
ICIMOD	International Centre for Integrated Mountain Development
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IPNM	Integrated Plant Nutrients Management
IPR	Intellectual Property Rights
ITK	Indigenous Traditional Knowledge
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	International Union for Conservation of Nature
LAPA	Local Adaptation Plan of Action
LBSAP	Local Biodiversity Strategy and Action Plan
LDC	Least Developed Country
LFUG	Leasehold Forest User Group
LI-BIRD	Local Initiatives for Biodiversity Research and Development
LNP	Langtang National Park
LPG	Liquefied Petroleum Gas
LRMP	Land Resources Mapping Project
LSGA	Local Self-Governance Act
M&E	Monitoring and Evaluation
MAP	Medicinal and Aromatic Plants
MDG	Millennium Development Goal
MEA	Multilateral Environmental Agreement
MLJPA	Ministry of Law, Justice and Parliamentary Affairs
MOAD	Ministry of Agricultural Development

MOCTCA	Ministry of Culture, Tourism and Civil Aviation
MOE	Ministry of Energy
MOEd	Ministry of Education
MOF	Ministry of Finance
MOFALD	Ministry of Federal Affairs and Local Development
MoFSC	Ministry of Forests and Soil Conservation
MOGA	Ministry of General Administration
MOIr	Ministry of Irrigation
MOIC	Ministry of Information and Communications
MOI	Ministry of Industry
MOLRM	Ministry of Land Reform and Management
MOPIT	Ministry of Physical Infrastructure and Transport
MOSTE	Ministry of Science, Technology and Environment
MRV	Monitoring, Reporting and Verification
NAPA	National Adaptation Programme of Action
NARC	Nepal Agricultural Research Council
NAST	Nepal Academy of Science and Technology
NBCC	National Biodiversity Coordination Committee
NBIMS	National Biodiversity Information Management System
NBS	Nepal Biodiversity Strategy (2002)
NBSAP	National Biodiversity Strategy and Action Plan
NBSIP	Nepal Biodiversity Strategy Implementation Plan (2006)
NBU	National Biodiversity Unit
NEA	Nepal Electricity Authority
NEFEZ	Nepal Forum of Environmental Journalists
NEFIN	Nepal Federation of Indigenous Nationalities
NFDIN	National Foundation for Development of Indigenous Nationalities
NFI	National Forest Inventory
NORAD	Norwegian Agency for Development Cooperation
NPC	National Planning Commission
NPR	Nepali Rupees
NPWCA	National Park and Wildlife Conservation Act
NRM	Natural Resources Management
NTB	Nepal Tourism Board
NTFP	Non-Timber Forest Product
NTNC	National Trust for Nature Conservation
ODA	Official Development Assistance
PES	Payment for Ecosystem Services
PGR	Plant Genetic Resource
PGRFA	Plant Genetic Resources for Food and Agriculture
POWPA	Programme of Work on Protected Area
RECAST	Research Centre for Applied Science and Technology
REDD	Reducing Emissions from Deforestation and Forest Degradation
SALT	Sloping Agricultural Land Technology
SDAN	Sustainable Development Agenda for Nepal
SDC	Swiss Agency for Development and Cooperation

SMTA	Standard Material Transfer Agreement
SNP	Sagarmatha National Park
TAL	Terai Arc Landscape
TEEB	The Economics of Ecosystems and Biodiversity
TISU	Tree Improvement and Silviculture Unit
TU	Tribhuvan University
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
VDC	Village Development Committee
WCMC	World Conservation Monitoring Centre
WECS	Water and Energy Commission Secretariat
WWF	World Wildlife Fund

Table of Contents

Message	ii
Foreword.....	iii
Acknowledgement	iv
Acronyms and Abbreviations.....	v
Table of Contents	ix
List of Tables.....	xii
List of Figures	xiv
List of Annexes	xvi
Executive Summary	xviii
CHAPTER 1: INTRODUCTION.....	1
1.1 Understanding Biodiversity.....	1
1.2 Importance of Biodiversity.....	1
1.3 Background to the National Biodiversity Strategy and Action Plan.....	2
1.4 Overview of the National Biodiversity Strategy and Action Plan Development Process	3
1.5 Structure of the National Biodiversity Strategy and Action Plan	3
CHAPTER 2: THE NATIONAL CONTEXT.....	5
2.1 Country Background	5
2.2 Status of Biodiversity	11
CHAPTER 3: THREATS TO BIODIVERSITY IN NEPAL	25
3.1 Forest Biodiversity	25
3.2 Rangeland Biodiversity.....	29
3.3 Wetland Biodiversity.....	30
3.4 Agro-biodiversity	31
3.5 Mountain Biodiversity.....	32

3.6 Climate Change: a Major Threat to Biodiversity	32
3.7. Factors Underlying the Threats	33
CHAPTER 4: EFFORTS, OUTCOMES AND GAPS IN THE MANAGEMENT OF BIODIVERSITY.....	36
4.1 Enabling Policies, Strategies and Regulatory Framework	36
4.2 Participation in International Conventions.....	37
4.3 Institutional Development.....	38
4.4 Establishment and Management of Protected Areas.....	42
4.5 Management of Forest Biodiversity outside Protected Area	46
4.6 Other Efforts in <i>In-situ</i> and <i>Ex-situ</i> Conservation of Forest Biodiversity.....	50
4.7 Key Gaps, Issues and Challenges in Management of Forest Biodiversity.....	53
4.8 Management of Rangeland Biodiversity.....	57
4.9 Management of Wetland Biodiversity	57
4.10 Management of Agrobiodiversity	58
4.11 Key Gaps and Issues in Management of Agrobiodiversity.....	59
4.12 Management of Mountain Biodiversity	60
4.13 Cross-cutting Efforts and Outcomes	60
4.14 Funding for Biodiversity Management in Key Sectors: Sources and Trends.....	69
4.15 Implementation of Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006): Status, Gaps and Lessons.....	72
CHAPTER 5: STRATEGY FOR MANAGMENET OF BIODIVERSITY	76
5.1 Vision, Goal and Objective	76
5.2 Principles Underpinning the Strategy	76
5.3 Strategic Approaches.....	76
5.4 Thematic Strategies and Priorities for Actions	77
5.5 Cross-thematic and Cross-sectoral Strategies and Priority Actions.....	88

CHAPTER 6: ARRANGEMENT FOR IMPLEMENTATION OF THE STRATEGY.....	110
6.1 Institutional Arrangements.....	110
6.2 Capacity Enhancement.....	115
6.3 Technology Needs Assessment.....	117
6.4 Communication, Extension and Outreach.....	121
6.5 Fund Generation and Mobilization	125
6.6 Monitoring and Evaluation.....	127
CHAPTER 7: FRAMEWORK FOR LOCAL BIODIVERSITY STRATEGY AND ACTION PLAN.....	129
7.1 Introduction	129
7.2 Objectives.....	129
7.3 LBSAP Development Process.....	130
7.4 Progress Monitoring.....	134
REFERENCES.....	135
ANNEXES	150

List of Tables

Table 1: Physiographic and Bioclimatic Zones of Nepal	6
Table 2: Changes in Nepal's Land Use/Land Cover in between 1979 and 1994	9
Table 3: Distributions of Ecosystems by Physiographic Zones.....	11
Table 4: Estimated coverage by different types of wetlands	14
Table 5: Status of Nepal's species diversity	17
Table 6: Number of selected group of species in the IUCN Red List	20
Table 7: Number of selected group of species included in CITES Appendices	20
Table 8: Number of selected group of species that are protected in Nepal	21
Table 9: Estimated botanical sources of cultivated and wild food crop species in Nepal	22
Table 10: Major direct threats to forest biodiversity in Nepal.....	28
Table 11: Major threats to agrobiodiversity in different physiographic zones.....	32
Table 12: Biodiversity related policies, strategies and legislations developed since 2002	36
Table 13: Changes in status of community forestry in between 2002 and 2013	46
Table 14: Changes in status of pro-poor leasehold forestry in between 2002 and 2013	47
Table 15: Protection Forests in Nepal.....	47
Table 16: Evolution of REDD+ Readiness in Nepal	49
Table 17: Changes in area of registered private forests in between 2000 and 2013.....	50
Table 18: Representation of ecosystems in Nepal's protected area system.....	53
Table 19: Distribution of community forests among the physiographic zones	55
Table 20: Sources and trends of funding (USD 000) for implementation of forestry programmes by the Ministry of Forests and Soil Conservation	70
Table 21: Status of implementation of NBS (2002) strategies	72
Table 22: Strategy for monitoring and evaluation of NBSAP implementation.....	103
Table 23: Composition of National Biodiversity Coordination Committee.....	111
Table 24: Strengths and gaps in national capacity for biodiversity management.....	115

Table 25: Capacity Needs for successful implementation of the NBSAP	116
Table 26: Action plan for technology development, acquisition and use.....	119
Table 27: Communication, extension and outreach framework	121
Table 28: Messages, communication tools and communication platforms	122
Table 29: Communication, Extension and Outreach Implementation Action Plan.....	123
Table 30: Year and theme-wise estimation of the NBSAP costs (USD ‘000).....	126
Table 31: Major sources of funding for implementation of the NBSAP (USD ‘000).....	126
Table 32: Strategies, actions and funding sources for implementation of LBSAP	132
Table 33: Description of the regional and district level consultation workshops.....	153
Table 34: Description of the community level consultation meetings	155

List of Figures

Figure 1: Physiographic Zones of Nepal	5
Figure 2: Main Rivers and their Catchments	8
Figure 3: Distribution (%) of wetlands among	14
Figure 4: Location of Ramsar sites in Nepal	15
Figure 6: Distribution of fish species in Nepal by physiographic zones (%).....	18
Figure 5: Distribution of fish species in Nepal by river basins	18
Figure 7: Changes in number of threatened bird species in Nepal during 2001-2010	20
Figure 8: Location and coverage of global terrestrial eco-regions in Nepal.....	24
Figure 9: Protected Areas in Nepal.....	42
Figure 10: Growth of protected area.....	43
Figure 11: Percent coverage by different categories of protected areas	43
Figure 12: Changes in population of tiger in Nepal.....	44
Figure 13: Changes in population of Rhino in CNP	44
Figure 14: Annual Revenue generated from tourism in protected areas	45
Figure 15: Some biodiversity-rich areas and strategic corridors that are without effective conservation	54
Figure 16: Landscapes under management in Nepal	61
Figure 17: Trend of funding to NARC Divisions working on management of agrobiodiversity.....	70
Figure 18: Trend of climate change related funding in Nepal	71
Figure 19: Approach adopted in formulation of the strategies, goal and vision.....	77
Figure 20: Main institutions involved in implementation of NBSAP	110
Figure 21: Agencies involved in coordination and monitoring of NBSAP implementation.....	114
Figure 22: Monitoring, evaluation and reporting mechanism	128
Figure 23: Process for development of Local Biodiversity Strategy and Action Plan	130
Figure 24: Methodology used in development of NBSAP	150

Figure 25: Individuals consulted as part of the NBSAP development process 152

Figure 26: Location of the regional and district level consultation workshops 153

List of Annexes

Annex 1: Methodology used in development of National Biodiversity Strategy and Action Plan .	150
Annex 2: Ramsar sites in Nepal.....	158
Annex 3: Major cropping patterns in different physiographic zones	158
Annex 4: Endemic bamboo and tree species of Nepal	159
Annex 5: Major plant species found in different types of rangelands	160
Annex 6: Freshwater fish species reported from Nepal.....	162
Annex 7: Some phytoplankton species reported from Nepal	165
Annex 8: Some zooplankton species reported from Nepal.....	166
Annex 9: Mollusk species reported from Nepal	168
Annex 10: Some amphibians reported from Nepal.....	169
Annex 11: Fish species endemic to Nepal	171
Annex 12: Common crops, fruits and vegetable species grown in Nepal	172
Annex 13: Livestock breeds found in different physiographic zones.....	173
Annex 14: Nationally-assessed status of wild mammals in Nepal	174
Annex 15: Threatened tree species found in the mountains of Nepal	175
Annex 16: Threatened wetland-dependent animal species of Nepal	176
Annex 17: Plant species protected in Nepal	177
Annex 18: Animal species protected in Nepal.....	178
Annex 19: Forest tree species with seed stands	179
Annex 20: Diversity of plant genetic resources in different locations.....	180
Annex 21: Brief description of the global terrestrial ecoregions found in Nepal.....	181
Annex 22: Invasive alien fish species found in Nepal.....	183
Annex 23: Biodiversity related cross-sectoral policies, strategies, and regulatory framework developed since 2002.....	184

Annex 24: Biodiversity related sectoral policies, strategies, and regulatory framework formulated since 2002	185
Annex 25: Selected biodiversity related international conventions, treaties, agreements that Nepal has signed and the progress.....	189
Annex 26: Protected Areas of Nepal	191
Annex 27: Tree species having breeding seedlings orchards	194
Annex 28: Status of implementation of the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006)	195
Annex 29: Strategic Plan for Biodiversity and Aichi Biodiversity Targets.....	199

Executive Summary

Biodiversity and its Importance

Biodiversity refers to all the living things on Earth and the ecological processes associated with them. It is often described in hierarchical terms including ecosystem diversity, species diversity, and genetic diversity. The concept of biodiversity is linked primarily to the idea of biological variation, which still comprises a vast amount of knowledge and projected future value that is unknown to science.

Biodiversity, which occurs in both terrestrial and aquatic environments, is constantly changing. It can be increased by natural evolutionary processes and genetic change or reduced by threats which lead to population decline and species extinction. The capacity of an ecosystem to respond to changes and threats determines the rate of biodiversity loss.

Biodiversity is important in a number of ways: (i) species have utilitarian (subsistence and commercial) value to human, (ii) biodiversity represents the natural balance within an ecosystem that provides a number of ecological services, including nutrient cycling and pollination of plants, and (iii) species have intrinsic value. Conserving biodiversity is thus an essential part of safeguarding the biological life support systems on Earth.

In Nepal, biodiversity is closely linked to the livelihoods and economic wellbeing of millions of rural people who directly depend on natural resources for meeting their daily subsistence needs and cash income. The subject touches upon many aspects of life directly and indirectly, including agricultural productivity, food security, human health and nutrition, indigenous knowledge, gender and social equality, culture, climate, water resources and aesthetic value to the society. The country's biodiversity is also an important source of revenue to the government.

Background to the National Biodiversity Strategy and Action Plan and Process Adopted in its Development

The Government of Nepal prepared and implemented Nepal Biodiversity Strategy in 2002 and Nepal Biodiversity Strategy Implementation Plan in 2006. Useful experience and lessons have been learnt from the implementation of the strategy and the plan. Moreover, substantial changes have taken place in the socio-political and environmental contexts of the country over the last decade. Several new themes and issues have emerged or gained prominence since 2002. In light of these changes, the Ministry of Forests and Soil Conservation (MoFSC) has prepared this revised National Biodiversity Strategy and Action Plan (NBSAP) with the financial support from the Global Environment Facility through the United Nations Environment Programme.

The NBSAP provides a guiding framework for the management of Nepal's biodiversity. It has been prepared to meet the national needs for managing biodiversity on a sustainable basis for the benefit of present and future generations, and also to fulfill the country's international obligations. It has a long-term (i.e. 35 years) vision, and includes specific short-term (up to 2020) strategies and priorities for action.

The NBSAP is primarily based on extensive review of the current situation through relevant literatures, analysis of available secondary data, wide consultations with stakeholders and experts at various levels (national, regional, district and community). The primary data consisted of the views, perceptions and opinions of a total of 1,664 individuals (including 26.7% women). Individuals were consulted in Kathmandu, the five regional headquarters, 15 (out of 75) selected district headquarters and 30 communities. The CBD's Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets provided a broad theoretical framework and technical guidance in the development of the Strategy.

Structure of the National Biodiversity Strategy and Action Plan

The NBSAP contains seven chapters, including: (i) introduction, (ii) the national context, (iii) threats to biodiversity in Nepal, (iv) efforts, outcomes and gaps in the management of biodiversity, (v) strategy for management of biodiversity, (vi) arrangements for implementation of the strategy, and (vii) framework for Local Biodiversity Strategy and Action Plan. The description and analysis of past efforts and achievements, and formulation of strategies and actions are focused around six thematic areas: (a) Protected Areas, (b) Forests outside Protected Areas, (c) Rangelands, (d) Wetlands, (e) Agriculture, and (f) Mountains. Fifteen cross-cutting themes, including gender and social inclusion, and climate change impacts and adaptation have been dealt with separately.

Strategies and priority actions have been clustered into the six themes and prioritized by taking into account the links between them and with reference to key biodiversity threats, gaps and issues. Quantitative targets have been set against each priority action, where appropriate. The arrangement for implementation of the strategy presented in Chapter 6 highlights the key aspects of institutional, capacity, technology, communication and extension, funding, and monitoring and evaluation that are required for successful implementation of the NBSAP. The framework for Local Biodiversity Strategy and Action Plan highlights key aspects of biodiversity management at the local level, which is intended to serve as a guide to the VDCs and municipalities in preparing their own strategy and action plan for management of local biodiversity.

The National Context

Nepal has tremendous geographic diversity that ranges from alluvial plains in the tropical lowlands to very rugged and permanently snow and ice covered Himalayan Mountains. The country can be divided into five major physiographic landscapes extending from east to west, namely the High Himal, High Mountains, Middle Mountains, *Siwaliks* and *Tarai*. The climate varies from alpine cold semi-desert type in the trans-Himalayan zone to tropical humid type in the *Tarai* lowlands. The climate is predominantly influenced by three major factors, namely the altitudinal variations, monsoon, and westerly disturbances.

Forests, together with shrub lands, covered 39.6 percent of the country's land area in 1994. Agriculture and grasslands covered 21 percent and 12 percent, respectively. There are regional variations in terms of changes in forest conditions. The commercially and biologically valuable forests in the *Tarai* lowlands and adjoining *Siwalik* Hills suffered from high rates of deforestation and degradation over the last four decades. According to a recent assessment of forest cover by the Forest Resources Assessment Project, however, indicates a declining rate of forest loss in the *Tarai* in recent years (i.e. by 0.44% per annum during 2001-2010). Forests in the Middle Mountains are,

in general, better conserved and in many places forest cover has increased in recent years due mainly to the community forestry programme.

Nepal's population grew with an average rate of 1.35 percent per annum during the last decade and reached 26,494,504 in 2011. The population distribution varies widely across the country. Nepal is a multi-lingual, multi-religious, multi-ethnic and multicultural country inhabited by 125 castes and ethnic groups. The last decade witnessed a substantial decline in poverty, improvement in income equality, increase in average literacy rate, and decrease in the Global Hunger Index. Remittance played a crucial role in these developments. Despite these positive signs, the country's overall economic growth has remained less than four percent since 2007.

Nepal is primarily an agricultural country. The country's economy is very much dependent on the use of natural resources. About half of the people live in rural mountain areas with fragile physiography and low productivity thereby creating a very strong poverty-environment-health and vulnerability nexus. Many marginal agriculture lands in those areas have been temporarily abandoned in recent years primarily because of labour scarcity due to out-migration of youths seeking off-farm and foreign employment.

The country made some visible progress in infrastructure development during the last decade, but many of the development projects are implemented without any environmental safeguard, thereby posing a direct threat to biodiversity. Rural roads constructed by local governments and cascades of hydropower dams and stations constructed on some rivers are examples of the development efforts that have caused considerable damage to local biodiversity and environment.

Status of Nepal's Biodiversity

Nepal's unique geography with its dramatic changes in elevation along the relatively short (150-250 km) north-south transect and associated high variability in the physiographic and climatic conditions have resulted in a uniquely rich diversity of flora and fauna in the country. Moreover, the country's standing at the crossroads of the Indo-Malayan and the Palearctic biogeographic regions has made the country a mixing place of species originating in both regions.

A total of 118 ecosystems have been identified in the country. The natural ecosystems range from tall grasslands, wetlands and tropical and sub-tropical broadleaved forests in the *Tarai* and adjoining *Siwalik* foothills to alpine meadows above the tree line. The country's forest ecosystems can be categorized into ten major groups, namely tropical, subtropical broadleaved, subtropical conifer, lower temperate broadleaved, lower temperate mixed broadleaved, upper temperate broadleaved, upper temperate mixed broadleaved, and temperate coniferous, subalpine, and alpine scrub. Among the rangeland ecosystems, the tropical savannas and alpine meadows are exceptionally rich in biodiversity. Nepalese wetlands have very high ecological significance, as they harbor many threatened species of flora and fauna and serve as resting places for many migratory and globally threatened birds. The wetlands also have high cultural and economic significance. Many ethnic groups are dependent on wetlands for their livelihoods. Nine of the country's wetlands have been listed as Ramsar sites. The country includes 12 of the 867 global terrestrial ecoregions.

The diverse climatic and topographic conditions have favored a maximum diversity of flora and fauna in Nepal. The country occupies about 0.1 percent of the global area, but harbors 3.2 percent and 1.1 percent of the world's known flora and fauna, respectively. This includes 5.2 percent of the world's known mammals, 9.5 percent birds, 5.1 percent gymnosperms, and 8.2 percent bryophytes. The country is also rich in diversity of agricultural crops, their wild relatives, and domestic animal species and varieties. Over 550 crop species are identified as having food value, and around half of those species are believed to be currently under cultivation. The country's horticultural diversity includes around 400 species and subspecies of horticultural crops, including 45 species of seasonal fruits. An estimated 200 species of vegetables, including 11 different local varieties of potatoes, are grown in the country. The available information suggests that the country is also rich in diversity of domestic animals.

A total of 284 flowering plants, 160 species of animals (including one species of mammal), one species of bird, and 14 species of herpeto-fauna are reportedly endemic to Nepal. The richness of endemic species increases steadily from low to high elevations. The high altitude rangelands are especially important from the perspective of endemism.

Many species of plants and animals, including 54 species of wild mammals and 18 species of trees found in the mountains, are threatened. Birds are among the most threatened group of fauna. Over half of Nepal's nationally threatened bird species inhabit lowland forests, and over a quarter live in wetlands. Among the known species of domestic animals, pure *siri* cattle has become extinct, *bampudke* pig (*Sus scrofa*) is under threat of extinction, and *Achhami* cattle (*Bos indicus*) and *lampuchhre* sheep (*Ovis aries*) are near endangered. Very limited updated information exists regarding the country's genetic diversity.

Nine species of plants, 55 mammals, 149 birds, 64 herpeto-fauna and 21 fish are included in the IUCN Red List. Similarly, 15 group and species of plants, 52 mammals, 108 birds and 19 reptiles and three insects have been listed in the CITES Appendices. Several species of plants and animals, including 27 mammals, nine birds, 14 angiosperms, and four gymnosperms have been declared as protected species by the government.

Threats to Biodiversity in Nepal

Nepal's biodiversity is threatened by multiple factors. Loss, degradation and alteration of natural habitats, such as forests, grasslands, and wetlands; overexploitation; invasion by alien species; and pollution of water bodies remain the predominant threats to natural ecosystems. Poaching and illegal wildlife trade and human-wildlife conflict are other major direct threats to forest biodiversity, particularly in protected areas. Rangeland biodiversity is threatened, among other, by overgrazing and shrinkage of grassland habitats due to intrusion of woody species. Invasion of water hyacinth (*Eichhornia crassipes*) is a major threat to tropical and sub-tropical wetlands. Uncontrolled forest fires and destructive fishing are some other important threats. Rapid expansion of hybrid varieties and improper use of insecticides and pesticides are the major threats to agrobiodiversity. Widespread mining of gravel from streams and river beds has been emerged as a major threat to aquatic biodiversity, which has also caused deforestation and forest degradation in the *Siwalik* region. Natural disasters, such as landslides, glacial lake outburst floods and drought pose considerable threat to mountain ecosystems and the people living in those areas. Climate change can

have profound impacts in the future, particularly in the mountains. Most threats continue to increase.

Demographic changes; poverty; weak enforcement of the law; ignorance to biodiversity values in government and corporate accounting systems; unclear administrative jurisdictions; inadequate awareness and motivation to conserve biodiversity; and lack of an integrated approach to development planning at the national and district levels are the major factors underlying the threats.

Efforts, Outcomes and Key Gaps

The Government of Nepal, together with its development and conservation partners and local communities, has made substantial efforts to conserve and sustainably use the country's biodiversity during the last decade. Many of the efforts and associated achievements relate to implementation of the strategies recommended by the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006), while many other achievements were made without reference to that strategy or implementation plan.

Various enabling plans, policies and legislations have been developed and implemented to facilitate sustainable economic growth and further enhance participation of local communities in the management of biodiversity and natural resources. All the periodic national development plans developed and implemented since 2002 have some provisions related to biodiversity. Biodiversity also has its place in the Interim Constitution of Nepal (2007), which recognizes the fundamental right of every person to live in a clean environment, and asks the government to make special arrangements for the conservation of biodiversity, and its sustainable use and equitable distribution of the benefits derived from it. The Constitution also obliges the state to pursue a policy aimed at identifying and protecting traditional knowledge, skills and practices.

Policies and legislation relating to community-based forest management and protected area management have been effective in bringing success. Moreover, a number of other sectoral policies have been formulated in recent past. The Herbs and Non-Timber Forest Products Development Policy (2004), Agrobiodiversity Policy (2007), Tourism Policy (2009), Rangeland Policy (2012), and National Wetland Policy (2012) are some examples. The Plant Protection Act (2007) can be taken as an important step towards controlling introduction of invasive alien plant species. Overall, Nepal has a fairly comprehensive set of biodiversity related policies and strategies, but the implementation of the policies, strategies and legislation are generally not encouraging. Moreover, there is poor integration and harmonization of biodiversity and environment-related laws. Some of the existing laws are inconsistent, overlapping or contradictory.

One of the major gaps in existing laws relates to sustainable utilization of biological resources and equitable sharing of the benefits accrued from conservation of genetic resources. The Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their utilization Bill and National Intellectual Property Policy, which were drafted in 2008 and 2012, respectively, still await approval. Lack of strategy to activate and capacitate local bodies (DDCs, VDCs, municipalities) for biodiversity management is another major gap. Lack of required legislation has also affected effective implementation of a number of multilateral environmental agreements concerning biodiversity conservation in which Nepal is a Party.

On the institutional front, establishment of high level committees, such as the National Biodiversity Coordination Committee, National Tiger Conservation Committee, and National Biotechnology Coordination Committee are examples of some noteworthy efforts of the government. Initiatives taken to strengthen cooperation and collaboration with China and India are some other good efforts aimed at curbing poaching and illegal trade of wildlife parts and trans-boundary biodiversity conservation. Inadequate human and financial capacities have negatively affected functioning of the government forestry institutions. Poor inter-agency coordination and cooperation, and inadequate education, awareness and participation of the general public in biodiversity management are some other major weaknesses.

The issue of protected areas is one of the few sub-sectors that have made impressive progress in biodiversity conservation in the last few decades. The country's protected area grew by more than 30 times in between 1973 and 2010. Currently, 23.23 percent of the country's total land area is under protection, which is one of the highest in Asia. Populations of some flagship species, including tiger and rhino, increased in recent years. Substantial efforts have been made to link local communities to benefits of protected areas through the establishment and management of conservation areas and buffer zones. Contribution of protected areas to government revenue through tourism increased continuously and significantly between 2003 and 2012. However, some gaps and issues remain unaddressed. For example, the Middle Mountain ecosystems still remain very much underrepresented in the country's protected area network. Illegal hunting and trade of important wildlife species and human-wildlife conflicts are common.

Community based forest management programmes, including community forestry, leasehold forestry, and collaborative forestry were substantially expanded during the last decade. These three programmes cover over 30 percent of the national forest area at present. Those efforts helped abate loss and degradation of forests and even reversed the trend in many areas, particularly the Middle Mountains. The improvement in forest condition under community management is believed to have positively contributed to biodiversity. Eight natural forests with high biodiversity value have been declared as protection forests since 2002. Some other efforts of Nepal towards management of forest biodiversity outside protected area include implementation of the landscape management programmes with considerable success, implementation of the *Siwalik* conservation programme, reclamation and reforestation of encroached forestland, and initiatives to implementing REDD+.

Continuous loss and degradation of forests in the *Tarai* and *Siwalik* regions, inadequate attention to management of biodiversity in community forests, poor linkage of community forestry with livelihoods and poverty alleviation, limited participation of women and other disadvantaged social groups, inadequate technical capacity for implementing REDD+ and scientific forest management are some of the major gaps and issues in the management of forest biodiversity outside protected area.

Despite having high biodiversity and livelihood values, the rangelands and wetlands in Nepal remained neglected resources until recently. As a result, there is inadequate information on the status and trends of rangeland and wetland biodiversity. More recently, however, the government has taken some concrete steps towards the conservation of these valuable resources. National Rangeland Policy was formulated in 2012. The Nepal Agriculture Research Council has been conducting some research on forage and pasture seeds. The Ministry of Forests and Soil

Conservation piloted wetland management activities in two Ramsar sites under a five year (2008-2013) project funded by GEF/UNDP. The project also contributed to prepare a draft of wetland bill and regulation legislation, and promoted a collaborative approach in the management of wetlands. Excessive human pressure, unclear management responsibilities and inadequate technical, economic and institutional capacities are some underlying factors behind the continuous loss and degradation of most of the rangelands and wetlands in the country.

Community-based biodiversity management, including the registration of farmers' landraces and varieties, participatory plant breeding, and community seed banks, are some successful initiatives contributing to agrobiodiversity conservation. Establishment of the National Agriculture Genetic Resource Center, tissue culture, and identification and characterization of local livestock breeds were some other key efforts and achievements made in conservation of agrobiodiversity during the last decade. Lack of incentives for conservation of native landraces, inadequate capacity for bio-prospecting and quarantine, and weak coordination and cooperation among different agencies are some of the major gaps related to conservation of agrobiodiversity.

Efforts to manage mountain biodiversity overlap with other thematic efforts, particularly with those related to protected areas, landscape management, and community-based forest management. Insufficient knowledge and understanding of mountain ecosystems, lack of long-term vision, and inadequate financial resources and technical capacity are some of the major gaps and constraints in the sustainable management of Nepal's mountain ecosystems.

Educational institutions, particularly Tribhuvan University, have been playing important roles in promoting biodiversity education by offering graduate and undergraduate level courses in biodiversity and environment. The media is playing a crucial role in improving conservation awareness in recent years. Several government agencies have regular radio and TV programmes on biodiversity and environment. For example, the Department of Forests has been broadcasting *Ban Batika* programme through Radio Nepal for many years. NGOs are also playing crucial roles in raising awareness. Nepal Forum of Environmental Journalists is at the forefront in improving awareness of general public through its popular television programme *Aankhi Jhyal*. Some NGOs also have their own radio and other awareness raising programmes. The National Trust for Nature Conservation, different I/NGOs and international organizations, such as WWF and ICIMOD, occasionally organize exhibitions, information boards, and distribute brochures and newsletters. A number of regional and local level NGOs and Civil Society groups also implement awareness programmes.

The government's efforts in addressing gender and social inclusion issues in the management of biodiversity and natural resources include: (i) emphasis of forestry and agriculture policies for women's participation in decision making and benefit sharing mechanisms, (ii) establishment of gender equality units in the National Planning Commission, ministries and central departments of the government, and (iii) ratification of the UN Declaration on the Rights of Indigenous People and ILO Convention 169 (Indigenous and Tribal Peoples Convention). Several agencies, including the Ministry of Forests and Soil Conservation, have adopted separate strategies to address gender and social inclusion issues.

The government has recognized the importance of dealing with the impacts of climate change that cross-cut several sectors and themes, including biodiversity. Development of the National

Adaptation Programme of Action and REDD Readiness Preparation Proposal in 2010, and Climate Change Policy in 2011 were some of the key strategic efforts of the government towards adapting and mitigating the impacts of climate change. A high level Climate Change Council chaired by the Prime Minister has been formed in 2009 to provide overall guidance in climate change adaptation and mitigation. Setting up of the REDD Forestry and Climate Change Cell at the Ministry of Forests and Soil Conservation; promotion of clean and renewable energy for low carbon emissions, and piloting of REDD+ in three watersheds are some other efforts of the government and its development partners in climate change mitigation and adaptation. Poor understanding of impacts of climate change on species and ecosystems, weak assessment and learning loop, and inadequate capacity are some of the major gaps and issues in effective implementation of climate change adaptation and mitigation programmes.

The key lessons learned from management of biodiversity in Nepal include: (a) meaningful participation of local communities in the management of natural resources is a key to ensuring success and sustainability of programme interventions, (b) landscape approaches are more appropriate for addressing multiple drivers of biodiversity loss, (c) cooperation and collaboration among relevant agencies (government, I/NGOs, local communities) is crucial to achieve success in biodiversity conservation, (d) regional cooperation can be helpful to curb trans-boundary trade of wildlife parts and strengthening ecological security in trans-boundary regions, (e) enabling policy is necessary to achieve the intended outcome and appropriate legislation is required in order to translate the policy pronouncements into practice, and (f) incentive measures, which promote conservation-friendly behaviors, are necessary to encourage local people in biodiversity conservation.

Strategy for Management of Biodiversity

The National Biodiversity Strategy and Action Plan has been prepared with a 35-year vision of “conservation of biodiversity for sound and resilient ecosystems and national prosperity”. The overall goal is to significantly enhance the integrity of Nepal’s ecological systems by 2020, thereby contributing to human well-being and sustainable development of the country. This is to be achieved through implementation of a number of sector specific and cross-sectoral strategies and priority actions. Eight principles underpin the strategy and 13 broad strategic approaches have been prescribed to facilitate its implementation. The experience gained and lessons learned from implementation of the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006) provided the necessary context for formulating the strategy.

The specific strategies and associated actions are grouped into the six biodiversity themes and 15 and cross-cutting subjects. The strategies for managing protected area and forest biodiversity aim at reducing or managing human pressures on natural resources, reducing human-wildlife conflict, controlling invasive alien species, mitigating climatic threats to ecosystems, species and their habitats, and addressing economic and social concerns of local and indigenous communities through targeted programmes, enabling policy and legislative environment. Reducing the rate of loss and degradation of forest habitats, improving biological connectivity, enhancing knowledge and understanding about forests, promoting conservation of species and genetic diversities, enhancement of forest-based livelihoods are some of the focused areas.

The strategies for management of rangeland biodiversity emphasize on improving knowledge and understanding of rangeland ecology and biodiversity, and development and implementation of integrated rangeland management plans and programmes for the conservation of rangeland and enhancing the herders' livelihood. The strategies for wetland biodiversity focus on effective conservation and sustainable utilization of wetland resources, and addressing the legislative gap and administrative ambiguities.

Improving and expanding the existing community-based management of agricultural genetic resources; strengthening the national *ex-situ* conservation programme; enhancing communication, education and public awareness; and promoting indigenous traditional knowledge, skills and practices are some of the strategies for management of agrobiodiversity.

Strategies and priority actions for managing mountain biodiversity include: improving understanding of mountain biodiversity and ecosystem services; promoting environment-friendly economic development and alternative livelihood opportunities through development of local forest and agriculture based enterprises; designing and implementation of ecosystem based adaptation programmes; and promoting public-private partnerships and regional cooperation.

The cross-sectoral strategies included in the report relate to: (i) addressing the policy and legislative gaps, (ii) institutional strengthening, (iii) mainstreaming biodiversity across government, society and economy, (iv) harmonization of biodiversity-related international conventions, (v) enhancement of national capacity for improved management of biodiversity, (vi) landscape management, (vii) management of invasive alien species, (viii) adaptation to and mitigation of the effects of climate change, (ix) integrating gender and social inclusion perspectives, (x) conservation of and respect to traditional knowledge, innovations and practices of indigenous and local communities, (xi) knowledge generation and management, (xii) technology development, acquisition and use, (xiii) communication, extension and outreach, (xiv) fund generation and mobilization, and (xv) monitoring, evaluation and reporting.

Arrangements for Implementation of the Strategy

The arrangements for implementation of the strategy are focused on the institution, capacity, technology, communication and extension, funding, and monitoring and evaluation aspects. The institutional arrangement plan has presented mechanisms for coordination and monitoring of biodiversity related plans, programmes and activities at the national, district and local levels. The capacity enhancement plan has identified the strengths, gaps or constraints in capacity and recommended the needs for actions to enhance national capacity for improved management of biodiversity. The plan for fund generation and mobilization has identified cost categories and possible financing mechanisms for successful implementation of the National Biodiversity Strategy and Action Plan. The monitoring and evaluation plan includes a monitoring and evaluation mechanism and framework.

The framework for Local Biodiversity Strategy and Action Plan (LBSAP) presented in Chapter 7 is to serve as a guide while preparing detailed and specific LBSAP by the VDCs and municipalities across the country for their own use. The framework outlines the process to be followed in development of the LBSAP; recommends specific strategies and actions for effective management of biodiversity at the local (VDC/municipality) level; and outlines monitoring and funding mechanisms.

CHAPTER 1: INTRODUCTION

1.1 Understanding Biodiversity

Biodiversity (or biological diversity) has been defined in many ways. The Convention on Biological Diversity (CBD) defines it as the variability among living organisms from all sources including, among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. The term generally refers to all aspects of variability evident within the living world, including diversity within and between individuals, population, species, communities, and ecosystems.

Biodiversity is often described in hierarchical terms including ecosystem diversity, species diversity, and genetic diversity. Ecosystem diversity refers to the variety of habitats, the dynamic complexes of plant, animal and microorganism communities and their non-living environment, which interact as a functional unit and their change over time. Species diversity refers to the frequency and variety of species within a geographical area, and genetic diversity refers to the genetic differences between population of a single species and between individuals within a single population.

Species diversity can be further distinguished into three types: *alpha*, *beta* and *gamma* diversities. *Alpha* diversity refers to the diversity at one site; *beta* diversity is species turn over across an environmental or geographical gradient; and *gamma* diversity refers to the total number of species in a region¹. Despite a wide range of definitions and approaches in describing it, the concept of biodiversity is linked primarily to the idea of biological variation whose extent and future values are yet to be fully explored (Gautam, 2007).

1.2 Importance of Biodiversity

Biodiversity is important for human beings in a number of ways.

- Species have utilitarian value to humans. Diversity of plants and animals is a crucial component in the livelihood of millions of rural people who depend on diverse species and varieties of these biological organisms to meet their nutritional, medicinal and energy needs. Different cultures and social groups use, value, and protect these resources and services in a variety of ways. The genetic diversity of cultivated and domesticated species is also of great importance from a human perspective, because it allows the species to adapt to changing conditions. Moreover, there are huge prospects of benefiting from unknown species and genetic diversity.
- Biodiversity represents the natural balance within an ecosystem. Detoxification and decomposition of wastes by biological communities (particularly bacteria and fungi), generation and renewal of soil fertility including nutrient cycling, and pollination of plants are just a few examples of ecological services associated with biodiversity.

¹The 'region' here means a geographical area that includes no significant barriers to dispersal of organisms.

- Species have intrinsic value. It is humankind's ethical responsibility to save them from extinction by conserving their habitats.
- Biodiversity services are also considered low cost and locally suitable adaptation measures to moderate the negative impacts of climate change. Studies have found that biodiverse systems, on average, store more carbon and do so more reliably (Bunker *et al.*, 2005).

In Nepal, biodiversity is closely linked to the livelihoods and economic well-being of most people. The subject touches upon almost every aspects of Nepalese life, including agricultural productivity, food security, building materials, human health and nutrition, indigenous knowledge, gender equality, culture, climate, water resources and aesthetic value for society. Agro-biodiversity is the backbone for sustainable development of agriculture, food security and poverty alleviation as it provides both the immediate needs and long-term sustenance of the country's farming communities. Diversity of crops and animals is particularly vital to the country's marginalized communities for maintaining their food security.

Millions of rural people directly depend on forest biodiversity for meeting their daily subsistence livelihoods requirements. According to an estimate, at least 1,463 species of herbal medicinal plants are used by the rural people in Nepal (MoFSC, 2006a). The collection and trade of several valuable herbs, such as chirayito (*Swertia chirayita*), jatamansi (*Nardostachys grandiflora*), yarchagumba (*Ophiocodyceps sinensis*) has generated considerable employment opportunities and income of the local people in remote areas. Large numbers of households are now directly benefitting from forest biodiversity managed under the widely acclaimed community based forestry and participatory protected area management programmes. The rich diversity of plants and animals that exists in wetlands provides a wide range of goods and services as well as income generating opportunities for the local people, including many ethnic groups (ICIMOD, 2004).

Mountain biodiversity is of high importance for a number of ecological functions, including soil retention and slope stability. Those functions are often closely connected with the extent of above-ground and below-ground vegetation. The high functional diversity of plants in mountain ecosystems may also add to the resiliency of those ecosystems that often provide effective barriers to high-energy events such as landslides, rock falls and avalanches. The country's biodiversity is also an important source of revenue.

1.3 Background to the National Biodiversity Strategy and Action Plan

Nepal is committed to conservation and utilization of the country's unique biodiversity and biological resources on a sustainable basis for the benefit of present and future generations. Moreover, as a Party to the CBD, Nepal has an obligation of developing a national strategy for conservation and sustainable use of her biodiversity and integrating conservation into relevant sectoral and cross-sectoral plans and policies. Accordingly, the first national biodiversity strategy and its implementation plan were prepared by the Ministry of Forests and Soil Conservation (MoFSC; CBD Focal Agency) in 2002 and 2006, respectively (MoFSC, 2002; MoFSC, 2006a).

This National Biodiversity Strategy and Action Plan (NBSAP) is a revised and updated version of the Nepal Biodiversity Strategy (NBS). It builds on the achievements and lessons learned from

implementation of the NBS. It is prepared by taking into considerations of the national needs in terms of conservation of biodiversity, sustainable use of its components and equitable sharing of benefits accrued from conservation and utilization of genetic resources. Relevant decisions and guidelines of the CBD Conference of Parties (COP), particularly the COP 10 Decision X/2 on Strategic Plan for Biodiversity 2011–2020 adopted by the Parties in October 2010, and the Aichi Biodiversity Targets provided theoretical framework and technical guidance for developing the NBSAP. The NBSAP has been prepared by the Ministry of Forests and Soil Conservation with funding support of the Global Environment Facility through the United Nations Environment Programme.

1.4 Overview of the National Biodiversity Strategy and Action Plan Development Process

The development of the NBSAP was primarily based on stocktaking of current situation through extensive review of relevant plans, policies, strategies, agencies reports and other literature, and collection and analysis of secondary data available with different government and non-government agencies. Consultations with stakeholders at various levels (national, regional, district and community) and limited field observations formed the main sources of primary data and information. Both quantitative and qualitative methods were used in data analysis.

The main tasks involved in the process are summarized below and the methodology used is described in Annex 1.

1. Assessment of the trends of changes and current status of Nepal's biodiversity.
2. Identification of major threats to Nepal's biodiversity, and their underlying causes.
3. Identification and analysis of stakeholders.
4. Review and critical analysis of the existing mechanisms for management of the country's biodiversity, and identifying key achievements, gaps and constraints.
5. Review and assessment of the progress made in implementation of the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006), and identification of gaps and lessons learned.
6. Formulation of strategies for conservation of the country's biodiversity, sustainable use of its components and equitable sharing of benefits accrued.
7. Development of action plans to implement the strategies, including the plans for institutional arrangements at different levels, capacity enhancement, technology development and use, communication and extension, funding, and monitoring and evaluation.
8. Development of a framework for managing biodiversity at the local level.

1.5 Structure of the National Biodiversity Strategy and Action Plan

The NBSAP has been structured into seven chapters, including: (i) introduction, (ii) the national context, (iii) threats to biodiversity in Nepal, (iv) efforts, outcomes and gaps in the management of biodiversity, (v) strategy for management of biodiversity, (vi) arrangements for implementation of the strategy, and (vii) framework for local biodiversity strategy and action plan.

The description and analysis of past efforts and achievements, and formulation of strategies and actions are focused around six thematic areas and sectors, namely: (i) protected areas, (ii) forests outside protected areas, (iii) rangelands, (iv) wetlands, (v) agriculture, and (vi) mountains. Cross-cutting themes, such as livelihoods, governance, gender and social inclusion, indigenous and local communities, and climate change impacts and adaptations have been dealt separately. The sectoral and cross-cutting themes have been selected based on the past strategy, recommendations of the consultative workshops and meetings organized at different levels, and suggestions from relevant experts.

Mountain biodiversity is treated separately in this report and for strategic planning purposes due to the following reasons: (i) mountains are characterized by high biodiversity and cultural diversity, (ii) mountain ecosystems are exceptionally fragile, (iii) half of the human population depends on mountains either directly or indirectly, (iv) poverty, ethnic diversity and vulnerability are high in mountain regions compared to lowland populations, and (v) strengthened highland-lowland linkages are necessary for the sustainability of both upstream and downstream population.

In Nepal, the mountain regions contain 84 percent of the country's protected areas, as well as about half of the country's global priority eco-regions. Many endangered species of flora and fauna inhabit the mountains. Sustainable development of the country, therefore, is very much dependent on mountain ecosystems and natural resources. However, these invaluable mountain ecosystems and the services they provide are increasingly at risk due to deep-rooted poverty, degradation of natural resources and the adverse impacts of climate change.

The strategies and priorities for actions have been clustered into six sectoral and 15 cross-sectoral thematic areas and have been prioritized by taking into account the links between the areas, and by reference to key biodiversity issues and threats. The implementation plan is intended to enable necessary arrangements that will allow for smooth implementation of the strategies in this document. The framework for Local Biodiversity Strategy and Action Plan (LBSAP) presented in Chapter 7 outlines the key components and process to be followed in the development of LBSAP by respective Village Development Committees and municipalities.

CHAPTER 2: THE NATIONAL CONTEXT

2.1 Country Background

Nepal is situated in the central part of the Himalayas between 26°22' and 30°27' N latitudes and 80°04' and 88°12' E longitudes, and covers an area of 147,181 square kilo meters with diverse geographical conditions. The country is landlocked by India on three sides and the Tibet Autonomous Region of the Peoples' Republic of China to the north. The elevation ranges from around 70 meters above sea level in the southeastern alluvial plains to 8,848 meters at the peak of Mount Everest. Nepal is an agricultural country, inhabited by a wide range of ethnic groups and a variety of people.

2.1.1 Physiography, Drainage and Climate

Nepal's physiography ranges from alluvial plains in the tropical lowlands to very rugged and snow and ice covered Himalayan Mountains. The range includes five major physiographic zones extending from East to West, including the High Himal, High Mountains, Middle Mountains (or Middle Hills), *Siwalik* (or *Chure*), and *Tarai* (LRMP, 1986; Figure 1). The physiographic zones closely correspond to the seven bio-climatic zones identified by Dobremez (1976) and used by the Biodiversity Profile Project (1995) for classification of the country's vegetation (Table 1).

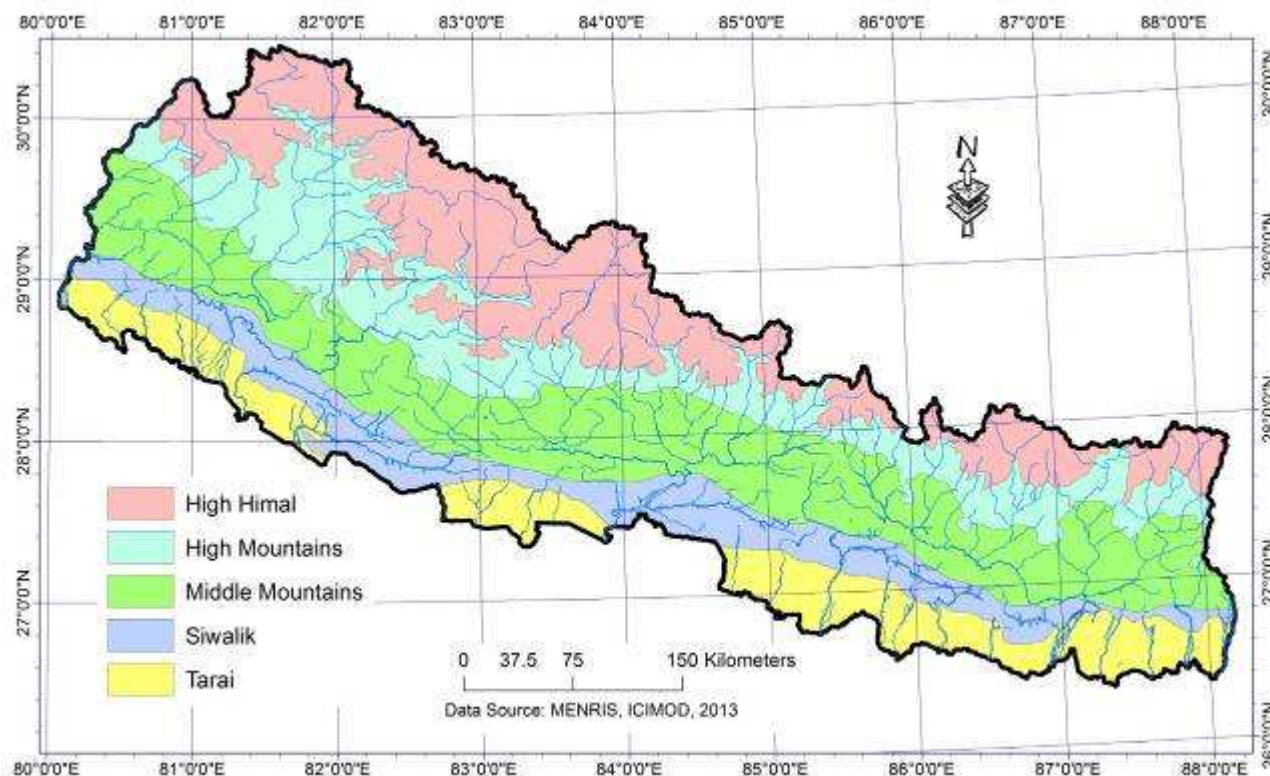


Figure 1: Physiographic Zones of Nepal

Table 1: Physiographic and Bioclimatic Zones of Nepal

Physiographic Zone	Coverage (%)	Elevation (m) ²	Bioclimatic Zone
High Himal	23	Above 5,000	Nival (Tundra and Arctic)
High Mountains	19	4,000-5,000	Alpine
		3,000-4,000	Subalpine
Middle Mountains	29	2,000-3,000	Montane (Temperate)
		1,000-2,000	Subtropical
<i>Siwalik</i>	15	500-1,000	Tropical
<i>Tarai</i>	14	Below 500	

Source: Dobremez (1976), Biodiversity Profile Project (1995)

The High Himal physiographic zone lies above 5,000m in northernmost part of the country. High altitude plant species adapted to very cold and dry climatic conditions are found in higher elevations. Heavy snowfall is common during the winter months. Above 5,500 meters, the Himalayas are covered with perpetual snow with no tree vegetation. The zone also includes some dry inner-Himalayan valleys and treeless plateaus, such as in Mustang, Manang and Dolpa districts. The dominant soil consists of glaciated bedrock with surfaces of gneiss, schist, limestone and shale.



Settlement and barren land in Humla district



Photo ©: Amit Poudyal/IUCN

Photo ©: Hem Raj Acharya

Grazing Pastures at High Himalayas at Khambachain, Taplejung

The High Mountains zone can be characterized by high steep slopes and deep gorges. The zone comprises subalpine and alpine climates and associated vegetation types. The higher elevation areas include biologically diverse summer grazing pastures. At the lower elevation, the zone harbors luxuriant natural conifer and mixed forests in some locations. The soils can be characterized by Precambrian metamorphosed gneisses and mica schist.

The Middle Mountains (also known as Middle Hills or Mid-hills) region is physio-graphically the most diverse. It has subtropical to temperate monsoonal climate and is characterized by a great variety of terrain types and intensive farming on hillside terraces. The dominant soil types include

²The characterization of the physiographic and bioclimatic zones into different elevation ranges is approximate. Some zones can extend beyond the given range.

Precambrian phyllite, quartzite, schist, granite and limestone. The zone has the greatest diversity of ecosystems and species in Nepal. It also includes several fertile and densely populated valleys, including Kathmandu and Pokhara.

The *Siwalik* zone comprises mainly of steep hills of unstable geomorphology, primarily composed of semi-consolidated Tertiary sandstone, siltstone, shale and conglomerate. The soils remain usually dry (except during Monsoon season) and are prone to high levels of erosion. The foothills (known as *Bhavar*), which are almost exclusively formed of gravel, boulders, stone, and sand washed down from the *Siwalik* hills, sustain luxuriant and economically valuable forests dominated by Sal (*Shorea robusta*). The zone also includes a few densely populated valleys (including Trijuga, Chitwan and Dang).



Photo ©: Ambika P. Gautam

Trijuga Valley in the *Siwalik* zone, Udaypur District

A mountain range, locally known as the Mahabharat, separates the *Siwalik* Hills from the Middle Mountains. The *Siwalik* zone provides numerous ecosystem services, including prevention of soil erosion, recharging of ground water for the *Tarai* plains, and preventing natural disaster such as flash floods.

The *Tarai* comprises of a narrow belt of flat and fertile land in the southernmost part of the country below 500 meters from the sea level. It is composed of recent post-Pleistocene alluvial deposits forming a piedmont plain. The natural vegetation consists of scattered patches of tropical evergreen and deciduous forests, and riverine forests dominated by *Dalbergia sisoo* and *Acacia catechu*.

There are some other physiographic or bio-climatic categorizations of the country. Hagen (1998), for example, divided the country into seven bio-climatic zones, including the *Tarai*, *Siwalik* Hills, Mahabharat Mountains, the Midlands, the Himalayas, Inner-Himalayan Valleys, and the Tibetan Marginal Mountains. Stainton (1972) categorized the country into six regions based on climate, vegetation and floristic composition.

Nepal is drained by four major Himalayan river systems, namely Koshi, Gandaki (also known as Narayani), Karnali and Mahakali. Karnali has the largest catchment area (29.3% of the country), followed by Gandaki (21.7%) and Koshi (19.0%). Mahakali, which flows along the Nepal-India border, covers 3.2 percent of the country's area. The rest of the country is drained by a few medium-sized perennial rivers that rise in the Middle Mountains and Mahabharat Range, and a large

number of small and usually seasonal rivers and streams those mostly originate in the *Siwalik Hills* and pass through the *Tarai* (Figure 2).



Figure 2: Main Rivers and their Catchments

Many different types of climate are found in Nepal, ranging from alpine cold semi-desert type in the trans-Himalayan zone to tropical humid type in the *Tarai*. The climate is predominantly influenced by three major factors namely the altitudinal variations, monsoon, and westerly disturbances. It is characterized by four distinct seasons, namely the pre-monsoon (March-May), monsoon (June-September), post-monsoon (October-November) and winter (December-February) (WECS, 2011). Other important climatic factors influencing biodiversity and the distribution of flora and fauna include humidity, temperature, and aspect (ADB/ICIMOD, 2006).

Based on analysis of long-term (1976-2005) data obtained from the Department of Hydrology and Meteorology, Practical Action (2009) estimated that Nepal receives average annual rainfall of around 1,600 millimeters. This varies from 165 millimeters in the rain-shadow areas of the northern Himalaya (Upper Mustang) to 5,500 millimeters in the Pokhara Valley. Most of the precipitation occurs during June-September in the form of monsoon rains. The country is highly vulnerable to seasonal floods and landslides (WECS, 2011).

2.1.2 Land Use and Land Cover

The first detail assessment and mapping of Nepal’s land resources was carried out by the Land Resources Mapping Project (LRMP) implemented by the Government of Nepal and Kenting Earth

Sciences Limited, Canada during 1977-1984. The assessment and mapping was based on aerial photography flown in 1978-79, supplemented by extensive field checking and sampling. The LRMP (1986) estimated the total area covered by forests and shrubs as 6.3 million hectares, including 4.0 million hectares in the mountains, 1.7 million hectares in the *Siwalik* and 0.6 million hectares in the *Tarai*.

The second nation-wide survey of forest resources was conducted by the Department of Forest Research and Survey between 1987 and 1998. Technical assistance was provided from the Forest Resource Information System Project and funded by the Government of Finland. The survey, named the National Forest Inventory (NFI), took 1994 as the reference year. The survey used different methods for different areas. The inventory results of NFI, which were published in 1999, show 4.3 million hectares (29%) area under forest cover and an additional 1.6 million hectares (10.6%) under shrubs (DFRS/FRISP, 1999).

A comparison of the NFI results with LRMP shows that the forest area in the country decreased by 24 percent over a period of 15 years (1979-1994) by an annual rate of 1.6 percent, and the area under shrubs increased by 125 percent during the same period. The high increase of shrubland and the decrease of the forest area is a clear evidence of high rates of forest degradation over the period, although the total loss of forested area was not substantial. The area under other land uses remained more or less stable during the period (Table 2).

Table 2: Changes in Nepal's Land Use/Land Cover in between 1979 and 1994

Category	1978/79 (LRMP)		1994 (NFI)		% Change, 1979-1994	
	Area (000 ha)	%	Area (000 ha)	%	Total	Annual
Cultivated	2,969.4	20.1	3,090.8	21.0	4.1	0.3
Non-cultivated	986.9	6.7	1,030.4	7.0	4.4	0.3
Forest	5,612.4	38.1	4,268.2	29.0	-24.0	-1.6
Shrubland	694.0	4.7	1,560.1	10.6	124.8	8.4
Grassland	1,755.9	11.9	1,766.2	12.0	0.6	0.0
Water	N/A	N/A	382.7	2.6	N/A	N/A
Other	2,729.8	18.5	2,619.8	17.8	-4.0	-0.3
Total	14,748.4	100.0	14,718.1	100.0		

There are regional variations in terms of changes in forest conditions. For example, the forest area in the *Tarai* decreased with annual rate of 1.3 percent during 1978/79-1990/91 (DOF, 2005). A recent assessment of forest cover by the Forest Resources Assessment (FRA) Project shows that the *Tarai* forest decreased by 0.44 percent and 0.40 percent per annum during the 2001-2010 and 1991-2010 periods, respectively (FRA/DFRS, 2014). The FRA findings indicate a declining rate of forest loss in more recent years. Forests in the Middle Mountains are, in general, better managed and in many places forest cover have increased in recent years due mainly to the community forestry programme (see example; Gautam *et al.*, 2002; Niraula *et al.*, 2013). Little information exists for the High Mountains.

2.1.3 Demography and Socio-economy

Nepal has a population of 26,494,504 with an average annual growth rate of 1.35 percent during the last decade. There is very wide variation in the distribution of population across the country. Mustang district has the lowest (i.e. three people per square kilometers) and Kathmandu the highest (i.e. 4,408 people per square kilometers) population density. Socio-culturally, Nepal is a multi-lingual, multi-religious, multi-ethnic and multicultural country inhabited by 125 castes and ethnic groups (CBS, 2012).

The results of the Third Nepal Living Standards Survey (2010-11) suggest a substantial decline in poverty, and an improvement in income equality in Nepal. The last decade witnessed an increase in average literacy rate to 65.9 percent from 54.1 percent in 2001. The Global Hunger Index for Nepal decreased from 20.3 in 2012 to 17.3 in 2013, and by 38.2 percent in the last two decades (IFPRI, 2013). Remittance is playing a crucial role in these developments. Despite this progress, the rate of country's economic growth has remained slow (<4% after 2007), and the Human Development Index (0.463) and Gender Inequality Index (0.485) were below the South Asian average in 2012 (UNDP, 2013).

The economy of Nepal is very much dependent on the use of natural resources, including agricultural lands, wetlands, rangelands, forests, and protected areas. Agriculture is the main occupation for a vast majority of the people. Agriculture (including forestry and fishery) remains the country's principal economic activity, employing about 80 percent of the population and providing 35 percent of the GDP (CBS, 2011). Agricultural diversity is, therefore, key to food and livelihood security of the people in Nepal.

Around half of the population lives in rural mountain areas with fragile physiography and low productivity thereby creating a very strong poverty-environment-health and vulnerability nexus. Many marginal agriculture lands in those areas have been temporarily abandoned in recent years primarily because of labour scarcity due to outmigration of youths seeking off-farm and foreign employment. This has increased the scope for the introduction of perennial cash crops or forest crops in private lands.

A vast number of rural families depend on Non-Timber Forest Products (NTFPs) for meeting their food and health care requirements. Many NTFPs, particularly the medicinal and aromatic plants, are also important sources of cash income for thousands of rural families. Nepalese farmers also extensively use traditional botanical pesticides for crop protection, which has considerable success rate (NPC/UNDP, 2005).

High dependency on forests for meeting subsistence needs has caused degradation of forests in many areas. For example, fuel wood supplied about 78 percent of the total energy consumed in 2008/09, and the demand is increasing by an annual rate of around 2.5 percent (WECS, 2010). Many NTFPs, which play important roles in maintenance of ecological balance, and income generation by the people in rural areas, are facing over and unsustainable exploitation of these resources. The high demand for agricultural land has led to considerable loss of forests, particularly in the *Tarai* and *Siwalik* regions.

2.2 Status of Biodiversity

The country's unique geography, with dramatic changes in elevation along the relatively short (150-250 kilometers) north south transect, and associated variability in the physiographic and climatic conditions have resulted in an extremely rich diversity of flora and fauna in Nepal. Other important climatic factors such as rainfall, winter snowfall, temperature, and aspect also have influence on biodiversity. Besides these local factors, the country's standing at the crossroads of two major biogeographic regions of the world (Indo-Malayan to the south and Palearctic to the north) has made Nepal a mixing place of species originating in both the regions (Stainton, 1972).

2.2.1 Ecosystem Diversity

Nepal's natural ecosystems range from the tall grasslands, marshlands and tropical and subtropical broadleaf forests along the *Tarai* and *Siwalik* foothills to subtropical and temperate broadleaf and conifer forests in the Middle Mountains; mixed and conifer forests in the High Mountains; and alpine meadows above the treeline. Forests, rangelands, wetlands, and agro-ecosystems are the major group of ecosystems.

The original study to identify and classify the country's ecosystems was carried out by Dobremez and his colleagues in the late 1960s. The classification was based on altitude, climatic variations and vegetation types (Dobremez, 1970; 1976). The Biodiversity Profiles Project (1995), which built upon Dobremez's work and reports 118 ecosystems with 75 vegetation types, is the most widely used categorization of ecosystems and vegetation since its creation. Most of the ecosystems are found in the Middle Mountains and High Mountains (Table 3).

Table 3: Distributions of Ecosystems by Physiographic Zones

Physiographic Zone	Ecosystems		
	Number	%	Types
High Himal and High Mountains	38	32.2	37 'forest', and one 'glacier/snow/rock'
Middle Mountains	53	44.9	52 'forest', and one 'cultivated' (Pokhara)
<i>Siwalik</i>	14	11.9	13 'forest', and one 'cultivated' (Dun)
<i>Tarai</i>	12	10.2	10 'forest', and two 'cultivated'
Other	1	0.8	'Water bodies', found in all zones, except the <i>Siwalik</i>
Total	118	100	

Source: Biodiversity Profile Project (1995)

(A) Forest Ecosystems

There has been no comprehensive study to identify and map Nepal's forest ecosystems. Stainton (1972) delineated phyto-geographic boundaries based on climate, vegetation and floristic composition and classified the country's forests into 35 types. These types are often categorized into 10 major groups: (i) tropical, (ii) subtropical broadleaved, (iii) subtropical conifer, (iv) lower temperate broadleaved, (v) lower temperate mixed broadleaved, (vi) upper temperate broadleaved,

(vii) upper temperate mixed broadleaved, (viii) temperate coniferous, (ix) subalpine, and (x) alpine scrub. This categorization has been used as a basis for classifying forest ecosystems since then.

Tropical forests mostly occur in the *Tarai* and *Siwalik* regions. *Shorea robusta*, *Terminalia* spp., *Adina cordifolia*, *Lagerstroemia parviflora*, *Bombax ceiba*, *Albizia* spp., *Eugenia jambolana*, and *Anogeissus latifolia* are the main tree species in these forests. *Acacia catechu*, *Dalbergia sissoo* and *Bombax ceiba* are common in riverine forests. The forests harbor globally threatened species of fauna and flora, and also contain tree species of high economic value such as *Shorea robusta*, *Dalbergia latifolia*, *Dalbergia sissoo* and *Acacia catechu*.

Subtropical broadleaved forests occur mainly in the eastern half of the country between 1,000 meters and 2,000 meters and are dominated by *Schima wallichii* and *Castanopsis indica*. Riverine forests of *Cedrela toona* are common along river valley sides, while *Alnus nepalensis* is widespread along streams and moist places. Subtropical conifer forests primarily consist of *Pinus roxburghii* forests that occur in southern dry slopes between 1,000-2,000 meters.

Lower temperate broadleaved forests are generally confined between 1,700 meters and 2,500 meters in the East and 2,000-2,700 meters in the west. *Castanopsis tribuloides*, *Castanopsis hystrix* and *Quercus lamellosa* are the main tree species in these forests. *Alnus nitida* forests are found in the riverbanks of Mugu Karnali in between 2,130-2,440 m elevations, and *Lithocarpus pachyphylla* forests occur in eastern Nepal (MoFSC, 2002). Lower temperate mixed broadleaved forests are found in the moister north and west-facing slopes. Many of the tree species in this forest type belong to the Lauraceae family.

Upper temperate broadleaved forests are found in drier south-facing slopes between 2,200-3,000 meters. *Quercus semecarpifolia* is the main tree species in these forests, except in higher rainfall areas such as the hills to the north of Pokhara, upper Arun and Tamor valleys. Upper temperate mixed broadleaved forests occur in moister North and West-facing slopes in between 2,500 to 3,500 meters and are dominated by *Acer* spp. and *Rhododendron* spp.

Temperate coniferous forests, which are commonly found between 2,000-3,000 meters, are mainly comprised of *Pinus wallichiana*, *Abies spectabilis*, and *Picea smithiana*.

Cupressus torulosa and *Tsuga dumosa* are other common tree species between 2,130-3,340 meters. *Cedrus deodara* forests are found in western Nepal (west of Bheri River). *Larix himalaica* forest, which favors glacial moraine habitats, is the only deciduous conifer in the region, and occurs in Langtang National Park and surrounding areas (Stainton, 1972).

Subalpine forests occur between 3,000 – 4,100 meters and are mainly comprised of small and generally ill-formed trees of *Abies spectabilis*, *Picea smithiana*, *Betula utilis*, and *Rhododendron* spp. Alpine scrub vegetation occurs between the treeline (around 4,000 meters) and snowline (around 5,500 meters) in the eastern half of the country.

(B) Rangeland Ecosystems

Rangeland ecosystems in Nepal are comprised of grasslands, pastures and shrublands that cover about 1.7 million hectares or nearly 12 percent of country's land area. About 79 percent of the rangelands are located in the High Mountains and High Himal areas, 17 percent in Middle Mountains and the remaining four percent in the *Siwalik* and *Tarai* (LRMP, 1986).

The country's rangeland ecosystems can be broadly grouped into five categories: (i) tropical savannas, (ii) subtropical rangelands, (iii) temperate rangelands, (iv) subalpine rangelands, and (v) alpine meadows. The tropical savannas are characterized by a mosaic of tall grasslands dominated by *Saccharum spontaneum* and *Imperata cylindrica*. Many of the riverside grasslands (e.g. in Chitwan Valley) are intermixed with broadleaved forests of evergreen and deciduous species such as *Eugenia jambolana*, *Bombax ceiba*, and *Trewia nudiflora*. These grasslands are excellent habitat for rhino (*Rhinoceros unicornis*) and prey-base for Bengal tiger (*Panthera tigris tigris*). Some of these grasslands are also home to several species of globally threatened birds, such as the Bengal florican (*Houbaropsis bengalensis*), and rufous-rumped grass bird (*Graminicola bengalensis*) (Baral and Inskipp, 2009).

Subtropical rangelands are mostly associated with *Pinus roxburghii* forests, which are heavily grazed and often infested with *Eupatorium adenophorum*, *Pteridium aquilinum*, *Urtica parviflora* and *Artemisia vulgaris* (LRMP, 1986; Pande, 2009). Temperate rangelands are associated with broadleaved or conifer tree species such as *Quercus* spp. and *Pinus wallichiana* forests.



Photo ©: Rabindra Maharjan

A temperate rangeland and associated mixed forest in Jumla

The subalpine rangelands are associated with a variety of shrubs such as *Berberis* spp., *Caragana* spp., *Juniperus* spp. *Elymus nutans* is one of the most valuable native species to highland pastoral systems. *Piptanthus nepalensis* shrub and forbs such as *Anaphalis* spp. and *Potentilla* spp. have heavily invaded many productive pastures, which were once dominated by *Danthonia* spp. (LRMP, 1986).

The alpine meadows are exceptionally rich in floral diversity, including numerous species of colorful flowers of alpine herbs. Varied associations of *Rhododendron* spp. and *Juniperus* spp. are

found scattered across the meadows. Many of the species found in these rangelands are endemic to Nepal and others are high-value medicinal and aromatic plants. These grasslands are also home to endangered snow leopard, Himalayan goral (*Naemorhedus baileyi*), serow (*Capricornis sumatraensis*) and Himalayan tahr (*Hemitragus jemlahicus*) (Mittermeier *et al.*, 2004). The meadows are heavily grazed during summer and rainy seasons.

(C) Wetland Ecosystems

Wetland ecosystems of Nepal fall into two broad categories: (i) natural wetlands, comprising of lakes and ponds, riverine floodplains, swamps and marshes, and (ii) man-made wetlands, including water reservoirs, ponds and deep-water paddy fields. Irrigated paddy fields cover the largest area followed by rivers (Table 4).

Nearly half (45%) of the wetlands are in High Himal (Figure 3). This is due mainly to the large number of glaciers and glacial lakes in the Himalayan region. Among the major river basins, Karnali houses the highest number (36%) of wetlands, followed by Koshi (Bhandari, 2009). Nine of the country’s wetlands are listed as Ramsar sites (Figure 4; Annex 2).



Photo ©: Kapil Khanal

Rupa Lake in Lekhnath Municipality, Pokhara

Table 4: Estimated coverage by different types of wetlands

Wetland Type	Estimated Coverage	
	Area (ha.)	%
Rivers	395,000	48.2
Lakes	5,000	0.6
Reservoirs	1,500	0.2
Ponds	7,277	0.9
Marginal swamps	12,500	1.5
Irrigated paddy fields	398,000	48.6
Total	819,277	100.0

Source: Directorate of Fisheries Development (DOFD; 2012)

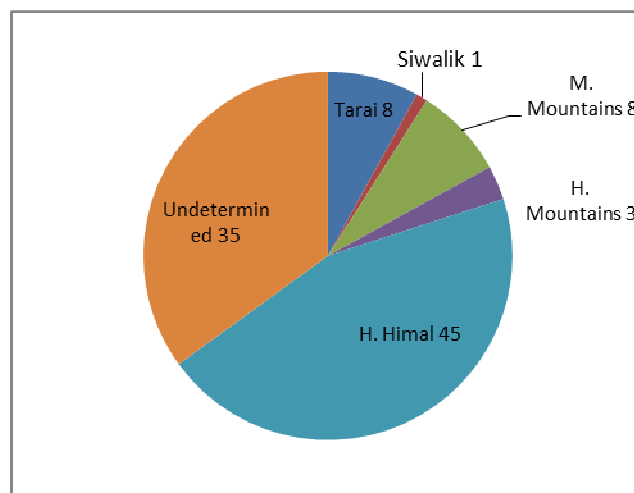


Figure 3: Distribution (%) of wetlands among the physiographic zones

Nepalese wetlands have very high ecological significance, as they harbor many threatened species of flora and fauna and serve as resting places for many migratory and globally threatened birds. The wetland ecosystems offer excellent habitats to at least 230 indigenous species of fish belonging to 104 genera of high economic, environmental and academic value (Rajbanshi, 2013).

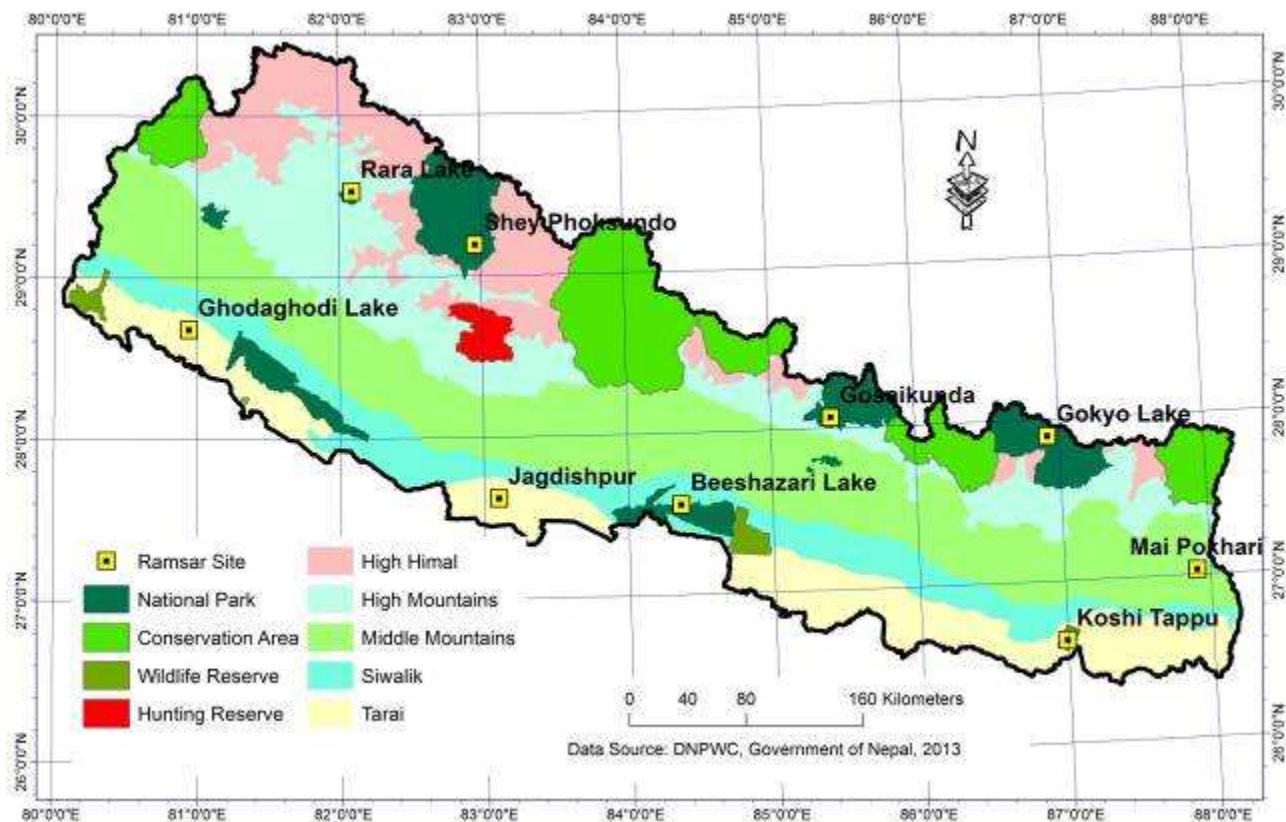


Figure 4: Location of Ramsar sites in Nepal

The wetlands also have high cultural and economic significance. Many ethnic groups are dependent on wetlands for their livelihoods. The wide variety of plants and animals that the wetlands support provide a wide range of goods and services as well as income-generating opportunities for the local people. Loss and degradation of these vital natural resources during the last few decades has severely affected these relationships.

(D) Agro-ecosystems

The diverse climatic and topographic conditions have favored for maximum diversity of agricultural crops, their wild relatives, and animal species in Nepal. Crops, livestock and forests are the three major components of the country's complex farming systems. Traditional farming systems, which use local knowledge and experiences and vary across the country (Annex 3), are assumed to have great role in maintaining the agricultural diversity. Forests are integral components of such systems.

Diversity of horticultural systems is an important component of the country's agro-ecosystem, which can be broadly classified into three types: (i) tropical and subtropical; (ii) subtropical and temperate, and (iii) temperate and alpine. Home gardens, which are an important agricultural production system in the country, plays a crucial role in conservation and sustainable use of a

number of vegetables, fruits, spices, uncultivated food plant species, and fodder and fuel wood trees (Shrestha *et. al.*, 2004; Gautam *et. al.*, 2007; LI-BIRD, 2013).



Photo ©: Sagar Kumar Rimal

A Middle Mountain farming system in central Nepal

Farm animal production systems in the country can be grouped into four major types: (i) transhumant migratory system, (ii) stationary with semi-migratory or with semi-intensive system, (iii) partial free grazing with stationary stall feeding or semi-intensive system, and (iv) stationary stall feeding or closed intensive system. The transhumant migratory system is the most common animal production system in the trans-Himalayan region. Stationary with semi-migratory or with semi-intensive system is more common in the Middle Mountains and High Mountain areas. Stationary stall-feeding or closed intensive system is common in urban and semi-urban areas.

2.2.2 Species Diversity

Species diversity, particularly the *beta* diversity, is very high in Nepal. The country occupies about 0.1 percent of the global area but harbors over three percent and one percent of the world's known flora and fauna, respectively (Table 5).

Table 5: Status of Nepal's species diversity

Group	Number of known species	Percent of known species in the world ⁺	Reference
Flora			
Angiosperms	6,973	3.2	UNEP-WCMC (2004)
Gymnosperms	26	5.1	Bista (2006)
Pteridophytes	534	5.1	DPR (2000)
Bryophytes	1,150	8.2	Pradhan and Joshi (2009)
Lichens	465	2.3	Sharma (1995)
Fungi	1822	2.6	Adhikari (2000)
Algae	1001	2.5	Prasad (2013)
Flora Total	11,971	3.2	
Fauna			
Mammals	208	5.2	Baral and Shah (2008); Inawali <i>et al.</i> (2011)
Birds	867 ³	9.5	BCN and DNPWC (2011)
Reptiles	123	1.9	Schleich and Kastle (2002)
Amphibians	117	2.5	ICIMOD and MOEST (2007)
Fishes	230	1.9	Rajbanshi (2013)
Mollusks	192	N/A	Budha (2012)
Moths	3,958	3.6	Haruta (2006)
Butterflies	651	3.7	ICIMOD and MOEST (2007)
Spiders	175	0.4	
Rotifers	61	N/A	Surana <i>et al.</i> (2005)
Crustaceans	59	N/A	Tiwari and Chhetry (2009)
Other Insects	5,052	0.7	Thapa (1997)
Platyhelminthes	168	1.4	Gupta (1997)
Fauna Total	11,861	1.1	

⁺ Computed based on Wilson (1988, 1992); NA = Not Available

A total of 284 flowering plants are endemic to Nepal (DPR, 2013a). Similarly, 160 animal species, including one species of mammal (i.e. Himalayan field mouse or *Apodemus gurkha*); one species of bird (i.e. spiny babbler or *Turdoides nipalensis*); and 14 species of herpeto fauna are reportedly endemic to Nepal (MoFSC, 2005). Of the endemic flowering plants, 14 species belong to tree and bamboo groups (Annex 4). The richness of endemic species increases steadily from low to high elevations (Vetas and Grytnes, 2002).

The species diversity in rangelands can be characterized by certain combinations of dominant grass species that are found in different



Dactylorhiza hatagireia (Panchaule)

Photo ©: Ram Prasad Chaudhary

³Of the total 867 recorded species, 755 are residents and summer and winter visitors, 29 are passage migrants, 74 are vagrants, and the rest are extinct or extirpated species.

types of rangelands. The major types include: (i) *Phragmitis- Saccharum- Imperata* type found in tropical savannas, (ii) *Themeda- Arundinella* type in subtropical rangelands, (iii) *Andropogon* type in temperate rangelands, (iv) *Danthonia* type in subalpine rangelands, and (v) *Kobresia* type found in alpine meadows. The major plant species found in these grasslands are listed in Annex 5.

The faunal diversity of Nepalese wetlands includes 230 species of freshwater fish, 102 species of phytoplankton, 109 species of zooplanktons, 192 species of mollusks, and 53 species of amphibians (Annex 6 to Annex 10). Sixteen species of fresh water fish are endemic to Nepal (Annex 11; Rajbanshi, 2013).

The diversity of fish species is highest in the *Tarai*, and decreases with increase in the elevation. Among the river basins, the highest richness of fish (195 species) is reported in Gandaki, followed by Koshi (178 species). Gandaki basin also has highest number of indigenous and endemic species (Rajbanshi, 2002; Swar, 2002; Shrestha, 2013; Figure 5 and 6).

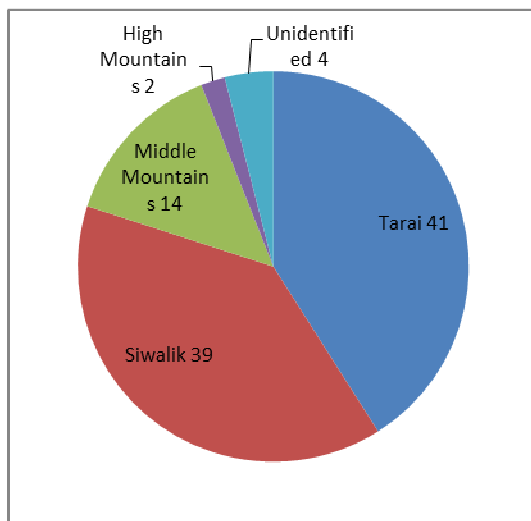


Figure 6: Distribution of fish species in Nepal by physiographic zones (%)

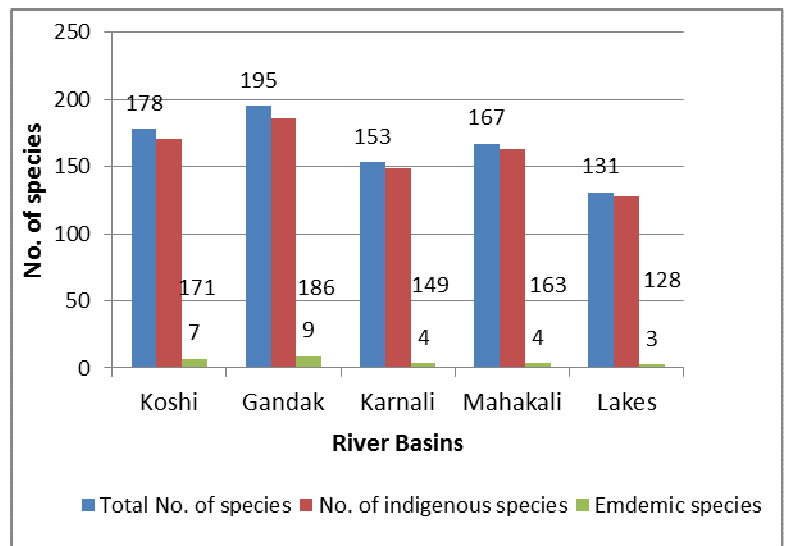


Figure 5: Distribution of fish species in Nepal by river basins

Many of the wetlands are resting places for migratory and globally threatened birds. Some of the important migratory species of birds that commonly visit Nepalese wetlands during their en route to the south include: cinereous vulture (*Aegypius monachus*), common green-shank (*Tringane bularia*), common teal (*Anas crecca*), Eurasian curlew (*Numenius arquata*), gadwall (*Anas strepera*), great cormorant (*Phalacrocorax carbo*), great spotted eagle (*Aquila clanga*), imperial eagle (*Aquila heliaca*), Kentish plover (*Charadrius alexandrinus*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), pallas gull (*Larus ichthyæetus*), and ruddyshe duck (*Tadorna ferruginea*).

Wetlands in Nepal also play a significant role in conservation of floral diversity. 25 percent of Nepal’s vascular plants are believed to be wholly or significantly dependent on wetlands and 26 endemic species of flowering plants (out of 284) are so dependent. Nepal’s wetlands also hold

several species of wild cultivars and wild relatives of cultivated crops, including five species of wild rice, namely *Oryza nivara*, *Oryza granulata*, *Oryza officinalis*, *Oryza sativa f. spontanea* and *Oryza rufipogon*, and two species of wild relatives of rice, namely *Hygrorhiza aristata* and *Leersia hexandra* (CSUWN, 2010).

Agrodiversity is another important component of Nepal's species diversity. A total of 550 crop species are identified as having food value, and around half of those species are believed to be currently under cultivation (MoFSC, 2002). The country's horticulture diversity includes 400 species and subspecies of horticultural crops, including 45 species of seasonal fruits, and 11 different local varieties of potatoes. Of the estimated 200 species of vegetables that are grown in the country, around 50 species have been commercialized (Upadhyay and Joshi, 2003). The common crop, fruit and vegetable species grown in different physiographic zones are listed in Annex 12. Several breeds and strains of domestic animals that are found in different ecological belts are yet to be identified and characterized at molecular level. The available information suggests that the country is rich in diversity of domestic animals, which varies across the physiographic zones (Annex 13).

The hills and mountains generally have higher agricultural biodiversity (both crop and animal) as compared to the lowlands (MoFSC, 2002). High climatic and physiographic variability, relatively low influence of modern technology, and higher level of ethnic diversity in human communities are believed to have contributed to greater richness of crop and livestock species in the mountains as compared to the *Tarai*.

Many species of plants and animals are threatened. For example, among the 208 known species of wild mammals, one (i.e. pigmy hog) is considered 'extinct' from Nepal, eight 'critically endangered', 25 'endangered', 14 'vulnerable' and seven 'near threatened' (Annex 14). Similarly, 18 species of trees found in the mountains are reportedly threatened (Annex 15). Many threatened fauna are wetland-dependent (Annex 16).

Birds are among the most threatened group of fauna in Nepal. A recent study revealed that the number of Threatened, Endangered, and Critically Endangered species significantly increased, and number of vulnerable species decreased in between 2004 and 2010 (Figure 7). Most of the threatened forest birds inhabit tropical, subtropical and lower temperate zones, where forests have been most depleted (BCN and DNPWC, 2011).



Photo © Himalayan Nature

Black stroke bird

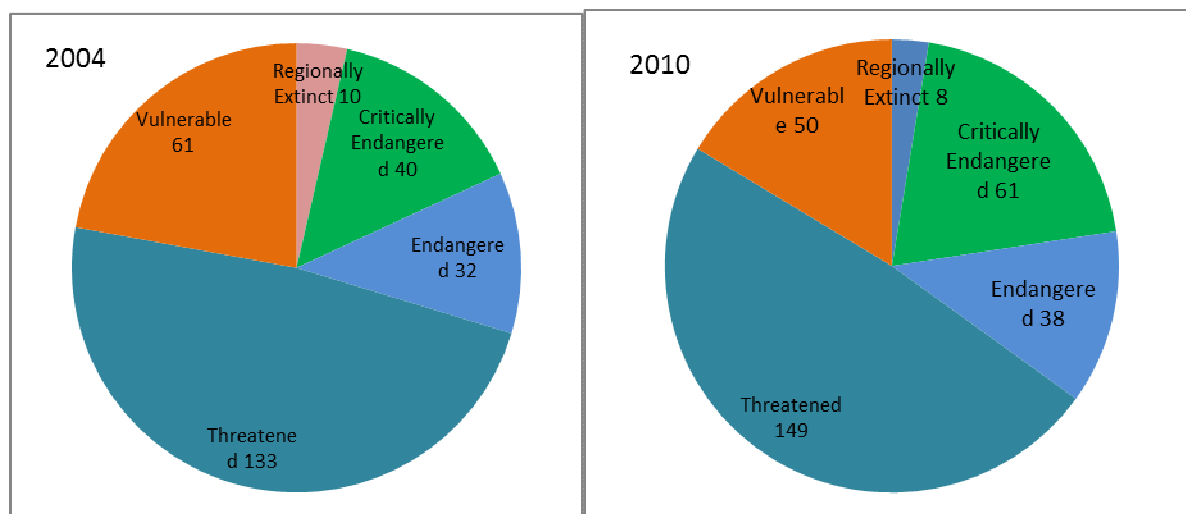


Figure 7: Changes in number of threatened bird species in Nepal during 2001-2010

Nine plants, 55 mammals, 149 birds, 64 herpetofauna, and 21 fish are included in the IUCN Red List (Table 6). Similarly, 15 groups and species of plants, 52 mammals, 108 birds and 19 reptiles and three insects have been listed in the CITES Appendices (Table 7).

Table 6: Number of selected group of species in the IUCN Red List

Category	Plants	Mammals	Birds	Herpetofauna	Fish
Critically Endangered	N/A	8	61	1	3
Endangered	2	26	38	3	1
Vulnerable	5	14	50	7	4
Near Threatened	2	7	N/A	4	13
Total	9	55	149	15	21

Source: Inawali *et al.* (2011); BCN and DNPWC (2011); Shah (2013)

Among the known species of domestic animals, pure *siri* cattle have become extinct and *Achhami* cattle (*Bos indicus*) are near endangered (Neopane and Pokharel, 2005). Pure *Tarai* goat has become rare due to indiscriminate cross-breeding of the breed with Indian large size goat (Neopane and Pokharel, 2008).

Table 7: Number of selected group of species included in CITES Appendices

Appendix	Plants	Animals				Total
		Mammals	Birds	Reptiles	Insects	
I	2	32	12	2	0	46
II	8*	16	95	15	3	129
III	5	4	1	2	0	7
Total	15	52	108	19	3	182

Source: DPR (2013b); UNEP-WCMC (2013).

* Includes all species belonging to Cycadaceae and Orchidaceae families (except those included in Appendix (I) plus other six species.

Lampuchhre sheep (*Ovis aries*) are near endangered (Neopane *et al.*, 2008) and *bampudke* pig (*Sus scrofa*) are under the threat of extinction (Neopane and Kadel, 2008). The Government has taken initiatives to conserve threatened species by declaring them as protected species. The list includes 27 species of mammals, nine species of birds, three species of reptiles, 14 species of angiosperms, and four species of gymnosperms (Table 8; Annex 17; Annex 18).

Table 8: Number of selected group of species that are protected in Nepal

Species Group	Protected Species		Reference
	Number	% *	
Fauna			
Mammals	27	14.9	Jnawali <i>et al.</i> (2011)
Birds	9	1.0	BCN and DNPWC (2011)
Reptiles	3	2.4	Chapagain and Dhakal (2003)
Amphibians	2	3.7	Shah and Tiwari (2004)
Flora			
Angiosperms	14	0.2	GON (2001)
Gymnosperms	4	15.4	
Lichen	1	0.1	

* Percent of known species in Nepal

2.2.3 Genetic Diversity

Information on forest genetic diversity is very limited in Nepal. The Silviculture Division under the Department of Forests has established seed stands for 38 socially and economically important tree species to conserve the genetic resources of these species (Annex 19). Among the forest tree species studied, *Dalbergia sissoo*, *Pinus roxburghii* and *Shorea robusta* have been found to possess a high level of genetic diversity (TISU, 2013).

Many wetlands are sources of important genetic material. For example, the Ajingara marsh in Kapilvastu harbors three species of wild rice, namely *Oryza rufipogon*, *Oryza minuta* and *Oryza nivara*. *Hygroryza aristata* is a wild relative of many rice varieties found in the *Tarai*. These local species provide genetic materials for improvement of commercial varieties (Bhandari, 1998).

Among the agriculture species, crops such as rice (*Oryza sativa*), rice bean (*Vigna unbellata*), eggplant (*Solanum melongena*), buckwheat (*Fagopyrum esculentum*, *Fagopyrum taticum*), soybean (*Glycine max*), foxtail millet (*Setaria italica*), citrus (*Citrus aurantium*, *Citrus limon*, *Citrus medica*) and mango (*Mangifera indica*) have high genetic diversity. Similarly, the genetic



Barley (*Hordeum vulgare*) in Manang

Photo © Ram Prasad Chaudhary

diversity of under-utilized or minor crops, such as calocacia (*Colocasia esculenta*), yam (*Dioscorea esculenta*), buckwheat (*Fagopyrum esculentum* (Sweet); *Fagopyrum tataricum* (Bitter), horse gram (*Macrotyloma uniflorum*), sweet potato (*Ipomoea batatas*), amaranthus (*Amaranthu shypochondriacus*), proso millet (*Panicum miliaceum*), foxtail millet (*Setaria italic*), and tropical fruit species such as litchi (*Litchi chinensis*), jack fruit (*Artocarpus heterophullus*), jujube (*Ziziphus jujube*) and black plum (*Syzygium cumini*) is very high. Traditional farming systems and wild relatives found in proximity have helped maintain the genetic variability in these species (Jha *et al.*, 1996; Table 9).

Table 9: Estimated botanical sources of cultivated and wild food crop species in Nepal

Plant Groups	Number of Food Crop Species			
	Cultivated	Wild	Imported	Total
Dicotyledons	175 (44)	190 (48)	30 (8)	395
Monocotyledons	50 (60)	20 (24)	13 (16)	83
Pteridophytes	-	11 (100)	-	11
Thallophytes	-	108 (100)	-	108
Gymnosperms	-	2 (100)	-	2
Total	225	331	43	599

Source: MoFSC (2002). Number in the parenthesis refers to percentage.

There are variations in the distribution of crop genetic diversity across the country. For example, the findings of an on-farm agrobiodiversity research carried out by the Strengthening the Scientific Basis of Agrobiodiversity Conservation Project showed the highest number of farmer-named cultivars of rice, taro and sponge gourds in Kaski (Middle Mountains). Genetic diversities of buckwheat and barley were high in Jumla (High Mountains), and the diversity of pigeon pea was highest in Bara (*Tarai*; Annex 20). There have been limited studies to assess genetic diversity of livestock species. The available information suggests that a high level of genetic diversity exists in *khari* goats (found across the Middle Mountains) (Kuwar *et al.*, 2003).

2.2.4 Mountain Biodiversity

The mountain ecosystems in Nepal are comprised of a complex of forests, rangelands, wetlands, farmlands and snow and rock covered landscapes that support and sustain a large number of plant and animal species. The Middle Mountains and lower parts of the High Mountains slopes are generally covered by different types of forests. At higher elevations, harsh environmental and climate conditions prevail and where sub-alpine and alpine vegetation and associated animal species are found. A significant proportion of the High Himal zone is covered by rock and ice. The zone includes 10 of the highest peaks in the world (out of 14 peaks over 8,000 meters), including Mount Everest (8,848 meters).



A typical mountain ecosystem in central Nepal

Photo ©: Rabindra Maharjan

Most of Nepal’s biodiversity is in the mountains. For example, 34 percent of the plant and animal biodiversity is found in the High Mountains (above 3,000 meters), and 63 percent in the Middle Mountains (1,000-3,000 meters). The highest numbers of plants occur between 1,500 and 2,500 meters elevations. About 420 flowering plant species are distributed in the areas that lie above 5,000 meters. Vascular plants (e.g. *Christolae himalayayensis*) have even been recorded at over 6,000 meters elevation in the eastern Himalaya (MoFSC, 2005). Mosses and lichens are seen up to 6,300 meters, and mammals and birds are seen even above 5,000 meters (MoFSC, 2002).

High altitude rangelands are especially important due to the presence of a variety of endemic flora and fauna. About 63 percent of the flowering plants that are endemic to Nepal are from the High Mountains, and 38 percent are from the Middle Mountains (ICIMOD and MOEST, 2007). Of the 41 key NTFP species, 14 species (34% of the country’s total), which are primarily medicinal herbs occur in alpine rangelands (Biodiversity Profile Project, 1995).

The high elevation mountains also possess an enormous diversity of species of wild fauna and the genetic resources contained therein. Some 80 species of mammals are known to occur in the High Mountains and High Himal areas of which eight, namely snow leopard, grey wolf, Tibetan argali, lynx, brown bear, musk deer, red panda and Tibetan antelope, are major wildlife species found in Nepal. Similarly, eight out of 20 endemic breeds of livestock are from the alpine region (Sherchand and Pradhan, 1998; MoFSC, 2005). Of the total 413 species of birds that are



Domesticated local breeds of yak (*Dimjo* and *Urang*)

Photo ©: Kapil Khanal

reported to occur above 3,000 meters, 19 species are known to breed in these high grounds. Nine species of birds are restricted to alpine rangelands of which five species, including imperial eagle, Pallas’ fish eagle, Hodgson’s bush chat, lesser kestrel, and Kasmir flycatcher are of international significance (Inskipp and Inskipp, 1991). Five of the nine Ramsar-listed wetlands are located above 2,000 meters elevations.

Considering the fact that the Himalayan Mountains are endowed with immense biodiversity, including a great diversity of endemic species, and the existence of significant threats to biodiversity due to human activities, Conservation International has identified the entire Himalayan region as one of 34 biodiversity hotspots in the world. Nepal lies at the center of the hotspot.

2.2.5 Representation of Global Terrestrial Ecoregions

Nepal includes 12 of the 867 terrestrial eco-regions in the world. These include: (i) The Eastern Himalayan Broadleaf Forests, (ii) Eastern Himalayan Conifer Forests, (iii) Eastern Himalayan Alpine Shrub and Meadows, (iv) Himalayan Subtropical Broadleaf Forests, (v) Himalayan Subtropical Pine Forests, (vi) Western Himalayan Subalpine Conifer Forests, (vii) Western Himalayan Broadleaf Forests, (viii) Western Himalayan Alpine Shrub and Meadows, (ix) Upper Gangetic Plains Moist Deciduous Forests, (x) Lower Gangetic Plains Moist Deciduous Forests, (xi) *Tarai-Duar Savannas and Grasslands*, and (xii) Rock and Ice (Figure 8; Annex 21).

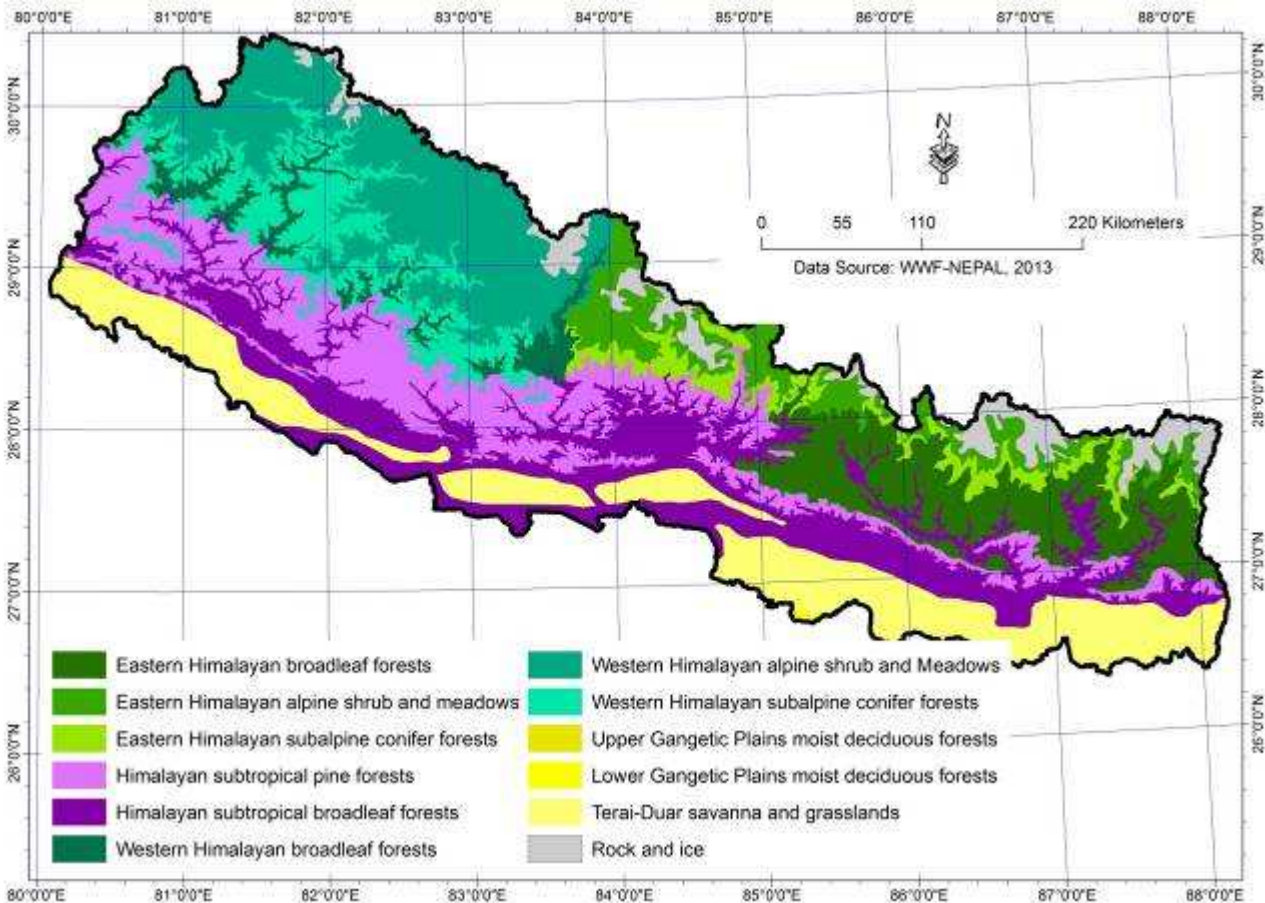


Figure 8: Location and coverage of global terrestrial eco-regions in Nepal

CHAPTER 3: THREATS TO BIODIVERSITY IN NEPAL

Nepal's biodiversity is threatened by multiple factors. Loss and degradation of natural habitats, such as forests, grasslands and wetlands due to expansion of settlements, agriculture and infrastructure; over exploitation; invasion by alien species; and pollution of water bodies remain the predominant threats to natural ecosystems. Rapid expansion of hybrid varieties and improper use of insecticides and pesticides are the major threats to agrobiodiversity. Climate change can have profound impacts in future, particularly in the mountains. Most threats continue to increase. Moreover, interaction of multiple threats is speculated to have increased pressures thereby leading to further decline, degradation and loss of habitats.

3.1 Forest Biodiversity

The threats to forest biodiversity can be categorized into two broad groups: (i) loss and degradation of natural habitats, and (ii) over exploitation and illegal exploitation of biological resources. The threats and their causative factors are briefly described in the following sections and impacts of the major threats and general trends in the impacts in different physiographic zones over the last decade are summarized in Table 11.

(i) Loss of Habitat

Continuous loss of forest area is a major threat to forest biodiversity. According to the Global Forest Resources Assessment by FAO, Nepal lost forest area by 2.1 percent and 1.4 percent during 1990-2000 and 2000-2005, respectively. During 1990-2000, the country lost 700 hectares of primary forest per year, but this figure rose by 10 times to 7,000 hectares per year during 2000-2005 (FAO, 2010). The factors driving loss of forest habitat slightly vary among the physiographic zones and include mainly the followings:

(a) **Encroachment** of forest areas for settlements is a major cause of deforestation in the *Tarai* and *Siwalik*. Some encroachments, especially along the East-West highway, are also for the expansion of local markets. Most of such settlements are illegal.

(b) **Expansion of cultivation** into forest areas is taking place to meet increasing demands for agricultural land. The problem is more severe in the *Tarai* and *Siwalik* where productivity of land and population density is high and enforcement of law is generally weak. Shifting cultivation on steep hill slopes is a major cause of forest loss and degradation in some areas of the *Siwalik* and the adjoining Mahabharat range.

(c) **Development of infrastructure** inside forestland is an important factor causing forest loss and degradation. Unplanned and unregulated construction is widely believed to be a major threat in the Middle Mountains, although the exact scale and severity of this problem is yet to be determined. The Department of Roads estimates that around 25,000 kilometers rural road tracks had been opened by 2010, most of which have been constructed without any environmental safeguard (DOR,

2010). Illegal construction of schools, hospitals, temples, water storage tanks and other infrastructure within forest is a problem, particularly in the *Tarai* and *Siwalik*.

A total of 82,934 hectares forestland was under illegal occupation in 2012 (DOF, 2012). This is 66 percent higher as compared to the encroached area in 1994.

(d) Planned conversion of forestland by the government for implementing economic development priority projects, such as construction of road, electric transmission line and reservoir is a cause of habitat loss and degradation in some places.

(ii) Degradation of Habitat

Degradation of forest habitats is a major threat to biodiversity. The World Bank (2008) estimated that one quarter of Nepal's forest area is heavily degraded, which has led to loss of biodiversity, increased landslides, and soil erosion. The following are the major causes of forest habitat degradation.

(a) Unsustainable overharvesting of biological resources to meet persistently high demands for fuel, construction timber, fodder and other forest products is common in forests outside protected areas. Illicit felling of commercially valuable trees and the trans-boundary timber trade are major problems in the *Tarai*, *Siwalik* and some parts of the High Mountain regions. High demand for fuel wood and unemployment has motivated many people to engage in illegal collection of firewood for sale, particularly along the highways. Selective felling of trees for building materials and over-logging for fodder and fuel wood also contribute significantly to forest degradation.

Over exploitation of high value and rare species, such as satsal (*Dalbergia latifolia*), champ (*Michelia champaca*), bijayasal (*Pterocarpus marsupium*) and wild olive (*Olea cuspidata*) has threatened the survival of these species in their natural habitats. Excessive commercial harvest of medicinal plants (legally and illegally) has caused direct threat to the high value species, including yarchagumba (*Ophiocordyceps sinensis*), jatamansi (*Valeriana jatamansi*), sarpagandha (*Rauvolfia serpentina*), and many species of orchids.

(b) Uncontrolled forest fire is a serious threat, particularly in the *Siwalik* region and high altitude areas. Most of the fires are deliberately set by local farmers to clear land for agriculture or stimulate early growth of grass for livestock to graze. Recurrent forest fires severely damage and prohibit regeneration and growth of seedlings, destroy non-timber forest products, injure ground fauna and flora and, in some cases, encourage invasive species. In the Middle Mountains, frequent burning has greatly reduced the regeneration and development of understory vegetation thereby leading to an open forest with relatively low biodiversity.

(c) Overgrazing in forests has negatively affected regeneration and growth of seedlings and ultimately caused forest degradation in many places. The practice of grazing in forests has substantially decreased in the Middle Mountains due to implementation of the community forestry programme, as FUGs rules usually do not allow grazing in community forests. In some areas of High Mountains (e.g. Taplejung, Rasuwa, Humla), however, the grazing prohibition in community forests, has invited conflicts between nomadic herders and CFUGs.

(iii) Poaching and Illegal Wildlife Trade

Illegal hunting and trade of important wildlife species is a major problem in the management of protected area biodiversity. The threat is particularly severe for some vertebrates driven in particular by demand for wildlife products in international markets. Rhino (*Rhinoceros unicornis*), tiger (*Panthera tigris tigris*), musk deer (*Moschus chrysogaster*), pangolin (*Manis spp*) are some of the species that are especially at risk from poaching. Around 43 nationally threatened bird species (29% of the total threatened) are affected to some degree by hunting or trapping (BCN and DNPWC, 2011).

(iv) Human-Wildlife Conflict

Human-wildlife conflict is related to crop raids and livestock depredation by wild animals, which is common in all protected areas. This is a major threat to wild fauna particularly large predators (e.g. snow leopard). Wild animals, such as wild boars, elephants, rhinos, deer, and monkeys destroy crops, which cause retaliation from human communities. Livestock depredation by predator species, especially leopards is also common both inside and outside protected areas. Occasionally, big wild animals also kill humans. Local villagers occasionally resort to retribution killings in the form of hunting, trapping and poisoning of wildlife species. The government is trying to resolve the problem through a number of initiatives, including systems of awareness, cash compensation, fencing, trenching, and ploughing back certain percent of the protected area revenue to human-wildlife conflict resolution and local community development. These efforts have to be made further effective in reducing human-wildlife conflicts.

(v) Invasion by Alien Plant Species

Invasive alien species affect native species mainly through predation, competition and habitat modification (McGeoch *et al.*, 2010). Invasion and rapid expansion of some alien species, such as *Mikania micrantha*, *Ageratina adenophora* (syn *Eupatorium adenophorum*), *Chromolaena odorata* and *Lantana camara* has emerged as a major threat to forest biodiversity. *Mikania micrantha* is a climber that spreads extremely fast over forest canopy, and blocks sunlight for native plants, and eventually kills them or stunts their growth. Its invasion has been a serious problem in the forests and grasslands of the Chitwan Valley, the Koshi Tappu Wildlife Reserve and many other areas in the *Tarai*, *Siwalik* and Middle Mountains.



Mikania micrantha in Chitwan National Park

Photo ©: Bharat B. Shrestha

Ageratina adenophora, which grows profusely in disturbed forest, forest margins and fallowlands and displaces the native ground flora, is a major cause of biodiversity loss in the Middle Mountains (500-2400 m). The plant has reportedly moved to higher elevation areas in recent year; this is possibly due to changing climatic conditions. *Chromolaena odorata* grows in sunny, open and drained areas. *Lantana camara* is commonly found in shrublands, fallow lands and forest margins in the *Siwalik* and lower Middle Mountains (sub-tropical areas). Many native plants have reportedly been replaced due to the invasion of *Lantana camara*.

Table 10: Major direct threats to forest biodiversity in Nepal

Physiographic Zone	A	B	C	D	E	Impact
High Himal			increasing	constant		
High Mountains	increasing	constant	increasing	increasing	increasing	
Middle Mountains	decreasing	decreasing	constant	increasing	increasing	
<i>Siwalik</i>	increasing	increasing	constant	constant	increasing	
<i>Tarai</i>	increasing	constant	constant	constant	increasing	

Impact

High

Medium

Low

A =Loss of habitat; B = Degradation of habitat; C = Poaching and illegal trade; D = Human-wildlife conflict; E = Invasion by alien plant species.

(vi) Stone, Gravel and Sand Mining

Excessive extraction of boulders, gravel and sand from rivers and streams is a localized cause of deforestation in some areas, which has posed a direct threat to biodiversity.

(vii) Other Threats

There are some location-specific threats. For example, cross-breeding of wild water buffalo (*Bubalus arnee*) with domestic buffalo (*Bubalus bubalis*) is a major problem in Koshi Tappu Wildlife Reserve (the only habitat of wild water buffalo), which is speculated to have caused substantial genetic degradation of the endangered wild species.



Photo ©: Rajendra Dhungana

Wild water buffalo in KoshiTappu

3.2 Rangeland Biodiversity

Threats to rangelands biodiversity differ with the location and type of rangelands. The following are the major threats.

- (i) **Overgrazing** and trampling by large herds of livestock is a main threat to biodiversity, especially in high altitude pastures, as it affects regeneration and development of ground flora.



Open grazing in the *Tarai*

- (ii) **Conversion** of grasslands and savannas to agriculture and other use is a major threat to the *Tarai*-Duar savannas, grasslands and marshlands. The loss and fragmentation has greatly affected grassland-dependent wild animals (such as rhino and deer) and bird species (e.g. Bengal florican).
- (iii) **Intrusion of woody species** has caused declines in quality and the surface area of some grassland habitats, including grasslands in Chitwan National Park. Intrusions by tree and shrub species have also been reported in subalpine and alpine grasslands, which pose threats to the diversity of rangelands, although the total richness of flora may be unaffected (see e.g. Sharma *et al.*, 2013).
- (iv) **Invasion of alien plant species** is a threat to many *Tarai*, *Siwalik* and Middle Mountains grasslands.
- (v) **Unregulated commercial harvest of medicinal plants** is a main threat to biodiversity in alpine and subalpine meadows.
- (vi) **Inappropriate management** of protected area grasslands, including untimely and intensive annual cutting, has posed a serious threat to the country's specialist grassland birds, many of which are now almost confined entirely to protected areas (BCN and DNPWC, 2011).
- (vii) **Fire**, which is an essential component of management tools used to maintain lowland grassland ecosystems and biodiversity (especially in protected areas), is also a serious threat to biodiversity. Fires during the breeding season can be extremely damaging to grassland birds

and reptiles as they destroy the nests and eggs. Comprehensive burning can also be harmful to other wildlife.

3.3 Wetland Biodiversity

Wetland biodiversity is threatened by: (i) drainage and encroachment for agriculture, settlement and infrastructure development, (ii) diversion and abstraction of water for irrigation, (iii) unsustainable exploitation of wetland resources, including overfishing and destructive fishing (iv) widespread mining of gravel from streams and rivers beds, (v) water pollution from households and industrial discharges and agricultural run-off, (vi) invasion of alien species into wetland ecosystems, (vii) illegal hunting and trapping of birds and other wildlife, (viii) siltation, and (ix) channeling and damming of rivers.

Invasion of water hyacinth (*Eichhornia crassipes*) is a major threat to tropical and sub-tropical wetlands. Many internationally important wetlands, including the Beeshazar Lake in the Barandabhar corridor forest in Chitwan and Phewa Lake in Pokhara, are already severely invaded by water hyacinth. The plant grows fast and soon covers the entire water surface. The substantial reduction in light and air (oxygen) reaching below the surface due to its invasion affects aquatic organisms. *Ipomoea carnea* and *Mikania micrantha* are also becoming more abundant around wetlands, thereby affecting habitats of wetland dependent fauna.



Blanket of *Eichhornia crassipes* on a stream in Dhanusha District

Photo ©: Ambika P. Gautam

There has been substantial increase in establishment of hydropower plants in Nepal in recent years. While on the one hand, this is a positive step towards meeting energy deficits, however on the other hand, the cascade of high dams and stations on some rivers have reportedly posed serious threats to both aquatic biodiversity and livelihoods of wetland dependent local communities as well as fishermen. The scale of this threat is expected to further increase in future. Improper use of pesticides and chemical fertilizers is a significant threat to many species of birds and aquatic life.

The eutrophication of wetlands due to overuse of fertilizers can cause more severe damage to freshwater biodiversity in future.

Over-fishing and fish-poisoning have significantly reduced the food supply of fish-eating birds. Some wetland bird species, such as brahminy kite (*Haliastur indus*), Caspian tern (*Sterna caspia*), black-bellied tern (*Sterna acuticauda*) and river tern (*Sterna aurantia*) have shown continuous decline in recent years due to degradation of their habitats. Some other species, including lesser fish eagle (*Ichthyaetus humilis*) and tawanyfish owl (*Ketupa flavipes*) are now included in the nationally threatened list (BCN and DNPWC, 2011).

Introduction and rapid expansion of exotic fish has also been emerged as a threat to native species. Eleven alien fish and one freshwater prawn species have been introduced in Nepalese wetlands for aquaculture development (Annex 22). Some of those exotic species (e.g. tilapia) can be invasive.

Although the extent of impacts of exotic species on native diversity is not assessed for Nepal, limited studies conducted at specific locations show the coverage of exotic species is being rapidly expanded and they can have significant negative effects on local biodiversity. For example, a recent assessment of natural lakes in Kailali district showed that of the 101 natural lakes found in the district at least 80 were being used for exotic fish farming, mostly carps (DOFD, 2012). Surviving native fish populations have been reduced through fry predation by exotics or by out-competing them for food and breeding sites, which can ultimately result into extinction of the native species.

3.4 Agro-biodiversity

Agrobiodiversity is under threat mainly due to: (i) commercialization of agriculture and widespread use of modern high yielding varieties, (ii) improper use of insecticides and pesticides, and (iii) conversion of farmlands into semi-permanent and permanent settlements. Further gaps include poor level of awareness about the importance of biodiversity, inadequate incentives for conservation of local land races, and inadequate knowledge.

Uncontrolled use of hybrids and improved varieties has caused rapid erosion of landraces of some food crops, particularly in the *Tarai*. A study carried out in Kachorwa village of Bara district showed that more than 50 percent of rice, finger millet, pigeon pea and sponge gourd landraces were lost in just five years (i.e. 1998-2003) (Shrestha *et al.*, 2005). Joshi and Bauer (2007) reported that there has been a decrease in varietal diversity and a loss of some rice landraces in western *Tarai* region mainly because of their low yield, their sensitivity to diseases and pests, and their late maturity. Invasion by *Parthenium hysterophorous* has emerged as a major threat in recent years, particularly in the tropical and sub-tropical fallow lands and road side areas (Timsina *et al.*, 2011).

Livestock diversity is threatened by: (i) decline of local breeds, mainly due to inadequate incentives to continue keeping less productive local breeds, (ii) weak quarantine, and (iii) limited *ex-situ* conservation of local breeds, (v) limited access to good quality seed of local breeds (live or semen), and (vi) lack of incentives to continue keeping less productive local breeds.

The type and intensity of threats to agrobiodiversity slightly vary among the physiographic regions. For example, commercialization of agriculture, extension of modern high yielding varieties, and urbanization are more prevalent in the *Tarai*, while poor level of awareness is more related to the mountains (Table 11).

Table 11: Major threats to agrobiodiversity in different physiographic zones

Threats	High Mountains	Middle Mountains	Tarai and Siwalik
Unorganized settlements and urbanization	-	√	√√
Uncontrolled use of hybrids and improved varieties/breeds	√	√√	√√√
Deteriorating or breaking down of local seed system	√	√√	√√
Prevalence of new insects and pests	√	√√	√√
Climate change (draught and flood)	√√	√√	√√
Improper use of insecticides and pesticides	√	√√	√√√
Invasion by alien species	√	√√	√√

Source: MoFSC (2002) and stakeholders consultations. Number of “√” indicates degree of the threat.

3.5 Mountain Biodiversity

Some of the main threats to mountain biodiversity include: (i) unplanned and unregulated construction of rural roads and other infrastructure, (ii) inappropriate management of natural resources, including overexploitation of non-wood and wood products, and (iii) inappropriate farming practices. Mountain ecosystems are fragile and vulnerable to natural disasters, such as landslides, glacial lake outburst floods and drought, which cause considerable damage to the ecosystems and people living in those areas.

3.6 Climate Change: a Major Threat to Biodiversity

Globally, climate change and its consequences present one of the most important threats to biodiversity and the functions of ecosystems. A recent study by the Intergovernmental Panel on Climate Change and the World Meteorological Organization has predicted that 20-30 percent species will likely be at a higher risk of extinction with increase in temperature due to climate change (IPCC, 2007).

The understanding of impacts of climate change on Nepal’s biodiversity is inadequate. Some of the known impacts are: (i) shifts in agro-ecological zones, prolonged dry spells, and higher incidences of pests and diseases, (ii) increased temperature and rainfall variability, (iii) increased emergence and quickened spread of invasive alien plant species, (iv) increased incidence of forest fire in recent years, (v) changes in phenological cycles of tree species, (vi) shifting of treeline in the Himalaya, and (vii) depletion of wetlands (MOSTE, 2010).

The following are some of the likely impacts of climate change on biodiversity.

(a) The climatic range of many species will move upward in elevation from their current locations. This will have differential effects on species. Some species will migrate through fragmented landscapes whilst others may not be able to do so.

(b) Many species that are already vulnerable are likely to become extinct. Species with limited climatic ranges and/or with limited geographical opportunities (e.g., mountain top species), species with restricted habitat requirements, and/or small populations are typically the most vulnerable.

(c) Changes in the frequency, intensity, extent, and locations of climatically and non-climatically induced disturbances will affect how and at what rate the existing ecosystems will be replaced by new plant and animal assemblages. The High Himal and High Mountain ecosystems are likely to be worst affected by climate change. Among the natural habitats, remnant native grasslands are highly vulnerable to the impacts of climate change (BCN and DNPWC, 2011).

The impacts of climate change are likely to increase in future, which will not only affect biodiversity but also livelihoods of millions of local and indigenous people who depend on biodiversity. Disruption of ecological services on which they depend due to climate change is expected to especially affect the poorest and most vulnerable communities (UNEP, 2010).

3.7. Factors Underlying the Threats

The threats to biodiversity discussed in the preceding sections are the results of several underlying factors. These factors constitute a complex of social, political, economic, technological, and cultural variables that operate at various spatial levels.

(i) Demographic Changes

Nepal's population grew with an average rate of 1.35 percent during the last decade. Moreover, there is a wide spatial variation in the distribution of population across the country (CBS, 2012). Although correlating population with forest use pattern is difficult, it is widely believed that the growth of population, along with changing density and distribution patterns are believed to have contributed to loss and degradation of forest habitats in different ways, including increased forest encroachment for agricultural expansions and increased pressure on forests for meeting energy and timber needs.

(viii) Poverty and Other Economic Factors

Widespread poverty, combined with a lack of or very limited alternative livelihood opportunities and general under development situation, has led to high dependency on forests, wetlands, and rangelands thereby increasing pressure on those natural resources. In the absence of cheap alternatives, firewood still remains the major source of energy in rural areas. Moreover, increased market accessibility due to opening of new roads has contributed to the commercialization of firewood, NTFPs and other forest products in some areas. Pressure on forests has substantially increased due also to increased demand of forestland and timber for infrastructural development. Remittance-based economic growth is creating more and more demands of timber for construction of new houses in recent years. Similarly, the pursuit of economic growth through intensive agriculture and urbanization has negative effects on agrobiodiversity.

(iii) Poor Governance

Weak enforcement of the law and regulatory mechanisms is considered to be one of the major underlying factors behind deforestation and forest degradation. Poor governance is related to conflicting sectoral policies, poor coordination, and inadequate capacity of forestry sector institutions. In some cases, misdirected and conflicting policies have resulted unintended deforestations. In other cases, preventable deforestations have not been precluded due to the failure of government institutions to function effectively.

Inadequate political will is also considered to be a significant underlying cause of weak forestry sector governance. Laws may exist, but are not properly implemented because of a lack of political will and financial resources dedicated to their implementation. Enforcement of forest law is especially weak when there are large-scale projects at stake. Lack of mainstreaming in forestry legislation by other government agencies has also contributed to weak forestry sector governance. Lack of or poor infrastructural facility (field offices) is a major problem in most districts.

High price of wildlife parts and products made from them in international markets and general lack of knowledge of the legal consequences of poaching are considered as the major underlying causes of poaching and illegal wildlife trade. Governance of community forests suffers from the absence of uniform guidelines regarding harvest and sales of forest products, lack of a standard reporting system or format, poor financial transparency, and weak monitoring, which has led to financial irregularities by some forest user groups. Weak institutional mechanisms have also negatively affected conservation of aquatic, rangeland and agrobiodiversity.

(iv) Ignorance to Biodiversity Values in Government and Corporate Accounting Systems

The current government and corporate accounting systems have not taken into account the environmental costs of biodiversity loss and degradation. This gap is speculated to have provided incentive for being indifference to the environment and biodiversity while pursuing economic goals.

(v) Unclear Administrative Jurisdictions

Unclear responsibilities and overlapping jurisdictions between the Department of Forests and Department of Livestock Services have negatively affected management of rangelands outside protected areas. The problem is even more serious in case of wetlands. Conflict between traditional tenure systems (e.g. *kipat* system in the eastern mountains) and contemporary forestry legislations has weakened enforcement of forest law in some areas.

(vi) Inadequate Awareness and Motivation to Conserve Biodiversity

Public awareness is critical in gaining support for biodiversity conservation. Inadequate information on genetic resources, inadequate awareness of communities on the importance of biodiversity conservation, and inadequate incentives for local forest user groups and farmers for conservation of economically less valuable local species have posed threat for sustaining the past achievements and improving management of biodiversity in future. Lack of incentives for conservation of less productive agriculture crop varieties (i.e. native landraces) and livestock breeds is a major underlying cause of agrobiodiversity loss.

(vii) Other Factors

Lack of scientific forest management has caused low productivity of forests, imbalance in supply of products and less optimal income from the forestry sector. This coupled with inefficient forest products distribution and marketing systems has contributed to illegal and unsustainable harvest of forest products. Social inequalities, continuation of inherited modes of resource use and farming practices (e.g. shifting cultivation), and general disregard of the sacredness of nature by some sections of the society are some other underlying causes of forest biodiversity loss. Lack of an integrated approach to planning at the national and district levels also has negative effects on biodiversity and the environment.

CHAPTER 4: EFFORTS, OUTCOMES AND GAPS IN THE MANAGEMENT OF BIODIVERSITY

4.1 Enabling Policies, Strategies and Regulatory Framework

Nepal has been adopting the concept of conservation-friendly economic growth since it was first introduced in the Ninth Five Year Plan (1997-2002). The concept was further refined and internalized by the Tenth Plan (2002-2007). Since then, various enabling plans, policies, strategies and legislations have been developed and implemented to facilitate sustainable economic growth with participation of local communities. Policies and legislation relating to community-based forest and protected area management are examples of such enabling policies and successful conservation models. Biodiversity has also been featured prominently in the Approach Paper to the Thirteenth Plan (2013). Some of the main biodiversity related policies, strategies and legislations developed since 2002 are listed in Table 12, and the same are briefly described in Annex 23 and Annex 24.

Table 12: Biodiversity related policies, strategies and legislations developed since 2002

Cross-sectoral		Sectoral	
1	Tenth Five-year Plan (2002-2007)	1	Nepal Biodiversity Strategy (2002)
2	National Foundation for Development of Indigenous Nationalities Act (2002)	2	Water Resource Strategy (2002)
3	Sustainable Development Agenda for Nepal (2003)	3	Mountaineering Expedition Regulations (2002)
4	Science and Technology Policy (2005)	4	Leasehold Forest Policy (2002)
5	Biotechnology Policy (2006)	5	National Agricultural Policy (2004)
6	Nepal Biodiversity Strategy Implementation Plan (2006)	6	Herbs and Non-Timber Forest Products Development Policy (2004)
7	National Biosafety Framework (2006)	7	Rural Energy Policy (2006)
8	Interim Constitution of Nepal (2007)	8	Agrobiodiversity Policy (2007)
9	Three-year Interim Plan (2007-2010)	9	Plant Protection Act (2007)
10	Three-year Plan (2010-2013)	10	Tourism Policy (2009)
11	Climate Change Policy (2011)	11	Plant Protection Rules (2010)
12	National Land Use Policy (2012)	12	Forest Fire Management Strategy (2010)
13	Environment Friendly Local Governance Framework (2013)	13	Industrial Policy (2011)
		14	Rangeland Policy (2012)
		15	National Wetlands Policy (2012)
		16	Forest Encroachment Control Strategy (2012)
		17	Wildlife Damage Relief Guidelines (2012)
		18	Irrigation Policy (2013)

The existing policies, strategies and legislation have the following major gaps with regard to management of biodiversity.

(i) Policy and legislative gaps

Although Nepal became a Party to the Convention on Biological Diversity (1992) in 1994, it is yet to enact comprehensive legislation for conservation of biodiversity and sustainable use of its components. This legislative gap is speculated to have negatively affected the functional ability of the National Biodiversity Coordination Committee and overall conservation of biodiversity, sustainable use of its components and fair and equitable sharing of the benefits arising from the utilization of biological resources. Similarly, Nepal has yet to enact legislation related to: (a) access to genetic resources and benefit sharing, (b) implementation of the National Biosafety Framework (2007), and (c) Intellectual Property Rights for protecting traditional knowledge, innovations, and practices. The draft Access to Genetic Resources and Benefit Sharing Bill and CITES Bill are yet to be finalized and promulgated. Similarly, Nepal became party to International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in October 2010 but policy, legislation and institutional mechanisms required for its implementation are not yet fully in place.

(ii) Inadequate importance to biodiversity by some policies and most of the legislations

Many of the relevant policies, such as those related to environment, industry, roads and local governance sectors do not have clearly stated objectives relating to biodiversity. Even the recently drafted Agriculture Development Strategy has not assigned due priority to conservation and sustainable use of agrobiodiversity. The emphasis given by the strategy to commercialization and competitive agriculture may undermine biodiversity management. Furthermore, there is inadequate participation of local people in most policy processes.

(iii) Poor integration and harmonization of policies and laws

The policies of different sectors are not well connected and coordinated. Some of the existing laws are inconsistent, overlapping or contradictory. The extent of the rights allocated by different laws to various local user groups differs substantially (Belbase and Thapa, 2007). For example, provisions in the Forest Act (1993) and several other environment-related Acts contradict with the Local Self-Governance Act (1999). The Local Self-Governance Act (1999) empowers VDCs to sell specified natural resources and products, and stipulates that the proceeds of such sales are to be deposited to the VDC fund (sections 58(d) and 58(e)). It also stipulates that any proceeds accrued from the sale of river sand, stone, concrete, soil, driftwood, and the bone, horn, feather and skin of any wildlife, which is not prohibited by prevailing Nepali laws, go into the DDC fund (sections 215 and 218). The Forest Act, on the other hand, empowers CFUGs to sell the same products by independently fixing their prices (sections 2(c) and 25(1)).

(iv) Gaps in implementation of policies

Nepal has many good policies and strategies for conservation of biodiversity and natural resources, but implementation and monitoring of many of the policies and strategies is less than satisfactory. Poor level of ownership over the policies and strategies by stakeholders because of their inadequate participation in the policy process has also negatively affected the implementation.

4.2 Participation in International Conventions

Nepal has committed itself to the conservation of biodiversity before the international community by signing or becoming a party to a number of Multilateral Environmental Agreements (MEAs). The MEAs provide important opportunities as well as bring obligations to the country. They

provide opportunity to securing international financial and technical assistance and networking with other countries and relevant international agencies and institutions. For example, Article 20 of the CBD gives special consideration to developing countries in funding the implementation of the CBD. Nepal could also immensely benefit from proper implementation of the CBD Article 15, which asserts that a given country must have the right of disposal over its own biodiversity. MEAs can also help improve environmental governance within the country and improve and harmonize relevant policies and legislations. More importantly, however, they can help enhance national capacity for setting conservation agenda and its implementation.

The government has made considerable efforts and achieved successes in the implementation of some of its international commitments, including those related to the CBD (1992), Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973), Convention on Wetlands of International Importance (Ramsar Convention; 1971), World Heritage Convention (1972), and International Treaty on Plant Genetic Resources for Food and Agriculture (2001). The country has also been participating in the Global Tiger Forum and Global Tiger Initiatives. Some of the main biodiversity related MEAs that Nepal has signed and highlights of the progress made in their implementation are presented in Annex 25. There are, however, some gaps in implementation of international conventions. For example, Nepal is yet to ratify the Cartagena Protocol on Biosafety (2001), and Nagoya Protocol on Access to Genetic Resources and Benefit Sharing (2010).

Promoting synergy among biodiversity related MEAs (e.g. CBD, CITES, Ramsar, World Heritage Convention and ITPGRFA) is an issue in smooth implementation of the MEAs. There is a need to generate a set of coherent guidelines to bring synergy among the biodiversity related MEAs. This can be useful in a number of ways, including: (i) enhancing the science-policy interface, (ii) promoting cooperation at the international level in the implementation of the NBSAP, (iii) simplifying the national reporting, (iv) improving information management, and (v) capacity building.

Nepal's progress on meeting the Millennium Development Goals of environmental sustainability has remained less than satisfactory due mainly to inadequate mainstreaming of environmental issues in the policies of development sectors such as infrastructure and energy. Conflicting legal provisions, duplication of responsibility and the lack of an integrated framework for coordination among responsible agencies are major gaps (NPC/UNDP, 2005; NPC/UNDP, 2010, NPC/UNDP, 2013).

4.3 Institutional Development

Nepal has made a number of efforts to strengthen institutional mechanisms for the management of biodiversity. The following are the main national level institutional entities that made contributions to conservation of biodiversity and sustainable management of natural resources in the last decade.

(1) Parliamentary Committees

The Natural Resources Committee and Environment Communication and Technology Committee of the last Legislature Parliament played important roles in the management of environment and biodiversity. Members of the Natural Resources Committee also made several field visits and provided necessary directives to different government agencies.

(2) Government Ministries and Departments

A number of government ministries and departments are responsible for biodiversity management efforts under their respective jurisdictions. The Ministry of Forests and Soil Conservation is the focal ministry for implementing the CBD, Cartagena Protocol on Biosafety, National Clearing House Mechanism for CBD, and the National Biosafety Clearing House for Cartagena Protocol. The Ministry is thus the main agency charged with overall responsibility for formulating and implementing policies and programmes related to the conservation and sustainable use of biodiversity, keeping records of relevant activities, and communicating with the CBD Secretariat and other conventions related to biodiversity. The Ministry implements its plans and programmes through five departments, five Regional Forests Directorates, 74 District Forest Offices, 20 protected area offices, 56 District Soil Conservation Offices, and seven District Plant Resource Offices.

The Ministry of Agricultural Development, with its three departments, two councils (Nepal Agriculture Research Council and Nepal Veterinary Council), three national boards, five Regional Agriculture Directorates, 75 District Agriculture Development Offices and hundreds of agricultural centers scattered all over the country, is responsible for managing agrobiodiversity. The Food Security and Environment Division of MOAD acts as focal point and implementing agency for ITPGRFA. The Ministry of Science, Technology and Environment has the main objectives of contributing to sustainable economic development through sound environmental policies. A number of other ministries, departments, programmes and projects have also been making direct or indirect contributions to biodiversity conservation.

(3) National Planning Commission

The National Planning Commission (NPC) provides advice to the government ministries on matters related to preparing periodic plans, programmes and projects, and conducting feasibility studies and initiating master plans of large projects. The Central Bureau of Statistics, under the NPC, periodically compiles and shares data and information on various sectors, including biodiversity and environment.

(4) National Biodiversity Coordination Committee

The National Biodiversity Coordination Committee (NBCC) was established with the objective of mainstreaming all biodiversity programmes in the country. The Committee, which was led by the Minister of Forests and Soil Conservation, has representatives from relevant government ministries, the private sector and donors. Four thematic sub-committees, one each regarding Forests and Protected Areas, Agrobiodiversity, Biosecurity, Genetic Resources, and Sustainable Use of Biodiversity, were formed under the NBCC to provide scientific and technical inputs for the committee. The formation of the NBCC was a key action by the government towards the implementation of the Nepal Biodiversity Strategy (2002) and fulfilling its national obligations under the CBD.

(5) National Tiger Conservation Committee

This Committee, formed on 16 May 2010, is chaired by the Rt. Honorable Prime Minister. The Honorable Minister for Forests and Soil Conservation is the Member Secretary. The other members of the eleven-member committee include the honorable Ministers for Home, Finance; Science,

Technology and Environment; Defense, and Law and Justice and the Chief Secretary. The group is completed by committee-nominated members, including two tiger experts, and a high-level representative of national and international organizations that contribute to tiger conservation in Nepal.

(6) National Agrobiodiversity Conservation Committee

This is a 20-member policy level committee chaired by the secretary for Ministry of Agricultural Development. Members include representatives from relevant government departments, research organizations, universities, NGOs, and farmers. A joint secretary at the Ministry (focal person for agrobiodiversity) acts as the member secretary of the committee. The Committee has been formed as per the provision of the Agriculture Biodiversity Policy (2007) for coordination and monitoring of agrobiodiversity related works in the country.

(7) National Wildlife Crime Control Committee and Wildlife Crime Control Bureaus

National Wildlife Crime Control Committee was formed in 2010. It is chaired by the Minister for Forests and Soil Conservation. The main function of the Committee is to maintain coordination among different agencies such as Customs, Ministry of Home Affairs, Ministry of Defense, Nepal Police and Nepal Army for prevention and control of wildlife poaching and trade. Similarly, the Wildlife Crime Control Bureau was established at the center and 28 district levels. The central bureau is chaired by Director General of DNPWC and the district bureaus are chaired by respective District Forest Officers or Chief Wardens.

(8) National Wetland Committee

The 11-member committee was formed in 2010 to provide strategic policy guidance for mainstreaming wetland issues into national policy and planning frameworks and to ensure inter-sectoral coordination, cooperation, and collaboration. The Committee is chaired by the Minister for Forests and Soil Conservation and has representation from key sectoral ministries.

(9) South Asia Wildlife Enforcement Network

The Secretariat of the South Asia Wildlife Enforcement Network is housed in the DNPWC. Currently, the Director General of the Department is working as the Coordinator of the Network.

(10) National Biotechnology Coordination Committee

This is a 20-member advisory committee led by the Minister of Science, Technology and Environment with representation from the NPC, government ministries, universities, NARC, and user groups. The Committee makes decision on biosafety proposals related to Genetically Modified Organisms (MoFSC, 2009).

(11) Climate Change Council

The Council, which was formed in 2009, is the highest level coordination body chaired by the Prime Minister to guide and direct formulation and implementation of climate change-related policies. Other responsibilities of the Council include: (i) taking necessary measures to make climate change a national development agenda, (ii) initiating and coordinating activities related to additional financial and technical support to climate change-related programme and projects, and

(iii) initiating and coordinating for additional benefits from climate change-related international negotiations and decisions.

(12) REDD Forestry and Climate Change Cell

The MoFSC has established a REDD Forestry and Climate Change Cell for further strengthening of climate change adaptation and mitigation activities through abatement of deforestation and forest degradation and promotion of sustainable forest management.

(13) Academic and Research Institutions

The Departments of Botany, Zoology and Environmental Science, and the Institute of Forestry of Tribhuvan University; the Agriculture and Forestry University; and several private academic institutions are playing important roles in human resource development, as well as the generation of biodiversity-related knowledge through research activities. NAST, NARC, RECAST and DFRS are some other key research institutions engaged in biodiversity research.

(14) Non-government Agencies

The NTNC, IUCN Nepal, WWF Nepal, FECOFUN, and ACOFUN are some of the main non-government agencies that are making substantial contributions to biodiversity conservation and natural resource management in Nepal. A number of other NGOs, volunteer and professional society organizations are working, directly or indirectly, to build capacity at various levels for effective conservation and management of biodiversity in the country. The Nepal Foresters' Association, Ecological Society of Nepal, ForestAction Nepal Nepal, Environmental Camps for Conservation Awareness, Women in Environment Nepal, Save the Environment Foundation, and Wetland Friends of Nepal are some examples of such organizations operational at the national level. Numerous NGOs and CBOs are operational at the local levels.

(15) Local Bodies

Some of the DDCs, municipalities and VDCs have done good work in environment conservation. It is expected that these local bodies will be further activated for biodiversity conservation after the implementation of the recently developed Environment Friendly Local Governance Framework begins.

(16) Local User Groups and their Networks

At the local level, forest user groups formed under the community forestry, leasehold forestry, collaborative forestry, and soil and water conservation programmes are playing crucial roles in the management of local biodiversity. The conservation area committees and buffer zone committees are contributing to the management of protected areas. Community-based farmer groups are involved in the implementation of agrobiodiversity related programmes under the MOAD. In addition a number of youth clubs, mother groups, women groups and other organizations are also actively contributing to conservation of biodiversity.

Gaps in Institutional Arrangement

Poor inter-agency coordination and cooperation are some of the major institutional gaps affecting biodiversity management in Nepal. A number of agencies and institutions are involved in biodiversity conservation, but cooperation and complementation among them is usually poor.

Absence of any particular agency with the responsibility of monitoring the implementation and enforcement of various policies, plans, and legislations could be one of the reasons behind this problem.

Other gaps include inadequate education, awareness, and participation. However, the country has made substantial progress in environmental education and awareness in recent years. The increased awareness and media support can be taken as an example. However, understanding of biodiversity and environmental issues is mostly limited to urban areas, especially among the youth demographic. A vast majority of the rural population, particularly in remote rural areas, are still unaware of the concepts and rationales for biodiversity conservation and climate change mitigation.

4.4 Establishment and Management of Protected Areas

Nepal has established 20 protected areas, covering a total area of 34,185.62 square kilometers or 23.23 percent of the country’s total area. The protected area network of the country includes 10 national parks, three wildlife reserves, one hunting reserve, six conservation areas, and 5602.67 square kilometers buffer zone areas established around nine national parks (except Shivapuri-Nagarjun) and three wildlife reserves (DNPWC, 2012; Figure 9; Figure 10; Annex 26).

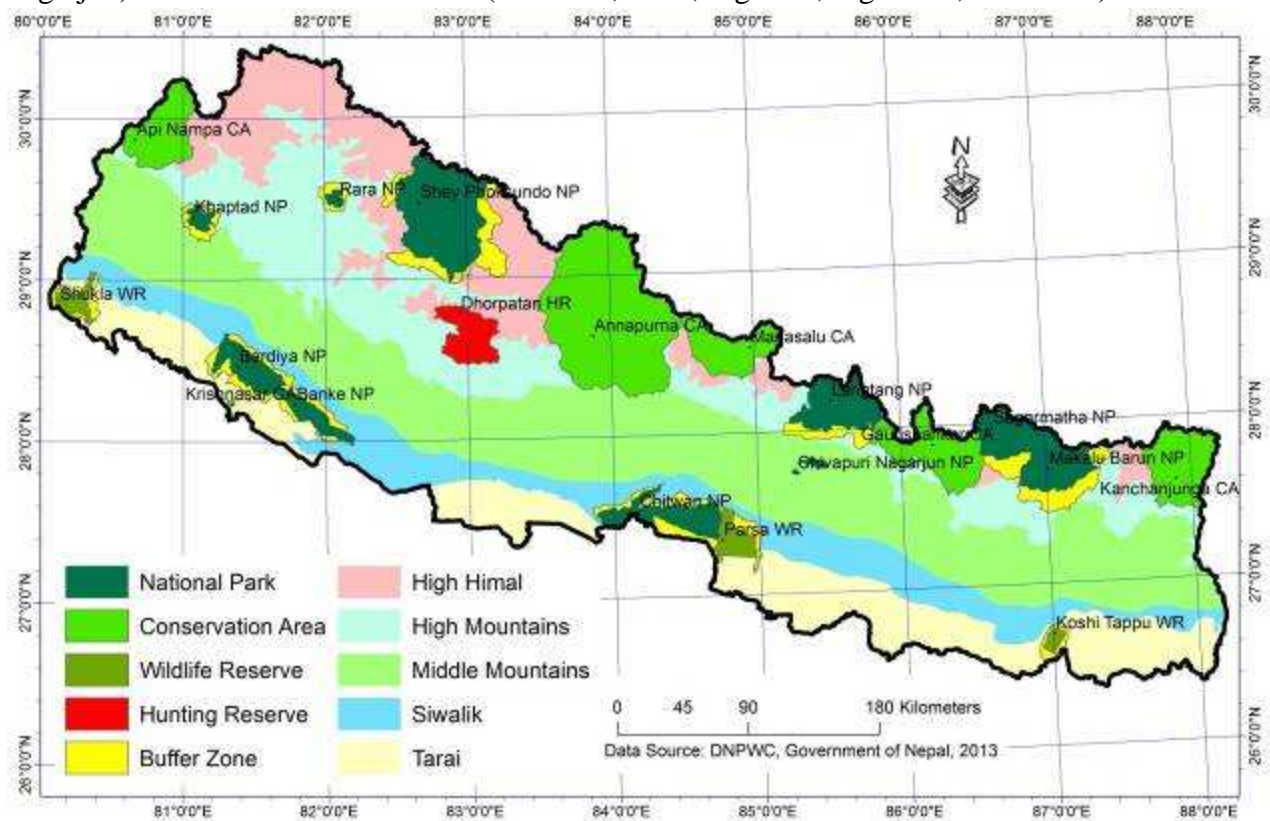


Figure 9: Protected Areas in Nepal

There has been a substantial expansion of protected area in recent years (Figure 11). A total of 6,120.6 square kilometers protected area was added just in between 2002 and 2010. Moreover,

buffer zones were declared around six protected areas during the period. These actions put Nepal in the top 20 countries in the world and second in Asia for the percentage of its surface area that is protected (USAID, 2012).

The following have been some of the key efforts and achievements of protected areas in biodiversity conservation during the last decade.

(i) Preparation and implementation of species conservation plans

Species conservation action plans for tiger (*Panthera tigris tigris*), rhino (*Rhinoceros unicornis*), wild elephant (*Elephas maximus*), snow leopard (*Panthera uncia*), and vulture (*Gyps spp*) have been prepared and implemented. Similar conservation plans for red panda (*Ailurus fulgens*), gharial (*Gavialis gangeticus*), and blackbuck (*Antelope cervicapra*) are being prepared at the moment.

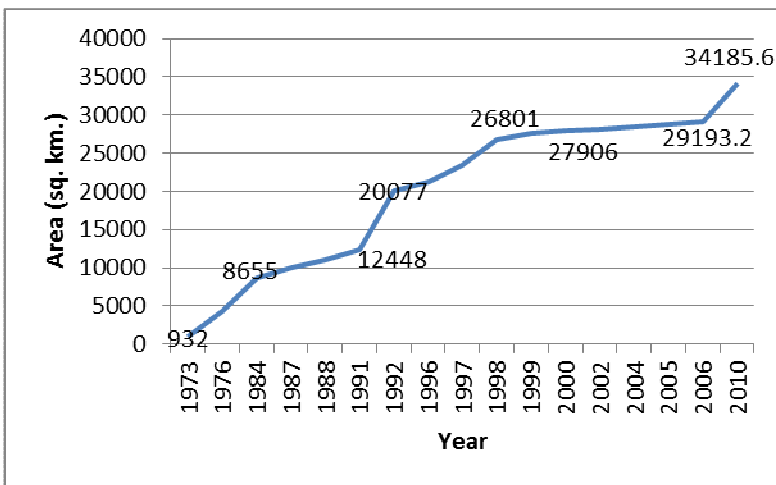


Figure 10: Growth of protected area

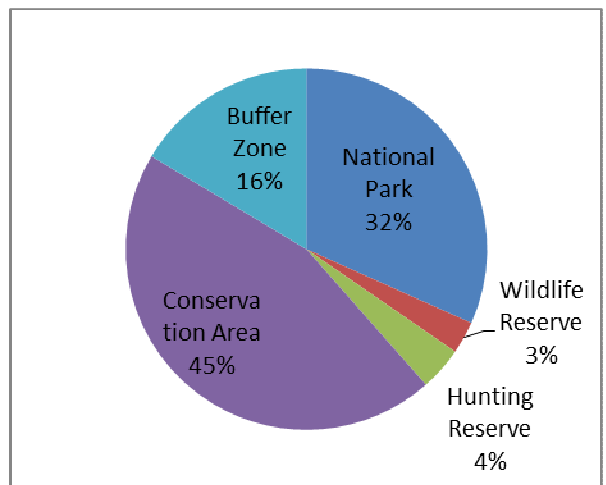


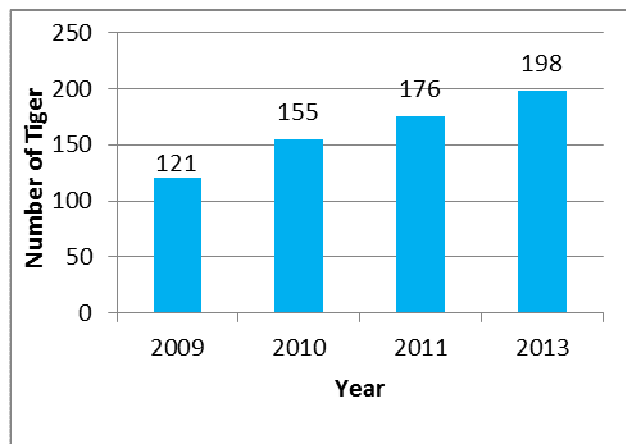
Figure 11: Percent coverage by different categories of protected areas

(ii) Controlling poaching and illegal trade in wild animal parts

Effective implementation of anti-poaching plans and activities and mobilization of the Central Investigation Bureau, Nepal Police are some of the steps the government together with its conservation partners took to control poaching and illegal trade of wildlife parts. The government also took initiatives to enhance international cooperation to curb illegal trade in animal parts and enhance conservation initiatives by strengthening cooperation with China and India, and forming South Asia Wildlife Enforcement Network for a coordinated regional response to combat illegal wildlife poaching and trafficking.

(iii) Increase in populations of important wildlife species

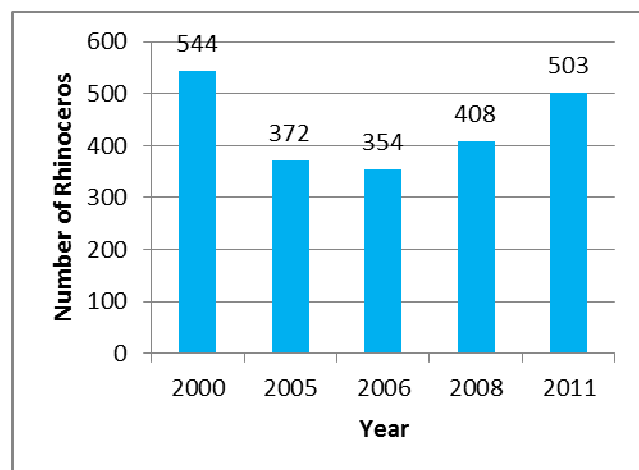
The efforts described in the preceding paragraphs helped increase populations of some mega wildlife species during the past few years. Available estimates show that the population of Bengal tiger (*Panthera tigris tigris*) has increased continuously since 2009 (Figure 12; Acharya and Dhakal, 2012; WWF, 2012; DNPWC, 2013). Nepal has made a commitment to double its 2010 population of tiger by 2022.



Bengal tiger (*Panthera tigris tigris*)

Figure 12: Changes in population of tiger in Nepal

Similarly, the population of rhino (*Rhinoceros unicornis*) in its main habitat, Chitwan National Park (CNP), recovered from its lowest (i.e. 354) in 2006 to 503 in 2011 (Figure 13; DNPWC, 2000; DNPWC, 2005; DNPWC, 2009; DNPWC, 2011). In total, there were 534 rhinos in the country in 2011 (DNPWC, 2011).



Rhino (*Rhinoceros unicornis*)

Figure 13: Changes in population of Rhino in CNP

(iv) Translocation of wild animals to new areas

Translocation processes began in 1986 with the translocation of rhino from Chitwan to Bardia National Park. The DNPWC has identified nine additional species for translocation to suitable

habitats. If implemented, these actions can contribute to conservation of threatened species and safeguard the populations against any epidemic outbreak.

(v) Monitoring of wildlife populations

Systematic monitoring of populations of some other wildlife species, including snow leopard (*Panthera uncia*), gharial (*Gavialis gangeticus*), blue sheep (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemlahicus*), guar (*Bos gaurus*) and swamp deer (*Cervus duvaucelii*) has been started since 2008 (WWF, 2012). Similarly, there have been several surveys of globally threatened bird species which have provided much useful information on their population sizes, key sites, threats and conservation needs. These efforts have contributed towards saving species from extinction (BCN and DNPWC, 2011).

(vi) Linking communities to benefits of protected areas

Involvement of local people in the management of protected area was further promoted during the last decade. In 2012, there were 12 buffer zone declared areas that covered 5602.7 square kilometers in 27 districts and 83 VDCs, which are being managed by 143 buffer zone user committees and 4,088 buffer zone user groups, involving around 700,000 local people (Acharya and Dhakal, 2012). The government handed over management responsibility of Kangchenjunga Conservation Area to the local conservation area management council in 2006 thereby making it the first protected area managed by local communities. Local people are also involved in the management of Annapurna, Manaslu and Gaurishankar conservation areas through conservation committees. These initiatives have put Nepal at the forefront in linking communities to benefits from protected areas.

(vii) Increased revenue from protected area tourism

The protected areas have made substantial contribution to not only conservation of forest biodiversity, but also conservation of cultural diversity and development of tourism in the country. The revenue from protected area based tourism increased by 364 percent during 2004/2005-2011/2012 period (Figure 14; DNPWC, 2012). This has provided incentives to conserve biodiversity through foreign exchange to the government, necessary fund to conservation agencies (e.g. NTNC), and economic opportunities for local communities.

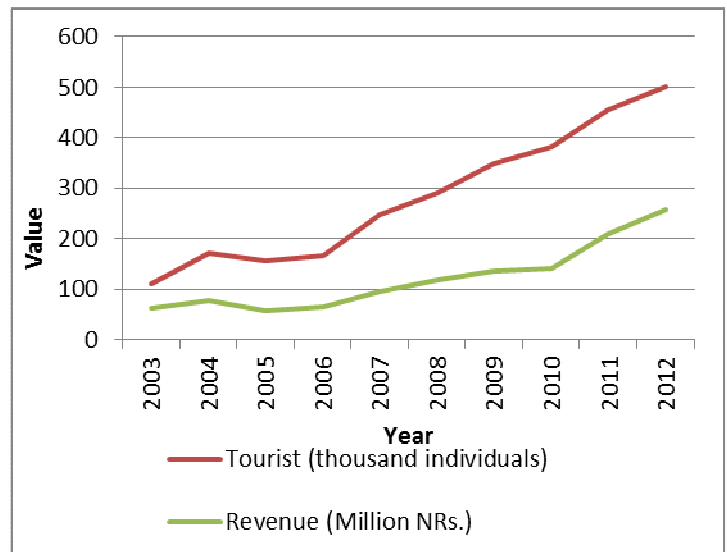


Figure 14: Annual Revenue generated from tourism in protected areas

4.5 Management of Forest Biodiversity outside Protected Area

(i) Implementation of participatory forest management programmes

The government has been implementing participatory forest management programmes, which have made substantial contribution to forest conservation, enhancement of local livelihoods and strengthening biodiversity-livelihood linkages. The programmes also became socially more inclusive in recent years (Kanel and Kandel, 2006; USAID, 2012; MoFSC, 2013a).

(a) Community Forestry

Forest degradation and loss has declined substantially and even reversed in many areas, particularly in the Middle Mountains, after implementation of the community forestry programme began (see e.g. Gautam, 2006; Niraula *et al.*, 2013). The programme has been continuously expanded since its inception. Currently (i.e. as of June 2013), 18,133 community forest user groups involving 2.24 million households are managing 1.7 million hectares of forestland under the community forestry programme (Table 13; DOF, 2013a).

Table 13: Changes in status of community forestry in between 2002 and 2013

Category	2002 (May)	2013 (June)	% Change (2002-2013)
User Groups	11,095	18,133	63.4
Households	1,208,943	2,237,195	85.1
Forest Area (ha.)	854,389	1,700,048	99.0

Community forests are directly contributing to conservation of biodiversity. Although, the planning and design of community forest management has not specifically considered biodiversity assessment and conservation, improvement in forest conditions under communities' management has positively contributed to biodiversity through the creation of habitat corridors and development of successive stages of forests (Gautam, 2009).

(b) Collaborative Forest Management

The Department of Forests has established 20 collaborative forests, covering a total area of 56,637 hectares, in 10 *Tarai* districts since 2004. Forest management plans have been prepared and approved for all of those forests and scientific forest management has been initiated in some of the sites (e.g. Tilaurakot, Lumbini). Eight other *Tarai* forests, covering a total area of 26,608 hectares were planned to be added to the list of collaborative forests in 2013. Biodiversity conservation is one of the objectives of collaborative forest management.

(c) Leasehold Forestry

The pro-poor leasehold forestry programme implemented in 39 districts across Nepal has played an important role in restoration of degraded forestlands, thereby contributing to biodiversity conservation alongside poverty alleviation. Currently (i.e. July 2013), a total 7,413 households living below the poverty line are engaged in the management of 42,773 hectares leasehold forests (Table 14).



Photo ©: Ambika P. Gautam

A leasehold forest at Hupsekot, Nawalparasi

Table 14: Changes in status of pro-poor leasehold forestry in between 2002 and 2013

Category	2002	2013 (June)	% Change (2002-2013)
User Groups	1,655	7,413	347.9
Households	11,253	74,950	566.0
Forest Area (ha.)	7,011	42,773	510.1

Source: DOF (2013c)

(ii) Establishment of Protection Forests

Eight forests covering a total area of 133,754.8 hectares have been declared as protected forests since 2002. These forests are important wildlife corridors and rich in biodiversity (Table 15).

Table 15: Protection Forests in Nepal

Forest	Year Estd.	Size (hectares)	Location	Conservation Significance
Kankre Bihar	2002	175.5	Surkhet	Historical; archeological and biodiversity
Madhane	2010	13,761	Gulmi	Biodiversity; ecotourism
Barandabhar	2011	10,466	Chitwan	Biological corridor; wetland; habitat for several endangered species.
Panchase	2011	5,775.7	Kaski, Parbat, Syangja	Biodiversity; ecotourism; religious
Laljhadhi-Mohana	2011	29,641.7	Kailai, Kanchanpur	Biological corridor; wetland
Basanta	2011	69,001.2	Kailai	Wildlife habitat and corridor
Khata	2011	4503.7	Bardia	Wildlife habitat and corridor
Dhanushadham	2012	430	Dhanusha	Historical; religious; biodiversity

Source: DOF (2013c)

Eight other forests, covering a total area of 223,107 hectares are in the process of being declared as protected forests in the near future. Enhancing biodiversity through rehabilitation of habitats of rare and important species, biological corridors, and wetlands, and enhancing local livelihoods through implementation of income generating activities are the main objectives of protected forest management. Promotion of alternative energy utilization, such as improved cooking stoves and bio-briquettes has recently been initiated in some protected forest sites (DOF, 2013b).

(iii) Implementation of Chure Conservation Programme

The *Rastrapati Chure* Conservation Programme has been implemented by the Ministry of Forests and Soil Conservation and Ministry of Agriculture Development in 26 *Siwalik* districts. Other Ministries such as the Ministry of Federal Affairs and Local Development and the Ministry of Home are also contributing to this programme. By February 2013, the programme protected regeneration of 1,047 hectares highly critical forest areas; established 292 hectares plantation and protected 79 kilometers riverside through bio-engineering techniques (DOF, 2013b).

(iv) Afforestation and Reforestation

Reforestation of deforested sites and enrichment plantation in degraded forest patches are regular activities implemented by most of the district forest offices and community forest user groups. For example, 2,986 hectares of new plantations were established, and 814 hectares of encroached forestland was reclaimed and reforested in the year 2011/2012 (DOF, 2013c). Most district forest offices distribute seedlings for institutional and private plantations during the monsoon season.

(v) Reclamation of Encroached Forest Areas

The Department of Forests has been making efforts to control forest encroachment and conserve forest resources under its jurisdiction by enforcing existing legislation through the district forest offices under it. The records at the Department show that a total of 1,462 hectares of encroached forestland was reclaimed and reforested in the last two fiscal years. The achievements, however, are negligible in comparison to the extent of forest encroachment in the country.

(vi) Conservation of Medicinal and Aromatic Plants

The medicinal and aromatic plants development programme has been implemented in 42 districts with the objective of commercial cultivation of medicinal and aromatic plants, including their processing at the local level (DOF, 2013b). The seven district offices under the Department of Plant Resources are actively involved in *in-situ* and *ex-situ* conservation of medicinal and aromatic plants. Some CFUGs have also started cultivation of medicinal plants and other NTFP species.



Photo ©: Srijana Shrestha

Cinnamomum tamala Breeding Seedling Orchard

(vii) Establishment and Management of Public land Agroforestry

In some *Tarai* districts (especially in central Nepal), many small agroforestry plots have been established on public common lands.



An agroforestry plot established on a public land in Dhanusha

The agroforestry plots, which are managed by local landless or poor people, usually possess a wide range of agriculture, horticulture and forest tree species. Environmental NGOs are supporting the district forest offices to implement the programme. If properly managed, these initiatives could substantially contribute to conservation of local biodiversity.

(viii) Initiatives to implementing REDD+

The government has been promoting REDD+ since 2008 as a mechanism to control forest loss and degradation (Table 16). The Readiness Preparation Proposal has identified five activities for payment under REDD+ schemes. These include: (i) reducing deforestation, (ii) reducing forest degradation, (iii) sustainable forest management, (iv) conservation of forest carbon, and (v) enhancement of forest carbon stock (MoFSC, 2010).

Table 16: Evolution of REDD+ Readiness in Nepal

Year	Activity
2008	REDD Readiness process started with financial support of the World Bank
2009	Establishment of an Apex Body, REDD Working Group, and REDD Forestry and Climate Change Cell in the Ministry of Forest and Soil Conservation
2010	REDD Readiness Preparation Proposal developed and approved
2012	National REDD+ Strategy development process started; the work is expected to be completed in 2015

There have been some initiatives to implement REDD+ in the field. The NORAD-funded REDD+ pilot project was implemented by ICIMOD, with FECOFUN and ANSAB, in community forests of three watersheds in Chitwan, Gorkha, and Dolakha districts, during 2009-2013. The project prepared a sub-national level MRV system by using a combination of remote sensing analysis and field measurements by CFUGs. A few PES schemes have also been implemented (e.g. in Rupa Lake) for compensating upstream forest user groups for their conservation efforts.

(ix) Increase in Private Forests and Trees Outside Forests

Private forest has increased throughout the country. Currently (i.e. 18 Aug. 2013), there are 2,458 registered private forests in the country with a total of 3,329,885 trees grown in 2,361 hectares of private land (Table 17; DOF, 2013c).

Table 17: Changes in area of registered private forests in between 2000 and 2013

	2000 (Jan)	2013 (Jun)	% Change (2000-2013)
Number of Forests	2,248	2,458	9.3
Area (hectares)	2,091	2,361	12.9

It is widely believed that there has also been a substantial increase in trees in community lands and other fallow lands in recent years. These resources outside public forests have helped alleviate pressure from national forests and made significant positive contributions to conservation of biodiversity.

4.6 Other Efforts in *In-situ* and *Ex-situ* Conservation of Forest Biodiversity

In addition to the efforts discussed in the preceding sections, the government and a number of NGOs, CBOs are making several other efforts for conservation of forest biodiversity across the country. The following are some examples.

(A) Elephant Breeding Center

The elephant breeding center at Khorsar, Chitwan has been playing a crucial role in elephant conservation since 1989. The center has also become a major tourist attraction in recent years.



Photo ©: Sagar Kumar Rimal

(B) Vulture Conservation Centers

The DNPWC, with support of NTNC, BCN, Zoological Society of London and Royal Society for Protection of Birds, has established a Vulture Conservation and Breeding Center at Kasara inside the Chitwan National Park in 2008. The objective of the center is to ensure long term survival of two vulture species: (i) slender billed vulture (*Gyps tenuirostris*), and (ii) oriental white-rumped vulture (*Gyps bengalensis*). The center had 59 Gyps vultures in 2012 (DNPWC, 2012). Moreover, seven community-managed ‘vulture restaurants’ have been established by the BCN and Himalayan Nature at different locations where safe and diclofenac-free carrion is provided to vultures.

(C) The Central Zoo

The Central Zoo located at Jawalakhel, Lalitpur is an important center for *ex-situ* conservation of animals. The zoo houses 854 individual animals, including 34 species of mammals, 58 species of birds, 10 species of reptiles and 14 species of fishes in 2011. The list includes several endangered

species such as one-horned rhinoceros, royal Bengal tiger, sloth bear, Himalayan black bear, elephant, black buck and mugger crocodile. The zoo also delivers educational and recreational services.

(D) Botanical Gardens

The Department of Plant Resources has established a national botanical garden in Godavari, Lalitpur. In addition to this, there are 10 other botanical gardens in Ilam, Dhanusha, Makawanpur, Banke, Salyan, Jumla, Kailali and Kaski districts, covering a total area of 642.2 hectares. The elevation of the gardens ranges from 110 meters to 2,500 meters (CBS, 2012).

(E) National Herbarium

The herbarium is an important institution for carrying out taxonomic research in the country. Based on the specimens in the herbarium, the DPR has reportedly completed cataloguing of flowering plants, ferns and fungi found in the country.

(F) Conservation of Forest Genetic Resources

The Silviculture Division (formerly, Tree Improvement and Silviculture Unit) under the Department of Forests has established seed stands for 38 socially and economically important tree species in various eco-regions to conserve the genetic resources of these species. Similarly, the division has established 27 breeding seedlings orchards (Annex 27), and has a plan for *in-situ* gene pool conservation of bijayasal (*Pterocarpus marsupium*) as its population in natural habitats (western *Tarai* and *Siwalik* mixed hardwood forests) is continuously declining. Farmers are also conserving considerable number of species, including threatened species such as *Acacia catechu*, *Buteamonosperma*, *Choerospondias axillaris*, *Elaeocarpus sphaericus* and *Michelia champaca*, on their farm as a part of their subsistence farming (MoFSC, 2013b).

(G) Plant Propagation by Tissue Culture

The tissue culture section under the Department of Plant Resources has been carrying out tissue culture of some plants species thereby contributing to *in-vitro* conservation of plant germplasm in the country. So far, the section has carried out *in-vitro* propagation of around 115 species of plants, including 22 tree species, orchids, fruits, vegetables, medicinal and aromatic plants and bamboo species (MoFSC, 2013b).

(H) Documentation of Flora

The Department of Plant Resources, Tribhuvan University, Royal Botanic Garden Edinburgh, and University of Tokyo are jointly implementing a long-term Flora of Nepal project. The project, which is funded by the British Government's Darwin Initiative, aims to help Nepal develop a detailed catalogue of its extraordinarily diverse but threatened flora. Specifically, the project will assist Nepal in its implementation of the CBD by: (i) enhancing national coordination and capacity building through human resources, research and international cooperation, (ii) increasing support for biodiversity research, (iii) reflecting the state of biodiversity knowledge through identification and



monitoring, (iv) strengthening the national biodiversity database network and facilitating information exchange, and (v) endorsing indigenous people's knowledge and innovations (Williams, 2005). The project has so far completed Volume 3 of the Flora, the first of the ten projected volumes to be published.

(I) Global Taxonomic Initiative Nepal

The Global Taxonomic Initiative Nepal was established with the objective of developing national taxonomic capacity on flora and fauna and developing network of national institutions working in this sector. The activities are to be carried out by an eleven-member steering committee coordinated by the Department of Plant Resources (DPR, 2007).

(J) Biodiversity Monitoring by Forest User Groups and NGOs

In many places, NGOs-affiliated conservationists are training members of local forest user groups in biodiversity monitoring techniques, which can be considered a good approach towards combining indigenous knowledge and modern scientific techniques to help build and sustain conservation capacity of local communities. The pilot programme, Participatory Assessment, Monitoring and Evaluation of Biodiversity, was designed and implemented by the BCN and FECOFUN with technical support of the Royal Society for the Protection of Birds, is an example of such initiatives. Civil Society networks, such as Nepal Bird Conservation Network, have been useful in sharing biodiversity related information and coordinating conservation actions.

4.7 Key Gaps, Issues and Challenges in Management of Forest Biodiversity

(1) Inadequate Representation of the Middle Mountains in Country's Protected Area System

The representation of the physiographic zones in the country's protected areas is very uneven (Table 18). The Middle Mountains in general and the zone between 400-2,800 meters in particular is significantly under represented, while the representation of the areas above 2,800 meters is comparatively high (Shrestha *et al.*, 2010). This gap can be largely filled by making the community-based forest management, particularly located in the critical biological corridors and bottlenecks, more conservation oriented.

Table 18: Representation of ecosystems in Nepal's protected area system

Physiographic Zone	Protected Areas		Ecosystems	
	Number	Coverage (sq. km.) ⁴	Total	Covered by the PA
High Himal	10	20293.9 (71)	43 (36.4)	32 (27.1)
High Mountains	2	3430.0 (12)	52 (44.1)	33 (28.0)
Middle Mountains	1	285.8 (1)		
<i>Siwalik</i>	4	2858.3 (10)	13 (11.0)	5 (4.2)
<i>Tarai</i>	3	1715.0 (6)	10 (8.5)	10 (8.5)
Total	20	28583.0 (100)	118 (100)	80 (67.8)

Source: Adapted from MoFSC (2013b). Figures in the parentheses refer to percentages.

(2) Gaps in Conservation of Biodiversity Rich Natural Forest Ecosystems and Corridors

Some natural forest ecosystems that have high conservation value remain without effective conservation system in place. Tinjure-Milke-Jaljale rhododendron area, Sapta Koshi Gorge, Morang-Illam Broadleaf Forests, Makalu-Barun southern extension, and Rolwaling Valley located in eastern Nepal; Daman-Palung-Phulchoki-Chandragiri range in central Nepal; Gaighat-Seti River-Panchase stretch, and Bardia National Park-Khaptad corridor in western Nepal are some of the areas needing priority conservation efforts in near future (Figure 15). If conserved effectively, these areas can also serve as important climate refugia.

⁴(i) Most of protected areas extend over more than one physiographic zone. The allocation of number in the table is based on inclusion of the major part, (ii) the coverage is excluding the buffer zones.

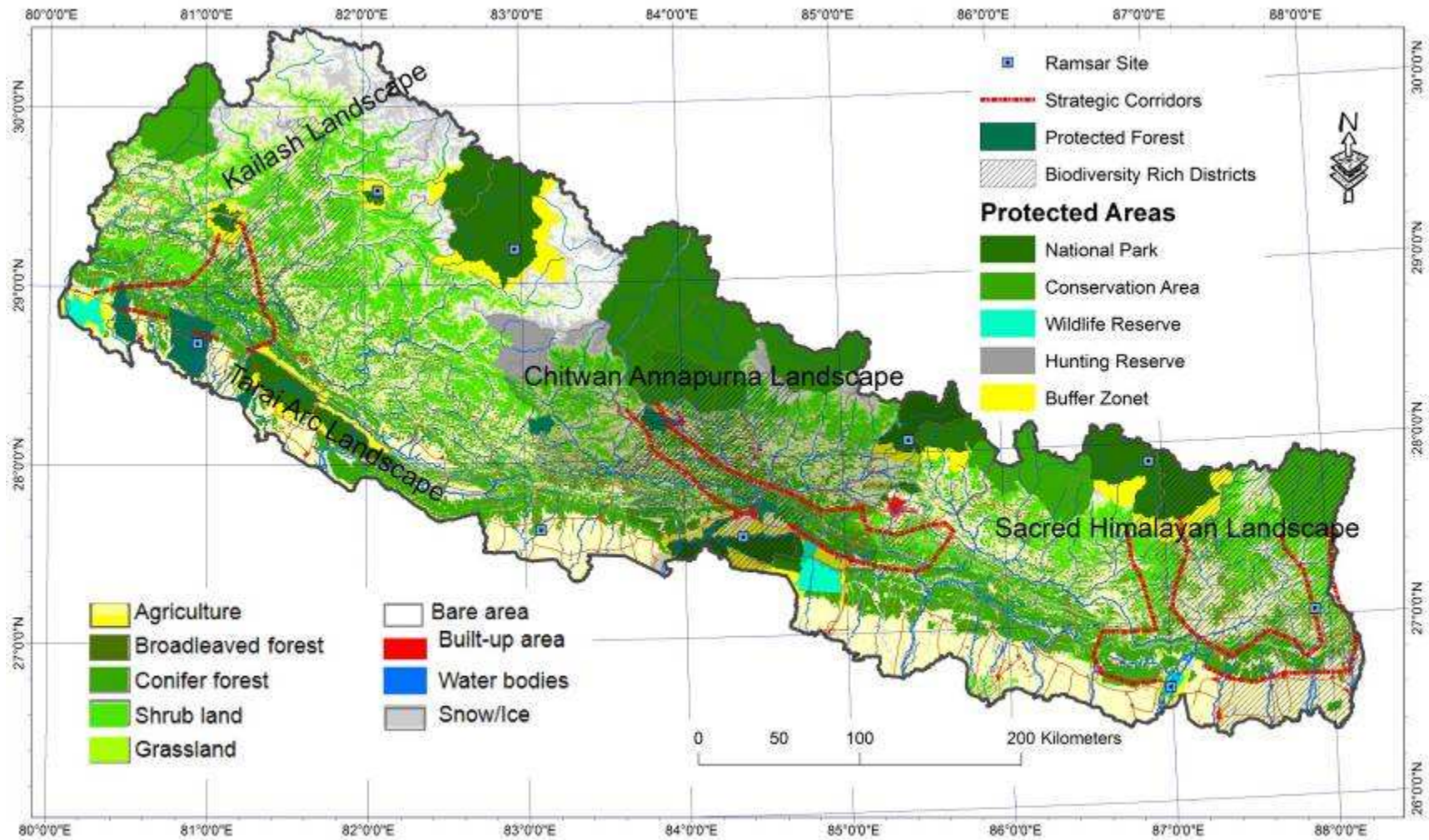


Figure 15: Some biodiversity-rich areas and strategic corridors that are without effective conservation

(3) Gaps in Species Conservation

While most of the threatened animal species are well protected in the current protected area system, threatened plant species have not yet received similar attention. Among the threatened animals, the populations of gharial (*Gavialis gangeticus*) and fresh water dolphin (*Platanista gangetica*) are speculated to be declining (NPC, 2011).

(4) Inadequate Human Resources and Technical Capacities

Understaffing in the district forest offices has negative impacts on implementation of community forestry, as well as enforcement of the law to control illegal activities. Lack of technical capacity for forest inventory and other technical activities makes most CFUGs dependent on the concerned district forest office for such services, but staff inadequacy makes it difficult for these offices to assist CFUGs in times of need. This has hampered timely preparation or renewal of community forest operational plans in many cases. Lack of fire-fighting equipment and training has been a major barrier for local communities, as well as agencies, in controlling forest fires. Inadequate taxonomists in DPR has hampered identification and documentation country's flora.

(5) Financial Constraints

Financial constraint remains a major challenge for abating deforestation and forest degradation, and controlling wildlife poaching. Inadequate budgets in the districts for day-to-day operations have hampered efforts to contain illegal logging and forest encroachments in the districts of the *Tarai* and *Sivaliks*. This has also been a bottleneck in expanding good forestry practices (e.g. successful leasehold forestry models) to wider areas.

(6) Wide Variations in the Success of Community Forestry Programme

There are wide variations in the success of community forestry programme among the physiographic zones. The programme has been generally successful in controlling or reversing the trends of deforestation and forest degradation in the Middle Mountains where 66.5 percent of Nepal's community forests user groups are managing 910,379 hectares (53.5 percent of community forest area), whereas the program is less successful in the *Tarai* and High Mountains regions (Table 19).

Table 19: Distribution of community forests among the physiographic zones

Physiographic Zone	Number of Districts	User Groups		Households		Coverage	
		Number	%	Number	%	Area (ha.)	%
High Mountains	15	2,875	15.9	294,532	13.2	270,370	15.9
Middle Mountains	36	12,056	66.5	1,295,421	57.9	910,379	53.5
<i>Sivalik</i> (including Inner- <i>Tarai</i>)	5	1,619	8.9	278,784	12.4	321,089	18.9
<i>Tarai</i>	18	1,583	8.7	368,458	16.5	198,210	11.7
Total	74	18,133	100	2,237,195	100	1,700,048	100

Data Source: DOF (2013a) (Data: as of June 2013)

(7) Inadequate attention to Conservation of Biodiversity in Community Forests

Not enough attention is being given to biodiversity and NTFPs during the development of community forest operational plans. This remains the situation despite the fact that both the

government and the international community have put biodiversity conservation high on their agendas and community forestry is a prioritized forest management programme in the country.

(8) Contention between Protected Area and Participatory Approaches to Conservation

In some cases, local communities could not be adequately consulted before declaration of protected area (e.g. the Gaurishankar, Padampur), which invited conflict between the government and local forest user groups. These events and activities led to some contention between the protected area approach and participatory approach to conservation of forest biodiversity. The government, however, has been making efforts to addressing this issue by adopting a more participatory approach in declaring buffer zones in more recent years.

(9) Limited Participation of Women and Other Disadvantaged Social Groups

Participation of women and other disadvantaged social groups in decision-making process of FUGs has increased over the years but it is still less than satisfactory.

(10) Challenge in Managing Human-Wildlife Conflict

Managing the conflict, which relates to crop and livestock depredation by wild animals, remains a major challenge.

(11) Challenge in Controlling Forest Encroachment and Illegal Logging

Controlling forest area encroachment and illegal logging are the key challenges in the *Tarai* and *Siwalik* regions. The limited efforts by local forest officials and community user groups are not enough to solve this chronic problem.

(12) Challenges in Implementation of REDD+

Complexities related to forest tenure and inadequate capacity for measurement, reporting and verification are some of the challenges to REDD+ implementation. Despite existence of these and other challenges, the findings of some recent studies (e.g. Paudel *et al.*, 2013; WWF, 2013) indicate a good prospect for REDD+ implementation in Nepal.

(13) Inadequate Knowledge and Capacity to Control Invasive Alien Species

There is a gap in the knowledge required to control invasive alien species. The gap relates to the modes of propagation, extent, and suitable control measures. Inadequate quarantine and detection capacity of customs and quarantine departments are some of the major gaps and challenges in controlling invasion and spread of alien species.

4.8 Management of Rangeland Biodiversity

There have been only limited efforts to assess, monitor and manage rangeland biodiversity in Nepal. Formulation of the Rangeland Policy in 2012 was a major milestone. Nepal Agriculture Research Council, in cooperation with the Department of Livestock Services and Ministry of Agriculture Development, has been conducting some research on forage development in high altitude pastures, including the introduction and evaluation of legume species (NARC, 2011). A few research studies on different aspects of rangeland ecology were conducted in recent years (see e.g. Limbu *et al.*, 2012).

One of the major issues in management of rangeland biodiversity relates to unclear management responsibility for rangelands. In Nepal, rangelands are legally owned by the Ministry of Forests and Soil Conservation while their utilisation by local communities implicitly associates them with the Ministry of Agriculture Development. Unclear administrative jurisdiction and management responsibilities of different agencies coupled with inadequate coordination and cooperation between them has created confusion and complexity in the management of rangelands located outside protected areas.

4.9 Management of Wetland Biodiversity

Wetlands in Nepal remain one of the most neglected natural resource until recently. However, there have been some recent concrete efforts towards conservation and sustainable use of the country's wetland resources. Formulation of National Wetlands Policy in 2003 and its revision in 2012, and implementation of 'Conservation and Sustainable Use of Wetlands in Nepal' project by the MoFSC were some of the major initiatives.

(i) Conservation and Sustainable Use of Wetlands

The Ministry of Forests and Soil Conservation piloted a project in Koshi Tappu Wildlife Reserve and Ghodaghodi Lake complex during 2008-2013 with the objective of ensuring maintenance and enhancement of wetland biodiversity, and environmental goods and services for improved local livelihoods. The project made an important contribution to building national capacity for an ecosystem approach to conservation and sustainable use of wetlands in Nepal (GON/UNDP-GEF, 2007; MoFSC, 2013c).

(ii) Restoration and Biodiversity Conservation in Rupa Lake

Rupa Lake Rehabilitation Fisheries Cooperative Limited has been implementing a community based conservation of lake resources and its wise use programme with the objective of lake restoration and biodiversity conservation in partnership with LI-BIRD and Lekhnath Municipality. The main activities include: (i) cleaning aquatic vegetation from the lake and stocking it with herbivorous carp fingerlings, (ii) harvesting the introduced exotic fishes without destroying the juveniles of native species, and (iii) controlling illegal fishing in the lake. Certain percent of the net benefits are paid to the upland communities through a PES system (Regmi *et al.*, 2009).

(iii) Gharial Breeding

The DNPWC has established gharial breeding centers in Chitwan and Bardiya. By 2010, around 761 individual gharial were released in different rivers, of which 102 reportedly survived (Acharya

and Dhakal, 2012). These two centers have played an important role in conservation of gharial in Nepalese wetlands.

(iv) Other Efforts

Community-based conservation of endangered dolphins (*Platanista gangetica*) has been initiated by a local NGO in the Karnali, Mohana, Patharia, Kanada and Kanda rivers, since 2001. Activities like awareness raising, pollution control, restriction on large mesh-size gill nets, enhancing natural food of dolphin (aquatic insects and fish) are being implemented in the place. The effort has reportedly shown positive impact on dolphin population. The Kali Gandaki Fish Hatchery established by the Kali Gandaki-A Hydropower Project has helped minimize adverse impacts of dams on native fish populations (Baidya and Devkota, 2011).

In spite of the above efforts, wetland ecosystems have been subjected to growing degradation. Inadequate integration of wetland biodiversity values into sectoral, legal and policy frameworks; inadequate inter-agency coordination; and inadequate technical, financial and institutional capacity, information base and awareness are some gaps related to management of wetland biodiversity (IUCN, 2004; World Bank, 2008).

4.10 Management of Agrobiodiversity

(i) Community Based Biodiversity Management

Community-based biodiversity management has been established as a successful approach for conservation and use of agro-genetic resources. Several good practices, such as community biodiversity registration, biodiversity fairs, participatory plant breeding, participatory variety selection, and community seed banks are components of this approach. Those good practices were developed through several years of on-farm research carried out in Bara (*Tarai*), Kaski (Middle Mountains) and Jumla (High Mountains) by NARC, Bioversity International (then International Plant Genetic Resources Institute) and LI-BIRD scientists in collaboration with local farmers. Currently, local farmers in those and some other districts are managing plant genetic resources on their own initiatives and resources. An excellent example is Kachorba community in Bara district where more than 100 local accession of rice is preserved at the local community gene bank managed by a local cooperative. So far (i.e. as of June 2013), 115 community seed banks have been established across the country of which 15 are focused on conserving local genetic resources and providing seeds to the community. LI-BIRD has also been piloting of community based management in 10 districts representing all three ecological zones of Nepal in partnership of Department of Agriculture, since 2008 (Upadhyay and Subedi, 2001; Rijal *et al.*, 2003; Subedi *et al.*, 2011; Joshi, 2013; Shrestha *et al.*, 2013).

(ii) Establishment and Management of National Agriculture Genetic Resource Centre

A National Agriculture Genetic Resource Centre (the Gene Bank) was established in 2010 at Khumaltar, Lalitpur under the management of NARC for *ex-situ* conservation agricultural genetic resources. The Gene Bank has also established tissue banks and laboratories for *in-vitro* culture, molecular research and seeds testing, and has created links with community seed banks (Bhatta *et al.*, 2012).

(iii) Tissue Culture Programme

NARC, through its National Potato Research Programme at Khumaltar, has been carrying out a separate tissue culture programme for the last two decades to propagate and supply pre-basic seeds of potato to farmers (NPRP, 2011).

(iv) Identification and Characterization of Local Livestock Breeds

Identification and characterization has been based mostly at the phenotypic level and only a few samples have been taken at the bio-chemical and DNA levels. A total of 26 local breeds of seven domestic animal species (cattle, buffalo, goats, sheep, pigs, poultry and horse) have been identified and characterized (Neopane, 2006). Lulu cattle have been evaluated at the mitochondrial DNA level in collaboration with Japan (Takeda *et al.*, 2004).



Photo ©: Sarose Sapkota

Lulu cattle in Mustang

(v) Production and Use of Cattle and Buffaloes Semen

The Animal Breeding Division, NARC and the National Livestock Breeding Centre, under the Department of Livestock Services, have been producing semen of cattle and buffaloes for improving dairy animals. At both institutions, cryo-preservation techniques have been applied as a part of *ex-situ* conservation efforts. The programme at the moment has been focused on trans-boundary (exotic) breeds, including Jersey and Holstein Friesians cattle and Murrah buffalo. There is a priority need for producing semen of local breeds and making good quality semen available to interested farmers.

(vi) Development of National Level Global Plan of Action

A national level global plan of action has been developed, which will help develop specific measures to reverse the ongoing trends of erosion and underutilization of animal genetic resources. The implementation of the strategic priorities of the plan of action is expected to make a significant contribution to international efforts to promote food security, poverty alleviation and sustainable development.

(vii) Awareness and Capacity Development

Raising awareness of the importance of local animal genetic resources is being carried out at different levels.

4.11 Key Gaps and Issues in Management of Agrobiodiversity

The National Agriculture Policy (2004) and National Agrobiodiversity Policy (2007) lagged behind their implementation. The agenda of the Agriculture Policy related to biodiversity conservation was only partly implemented. Poor knowledge of existing strategies and policies related to biodiversity, particularly at the community level, is another gap. Similarly, inadequate manpower and infrastructure for agrobiodiversity conservation are other important gaps.

Absence of land use classification system and relevant legislation has resulted increased conversion of agricultural land to residential use, thereby reducing the availability of productive agricultural

lands. Creation of unplanned urban enclaves in rural areas has negative impacts on agrobiodiversity. If fully implemented, the newly formulated National Land Use Policy (2012) is expected to address this problem to some extent.

Inadequate incentives for conservation of native landraces and animal genetic resources; weak research and quarantine capacities; and limited efforts in *ex-situ* conservation of local livestock breeds are some other major gaps. Increased abandonment of farmlands due mainly to outmigration of youths from rural areas to urban areas and abroad and decreased productivity of marginal farmlands are some emerging issues.

4.12 Management of Mountain Biodiversity

Efforts to manage mountain biodiversity overlap with other thematic efforts, particularly with those related to protected areas, landscape management, and community based forest management. Of the 20 protected areas, 13 are located in the mountains, which cover 84 percent of the total protected area in the country. Similarly, two biodiversity-rich mountain sites (i.e. Madhane and Panchase) have recently been declared as protection forests by the government.

The MoFSC has been implementing landscape-specific programmes in two important mountain landscapes, namely the Sacred Himalayan Landscape, and the Kailash Sacred Landscape. There are a few other initiatives that have been exclusively designed and implemented to conserve mountain biodiversity and ecosystems. These include: (i) promulgation of long-term policies and programmes, and (ii) integrated water resource management in two sub-basins in the Koshi River. Following the Global Mountain Summit held during 29 October to 01 November 2002 in Bishkek, the MoFSC has increased its efforts to management of mountain biodiversity.

Insufficient knowledge and understanding of mountain ecosystems, lack of long-term vision, and inadequate financial resources and technical capacity are some of the major gaps and constraints in sustainable management of Nepal's mountain ecosystems. In-depth understanding and incorporation of the value of mountain ecosystem services in national development planning, GDP accounting, and decision-making is one of the key requirements for sustainable management of mountain biodiversity (NPC, 2011).

4.13 Cross-cutting Efforts and Outcomes

4.13.1 Landscapes Management

The Tenth Five Year Plan (2003-2008) incorporated landscape approach as a new strategic and operational direction to conservation and sustainable use of biological resources. Accordingly, the MoFSC has been implementing landscape-specific programmes in the Terai Arc Landscape, Sacred Himalayan Landscape, and Kailash Sacred Landscape. Another landscape programme has been under implementation by a consortium of I/NGOs in the Chitwan-Annapurna Landscape and *Tarai* Arc Landscape since 2011 with USAID funding (Figure 16).

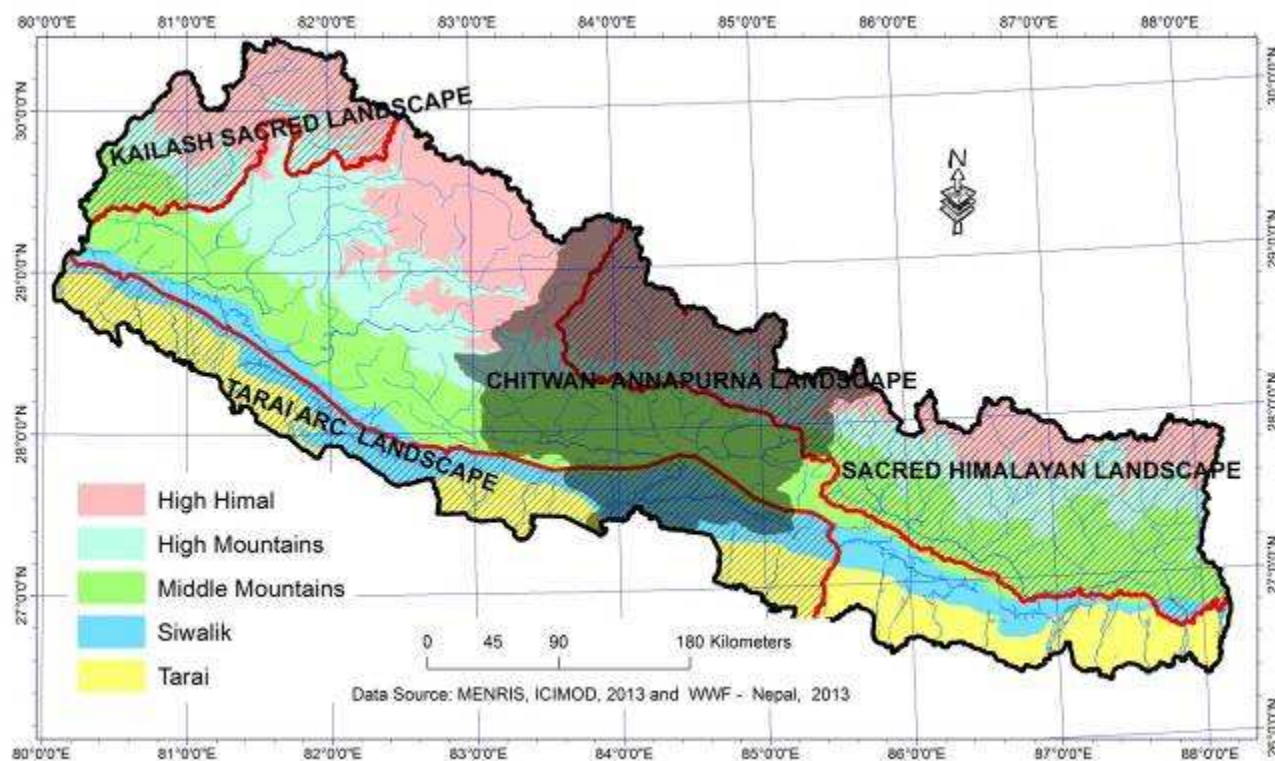


Figure 16: Landscapes under management in Nepal

The landscape approach to conservation has been adopted to enhance ecological integrity and conservation of endangered species, as many of the protected areas are like islands and too small to support viable population of endangered species and ecological processes. Some notable achievements have been reported in restoration of forest, grassland and wetland habitats and increase in population of several important wildlife species, including tiger, swamp deer and blackbuck, and conservation of local varieties of crops in the Western Tarai Landscape Complex (Acharya *et al.*, 2010).

The MoFSC has developed and implemented a ten-year (2006-2016) strategic plan for long-term sustainable management of biodiversity, local culture and water resources in the Nepal side of the Sacred Himalayan Landscape that extends eastward from Langtang National Park in central Nepal through the Kanchenjunga region in India to Toorsa Strict Nature Reserve in western Bhutan, covering 39,021 square kilometers (MoFSC, 2006c).

The Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI) is another trans-boundary collaborative programme between Nepal, China, and India. In Nepal, it is implemented by the MoFSC in close cooperation with ICIMOD, RECAST and other partner institutions. The main components of the KSLCDI include: (i) innovative livelihoods, (ii) ecosystems management, (iii) access and benefit sharing, (iv) long-term environmental and socio-economic conservation and monitoring, and (v) regional cooperation (ICIMOD, 2013).

An USAID-funded landscape management programme (Hariyo Ban) is being implemented in the Chitwan-Annapurna Landscape and TAL by WWF Nepal and its consortium partners CARE Nepal, FECOFUN, and NTNC. The landscape includes whole or part of 19 districts and covers an area of 32,057 square kilometers of the Gandaki river basin in western Nepal (USAID, 2010).

4.13.2 Climate Change Adaptation and Mitigation

Nepal joined the UNFCCC in 1992 and Kyoto Protocol in 1997. Since then, the Government has focused on managing climate change impacts by: (i) developing institutions, (ii) formulating policies, development of plans, (iii) establishing coordination mechanism, (iv) generating and mobilizing climate funds, (v) implementing adaptation projects, and (vi) integrating climate change issues in planning process, among others.

Nepal is considered the fourth most vulnerable country in the world from the perspective of climate change. As the per capita greenhouse gas (GHG) emission in Nepal is negligible, adaptation has remained as a top priority for Nepal. However, the Government of Nepal has also recognized the need for mitigation through various means. Realizing the need of climate compatible development by synergizing adaptation, mitigation and development, the government of Nepal developed Climate Change Policy (2011), NAPA (2010), LAPA framework (2011) and climate resilient planning framework (2010). Seventy LAPA are now under implementation. The 13th National Development Plan has proposed several interventions to support synergies.

The following were some of the key efforts and outcomes for adaptation and mitigation to climate change.

- Development of Low Carbon Economic Development Strategy in 2013.
- Mountain Initiative has been launched to make the global community aware of the impacts for ensuring increased attention and concrete adaptation and mitigation actions for alleviating the risks and vulnerability of mountain ecosystems.
- Nepal has agreed to the Cancun Adaptation Framework and advocates a country-led process in instruments such as REDD+ and CDM. Such programmes, including Hariyo Ban Programme, Ecosystems Based Adaptation, Herbs development programme, Watershed management programme, Forest fire control programmes and the *Siwalik* conservation programme, etc. support biodiversity conservation.
- NARC is engaged in breeding drought and water tolerant varieties of rice. Examples are *Sukha Dhan* 1, 2 and 3 for drought condition and *Swarna Sub-1* for sub-merged condition has been released for their cultivation.
- The government has assigned a separate, dedicated budget code for climate change and started allocating substantial amount of fund (about 5% of annual budget) for climate change related activities from the current fiscal year. This can be considered as a good sign of reflecting Nepal's concerns on internal adaptation financing.
- The government has established Nepal Climate Change Knowledge Management Centre at the NAST, which has helped to document climate change related knowledge and share among stakeholders.
- Nepal has been implementing climate change adaptation and mitigation related projects. Some of such projects include: (i) pilot project on climate resilience supported by the World Bank/CIF, (ii) LDC funds on disaster and ecosystems based adaptation of climate change

impacts on agriculture and water resources, and (iii) ecosystems based adaptation on mountain ecosystems.

- Climate resilience has become an important aspect of community forest management planning since 2010. According to unpublished records available at the Department of Forests, so far 1359 community forest operational plans have been prepared or revised with provisions for enhancing climate change resilience.

The following are the main gaps in climate change adaptation and mitigation.

(1) Knowledge Gap

There is a gap in climate change related knowledge in Nepal. Inadequate research does not provide a comprehensive understanding of climate change impacts on biodiversity; identification and development of adaptation strategies; understanding and predicting climate change impacts; and development of adaptation strategies at regional and national scales. There is also a weak understanding of how biodiversity and ecosystems functions would response to climate change.

(2) Inadequate Capacity

Inadequate institutional capacity is hindering successful climate adaptation in biodiversity management. The existing mechanisms are insufficient to address systemic problems and implementing adaptive management. Efforts to REDD+ implementation have been affected by inadequate capacity to develop the safeguard standards, weak cross-sectoral coordination, data gaps, high transaction costs, complexity of benefit sharing and high investment cost (Dangi, 2012).

4.13.3 Gender and Social Inclusion

The government's commitment to addressing gender and social inclusion issues has been clearly reflected in all the national development plans, policies and strategies developed after 2002. The Tenth Five-Year Plan (2002–2006) emphasized linking forest conservation with poverty alleviation and social inclusion by encouraging participatory systems in which the poor, women and other members of disadvantaged sections of society have equal employment opportunities. The Interim Constitution of Nepal (2007) includes provisions that support gender equality and social inclusion. The Three-Year Interim Plan (2008–2011), the current Three Year Plan (2011–2013) and the Approach Paper to the Thirteenth Plan (2013/14–2015/16) also pursue gender equality and women's empowerment through a gender mainstreaming strategy.

All sectoral policies and legislation have emphasized the involvement of women in decision making and benefit sharing mechanisms. The Ministry of Forests and Soil Conservation has adopted a separate strategy to address gender and social inclusion issues. The strategy has identified the following four change areas in order to attain the institutional vision: (i) gender and equity sensitive policy and strategy, (ii) equitable governance, (iii) gender and equity sensitive organizational development and programming, and (iv) equitable access to resources and benefits (MoFSC, 2007). Accordingly, Community Forest User Committees are required to have representation of women, *dalits* and members of indigenous community in certain proportions.

The National Agricultural Policy (2004) has targeted 50 percent representation of women in farmers groups and community based programmes. The Climate Change Policy (2011) has provision for

women's participation in the implementation of climate adaptation programmes. Section 8.4.2 of the Policy calls for ensuring the participation of poor people, *dalits*, marginalized indigenous communities, women, children and youth in the implementation of climate adaptation and climate change related programmes.

The Gender Equality and Environment Section within the Social Development Division of NPC is responsible for addressing gender and social inclusion issues in national plans and policies. Likewise Gender Equity and Social Inclusion section under the General Administration Division of the Ministry of Federal Affairs and Local Development looks after this issue. A separate *dalit* and *adivasi janajati* (indigenous people) Coordination Committee and their respective commissions have been formed to coordinate and implement various activities related to gender and social inclusion. Most other government and non-government agencies also have gender and social inclusion policies. FECOFUN, for example, has established rules to include women in the decision-making process and it encourages local forest user groups to include women and disadvantaged groups for involvement in the committee and participation in every activity of CFUG.

The following are some of the gaps, issues and challenges in addressing gender and social inclusion issues: (i) gender equality and social inclusion policies are not well implemented, (ii) institutional structure and capacity is weak, (iv) gender and social inclusion criteria are not included in monitoring and evaluation or in budgeting programmes, (vi) inadequacy of gender disaggregated data, and (vii) inadequate awareness.

4.13.4 Addressing Concerns of Indigenous and Local Communities

Nepal's ratification of the UN Declaration on the Rights of Indigenous People (UNDRIP), and Indigenous and Tribal Peoples Convention (ILO Convention No. 169) shows the country's commitment to the rights of indigenous nationalities. The organizational activism and rights assertions of *aadibasi janajatis*, which have increased substantially after the restoration of democracy in 1990, have contributed positively in addressing the concerns of indigenous and local communities.

A high level National Foundation for Development of Indigenous Nationalities (NFDIN) was established in 2002 with the objective of ensuring welfare of different indigenous peoples living in the country. The foundation is an autonomous body fully authorized to operate independently to address the concerns of indigenous nationalities. The Interim Constitution of Nepal (2007) declares the country as independent, secular, inclusive, democratic and federal, which has raised considerable hope among indigenous nationalities for a better future. The MoFSC has been giving due importance for participation of NFDIN in strategic planning for biodiversity, including the NBSAP development process. The Nepal Federation of Indigenous Nationalities has been formed in 1991 with a goal of documenting, preserving and promoting cultures, languages, religion, customs, traditions of the indigenous nationalities of Nepal and to assist them in developing and obtaining equal rights.

The progress towards protecting and establishing rights of indigenous communities over their traditional knowledge, innovations, skills and practices, remain to be strengthened. The MoFSC, IUCN Nepal, South Asia Watch and Trade Economics and Environment and LI-BIRD have made

some efforts to document traditional knowledge, innovations and practices associated with biological resources in few districts but the process has not gained required momentum.

4.13.5 Access and Benefit Sharing, and Intellectual Property Rights

Nepal has made some progress towards achieving the CBD objective of fair and equitable sharing of the benefits arising out of the utilization of genetic resources in Nepal. Widespread involvement of local people in the management and use of local biological resources can be taken as an example of a mechanism for equitable access and benefit sharing.

Article 35 (5) of the Interim Constitution of Nepal makes the government responsible for the protection of forests, vegetation and biodiversity; its sustainable use; and for equitable distribution of the benefits derived from them. Similarly, the constitutional provision requires the state to pursue a policy aimed at identifying and protecting traditional knowledge, skills and practices (Article 35 (18)). Both of these provisions are crucial for the state to implement a pro-community access and benefit sharing regime and devise mechanisms to protect the rights of local, indigenous and farming communities regarding natural resources, biodiversity and traditional knowledge (Adhikari, 2012). The MoFSC drafted an Access to Genetic Resources and Benefit Sharing Bill in 2008, which is yet to be finalized and enacted. Moreover, Nepal has yet to ratify the Nagoya Protocol on Access and Benefit Sharing.

Article 8(j) of the CBD requires parties to the convention to “respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities” as part of biodiversity conservation. As per 27.3(b) of the Trade related Intellectual Property Rights of the World Trade Organizations (WTO), Nepal as a member country needs to develop its own *sui generis* system to protect its genetic resources. The MOAD has drafted Plant Variety Protection and Farmers’ Right Bill (2005), which is yet to be finalized and approved.

Article 15 of the CBD has specifically mentioned access and benefit sharing provisions. The Article recognizes the sovereign rights of States over their natural resources; that the authority to determine access to genetic resources rests with the national governments and is subject to national legislation. It also asks the contracting parties to create renditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention. The article has also set out conditions for access to genetic resources and associated traditional knowledge.

As per the Article 18(4) of the CBD, there is a need to promote bio-cultural heritage, which embraces cultural and spiritual context from which traditional knowledge, innovations and practices emerge and are continually renewed and to provide intellectual property rights to the indigenous and local communities on whose bio-cultural heritage products are based. Geographical Indication (GI) and trademarks are capable of recognizing and supporting group rights as opposed to the individual or joint rights of individual persons or businesses (Spence, 2007). The idea of a group right is that a certification trademark or GI is available for a potentially large number of individuals to use (Dutfield, 2011). One sub-set of Intellectual Property Rights (IPRs) instruments, which are often referred to as “soft IPRs” that include geographical indications, trademarks, petty patents, copyrights and design rights. Such rights have proven to be particularly important and useful in the protection of traditional knowledge (Argumendo, 2013). In Nepal, a legal provision for geographic

indication has yet to come into existence. The amendment of the Agrobiodiversity Policy (2007) is in the final stage to accommodate requirements of the implementation of ITPGRFA.

4.13.6 Mainstreaming Biodiversity Considerations into National Development Plans, Policies, Programmes and Sectors

Mainstreaming efforts are limited to the incorporation of biodiversity and environmental conservation into national development plans and most of the sectoral policies. For example, Nepal has been systematically adopting the concept of conservation-friendly economic growth since it was first introduced by the Ninth Five Year Plan (1997-2002). Biodiversity has also been featured prominently in the Approach Paper to the Thirteenth Plan that was recently developed by the National Planning Commission. The Nepal Biodiversity Strategy (2002) sufficiently emphasized the need for mainstreaming biodiversity considerations into national development plans, programmes, policies and sectors. Despite these efforts, there has been little effort to mainstream biodiversity across different sectors, primarily because it has so far been a priority for only the Ministry of Forests and Soil Conservation. There is need for a more proactive role by government agencies, particularly the National Planning Commission and the Council of Ministers, in mainstreaming biodiversity considerations into national development plans, policies and programmes and across different sectors.

4.13.7 Education and Research

There have been considerable efforts to improve and strengthen biodiversity related education and research in recent years. The central departments of Botany, Zoology, and Environmental Science under the Tribhuvan University have been playing important roles in promoting biodiversity education by offering graduate and undergraduate level courses in biodiversity and environment. The Central Department of Botany, in collaboration with the University of Bergen, Norway and regional partners, has taught a two year masters level programme in 'Biodiversity and Environmental Management' since 2008. The Central Department of Environment Science has been offering a full course on Biodiversity Conservation and Management. Kathmandu University has a Department of Biotechnology. The Institute of Agriculture and Animal Science has included agricultural biodiversity in its bachelor level course and is in the process of finalizing and approving a master's programme in agricultural biodiversity. The Agricultural and Forestry University, Purwanchal University and Pokhara University also offer courses related to biodiversity and biotechnology. Faculty members and students in these universities conduct research in different aspects of biodiversity.

The Department of Forest Research and Survey and the Department of Plant Resources occasionally conduct research in forest and floral diversity. NARC conducts research in agrobiodiversity including plants, animals and fisheries through its research centers located throughout the country (MoFSC, 2002). Some other academic institutions and I/NGOs also undertake scientific research on different aspects of biodiversity. ICIMOD, WWF Nepal, IUCN and NTNC are some of such organizations that regularly conduct research and disseminate the findings. Empirical research conducted by individual scholars affiliated to different national and international academic institutions is another major dimension of biodiversity related research in Nepal.

Some of the major gaps in knowledge of biodiversity in Nepal relate to: (i) incomplete understanding of the country's biodiversity, (ii) lack of economic valuation of ecosystem services, (iii) inadequate understanding of climate change impacts on biodiversity, including responses of species and ecosystems, (iv) inadequate research and knowledge of NTFPs, and (v) weak linkage between research and policy.

4.13.8 Awareness Raising

The awareness raising efforts can be categorized into two main groups: (i) raising awareness of local communities, and (ii) improving awareness of general public. Government ministries, such as MoFSC and MOAD, and concerned department have been implementing targeted awareness raising programmes using TV and radio programs, regular publications, training, visits, and study tours. Many forest user groups are implementing awareness campaigns against forest fires. The Department of Forests is using different media (including television and radio) to raise awareness on forest fire, uncontrolled grazing, and afforestation. Training on REDD awareness and forest fire control are important components of protected forest and conservation area management programmes. Some protected forests (e.g. Panchase) have established demonstration plots for important plant species.

Many NGOs are working to change local people's attitudes towards biodiversity by working with them to recognize the importance of conserving biodiversity for their own livelihoods and well-being. The efforts of the Red Panda Network in eastern mountain districts and the Bird Education Society's Green Clubs in local schools are some examples of these efforts (BCN and DNPWC, 2011).

Efforts towards improving awareness of the general public include a broad range of activities. Some examples of such activities include: (i) a television programme implemented by the Nepal Forum of Environmental Journalists (e.g. *Aankhi Jhyal*), (ii) radio programmes (such as *Ban Batika*, *Panchhi Sansar*, *LI-BIRD ko Chautari*), (iii) public awareness campaigns on International Biodiversity Day (May 22), World



Photo ©: Kapil Khanal

Biodiversity related awareness raising rally

Environment Day (June 5), National Conservation Day (September 23), World Wetlands Day (February 2), World Wildlife Day (March 03), World Migratory Bird Day (10-11 May) and International Vulture Awareness Day (First Saturday of September), (iv) exhibitions, (v) information boards, and (vi) distribution of brochures and newsletters by different agencies. Print media and television programmes are also contributing to raise awareness. Some individuals are also putting substantial efforts to raise awareness of general public.

4.13.9 Economics and Valuation of Biodiversity

Understanding the manifold values of biodiversity and embedding these values in decision-making is essential for ensuring more equitable and sustainable policies. Assessing and highlighting the economic value of biodiversity and biodiversity resources, including the non-consumptive economic values, can be the basis of a compelling case for conservation activity in the context of economic sectors. In addition, this can help to establish the basis of any benefit sharing discussion; activate appropriate conservation incentive measures and instruments; include the value of biological resources in adjusted national accounting systems and assist to informed policy decision to conserve biodiversity (Dale and Polasky, 2007).

Realizing these benefits and need for an urgent action, the CBD has emphasized for increased knowledge on biodiversity and ecosystem services and its application for effectively communicating and mainstreaming biodiversity. The Economics of Ecosystems and Biodiversity (TEEB) is being promoted as a tool to make the case for investment for biodiversity and ecosystem services and to strengthen policy commitment to biodiversity at the highest level. TEEB is a global initiative focused on drawing attention to the economic benefits of biodiversity. The essence of the concept is that the contribution of biotic nature to human well-being is unrecognized and undervalued, which results in destruction of biodiversity and ecosystems (Millennium Ecosystems Assessment, 2005; Christie *et al.*, 2006; Lele *et al.*, 2013).

ICIMOD (2011) identified following sectors for economic valuation in the context of Himalaya including in Nepal: (i) creating awareness on importance of ecosystems services among users; (ii) creating a 'market' for ecosystems by demonstrating the importance and value of mountain ecosystems; (iii) improving management mechanisms by identifying more efficient and cost effective alternatives, and in designing appropriate institutional and market (and non-market) instruments, including payment for ecosystem services; (iv) providing a framework for decision making offering a trade-off between the resources and their utility values and various options; and (v) extending justice and equity to those who are the main custodians of mountain ecosystems.

There have been very few studies to assess the value of biodiversity in Nepal. Baral *et al.* (2008) assessed the willingness to pay for the conservation, maintenance, and enhancement of biodiversity resources using contingent valuation in Annapurna and Kanchenjunga Conservation Area. In a study to assess value of rice genetic diversity in Nepal, Pant (2009) found that the consumers value NPR 11 billion per annum for aromatic trait and rupees two billion for tasty trait. Poudel and Johnsen (2009) used the contingent valuation method to document the economic value of crop genetic resources based on the farmers' willingness to pay for conservation in Kaski district. Rai and Scarborough (2012b) conducted a study using the choice experiment approach to estimate the social benefits of a *Mikania* management programme. The Conservation and Sustainable Use of Wetlands in Nepal project has developed tools for economic valuation of wetlands.

4.14 Funding for Biodiversity Management in Key Sectors: Sources and Trends

The Nepal Biodiversity Strategy (2002) envisioned establishing Nepal Trust Fund for Biodiversity as a long-term funding mechanism involving a number of bilateral, multilateral, private sector and the government agencies. The fund, which was supposed to provide financial and technical support to government agencies, NGOs and other institutions involved in biodiversity conservation in Nepal to enable them to undertake appropriate activities and projects both within and outside protected areas, could not come into existence.

The Three-year Interim Plan of the government had allocated NPR 7,678 million for genetic and botanical resources development, biodiversity conservation, and research programmes and additional NPR 379 million for implementation of the Nepal Biodiversity Strategy Implementation Plan (NPC, 2007). The Environment Protection Fund was established in accordance with the Environment Protection Act, 1996 (Section 13) for the protection of environment and national heritages, and prevention and control of pollution.

In addition, a number of other sources financially contributed to biodiversity conservation programmes. NTNC-collected entry fee from visitors remains one of the main sources of funding for implementing biodiversity management programmes in the Annapurna and Manaslu conservation areas. Investments by local forest user groups and protected area related local institutions are also contributing towards conservation of biodiversity at the local level. Technical assistance by international community, and grants and loans from bilateral and multi-lateral donor agencies are some other important sources of funding. A significant amount of external funds are considered to be channelled through INGOs and NGOs.

4.14.1 Forest Biodiversity

An analysis of the programme budget allocated for the Ministry of Forests and Soil Conservation shows that it continuously and significantly increased during the last decade. Bulk of the funds (i.e. 84.4%) came from the government or internal source, and remaining from foreign assistance in the form of grant (14.1%) and soft loan (1.5%) (Table 20).

Table 20: Sources and trends of funding (USD 000) for implementation of forestry programmes by the Ministry of Forests and Soil Conservation⁵

Year	Government (Internal) Funding*		Foreign Assistance				Total Budget
			Grant		Loan		
	Amount	%	Amount	%	Amount	%	
2003/04	3,360	52.38	2,932	45.71	123	1.92	6,415.9
2004/05	16,149	82.74	3,061	15.69	307	1.57	19,517.5
2005/06	17,377	88.56	1,762	8.98	484	2.47	19,623.0
2006/07	18,982	93.95	692	3.42	530	2.62	20,203.8
2007/08	21,010	89.22	1,905	8.09	635	2.70	23,549.6
2008/09	23,685	85.71	3,181	11.51	767	2.78	27,633.4
2009/10	30,818	87.84	3,409	9.72	859	2.45	35,086.2
2010/11	41,250	90.56	3,323	7.30	978	2.15	45,551.0
2011/12	44,860	82.83	8,635	15.94	662	1.22	54,157.6
2012/13	43,317	84.44	7,618	14.85	363	0.71	51,298.1
2013/14	69,426	78.49	18,690	21.13	338	0.38	88,453.6
Total							

* Includes all the programme costs. Source: Red Books (2003 to 2011), Ministry of Finance. USD 1=NPR 97.61 (19 March 2014 buying rate of Nepal Rastra Bank).

4.14.2 Agrobiodiversity

The budget is generally allocated and spent without disaggregating for biodiversity component as the biodiversity has not been awarded with budget code so far. However, in general the budget trend shows that the total budget for agrobiodiversity⁶ has increased both in case of plant science and animal science. The plant science component includes the Gene Bank and Botany Division of NARC, and animal science component includes Animal Breeding Division and Pasture and Fodder Division of NARC,

and Department of Livestock Services (Figure 17).

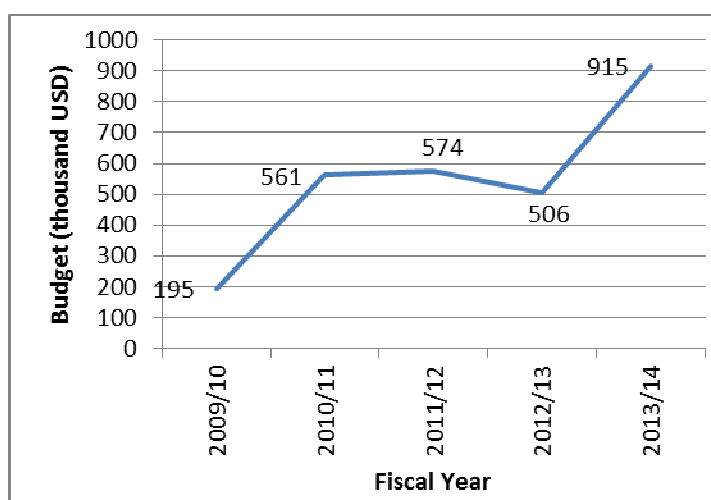


Figure 17: Trend of funding to NARC Divisions working on management of agrobiodiversity

⁵ The figures in the table refer to the total budget allocated for all forestry programmes, which may not necessarily be only for management of forest biodiversity.

⁶ The budget presented in Figure 17 relates to only two divisions of the NARC and does not represent the whole of the budget that was available for management of agrobiodiversity. The figure is only intended to show an example of the budgetary trend.

The total budget allocated for agriculture research and development in the public sector is much higher than what is spent for biodiversity conservation. The funds spent for active conservation is estimated to be lower than 10 percent of total programme budget. The trend of funding presented here relates exclusively to the government funding. It does not include the funding through INGOs sources, which is speculated to be substantial.

4.14.3 Climate Change Adaptation and Mitigation

At the 2010 Cancun Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), the international community agreed, in principle, to one of the largest development programmes in history. The developed nations pledged to mobilize USD100 billion per year by the year 2020 to address the needs of developing countries in responding to climate change. The funds, which may apply to adaptation and mitigation, are proposed to flow through multiple channels, including existing development banks, official development assistance, bilateral programmes, international private investment flows (e.g., carbon markets), and other public and private mechanisms.

In the last few years, Nepal received support for climate change programmes from various sources such as LDC fund, CIF, bilateral and international organizations. The government has also allocated some resources from its regular budget. During the last five years, the annual expenditure in climate change related programmes constituted around 1.3 percent to 2.1 percent of Gross Domestic Product (GDP), and 5.7 percent to 7.2 percent of total government expenditure. These statistics indicate that the share of climate change related budget allocations and expenditure as percentage of GDP and government expenditure are both increasing over the period (Nepal, 2012).

Climate change programmes in the country received a new boost from fiscal year July 2012 onwards after the government assigned a dedicated budget code for climate change. The government has reportedly allocated 10.34 (5.8 % direct and 4.6% indirect) percent of its budget for 2013-2014 to climate funding. The budget for climate change has been increased in the recent years (Figure 18; Nepal, 2012).

There are many other funding through bilateral, multi-lateral, NGOs and INGOs sources, which in most cases remain out of the government monitoring system. It is estimated that more than half (55%) of the total government climate change expenditure comes from the donor support (Nepal (2012)).

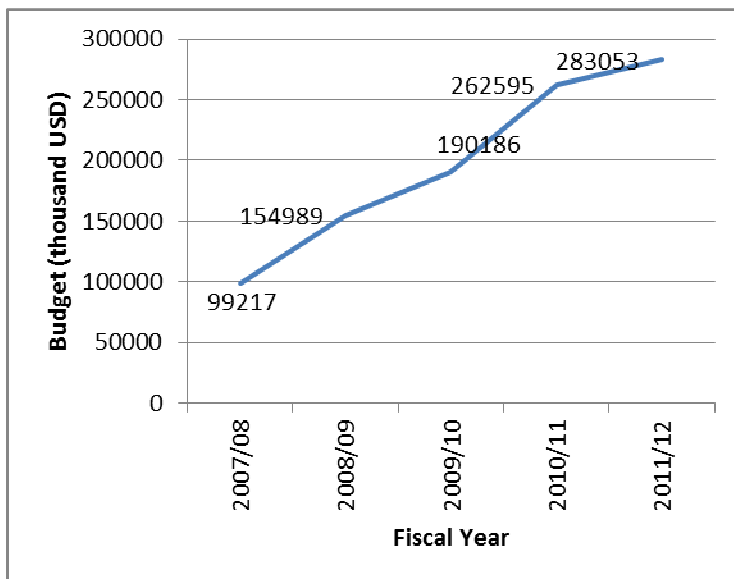


Figure 18: Trend of climate change related funding in Nepal

Around 44 percent of the climate change adaptation funding in Nepal was allocated for forests and biodiversity (Oxfam, 2014). The climate change adaptation programmes and projects, like Ecosystem based Adaptation implemented by IUCN, UNEP and UNDP under the financial support of German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (USD 3 million) and the Hariyo Ban (USD 30 million) are some examples of funding that directly contributes to biodiversity conservation. DFID and European Union have committed USD 21 million for implementation of 70 village level LAPAs in 14 districts in western Nepal. In addition, the Forest Carbon Partnership Facility has recently approved the Nepal Emission Reduction Programme Idea Note (ER-PIN) to work on REDD plus issues in the TAL area.

4.15 Implementation of Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006): Status, Gaps and Lessons

4.15.1 Overview of the Progress

Review and analysis of the progress made in implementation of the Nepal Biodiversity Strategy (NBS) and Nepal Biodiversity Strategy Implementation Plan (NBSIP) indicate that the NBS was partially successful in achieving its goal of providing a strategic planning framework for managing biodiversity in the country. A subjective evaluation indicated that implementation of around 30 percent of the NBS strategies related to the six thematic areas was 'very good', 30 percent 'good' and 41 percent 'poor'. Of the 17 cross-sectoral strategies, four were almost fully implemented and two were not implemented. Implementation status of the rest of the strategies remained medium (Table 21; Annex 28).

Table 21: Status of implementation of NBS (2002) strategies

Sector/Theme	Number of Strategies	Status of Implementation*			
		Very Good	Good	Poor	Not Implemented
Protected Area	8	2 (25)	3 (37.5)	3 (37.5)	-
Forest Biodiversity	9	2 (22.2)	3 (33.3)	4 (44.4)	-
Rangeland Biodiversity	4	1 (25)	-	3 (75)	-
Wetland Biodiversity	1	-	1 (100)	-	-
Agro-biodiversity	3	2 (66.6)	1 (33.4)	-	-
Mountain Biodiversity	2	1 (50)	-	1 (50)	-
Cross-sectoral	17	4 (23.5)	6 (35.3)	5 (29.4)	2 (11.8)

* The number in parenthesis refers to the percentage

Landscape approach to *in-situ* conservation with active involvement of local people; expansion of protected areas; increased participation of local people, including women and disadvantaged groups, in forest and protected area management; formulation of the National Rangeland Policy in 2012; and integrated management of two wetlands of international importance (i.e. Koshi Tappu and Ghodaghodi) were some of the strategies that were successfully implemented. Three agrobiodiversity strategies were also successfully implemented.

Of the 13 priority projects planned by the NBSIP (2006), three were successfully implemented, and four were partially implemented. The successfully implemented projects include: (i) integrated wetlands management, (ii) landscape level biodiversity conservation, and (iii) conservation and management of pollinators for sustainable agriculture through ecosystem approach. Three of the priority projects, namely Phulchoki-Chandragiri Biodiversity Conservation Programme, Rhododendron Conservation Programme in Tinjure-Milke-Jaljale, and Establishment of the Kanchenjunga Tri-national Peace Park were not implemented.

A number of other efforts and achievements both indirectly and significantly contributed to achieving the objectives of the NBS (2002) and NBSIP (2006). Development of enabling plans, policies, strategies and regulatory frameworks; formation of high level committees (e.g. National Tiger Coordination Committee, Climate Change Council); and efforts made to control cross-border illegal trade of wildlife parts by strengthening cooperation with China and India are some examples. Similarly, the declaration of eight natural forests with high conservation significance as protected forests; implementation of the *Chure* Conservation Programme in 26 districts; implementation of tree improvement programme, and public land agroforestry by the DOF; preparation of the National Biosafety Framework; and tissue culture programme implemented by the Department of Plant Resources, NARC and some private companies; initiative to implement REDD+ and PES are some other efforts.

4.15.2 Major Gaps

The lack of linkage between the NBS and most of the sectoral and cross-sectoral strategies, plans, policies and programmes that were formulated after 2002 is probably the most important visible gap in implementation of the strategy. One of the main reasons behind this missing link between the NBS and subsequent strategies, plans and policies is the lack of an effective institutional mechanism to coordinate implementation of the strategy and monitor progress. The National Biodiversity Coordination Committee (NBCC), which was supposed to guide, coordinate and monitor the implementation, could not become so effective. Another major gap was related to funding. The National Trust Fund for Biodiversity, which was supposed to be the main source of funding for the NBCC and NBU, could not be established.

Some other gaps that affected implementation of the NBS include: (i) inadequate inter-and intra-agency coordination and cooperation, (ii) contradictory or conflicting legislations and administrative jurisdictions, (iii) inadequate mainstreaming of biodiversity into national development plans and programmes, (iv) lack of legislation to translate the strategy and policies into actions (e.g. agrobiodiversity policy, tourism policy), (v) inadequate incentives for conservation of less productive native landraces of agri-crop varieties and livestock breeds, (vi) lack of time-bound targets, in most cases, for implementation of sectoral conservation plans, (vii) poor enforcement of laws, (viii) lack of system for mainstreaming indigenous knowledge and innovations into national development programmes, (ix) gap in linking gap documentation of traditional knowledge related to biodiversity with biodiversity conservation, use and benefit sharing, (x) inadequate technical capacity for bio-prospecting, and *ex-situ* conservation of agrobiodiversity, and (xi) unorganized information sharing and dissemination system.

The following were some of the major gaps in implementation of the NBSIP: (i) lack of updated data and or information on vegetation types of Nepal, (ii) inadequate consultation and cooperation with indigenous and local communities while devising plans for conservation of biodiversity-rich areas (e.g. Phulchoki-Chandragiri, Tinjure-Milke-Jaljale), (iii) poor monitoring, (iv) lack of an effective system of benefiting local communities from protected area tourism (except in conservation areas and buffer zones), (v) delay in preparation and implementation of conservation plans for many important wildlife species, including water buffalo, dolphin and swamp deer, (vi) incomplete baseline information on biodiversity, including agrobiodiversity, (vii) lack of vision and plan to use the existing NARC farms for conservation of agrobiodiversity. The NBSIP implementation also suffered from inadequate financial resource. There was a lack of linkage between the priority projects and donor assistance (MoFSC, 2009).

4.15.3 Lessons Learned

The following are some of the key lessons learned from implementation of the NBS and NBSIP.

- i. Meaningful participation of local communities in the management of natural resources is a key to ensuring success and sustainability of programme interventions. The successful management of thousands of community and leasehold forests across the country; Kanchenjunga and Annapurna conservation areas and corridors; and community based conservation of agrobiodiversity are some evidences. Ensuring meaningful local participation requires ensured economic incentives, and incorporation of traditional practices, local knowledge and institutions in the design and implementation of the programmes.
- ii. The landscape approach is an appropriate strategy for addressing multiple drivers of biodiversity loss, enhancing ecological processes, conserving threatened species and addressing livelihood related issues. This is particularly true in areas where the protected areas are scattered like islands and are too small to support viable population of species and ecological processes.
- iii. Cooperation and collaboration among relevant agencies (government, INGOs, local communities) is crucial to achieve success in biodiversity management.
- iv. Regional cooperation can be helpful to curb trans-boundary trade of wildlife parts and strengthening ecological security in trans-boundary regions.
- v. Protected area tourism can be a reliable source to generate necessary fund for implementing conservation programmes, and to provide economic opportunities for local communities.
- vi. Enabling policy is necessary to achieve the intended outcome and appropriate legislation is necessary in order to translate the policy pronouncements into practice.
- vii. Positive incentive measures, which promote conservation-friendly behaviors, are necessary to encourage local people in biodiversity conservation. This lesson has been particularly

learned from the PES-like systems implemented in the Rupa Lake, Kaski and Langtang National Park.

- viii. Consultation and discussion with local communities and other stakeholders is necessary before making any important governance decision that affects the local communities' use of the local resources.

CHAPTER 5: STRATEGY FOR MANAGEMENT OF BIODIVERSITY

5.1 Vision, Goal and Objective

5.1.1 Vision for 2050

Conservation of biodiversity for sound and resilient ecosystems and national prosperity.

5.1.2 Goal and Objective

The overall goal of the NBSAP is to significantly enhance the integrity of Nepal's ecological systems by 2020, thereby contributing to human well-being and sustainable development of the country. The objective of developing the NBSAP is to provide a strategic planning framework for conservation and sustainable use of biodiversity and biological resources of Nepal for enhancing local livelihoods and eco-friendly national development, and equitable sharing of the benefits accrued from utilization of biological resources among all sections of the society.

5.2 Principles Underpinning the Strategy

1. Nepal's biodiversity is a common resource for all Nepali citizens and every individual has the responsibility to conserve these resources.
2. Biodiversity and ecosystem services are the important bases for enhancing food security, improving local livelihoods and maintaining socio-ecological resilience.
3. Biodiversity is best conserved *in-situ* as well as *ex-situ*.
4. Full and effective participation of local communities, and cooperation and collaboration among stakeholders are keys to ensure long-term sustainability of the biodiversity conservation efforts.
5. Knowledge, innovations and practices of indigenous and local communities play crucial roles in the management of biodiversity.
6. Legitimate rights of indigenous and local communities, women, *dalits*, and other disadvantaged social groups over local biological resources deserve due recognition.
7. Long term scientific research and knowledge generation is an essential element of biodiversity conservation initiatives.
8. Enabling policy and legislative environment is necessary to achieve intended outcomes in the management of biodiversity.

5.3 Strategic Approaches

1. Adoption of programme-based, adaptive and multi-stakeholder approaches in the management of biodiversity.
2. Building on and consolidating the successful past efforts and achievements.
3. Promoting participation, cooperation and collaboration of stakeholders.
4. Mainstreaming of biodiversity into relevant sectoral plans, policies and programmes.

5. Promotion of clean energy technologies, and green infrastructures for reducing pressure on biodiversity.
6. Creation of an enabling environment through effective policies and legislation.
7. Development and implementation of appropriate incentive measures for conservation and sustainable use of biodiversity.
8. Strengthening the knowledge base regarding biodiversity and ecosystems through scientific research and innovations.
9. Exploration of sustainable biodiversity financing mechanisms.
10. Promotion of effective response measures against natural and anthropogenic threats to biodiversity loss.
11. Promotion of landscape conservation and climate resilient approaches for ecosystems and biodiversity management.
12. Broadening the conservation constituencies by effectively involving local governments and private sector in conservation and sustainable use of biological resources.
13. Strengthening bilateral, regional and international cooperation.

5.4 Thematic Strategies and Priorities for Actions

The sector-specific strategies, and priority actions are designed to address: (i) the key biodiversity threats, gaps, and issues; (ii) the 20 Aichi Biodiversity Targets⁷ of the Strategic Plan for Biodiversity 2011–2020 (CBD, 2010); and (iii) the Millennium Development Goals (2013) of ensuring environmental sustainability. The national context, and past efforts and outcomes, including the experiences and lessons learned from implementation of the Nepal Biodiversity Strategy (2002) provided additional background to the formulation of the strategies and action (Figure 19).



Figure 19: Approach adopted in formulation of the strategies, goal and vision

The strategies are grouped into six biodiversity themes, namely protected areas, forests outside protected areas, rangelands, wetlands, agriculture, and mountains. They are prioritized by taking

⁷ In the COP-10 meeting of the CBD held at Aichi of Nagoya, Japan, the Conference of Parties came up with a new plan and targets to conserve biodiversity and enhance its benefits to the people. The plan known as the “Strategic Plan for Biodiversity 2011-2020” includes a set of 20 ambitious yet achievable targets, which are collectively known as the Aichi Biodiversity Targets (see Annex 5.1 for details).

into account the links between them and by referencing to the key biodiversity issues. To avoid redundancy, some of the theme or sector-related strategies and priorities actions, such as those related to improving governance, addressing policy and legislative gaps and capacity building, have been pulled together under relevant cross-sectoral theme. Unless specified otherwise, the strategies and associated priority actions presented in this section are to be implemented by the year 2020.

5.4.1 Management of Protected Area

5.4.1 Management of Protected Area

PA Strategy A: Improvement in management of protected area and species			
Priority Actions		Implementing Agency	
		Main	Support
PA-A1	Development and effective implementation of the Programme of Work in selected Protected Area.	DNPWC	I/NGOs
PA-A2	Development and implementation of conservation plans for at least 20 additional priority species (10 flora and 10 fauna) identified by the MoFSC.	DNPWC, DOF, DPR	I/NGOs
PA-A3	Putting in place effective measures to control cross-breeding of wild water buffalo with domestic buffalo in Koshi Tappu Wildlife Reserve.	DNPWC	DLS, I/NGOs
PA-A4	Reviewing and strengthening governance and management of buffer zones. This, among other, includes addressing the issue related to management of community and leasehold forests located inside buffer zones, and improving financial management.	DNPWC/ MoFSC	DOF, BZCF local institutions
PA-A5	Improvement in the existing human-wildlife conflict management system (by making it rational, simple and transparent) for compensating the loss from wildlife damage.	DNPWC/ MoFSC	DOF
PA-A6	Development of a system for economic valuation of ecosystem services provided by the country's protected areas.	DNPWC	IUCN
PA Strategy B: Abatement in poaching and illegal trade of wildlife and wildlife parts			
Priority Actions		Implementing Agency	
		Main	Support
PA-B1	Revising and strengthening by 2016, mechanisms (including incentive measures) to effectively control wildlife crimes.	DNPWC	Police, I/NGOs, NTNC, local communities
PA-B2	Further strengthening of bilateral and regional cooperation, particularly with China and India.	MoFSC	
PA Strategy C: Improvement in protected area habitats and connectivity			
Priority Actions		Implementing Agency	
		Main	Support
PA-C1	Development and implementation of guidelines for sustainable management of grasslands, wetlands and other important habitats located inside protected areas and	DNPWC/MoFS C	DOF

	corridors.		
PA-C2	Building “overpass” and/or “underpass” in at least three key locations to allow free movement of wild animals across the adjacent habitats.	DOR/ MOPIT	DNPWC
PA-C3	Integrate the concept of Smart Green Infrastructure in physical infrastructure development plans.	MOPIT, MOE, NEA, MOFALD, MOI	
PA-C4	Identification of potential additional habitats of large mammals for translocation and management.	DNPWC	WWF, NTNC
PA-C5	Banning development projects in core areas of National Parks and Wildlife Reserves	Council of Ministers	DNPWC/MoFS C
PA Strategy D: Improvement in management of protected area tourism			
Priority Actions		Implementing Agency	
		Main	Support
PA-D1	Promotion of eco-tourism ⁸ in protected areas.	DNPWC/MoFS	NTNC,
PA-D2	Review and revision of existing guidelines on tourism in protected areas.	C	MOCTCA/NTB
PA-D3	Promotion of sustainable tourism in selected protected areas.		

5.4.2 Management of Forest Biodiversity outside Protected Area

FB Strategy A: Improvement in forest governance and management			
Priority Actions		Implementing Agency	
		Main	Support
FB-A1	Development and implementation of criteria and indicators of Sustainable Forest Management.	DOF/ MoFSC	DFRS
FB-A2	Improving forest productivity, biodiversity conservation and climate change resilience of forests through sustainable management. At least 50 percent of the production forests to be brought under sustainable management by 2020.	DOF/ MoFSC	CBFM groups, federations and networks
FB-A3	Further promotion, improvement and strengthening of the community based forestry programmes. By 2020, at least 10 percent of the remaining government-managed forests to come under community based management.		

⁸ Eco-tourism is a responsible travel to natural areas that conserves the environment and sustains the well-being of local people. It fundamentally differs with the nature or adventure tourism in which the focus is what the tourist is seeking rather than what the tourist does and what impact it has on the environment and the local people. Ecotourism, therefore, involves a different philosophy, a set of practices and principles rather than simply another niche market within the tourism industry (Honey, 2002).

FB-A4	Development and implementation of NTFPs/MAPs management plan by all district forest offices and relevant community based forest user groups, especially targeting conservation of over-harvested and threatened species.		
FB Strategy B: Significant reduction (by at least 75 percent of the current rate) in the loss and degradation of forest			
Priority Actions		Implementing Agency	
		Main	Support
FB-B1	Controlling illegal harvest and trade of timber and other forest products through effective enforcement of the Law.	DOF	Other law-enforcement agencies
FB-B2	Promotion of nonconventional energy sources (such as biogas, solar energy, and hydropower), and fuel-efficient technologies (such as bio-briquettes, improved stoves) to reduce demand of firewood.	AEPC, WECS	I/NGOs, DOF
FB-B3	Designing and implementation of targeted programmes to promote agroforestry and private forestry (including trees on farm), and enhance alternative livelihoods to reduce dependency on national forests.	DOF, DOA	I/NGOs, CBOs, research institutions
FB-B4	Effective enforcement of measures to discourage use of forestland for non-forestry purposes.	DOF and DNPWC/MoFSC	Council of Ministers
FB-B5	Effectively implementing the mitigation measures recommended by EIA and IEE reports and conducting compliance monitoring.	MOSTE, NBCC	
FB-B6	Development and implementation of plans to reduce occurrence of forest fires and overgrazing.	DOF, DNPWC	CBFM groups, federations and networks
FB-B7	Reclaiming at least 10,000 hectares encroached forestland through effective implementation of the Forest Encroachment Control Strategy (2012).	DOF	Other law-enforcement agencies
FB Strategy C: Improvement in conservation of biodiversity in community-managed forests			
Priority Actions		Implementing Agency	
		Main	Support
FB-C1	By 2020, all the community managed forests to include a biodiversity chapter in their management or operational plans and respective user groups to effectively implement those plans.	DOF, FUGs	CBFM networks
FB Strategy D: Improvement in biological connectivity of forest ecosystems, particularly in the Middle Mountains			
Priority Actions		Implementing Agency	

		Main	Support
FB-D1	Promoting the concept of biological corridors and connectivity among community managed forests. By 2020, at least the five priority areas shown in Figure 15 to have conservation-friendly management	DOF, DNPWC	CBFM groups, federations and networks
FB-D2	Establishment of protection forest where necessary and feasible.	DOF/ MoFSC	
FB Strategy E: Enhancing conservation of species and genetic diversity			
Priority Actions		Implementing Agency	
		Main	Support
FB-E1	Promoting mixed forests of indigenous plant species in community managed forests with due consideration to NTFPs and biodiversity.	DOF, FUGs	CBFM federations and networks
FB-E2	Strengthening conservation of threatened and rare plant species through network of botanical gardens and other means.	DPR/ MoFSC	I/NGOs
FB-E3	Strengthening <i>ex-situ</i> conservation of threatened fauna by establishing at least two new, modern zoos at suitable locations.	MoFSC	NTNC, I/NGOs
FB-E4	Further promotion and strengthening of breeding seed orchards and seed stand programmes for threatened species.	DOF	DPR
FB-E5	Establishment of, by 2019, a Gene Bank to conserve genetic resources of wild flora and fauna	MoFSC	INGOs, donors
FB Strategy F: Enhancing forest-based livelihoods			
Priority Actions		Implementing Agency	
		Main	Support
FB-F1	Promoting NTFP-based and other green micro-enterprises, and culture and environment based tourism in community managed forest sites to enhance local livelihoods and income.	MOI, DOF, NTB	I/NGOs
FB-F2	Replicating and expanding the successful leasehold forestry model in feasible areas. At least 5,000 hectares additional degraded forests to be covered by 2020.	DOF, DLS	INGOs, donors
FB-F3	Promoting PES as a means of income generation by forest-dependent local communities.	MoFSC	I/NGOs

5.4.3 Management of Rangeland Biodiversity

RB Strategy A: Improving understanding of rangeland ecology and biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
RB-A1	Carrying out inventories to assess the status and trends of rangeland resources.	DFRS, NARC,	Universities
RB-A2	Conducting research on the nature and level of rangeland biodiversity-livelihood linkages, wildlife ecology, wildlife-livestock interactions, and indigenous pastoral management in selected rangelands across all physiographic zones.		
RB Strategy B: Improved conservation of rangeland biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
RB-B1	Effective implementation of the Rangeland Policy (2012) through development and implementation of action plan.	DLS, DNPWC, DOF	I/NGOs, Universities
RB-B2	Development and implementation of conservation plans for at least 10 rangeland dependent plant and animal species.		
RB-B3	Clarification and harmonization, by 2016, of the roles and responsibilities of DOF and DLS in the management of rangelands located outside protected area.	MoFSC and MOAD	
RB-B4	Rehabilitation of overgrazed rangelands.	DLS, DNPWC, DOF	I/NGOs
RB-B5	Adoption of integrated approach in the management of rangeland resources (involving multi-sectors and multi-partners).		
RB-B6	Designing and implementation of practical monitoring systems to assess change in rangeland biodiversity and regulating the use of rangelands as per their carrying capacity.	DLS, DNPWC, DOF	NARC, DFRS, Universities
RB-B7	Development and implementation of grazing management programmes.	DLS, DNPWC, DOF	NARC, DFRS,
RB Strategy C: Sustainable utilization of rangeland resources for enhanced local livelihoods			
Priority Actions		Implementing Agency	
		Main	Support
RB-C1	Development and application of appropriate technologies for improving productivity of rangelands.	NARC, DLS, DNPWC, DOF	I/NGOs
RB-C2	Identification and promotion of economically valuable species and varieties of	NARC, DLS,	DOF, DFRS

	forage legumes that also have high productivity.		
RB-C3	Strengthening of the local innovations, knowledge and practices related to sustainable management of rangeland resources.	DLS DNPWC, DOF	NARC, I/NGOs
RB-C4	Promotion of rangeland-based sustainable livelihood options.	NARC, DLS DNPWC, DOF	I/NGOs

5.4.4 Management of Wetland Biodiversity

WB Strategy A: Improving understanding of wetlands and wetlands biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
WB-A1	Designing and carrying out, by 2017, inventory and research to assess the status and trends of changes in wetlands and wetland biodiversity.	DNPWC, DOF, DOA,	Universities
WB-A2	By 2020, additional five wetlands of international importance to be enlisted as Ramsar sites.	DNPWC, DOF	Universities, I/NGOs
WB Strategy B: Effective conservation and sustainable utilization of wetlands biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
WB-B1	Effective implementation of the National Wetlands Policy (2012).	MoFSC, MOAD	MOFALD, I/NGOs
WB-B2	Development and implementation, by 2020, of a plan for maintaining unhindered north-south biological connectivity in at least three major rivers (one each in the eastern, central and western parts of the country).	MoFSC	I/NGOs, MOFALD
WB-B3	Clarification and harmonization, by 2015, of the roles and responsibilities of different government line agencies (such as DOF, DOA, NEA, DOI etc.) in the management of wetlands located outside protected area.	MoFSC, MOAD, MOE, MOIr	
WB-B4	Controlling encroachment and eutrophication in at least 10 major wetlands and restoring at least 5 major degraded wetlands by 2020.	DNPWC, DOF, DOA,	I/NGOs
WB-B5	Development and implementation, by 2015, an effective mechanism to control mining of gravel and sand from rivers and streams.	MoFSC, MOSTE	MOFALD
WB-B6	Establishment of an effective regional cooperation mechanism (among Nepal, India and Bangladesh) to conserve valuable and threatened aquatic fauna (including fresh water dolphin, crocodile, and native fish species).	MOAD, MoFSC	

WB-B7	Development and implementation of <i>in-situ</i> and <i>ex-situ</i> conservation plans for at least 10 threatened and economically valuable native fish and other aquatic species by 2020.	DOA, NARC	I/NGOs
WB-B8	Formulation and implementation of a plan for regulating introduction and expansion of invasive alien species of aquatic fauna, by 2018.	DOA/MOAD	
WB-B9	Effective implementation of EIA provisions relating to hydropower and water resources development projects.	MOSTE, MOE	Private Sector
WB-B10	Declaration and management of at least three suitable wetlands as fish sanctuaries, by 2017.	MOAD	MoFSC
WB-B11	Development and implementation of plans to control industrial pollution in five major rivers and five major wetlands, by 2020.	MOSTE, MOI	MoFSC, MOAD, FNCCI
WB Strategy C: Enhancement of wetland biodiversity-livelihood linkages			
Priority Actions		Implementing Agency	
		Main	Support
WB-C1	Promotion of PES mechanism in selected sub-watersheds.	MoFSC	MOAD, I/NGOs
WB-C2	Diversifying wetland-based sustainable livelihood options through promotion of economically important wetland species.	MOAD	MoFSC
WB-C3	Initiation of local fish farming in at least three hydropower reservoirs, by 2020.	DOA	Private Sector

5.4.5 Management of Agrobiodiversity

AB Strategy A: Improving management of agrobiodiversity			
Priority Actions		Implementing Agency	
		Main	Support
AB-A1	Strengthening community based management of agrobiodiversity, and expanding it to at least five additional districts by 2020.	DOA	NARC, I/NGOs
AB-A2	Establishing and strengthening functional linkage between the National Agriculture Genetic Resources Center (Gene Bank) and community based seed or gene banks.	NARC	DOA
AB-A3	Development and implementation of incentive measures for on-farm conservation of agrobiodiversity, and elimination of perverse incentives (if any).	MOAD	
AB-A4	Development and implementation of a plan for effective collaborations among	MOAD, NARC	Private Sector,

	national and international research organization, private sector and academic institution for conservation of agro-genetic resources.		I/NGOs
AB-A5	Expansion of organic management, IPM and IPNM activities at the local level.	DOA	Private Sector, I/NGOs
AB-A6	Applying holistic and integrated approach to conservation of agrobiodiversity.	MOAD	NARC, Universities
AB-A7	Strengthening plant and animal quarantine.	DOA, DLS	Law enforcement agencies
AB-A8	Strengthening seed certification and registration programmes.	MOAD, NARC	DOA
AB Strategy B: Preventing extinction of species and maintaining genetic diversity of crops and animals			
Priority Actions		Implementing Agency	
		Main	Support
AB-B1	Periodic monitoring of the trend of changes in the status of agrobiodiversity.	MOAD/ NARC	
AB-B2	The Gene Bank to collect and conserve genetic materials of at least 75 percent of the commonly cultivated crop and horticulture species, by 2020.	NARC	DOA, I/NGOs
AB-B3	Application of suitable methods and techniques for effective conservation of threatened species, varieties and breeds.	DOA, DLS	NARC, I/NGOs, Universities
AB-B4	By 2020, at least 10 wild relatives of domesticated crops are to be effectively conserved (<i>in-situ</i> and/or <i>ex-situ</i>).	DOA, NARC	
AB-B5	By 2020, a plan to be developed and implemented to monitor the level and nature of use of insecticides, pesticides and chemical fertilizers.	MOAD	NARC, I/NGOs
AB-B6	By 2020, DNA Level characterization of at least 10 native breeds of livestock completed.	NARC, DLS	
AB Strategy C: Improving access to genetic resources for food and agriculture			
Priority Actions		Implementing Agency	
		Main	Support
AB-C1	Linking the Gene Bank with national (private and public) and international research centers and institutions for increased access and exchange of genetic resources needed for the country to enhance national food security.	MOAD, NARC	Private Sector
AB-C2	Establishment of an efficient system for exchange of information on all kinds of	MOAD	Private Sector

	agricultural genetic resources and implementation of ITPGRFA and multilateral system of exchange of PGRFA.		
AB-C3	Facilitating access to genetic resources and materials and associated traditional knowledge with prior informed consent and on mutually agreed terms.	MOAD	Private Sector, I/NGOs
AB-C4	Establishing one-door system for regulating the provisions as mentioned in the international treaties related to genetic resources (both PGR and AnGR).	MOAD	Private Sector

5.4.6 Management of Mountain Biodiversity

MTB Strategy A: Improving understanding of mountain biodiversity and ecosystem services			
Priority Actions		Implementing Agency	
		Main	Support
MTB-A1	Designing and conducting research focusing on biological richness of mountain ecosystems, and diversity-driven ecosystem services in at least 10 major mountain ecosystems, by 2020.	MoFSC, Universities	IUCN, ICIMOD, I/NGOs
MTB-A2	Designing and conducting research to explore different management scenarios, which serve both the sustained integrity of diverse mountain biota and human needs.		
MTB Strategy B: Conserving mountain biodiversity and promoting environment-friendly economic development			
Priority Actions		Implementing Agency	
		Main	Support
MTB-B1	Designing and implementation of ecosystem based adaptation programmes in the mountains. By 2020, at least 10,000 hectares degraded mountain ecosystems to be restored through participatory approach.	MoFSC	I/NGOs, CBFM groups, federations
MTB-B2	Promoting eco-friendly tourism, with particular focus on community-based ecotourism.	MOCTCA, Private Sector	MoFSC
MTB-B3	Designing and implementing green projects (water, biodiversity, forests, and clean energy).	Private Sector, AEPC	FNCCI, MoFSC, MOSTE
MTB-B4	Development and implementation of a regional cooperation plan to strengthen conservation of mountain biodiversity in trans-boundary landscapes.	MoFSC	ICIMOD, I/NGOs

5.5 Cross-thematic and Cross-sectoral Strategies and Priority Actions

5.5.1 Addressing the Policy and Legislative Gaps

PL Strategy A: Filling the existing gaps in policy and legislation			
Priority Actions		Implementing Agency	
		Main	Support
PL-A1	Developing, by 2016, umbrella biodiversity management legislation for conservation and sustainable use of biodiversity.	MoFSC	MLJPA
PL-A2	Ratification and implementation of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, by 2015.	Council of Ministers	MoFSC, MLJPA
PL-A3	Finalization and enactment, by 2016, of Access to Genetic Resources and Benefit Sharing Bill, by incorporating Geographical Indication (GI) mapping of valuable indigenous species, biodiversity registration and biosafety.	MoFSC	MLJPA
PL-A4	Finalization, by 2018, endorsement and implementation of the National Intellectual Property Rights Policy.	MOI	
PL-A5	Finalization and enactment of legislations on CITES, ABS, plant protection, and farmers' rights, by 2018.	MoFSC. MOAD	MLJPA
PL-A6	Development of <i>sui generis</i> legislation for protection of plant varieties, by 2017.	MOAD	MLJPA
PL-A7	Amending, by 2016, the existing National Parks and Wildlife Conservation Act to address the changed ecological, social, economic and political context and facilitate farming of wildlife.	MoFSC	MLJPA
PL-A8	Amendment of existing legislation or enactment of new legislation, by 2017, to provide legal base to policy pronouncements of Agrobiodiversity Policy, Rangeland Policy, Tourism Policy and Wetland Policy.	MOAD, MOCTCA, MoFSC	MLJPA
PL-A9	Development and implementation of National Zoo Policy by 2020.	MoFSC	NTNC
PL-A10	Making necessary revision in the Wildlife Damage Relief Guidelines, including simplification of the administrative procedure related to compensating the loss and damage of human life and property by wildlife by the end of 2014.	DNPWC/ MoFSC	
PL-A11	Promotion of synergy among various legislations (e.g. Forest Act, Water Resources Act, Environment Protection Act, Electricity Act, Local Self -governance Act, Mines and Minerals Act, National Parks and Wildlife Conservation Act, and Public	MLJPA	MoFSC, MOE, MOSTE,

	Roads Act) through necessary amendments, by 2018.		MOFALD, MOPIT
PL-A9	Reforming policies, by 2016, to provide incentives to sectors that offer opportunities for sustainable green growth in the mountains.	NPC	MOSTE, MoFSC, MOAD, Private Sector
PL-A10	Development, by 2016, and implementation of policy and guidelines including the nation's Information and Communication Policy for involving mass media in dissemination of information related to biodiversity.	MOIC	
PL-A11	Updating, by 2017, the list of threatened and legally protected list of flora and fauna species.	MoFSC	IUCN
PL-A12	Incorporation of non-carbon benefits (e.g. biodiversity, subsistence needs of local communities) in the REDD+ Strategy, which is to be developed and approved by 2016.	MoFSC	
PL-A13	Development by 2015 and implementation of a National Strategic Framework for Nature Conservation	NPC	IUCN, and other relevant agencies
PL Strategy B: Enhancing implementation of policies and legislations			
Priority Actions		Implementing Agency	
		Main	Support
PL-B1	Ensuring effective implementation of environmental management (mitigation) plan included in the environmental impact assessment report of hydropower, industries, irrigation, mining, roads, and other infrastructure projects, by 2016.	All sectoral ministries/ departments	Private Sector
PL-B2	Promoting wider participation of stakeholders in conservation of biodiversity, sustainable use of its components and fair and equitable benefit sharing.	MoFSC, MOAD	I/NGOs, CBFM groups, federations and networks, Private sector

5.5.2 Institutional Strengthening

IS Strategy A: Improving the forestry sector governance			
Priority Actions		Implementing Agency	
		Main	Support
IS-A1	Revising, by 2016, organizational structure of the MoFSC departments as per the changed context.	MoFSC	MOGA, MOF
IS-A2	Development and implementation of forestry sector human resource development plan by 2016.	MoFSC	
IS-A3	Strengthening law enforcement capacities of district forest and protected area offices.	MoFSC	MOF, I/NGOs
IS-A4	Enhancing coordination and cooperation amongst government law enforcement agencies, I/NGOs, and local user groups to control illegal harvest and trade of timber and other forest products, forest area encroachment, and wildlife crimes.	NBCC/ MoFSC	
IS Strategy B: Establishment and/or strengthening of institutional arrangements at different levels for effective coordination and monitoring of biodiversity management			
Priority Actions		Implementing Agency	
		Main	Support
IS-B1	Strengthening the NBCC (by also providing legal recognition) and its secretariat (through provision of adequate human and financial resources), by 2016.	MoFSC	Council of Ministers
IS-B2	Establishment and operationalization, by 2015, of Biodiversity and Environment Division at the MoFSC.	MoFSC	MOGA, MOF
IS-B3	Putting in place an effective district and VDC/municipality level coordination and monitoring mechanism through establishment of Environment Friendly Governance District Coordination Committee in at least 15 DDCs, and Environment Friendly Local Governance Village Coordination Committee or Environment Friendly Local Governance Municipal Coordination Committees in at least 30 selected VDCs/municipalities by 2017.	MOFALD , NBCC/ MoFSC	
IS-B4	Strengthening inter-agency coordination for policy and programmes for improved management of biodiversity.	Council of Ministers	NPC

5.5.3 Mainstreaming Biodiversity across the Government, Society and Economy

MB Strategy A: Improved mainstreaming of biodiversity across government, society and economy			
Priority Actions		Implementing Agency	
		Main	Support
MB-A1	Incorporation of biodiversity management in the mandate of Council of Ministers and relevant ministries by amending the Government of Nepal (Allocation of Business) Regulations (2012) by 2016.	Council of Ministers	MoFSC
MB-A2	Incorporation of biodiversity considerations, by 2019, in the policies, plans and programmes of different line ministries and other relevant government and non-government agencies.	Sectoral ministries	MoFSC
MB-A3	Development and implementation of biodiversity management programmes by DDCs in accordance with the provisions of this NBSAP and the Local Self-governance Act (1999).	MOFALD	MoFSC, I/NGOs
MB-A4	Development and implementation of LBSAP in at least 30 VDCs and municipalities as per the framework presented in Chapter 7.	MOFALD	MoFSC, I/NGOs
MB-A5	Designing and implementation of pilot projects to demonstrate synergy between conservation and economic development. At least one such project to be implemented in each physiographic and development region.	MOSTE, MOFALD	MOF, MoFSC
MB-A6	Development and implementation of a system for strategic environmental assessment.	MOSTE	IUCN
MB-A7	Development and implementation of a national strategic framework for effective coordination and monitoring of mainstreaming efforts.	NPC	IUCN
MB-A8	Initiating TEEB study for forest, mountains, wetlands and agriculture sectors.	All relevant ministries	CBS, Universities

5.5.4 Harmonization of Biodiversity related International Conventions

IC Strategy A: Harmonization of biodiversity-related international conventions			
Priority Actions		Implementing Agency	
		Main	Support
IC-A1	Setting up, by 2015, a committee under the NBCC for reviewing and harmonizing biodiversity related conventions and treaties.	NBCC	MoFSC

IC-A2	Acceding to the Convention on the Conservation of Migratory Species of Wild Animals (1979).	Council of Ministers	MoFSC
IC-A3	Initiating, by 2016, harmonization of national reporting of the three biodiversity related conventions, namely the CBD, CITES, and Ramsar.	NBCC	MoFSC
IC-A4	Development and implementation of joint capacity development programmes for the national focal points of biodiversity-related MEAs.	MoFSC	MOAD, I/NGOs
IC-A5	Effectively informing the decision-makers that achieving most of the MDGs depend directly on ecosystem services including the targets on poverty, hunger, gender equality, child mortality, and sustainable development.	NPC	All relevant ministries
IC-A6	Including these targets in the Post 2015 MDGs: (i) significant reduction in the rate of loss and degradation of forests, (ii) improving the status of biodiversity by safeguarding ecosystems, species and genetic diversity, and (b) ensuring poor's access to environmental resources and decision making.		

5.5.5 Enhancement of National Capacity for Improved Management of Biodiversity

CE Strategy A: Enhancement of national capacity for biodiversity management			
Priority Actions		Implementing Agency	
		Main	Support
CE-A1	Conducting training needs assessment on different aspects of biodiversity management.	MoFSC, MOAD, and other relevant ministries	Universities, I/NGOs
CE-A2	Organizing training to trainers, law enforcement officials, community groups, NGOs, CSOs, private sector, media persons and other stakeholders at various levels on different aspects of biodiversity management, including on access to genetic resources and materials and equitable sharing of benefits.		
CE-A3	Providing periodic orientation and refresher training to protected area, district forest, district agriculture, and district livestock offices to enhance their technical capacity.		
CE-A4	Capacitating the CFUGs, collaborative groups, LFUGs, protected area local institutions, farmers' groups, and other CBOs to address governance issues such as GSI and management of funds, and for conservation-friendly management of their forests, rangelands, wetlands and farmlands.	DOF, DNPWC, DOA	Universities, I/NGOs
CE-A5	Enhancing national capacity for producing quality seeds of both local and improved	MOAD, NARC	I/NGOs,

	varieties/breeds (PGR and AnGR) and seed certification.		Private Sector
CE-A6	Strengthening collection, conservation, rejuvenation, characterization and documentation facilities and human resources capacity of the Gene Bank.	NARC	DOA, I/NGOs, Private Sector
CE-A7	Enhancing technical capacity of the National Forensic Laboratory on analyzing wildlife crimes.	NAST	I/NGOs
CE-A8	Conducting targeted programmes to enhance capacities of local communities, particularly the disadvantaged groups such as women, <i>dalit</i> , <i>janajatis</i> and indigenous peoples to support their livelihoods and conserve biodiversity.	All relevant ministries	I/NGOs, community based groups and networks

5.5.6 Landscapes Management

LM Strategy A: Improving landscapes management			
Priority Actions		Implementing Agency	
		Main	Support
LM-A1	Effective implementation of the National Land Use Policy (2012). This, among other, include identification and promotion of appropriate land use and land management systems to improve biodiversity conservation, control watersheds degradation and reduce pressure on forests.	MOLRM, MOAD, MoFSC	Other relevant ministries and agencies
LM-A2	Revision and implementation of the landscape management strategy by 2016.	MoFSC	MOAD, I/NGOs
LM-A3	Taking a more programmatic and integrated approach in local level development planning, including promotion of participatory land evaluation and land use planning at the local level.	DDCs, VDCs, Municipalities	MOFALD, other relevant agencies
LM-A4	Establishment and management of a network of biological corridors to enhance connectivity of habitats across the landscapes and beyond.	MoFSC	MOFALD, I/NGOs
LM-A5	Improvement and expansion of participatory soil and water conservation initiatives based on principles and approaches of integrated watershed management with emphasis on bio-engineering in at least 30 critical sub-watersheds.	DSCWM	I/NGOs
LM Strategy B: Conservation of critical landscapes			
LM-B1	Designing and implementation of programmes to raise awareness about the fragility, vulnerability and importance of the <i>Chure (Siwalik)</i> range.	MoFSC	MOAD, DDCs, VDCs, municipalities,
LM-B2	Development, by 2015, and effective implementation of <i>Chure</i> conservation		

	strategy by also involving local governments, relevant government line agencies, and community based forest user groups.		CBFM groups, federations and networks, and other relevant agencies
--	--	--	--

5.5.7 Management of Invasive Alien Species

IAS Strategy A: Enhancing knowledge and understanding of invasive alien species			
Priority Actions		Implementing Agency	
		Main	Support
IAS-A1	Nation-wide survey and research on at least five most problematic invasive alien plant species by 2020.	DPR, DFRS, NARC	Universities, I/NGOs
IAS-A2	Development of an Invasive Plant Atlas for identification, early detection, prevention and management of invasive plants.		
IAS Strategy B: Controlling invasion and spread of alien species			
Priority Actions		Implementing Agency	
		Main	Support
IAS-B1	Enhancing quarantine and detecting capacity of custom and quarantine offices.	MOAD, MOF	I/NGOs
IAS-B2	Development and implementation of programme to raise awareness of local people on invasive alien species, their impacts and control measures.	DOF, DNPWC, DOA, DLS	Universities, I/NGOs
IAS-B3	Development, testing and application of appropriate biological control agents.	NARC	Universities

5.5.8 Adaptation to and Mitigation of the Effects of Climate Change

CC Strategy A: Adaptation to and mitigation of the impacts of climate change on biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
CC-A1	Development and implementation of long-term environmental monitoring programmes by considering climate change impacts.	MOSTE, and other relevant agencies	ICIMOD, I/NGOs, universities
CC-A2	Development and implementation of a Low Carbon Economic Development	MOSTE	Other relevant

	Strategy.		agencies
CC-A3	Revision or development of guidelines for integration of biodiversity on climate change adaptation projects and programmes, such as climate refugia, functional connectivity of ecosystems and landscapes, climatic gradients, translocation of species and water security.	MoFSC, MOSTE	I/NGOs
CC-A4	Assessment of vulnerability of ecosystems and species to the impacts of climate change, setting up conservation targets and implementing necessary adaptation measures.	MoFSC, MOAD	Universities, NARC
CC-A5	Promotion of environment-friendly farming systems (organic agriculture, minimum tillage etc.) and climate smart agriculture programmes.	MOAD	NARC
CC-A6	Implementation of PES and REDD+ where feasible. This, among other, include: (i) devising mechanism for sharing the benefits from such projects, (ii) ensuring participation of all the stakeholders in decision-making process, (iii) defining the goal of biodiversity conservation in the REDD+ strategy roles of different stakeholders, (iv) devising mechanism to assess of changes in biodiversity following REDD+ implementation, and (v) developing and implementing safeguards against possible negative effects of REDD+ implementation on biodiversity. At least 5 percent of the forest ecosystems to come under REDD+ implementation by 2020.	MoFSC	CBFM groups, federations and networks, I/NGOs
CC Strategy B: Enhancing the resilience of ecosystems, species and human communities to climate change impacts			
Priority Actions		Implementing Agency	
		Main	Support
CC-B1	Integrating climate risk/vulnerability approach in biodiversity management related guidelines, programmes/projects to ensure climate compatible development	NPC, MoFSC and other relevant ministries	I/NGOs, CBFM groups, federations and networks
CC-B2	Improving connectivity of natural ecosystems, particularly north-south connectivity through effective mainstreaming of biodiversity in community forestry and other forest management regimes.	DOF, DNPWC	I/NGOs, CBFM groups, federations and networks
CC-B3	Development and implementation of climate change adaptation plans by forest user groups. At least 3,000 community based forestry groups will be adopting climate-smart planning by 2020.	DOF, FUGs	CBFM groups, federations I/NGOs

5.5.9. Integrating Gender and Social Inclusion Perspectives

GSI Strategy A: Formulation and implementation of gender-responsive policy and strategy by all the government and non-government agencies			
Priority Actions		Implementing Agency	
		Main	Support
GSI-A1	Formulation and effective implementation of GSI strategy at all levels of governance.	All relevant ministries and agencies	I/NGOs, CSOs
GSI-A2	Strengthening links to advocacy networks and platforms (including media and women-focused civil organizations) for raising awareness on gender and social inclusion related issues focusing on biodiversity management.		
GSI Strategy B: Promoting equitable participation of all sections of the society in the development and implementation of conservation policies and programmes			
Priority Actions		Implementing Agency	
		Main	Support
GSI-B1	Promoting proportional representation of women, <i>adivasi janajatis</i> , <i>madheshi</i> and <i>dalits</i> in biodiversity related institutional mechanisms at all levels.	All relevant ministries and agencies	I/NGOs, CSOs, universities
GSI-B2	Collection and analysis of gender-segregated data on different aspects of biodiversity and natural resource management for better understanding of the issues and underlying factors.		
GSI-B3	Empowering women and other disadvantaged groups through financial and technical capacity building for conservation, sustainable use and access to equitable sharing of benefits.		
GSI-B4	Integrating GSI into relevant plans and programmes directly or indirectly related to biodiversity.		
GSI-B5	Preparing and distributing GSI implementation handbooks in different languages focusing on biodiversity management.		
GSI Strategy C: Ensuring equitable access of women and men, including disadvantage social groups to biological resources and benefits sharing			
Priority Actions		Implementing Agency	
		Main	Support
GSI-C1	Ensuring access to biological resources and ecosystem services to poor, women, indigenous and local and disadvantaged communities.	All relevant ministries and agencies	I/NGOs, CSOs,
GSI-C2	Evaluation of gender access and ownership of natural resources with regards to the		

	current institutional and policy environments, with the aim of addressing gaps or inequalities in national policies.		
GSI-C3	Further promotion of social equity in the use of biological resources.		

5.5.10 Conservation of and Respect to Traditional Knowledge, Innovations and Practices of Indigenous and Local Communities

TK Strategy A: Integrating traditional knowledge, innovations and practices of indigenous and local communities in the management of biodiversity and ecosystems			
Priority Actions		Implementing Agency	
		Main	Support
TK-A1	Development and implementation of programmes for protection and promotion of traditional knowledge, innovations and practices of indigenous and local communities relevant to conservation and sustainable use of biodiversity, by 2016.	MoFSC	NEFDIN, NEFIN
TK-A2	Enacting, by 2018, Intellectual Property Rights Act recognizing prior art, geographical indication and trademarks and providing intellectual property rights to the group of indigenous and local communities on whose biocultural heritage such products are based.	MOI	MoFSC, MLJPA
TK-A3	Development and implementation of protocol to document traditional knowledge, innovations and practices of indigenous and local communities associated to conservation and use of biological resources.	MoFSC, MOAD	I/NGOs, CSOs
TK-A4	Development and implementation, by 2017, of mechanism to incorporate the local knowledge, customary practices and institutions of indigenous peoples and local communities in the management of biodiversity.	MoFSC, MOAD	I/NGOs, CSOs
TK-A5	Integrating relevant local cultural and religious practices in the management of sacred natural sites within protected areas and protected forests, by 2016.	MoFSC	I/NGOs
TK Strategy B: Enhancing implementation through participatory planning, knowledge, management and capacity building			
Priority Actions		Implementing Agency	
		Main	Support
TK-B1	Supporting National Foundation for Development of Indigenous Nationalities, Nepal Federation of Indigenous Nationalities and other federations and networks to protect and promote traditional knowledge, innovations and practices of indigenous and local communities relevant to conservation and sustainable use of biodiversity, and their	MoFSC, MOAD and other relevant agencies	I/NGOs, CSOs

	customary use of biological resources.		
TK-B2	Conducting research on indigenous and traditional knowledge of biodiversity and benefit sharing.	NARC, universities	MoFSC, MOAD, I/NGOs

5.5.11 Knowledge Generation and Management

KM Strategy A: Enhancement in knowledge of biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
KM-A1	Conducting a comprehensive inventory of ecosystem and species, and updating the existing information on ecosystems by 2017.	Universities, DFRS	MoFSC, NARC, IUCN, other relevant agencies
KM-A2	Conducting country-wide baseline survey of MAPs and other NTFPs, and breed-wise inventory of AnGR.	MoFSC, NARC	I/NGOs, Universities
KM-A3	Promoting collaborative research among national and international agencies, and private sector.	NARC, NAST, DFRS	Universities, private sector
KM-A4	Carrying out exploratory surveys of areas with possible existence of endangered species of fauna and flora.	MoFSC	NARC, Universities, NAST
KM-A5	Expediting the works of the Flora of Nepal project to complete it by 2020.	DPR, NAST, CDB/TU	Other relevant agencies
KM-A6	Preparing and updating national Red List of flora, fauna, and ecosystems following IUCN guidelines.	MoFSC	IUCN
KM-A7	Updating the status of endemic plant species by 2016.	DPR, NARC	Universities, NAST
KM-A8	Establishment of a system for regularly monitoring changes in biodiversity.	NBCC	All relevant agencies
KM-A9	Establishing center of excellence on biodiversity research at different universities.	Respective universities	Relevant agencies
KM Strategy B: Establishment and management of a National Biodiversity Information Management System			
Priority Actions		Implementing Agency	

		Main	Support
KM-B1	Designing and implementation, by 2016, of a plan for establishment and management of a National Biodiversity Information Management System (NBIMS).	NBCC/ MoFSC	All relevant agencies
KM-B2	Upgrading the national Clearing House Mechanism and making it fully functional by 2015.	BED/ MoFSC	All relevant agencies

5.5.12 Technology Development, Acquisition and Use

TEC Strategy A: Improvement in development, acquisition, use, transfer and application of innovations and technologies relating to biodiversity management			
Priority Actions		Implementing Agency	
		Main	Support
TEC-A1	Identification and prioritization of appropriate technologies to meet the country's needs.	All relevant ministries and agencies	I/NGOs
TEC-A2	Enhancing national technical capacity in genetic analysis and gene mapping of threatened fauna and flora, monitoring changes in landscapes, communities and populations, and controlling invasive alien species.	MoFSC, NAST, NARC, Universities	I/NGOs
TEC-A3	Strengthening public-private partnership for biodiversity-related technology development and management.	All relevant ministries and agencies	Private sector, I/NGOs
TEC-A4	Establishing linkage between biodiversity conservation and food security for greater synergy	MoFSC, MOAD	Private sector, I/NGOs
TEC-A5	Mainstreaming biodiversity research and conservation into sectoral programmes.	NBCC, NPC	All relevant agencies
TEC-A6	Enhancing national and local institutions' technical capacities in general and academic institutions' capacity in particular for biodiversity research and management.	NBCC, NPC, MOF	Universities, I/NGOs, private sector
TEC-A7	Promoting evidence-based research for biodiversity conservation and sustainable use of biological resources.	NARC, DFRS, Universities	I/NGOs
TEC-A8	Promoting use of local innovations and knowledge for effective management of biodiversity.	MoFSC, MOAD	I/NGOs
TEC-A9	Removing the policy barriers, and piloting new technologies for demonstration and	NBCC,	I/NGOs,

	promoting collaborative culture.	relevant sectoral agencies	private sector
TEC-A10	Increasing linkage and cooperation between biodiversity research in the country with international universities and research institutions	NAST, NARC, DFRS, Universities	

5.5.13 Communication, Extension and Outreach

CEO Strategy A: Increasing awareness about biodiversity and ecosystem services			
Priority Actions		Implementing Agency	
		Main	Support
CEO-A1	Designing and launching communication, education and outreach programmes to promote conservation and sustainable use of biodiversity.	All relevant ministries and agencies	I/NGOs, CSOs
CEO-A2	Development and implementation of biodiversity awareness campaigning programme through use of the mass media (radio, television, newspaper). By 2020, at least 100 new audio-visual packages on different aspects of biodiversity to be prepared and distributed.	Relevant government ministries/departments	Media, I/NGOs, CSOs
CEO-A3	Sensitizing political parties, policy-makers, and local government authorities to the negative environmental impacts of forest loss and degradation.	NBCC, MoFSC, MOSTE	I/NGOs, CSOs, Media
CEO-A4	Implementing awareness programmes on documentation, use and promotion of Indigenous and Traditional Knowledge for conservation and use of agrobiodiversity.	MOAD	
CEO-A5	Designing and implementation of programmes to raise awareness and build capacity of local community based forest user groups in the corridors and buffer zone user groups for conservation-friendly and climate responsive management of the forests.	DOF, DNPWC, FECOFUN, BZDC	I/NGOs, CSOs, Media
CEO-A6	Designing and implementation of advocacy programmes for mainstreaming biodiversity in policies and regulations that govern utilization of natural resources.	Relevant CSOs, I/NGOs	
CEO Strategy B: Enhancing awareness on threatened fauna and flora			
Priority Actions		Implementing Agency	
		Main	Support

CEO-B1	Improving awareness of local people about behaviors of different wild animals and locally suitable low cost measures to deal with them to minimize human-wildlife conflict	DNPWC, DOF	NTNC, WWF
CEO-B2	Use of multipurpose nurseries, modern zoos, freshwater aquarium and botanical gardens to educate people about the ecology and behaviors of indigenous and threatened flora and fauna and their relation to human being.	Relevant government agencies	I/NGOs, Private Sector
CEO-B3	Educating people about using local innovations and skills in propagating indigenous varieties of crops and vegetables and breeds of livestock.	NARC, DOA, DLS	I/NGOs
CEO Strategy C: Promoting and strengthening demonstration and outreach programmes			
Priority Actions		Implementing Agency	
		Main	Support
CEO-C1	Developing on-site lecturing, demonstration and interpretation infrastructure in at least five selected protected areas and Ramsar sites, by 2020.	DNPWC	NTNC, I/NGOs
CEO-C2	Designing and conducting Farmer's Field Schools for management of biodiversity.	DOA	I/NGOs
CEO-C3	Demonstrating multipurpose "green projects".	MOSTE	Private Sector
CEO Strategy D: Increasing knowledge and awareness through formal and non-formal conservation education programmes			
Priority Actions		Implementing Agency	
		Main	Support
CEO-D1	Including biodiversity in the school, undergraduate and post-graduate level curricula.	MOEd, Universities	Relevant government ministries
CEO-D2	Improving public-private partnership for agrobiodiversity research and extension.	MOAD, NARC	Universities, FNCCI
CEO-D3	Educating society and business communities on the importance of biodiversity conservation and ecosystem services.	Relevant ministries	Media, I/NGOs

5.5.14 Fund Generation and Mobilization

FG Strategy A: Significant increment in public funding for management of biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
FG-A1	Enhancing the existing sources of funding and exploring new sources.	All relevant ministries and	MOF

		agencies	
FG-A2	Ensuring proper and timely use of the compensatory plantation funds for conservation of threatened and rare species of flora and fauna.	MoFSC	MOF
FG-A3	Ensuring optimal and sustainable financing for biodiversity research through improved coordination amongst the relevant ministries, National Planning Commission and Ministry of Finance.	MoFSC, MOAD, MOF	NPC
FG Strategy B: Exploring and promoting new sources of funding for management of biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
FG-B1	Introducing system of PES in forestry and other relevant sectors' Acts and Rules and involving private/corporate sector in PES	MoFSC and other ministries	MLJPA
FG-B2	Exploring and promoting possible additional sources of sustainable income from protected areas.	DNPWC	NTB, other relevant agencies
FG-B3	Developing a fair mechanism for increasing private sector funding for biodiversity management.	MoFSC, NPC, MOF	FNCCI
FG-B4	Promoting the culture of corporate environmental responsibility.	FNCCI, MOSTE, MoFSC, MOF	NPC, other relevant agencies
FG Strategy C: Effective mobilization of local funds for management of biodiversity			
Priority Actions		Implementing Agency	
		Main	Support
FG-C1	Starting from 2015, ensuring allocation of certain proportion of DDC, VDC/municipality budget for development and implementation of the LBSAP in the selected VDCs and municipalities.	MOFALD, NPC	MOF, MoFSC
FG-C2	Ensuring allocation of certain proportion of community based forest user groups' budget for conservation of forest biodiversity.	MoFSC	FECOFUN, ACOFUN and other similar agencies
FG Strategy D: Increasing external sources of funding for management of biodiversity			
Priority Actions		Implementing Agency	
		Main	Support

FG-D1	Making NBSAP implementation as one of the priority national development agenda.	Council of Ministers, MoFSC, NPC	MOF, and all relevant agencies
FG-D2	Promoting, under the climate change funding, ecosystem based adaptation for conserving biodiversity and enhancing ecosystem services.	MOSTE, MoFSC	MOF, MOAD; I/NGOs
FG-D3	Building synergy among the plans and programme of MEAs through the coordinated efforts of MEA Focal Points in securing multilateral funding for biodiversity.	MoFSC	MOAD, NPC and other relevant agencies
FG Strategy E: Efficient financial management and reporting			
Priority Actions		Implementing Agency	
		Main	Support
FG-E1	Introduction of a system of “biodiversity budget code” and integrating it in national plans and programmes of relevant ministries by 2016.	MoFSC, MOF	NPC

5.5.15 Monitoring, Evaluation and Reporting

Designing and implementing monitoring and evaluation (M&E) systems and their regular reporting on the state of biodiversity and the success of conservation actions are crucial to ensure that national efforts are making a difference to biodiversity management. The M&E system proposed here is based on ‘the theory of change’ approach and entails, among others, setting targets, identification of performance indicators and means of verification. This will ensure independent evaluation process and will further identify clear roles and responsibilities of concern stakeholders to meet minimum national and international quality standards.

Table 22: Strategy for monitoring and evaluation of NBSAP implementation

Selected National Targets	Performance Indicator(s)	Means of Verification	M&E Schedule	M&E Responsibility
Protected Area Biodiversity				
Programme of Work on Protected Area (POWPA) developed and implemented by 2016.	Status of POWPA implementation	Office records and field verification	2017 and 2020	BED/MoFSC
Conservation plans for 20 additional priority species (10 animals and 10 plants) developed and implemented by 2020.	Number of species’ conservation plans developed and implemented.	Office records and field verification	2017 and 2020	BED/MoFSC
Methods/processes for economic valuation of ecosystems services available by 2017.	Existence of such Methods/processes	Office records and field verification	2017 and 2020	BED/MoFSC

Plans for sustainable management of at least five grasslands and five wetlands inside protected area prepared and implemented by 2020	Number of habitat management plans developed and implemented.	Office records and field verification	2017 and 2020	BED/MoFSC
“Overpass” and/or “underpass” built in at least three key locations (including one at the highway in Barandabhar corridor) to allow free movement of wild animals across adjacent habitats, by 2020.	Number of “overpass” and/or “underpass” built	Office records and field verification	2017 and 2020	BED/MoFSC
Protected area tourism management system revised (including structure of the entry fee and its distribution) by 2016.	Number of protected areas implementing ecotourism; change in revenue generated	Office records; field verification	2017 and 2020	BED/MoFSC
Forest Biodiversity outside Protected Area				
At least 50 percent of the production forests come under sustainable management by 2020.	Change in forest area under scientific management	Office records and field verification	2017 and 2020	BED/MoFSC
At least 10 percent of the remaining government-managed forests come under community based management by 2020.	Change in forest area managed by communities	Office records and field verification	2017 and 2020	BED/MoFSC
All the DFOs and FUGs will develop and implement NTFPs management plan, especially targeting conservation of over-harvested species by 2020.	Number of districts and user groups implementing such plans	Office records and field verification	2017 and 2020	BED/MoFSC, DOF
The rate of forest loss and degradation reduced by at least 75 percent of the current rate by 2020.	Change in rate of forest loss and degradation	Survey reports and maps	2016 and 2020	DFRS
At least 10,000 ha of the encroached forestland reclaimed by 2020.	Area of encroached forestland	Office records and field verification	2016 and 2020	BED/MoFSC
All the districts, community forests, collaborative forests, and leasehold forests management plans have mandatory inclusion of a biodiversity chapter and the DFOs and user groups implement those provisions by 2020.	Percentage of the districts and user groups having mandatory inclusion of a biodiversity chapter in their forest management plans	Review of management plans and sample field verifications	2017 and 2020	DOF
All the forests in the five north-south priority corridors (Figure 15) have conservation-friendly management by 2020.	Proportion of the corridors forest area with conservation-friendly management	Review of management plans and sample field verifications	2017 and 2020	BED/MoFSC
Additional 5,000 hectares degraded forest rehabilitated through pro-poor leasehold forestry by 2020.	Change in forest area under leasehold forestry	Office records and field verification	2016 and 2020	BED/MoFSC
Rangeland Biodiversity				
Assessment of status and trends of biodiversity and biological resources in at least 10 major rangelands completed by 2020.	Changes in understanding of rangeland ecology and biodiversity.	Scientific reports and publications	2017 and 2020	BED/MoFSC, MOAD
Conservation action plans for at least 10 threatened rangeland-dependent plant and animal species	Number of species’ conservation plans developed	Office records and field verification	2017 and 2020	BED/MoFSC, MOAD

developed and implemented by 2020.	and implemented.			
The roles and responsibilities of DOF and DLS in the management of rangelands located outside protected area harmonized by 2016.	Status of harmonization in the roles and responsibilities of the two departments.	Office records and interviews with relevant officials	2017 and 2020	BED/MoFSC, MOAD
Wetland Biodiversity				
By 2017, status of biodiversity in at least 10 major wetlands assessed.	Change in understanding of wetland biodiversity.	Scientific reports and publications	2017 and 2020	BED/MoFSC
By 2020, additional five wetlands of international importance enlisted as Ramsar sites.	Number of additional wetlands in Ramsar list	Ramsar List	2020	BED/MoFSC
By 2020, plans for maintaining unhindered north-south biological connectivity in at least three major rivers developed and implemented.	Number of rivers with unhindered biological connectivity	Office records and field visits	2017 and 2020	BED/MoFSC
Encroachment and eutrophication controlled in at least 10 major wetlands by 2020.	Number of wetlands with encroachment and eutrophication controlled	Office records and field visits	2017 and 2020	BED/MoFSC
An effective mechanism to control mining of gravel and sand from rivers and streams developed and implemented by 2015.	Existence of such mechanism and status of its implementation	Office records and field visits	2016	BED/MoFSC
By 2020, conservation plans (<i>in-situ</i> and <i>ex-situ</i>) for at least 10 threatened and economically valuable native fish and other aquatic species developed and implemented.	Number of species' conservation plans developed and implemented.	Office records and field verification	2017 and 2020	MOAD
By 2017, at least three suitable wetlands declared and managed as fish sanctuaries.	Number of fish sanctuaries developed and managed.	Office records and field verification	2018	BED/MoFSC
By 2020, plans to control industrial pollution in at least five major rivers and five other wetlands developed and implemented.	Number of plans developed and implemented.	Office records and field verification	2017 and 2020	MOSTE
By 2020, commercial fish farming initiated in at least three hydropower reservoirs.	Number of reservoirs with commercial fish farming.	Office records and field verification	2017 and 2020	MOAD
By 2016, the roles and responsibilities of different government line agencies (such as DOF, DOA, NEA, DOI) in the management of wetlands located outside protected area clarified/harmonized.	Change in current status of clarity/harmonization in the roles and responsibilities of the agencies.	Office records and interviews with relevant officials	2016	BED/MoFSC
Agrobiodiversity				
Community based management of agrobiodiversity strengthened and expanded to at least five additional districts by 2020.	Change in coverage of community based agrobiodiversity management	Office records and field verification	2017 and 2020	MOAD
By 2020, effective functional linkage established between the Gene Bank and community based seed or gene banks.	Existence and nature of such linkage	Office records and field verification	2017 and 2020	MOAD, NARC

By 2020, the Gene Bank will collect and conserve genetic materials of at least 75 percent of the commonly cultivated crop and horticulture species.	Change in status of the Gene Bank	Gene Bank records and verification by observation	2017 and 2020	NARC
By 2020, at least 10 wild relatives of domesticated crops effectively conserved (<i>in-situ</i> or <i>ex-situ</i>).	Number of such wild relatives conserved	Office record and field verification	2017 and 2020	MOAD
By 2020, a plan to monitor the level and nature of use of insecticides, pesticides and chemical fertilizers developed and implemented.	Existence of such plan and status of its implementation	Office record and field verification	2019	MOAD, and NARC
By 2020, DNA level characterization of at least 10 native breeds of livestock completed.	Status of DNA level analysis by species/breeds and quality	Office record and interviews with relevant officials	2020	NARC
By 2020, one-door system for regulating genetic resources (both PGR and AnGR) established.	Existence of such system and status of its implementation	Office record and interviews with relevant officials	2019	MOAD, and NARC
Mountain Biodiversity				
Research focusing on biological richness of mountain ecosystems, and diversity-driven ecosystem services completed in at least 10 major mountain ecosystems, by 2020.	Change in understanding of mountain biodiversity and ecosystem services.	Scientific reports and publications	2017 and 2020	BED/MoFSC
By 2020, at least 10,000 hectares degraded mountain ecosystems restored through implementation of ecosystem based adaptation programmes.	Area of degraded mountain ecosystems restored	Office record and field verification	2017 and 2020	BED/MoFSC
Cross-cutting Themes and Sectors				
By 2015, a National Strategic Framework for Conservation developed and implemented	Status of the Framework	Office records	2016	NBCC
Umbrella legislation for conservation and sustainable use of biodiversity enacted by 2016.	Existence of such legislation	Office records	2017	BED/MoFSC
Legislations on CITES, ABS, plant protection, and farmers' rights formulated and enacted by 2018.	Existence of such legislations	Office records	2019	BED/MoFSC
By 2016, the National Parks and Wildlife Conservation Act (1973) amended to address the changed ecological, social and political context	Status of revision in the Act	Review of the Act	2017	BED/MoFSC
The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization ratified by 2015.	Nepal's position in the Nagoya Protocol	Review of the Protocol	2016	BED/MoFSC
The Genetic Resources and Benefit Sharing Bill finalized and enacted by 2016.	Status of the Bill	Office records	2017	BED/MoFSC
A <i>sui generis</i> legislation for protection of plant varieties formulated and enacted by 2017.	Existence of such legislation	Office records	2018	BED/MoFSC
Intellectual property rights legislation formulated and	Existence of such legislation	Office records	2019	BED/MoFSC

enacted by 2018.				
By 2019, biodiversity considerations incorporated in the policies, plans and programmes of relevant line ministries and other relevant government and non-government agencies.	Number and proportion of new and revised policies, plans, and programmes that have integrated biodiversity.	Office records	2019	BED/MoFSC; Academic institutions
By 2016, the Government of Nepal (Allocation of Business) Regulations (2012) revised for giving biodiversity mainstreaming due importance	Changes in scope of work of the Council of Ministers, NPC and relevant sectoral ministries	Office records	2017	BED/MoFSC
By 2016, at least all the government policy have been reviewed and mainstreamed gender and social inclusion policy	Number of policy documents with GSI mainstreamed	Office records	2017	BED/MoFSC, Universities
By 2020, government and all other stakeholders will ensure at least 33 percent meaningful participation of women, <i>dalit</i> , <i>janajatis</i> and marginalized communities at all levels of planning and decision making.	Change in the level of participation	Office and field records	2016	Relevant ministries
By 2020, ensure equitable access of women and men, including disadvantage social groups to biological resources and benefits sharing.	Change of access and benefit sharing of women, men, indigenous groups and marginalized communities	Office and field records	2020	Relevant ministries
By 2015, separate Biodiversity and Environment Division established and operationalized at the MoFSC.	Existence of the division	Ministries records, and interviews with officials	2016	BED/MoFSC
By 2016, organizational structure of the MoFSC departments revised as per the changed context.	Existence of the revised organizational structures	Office records, and interviews with officials	2017	BED/MoFSC
By 2017, Environment Friendly Governance District/Village/Municipality Coordination Committees established in at least the selected 15 DDCs and 30 VDCS/Municipalities to plan, coordinate, monitor and execute biodiversity management in respective areas.	Existence of such institutions	Office records, and interviews with officials	2017	NBCC, MOFALD
By 2020, LBSAP developed and implemented by 30 VDCs/municipalities	Existence of LBSAP and status of implementation	Office records, and interviews	2020	NBCC, MOFALD,
By 2016, a forestry sector human resource development plan developed and implemented.	Existence of such plan and status of its implementation	Office records, and interviews with officials	2017	BED/MoFSC
The landscape management strategy revised and implemented by 2016.	Existence of revised strategy and status of its implementation	MoFSC records	2017	BED/MoFSC

Development, by 2015, and effective implementation of <i>Chure</i> conservation strategy	Existence of such strategy and status of its implementation	Office records, and interviews with officials	2016	BED/MoFSC
By 2020, participatory and integrated soil and water conservation initiatives implemented in at least 30 critical sub-watersheds.	Number and area of critical sub-watersheds where such initiatives are implemented.	Office records and field verification	2017 and 2020	BED/MoFSC
By 2020, detail survey of the coverage and research on modes of propagation, ecological and economic damage and loss, control measures, and possible uses of at least five most problematic IAPs completed.	Number of surveys conducted and species and area covered	Office records and field verification	2017 and 2020	BED/MoFSC
By 2020, a low-carbon economic development strategy and climate-smart biodiversity management plan developed and implemented.	Existence of such strategy and plan and status of their implementation	Office records, and interviews with officials	2017	MOSTE, BED/MoFSC
The National REDD Strategy finalized and approved by 2016.	Status of the Strategy	Office records	2017	BED/MoFSC
By 2020, climate change adaptation planning adopted by at least 3,000 communities based forest user groups.	Changes in number of such climate resilient plans	Office records, and interviews	2017 and 2020	DOF
By 2020, at least five percent of the forested ecosystems restored through implementation of REDD+ program.	Number of ecosystems and area covered by REDD+ program.	Office records, and interviews with officials	2017 and 2020	BED/MoFSC
By 2020, the concept of Smart Green Infrastructure applied while constructing new infrastructure such as roads, railways and transmission lines within protected areas.	Type and status of infrastructures constructed within protected area	Office records and field verification	2017 and 2020	BED/MoFSC
By 2017, existing information on ecosystems and species updated, by 2017.	Changes in understanding of ecosystems and species.	Scientific reports and publications	2018	BED/MoFSC;
The Flora of Nepal project successfully completed by 2020.	Status of the project's progress	Number of volumes published	2017 and 2020	BED/MoFSC
Updated information on the status of endemic plant species available by 2016.	Status report	Publication of the report	2017	BED/MoFSC
National Clearing House Mechanism upgraded and made fully functional by 2015.	Status of the National Clearing House Mechanism	Review of the Mechanism	2016	NBCC
A National Biodiversity Information Management System (NBIMS) established at the MoFSC and operationalized by 2016.	Status of the National Biodiversity Information Management System	Review of the System	2017	NBCC
By 2020, status of nationally threatened, rare and endangered species of flora and fauna updated.	Changes in knowledge of threatened species.	DNPWC records	2017 and 2020	BED/MoFSC
Baseline survey of NTFPs and animal genetic resources completed by 2020.	Changes in status of knowledge in the subjects	Office records, and publications	2017 and 2020	MoFSC, MOAD
By 2020, at least 100 new audiovisual packages on	Number of audiovisual	Office records and	2017 and	BED/MoFSC

different aspects of biodiversity prepared and disseminated	packages developed and distributed	interviews	2020	
By 2020, on-site lecturing, demonstration and interpretation infrastructure developed in at least five selected protected areas and Ramsar sites.	Number and type of infrastructural facilities established	Office records and interviews	2017 and 2020	BED/MoFSC
By 2020, three modern zoos established to conserve threatened flora and fauna and to educate people about them.	Status of the new zoo	Office records and field verification	2017 and 2020	BED/MoFSC
Knowledge in climate risk assessment and initiate climate-smart agriculture and forest management programmes developed by 2020	Number of climate-smart programmes developed	Office records and interviews	2017	MOAD, MoFSC
Result based monitoring and evaluation systems developed and implemented in at least two programmes by 2020	Existence of such M&E framework, and number of programmes with M&E system implemented	Office records and interviews	2016 2020	NBCC

CHAPTER 6: ARRANGEMENT FOR IMPLEMENTATION OF THE STRATEGY

6.1 Institutional Arrangements

6.1.1 Implementing Agencies

The main responsibility of implementing the NBSAP lies with the relevant government ministries, departments and their district, sub-district, and VDC/municipality level line agencies. Local governments (DDCs, VDCs, and municipalities), NGOs, academic institutions, user groups and other CBOs, and farmer households are other key institutions to be involved in its implementation (Figure 20).

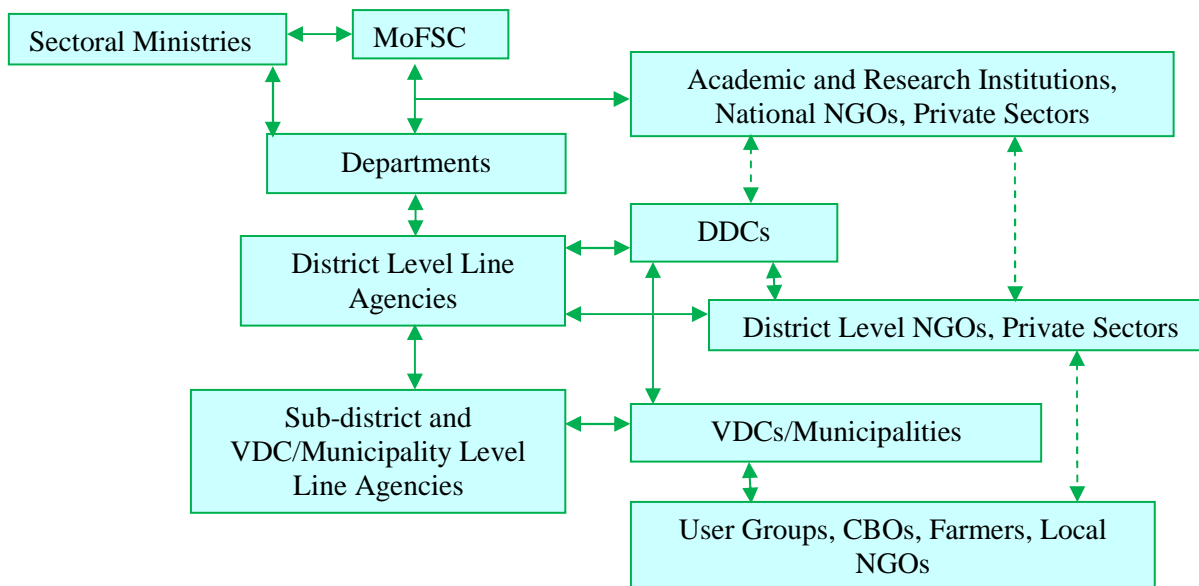


Figure 20: Main institutions involved in implementation of NBSAP

The Ministry of Finance, relevant international agencies, donors, INGOs, Civil Society Organizations, and private sector will support the government agencies, user groups, and other stakeholders for smooth implementation of the NBSAP. With diverse drivers of biodiversity loss, it is apparent that concerted and consolidated effort by all stakeholders is required to address them. All the sectoral ministries, their departments and district level line agencies whose policies, plans, and programmes have direct or indirect impact on biodiversity, will take appropriate measures for conservation of biodiversity, and prevention and controlling the loss of biodiversity and degradation of ecosystems.

Relevant government agencies at different levels will be directly responsible and fully accountable for ensuring that their policies, plans and programmes support ecologically, economically and socially sustainable development. Besides, they should comply with the relevant decisions of the National Biodiversity Coordination Committee (NBCC), Environment Friendly Governance District Coordination Committee (EFGDCC), Environment Friendly Local Governance Village Coordination Committee (EFLGVCC) and Environment Friendly Local Governance Municipal

Coordination Committee (EFLGMCC). While carrying out their sectoral mandates, the agencies will ensure that fulfillment of their sectoral mandates do not cause any adverse impact on biodiversity and ecosystems.

6.1.2 Coordination and Monitoring

(A) National Level Coordination and Monitoring

The National Biodiversity Coordination Committee (NBCC) will be the main institutional entity for coordination and monitoring of biodiversity related programmes at the national level. The NBCC will be a 27-member body chaired by the Minister for Forests and Soil Conservation, and represented by the government, academic sectors, independent experts and I/NGOs (Table 23).

Table 23: Composition of National Biodiversity Coordination Committee

SN	Designation and Organization	Position in NBCC
1	Honorable Minister, Ministry of Forests and Soil Conservation	Chairperson
2	Honorable Member (Agriculture and Rural Development Portfolio), National Planning Commission	Member
3	Secretary, Ministry of Agricultural Development	Member
4	Secretary, Ministry of Science, Technology and Environment	Member
5	Secretary, Ministry of Federal Affairs and Local Development	Member
6	Secretary, Ministry of Energy	Member
7	Secretary, Ministry of Commerce and Supplies	Member
8	Secretary, Ministry of Physical Infrastructure and Transport	Member
9	Secretary, Ministry of Finance	Member
10	Professor, Tribhuvan University*	Member
11	Professor, Agriculture and Forest University*	Member
12	President, Federation of Nepalese Chamber of Commerce and Industry	Member
13	Senior Official, National Foundation for Development of Indigenous Nationalities	Member
14	Chairperson, Nepal Federation of Indigenous Nationalities	Member
15	Country Representative, IUCN Nepal	Member
16	Representative of a conservation I/NGO*	Member
17	Chairperson, FECOFUN	Member
18	Chairperson, National Federation of Buffer Zone Development Council	Member
19	Chairperson, National Federation of Private Forestry	Member
20	Representative from Farmer Groups/Associations*	Member
21	Two independent biodiversity experts (at least one woman)*	Members (2)
22	Coordinators of thematic sub-committees on Forest and Protected Areas; Agrobiodiversity; Biosecurity; and Monitoring and Evaluation	Members (4)
23	Secretary, Ministry of Forests and Soil Conservation	Member Secretary

* As nominated by the NBCC Chairperson.

The power and functions of the NBCC will be, among others, to:

- Advise the government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilization of biological resources.

- Lead and coordinate in developing policies, plans and programmes related to biodiversity management.
- Coordinate and monitor the implementation of biodiversity related policies, plans and programmes by different ministries, local governments, and other agencies.
- Provide political and institutional guidance for implementation of the NBSAP.
- Coordinate with donors for securing funds for implementation of the NBSAP.
- Facilitate implementation of access to genetic resources and benefit-sharing mechanism.
- Facilitate and monitor works of the EFGDCC and DFSCC.
- Set up NBCC thematic sub-committees as necessary, including separate sub-committees on Forest and Protected Areas, Agrobiodiversity, Biosecurity, Wetlands and Monitoring and Evaluation.
- Conduct regular monitoring and evaluation of implementation of the NBSAP to ensure that biodiversity related programmes and projects are in line with the vision and goal of the NBSAP.
- Coordinate with the NPC, Council of Ministers, and Parliament.
- Prepare and disseminate national status report on NBSAP implementation, including an annual report to the Parliament.
- Perform any other functions as may be necessary for the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits.

There will be four theme-specific sub-committees under the NBCC, one each on Forest and Protected Areas, Agrobiodiversity, Biosecurity, and Monitoring and Evaluation. Each of the thematic sub-committees will comprise of five to seven relevant experts nominated by the NBCC. The experts can be associated with relevant government or non-government agencies or independent professionals who have excelled in the subject. The sub-committee members will select a coordinator from among themselves. The sub-committees will support the NBCC in all aspects of the theme-specific technical matters.

A Biodiversity and Environment Division (BED) headed by a technical joint secretary will be set up at the MoFSC to manage day-to-day operations, including implementation of decisions of the NBCC and CBD COP. The Division will serve as the secretariat of the NBCC and National Focal Agency for the CBD, and will manage the national Clearing House Mechanism. It will be provided with adequate human and financial resources. In addition to the MoFSC staff, the division will also pull relevant technical staff from some other ministries on deputation. The NBCC and BED may form a technical committee to support them on technical matters, and can seek technical assistance from any national or international conservation agency.

The BED will be responsible for the following:

- Assist the NBCC chairperson and member secretary in discharging the power and functions of the NBCC effectively and efficiently.
- Follow up and liaise with different ministries and departments, CSOs and development and conservation partners for the implementation of the NBCC decisions.
- Coordinate with other relevant sectoral ministries, international organizations, and other stakeholders as may be required for the effective discharge of its duties and responsibilities.
- Assist the NBCC in coordination and monitoring the works of EFGDCCs and DFSCCs.

- Prepare and submit report to the NBCC on the status of implementation of the decisions of the NBCC; and the periodic national report to the CBD, Ramsar Convention, and CITES.
- Serve as the secretariat of the NBCC thematic sub-committees.
- Perform such other functions as may be determined by the NBCC.

(B) District Level Coordination and Monitoring

District level coordination and monitoring of biodiversity related programmes, projects and activities would be the responsibility of the Environment Friendly Governance District Coordination Committee (EFGDCC) to be constituted as per the provisions of the recently developed Environment Friendly Local Governance Framework (2013) of the government. The DFCC will continue to take lead in coordination and monitoring district level biodiversity related programmes until the EFGDCC is formed and becomes operational.

The composition of the EFGDCC will be as mentioned in the Environment Friendly Local Governance Framework (2013). Besides, one representative each of NGOs working to promote the interests of women; *adivasi janajati*; farmers and *dalits* will be included as members of the EFGDCC. The EFGDCC can form a biodiversity sub-committee comprised of representatives from relevant organizations and individual experts. The specific functions of the EFGDCC concerning NBSAP are as follows:

- Assist the DDC to develop and implement policies, plans and programmes related to conservation of biodiversity, sustainable use of its components and equitable sharing of benefits.
- Take lead in development and implementation of LBSAP by VDCs and municipalities.
- Implement decisions and comply with the directives of the NBCC.
- Report to the NBCC on quarterly basis.
- Encourage, motivate and facilitate local NGOs to support in the design and implementation of biodiversity management related programmes and activities.
- Regularly monitor relevant programmes of government line agencies and provide feedback.
- Document good practices and facilitate their replication to other areas.
- Perform any other functions as may be necessary for the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits.

It is the responsibility of concerned DDC to implement the decisions of the EFGDCC.

(C) Local (VDC/Municipality) Level Coordination and Monitoring

An Environment Friendly Local Governance Village Coordination Committee (EFLGVCC) and Environment Friendly Local Governance Municipal Coordination Committee (EFLGMCC) will be responsible for coordination and monitoring of biodiversity related programmes, projects and activities in respective VDCs and municipalities. The EFLGVCC and EFLGMCC will be constituted as per the provisions of the recently developed Environment Friendly Local Governance Framework (2013). The composition of the EFLGVCC and EFLGMCC will be as mentioned in the Framework. Besides the powers, functions and responsibilities provided to it by the Framework, the EFLGVCC and EFLGMCC will also be responsible to: (i) develop and implement programmes related to conservation of biodiversity including LBSAP at the VDC or municipality level, (ii) coordinate the implementation of biodiversity related policies, plans and programmes with the VDC

or municipality level line agencies, CSOs and user groups, and (iii) implementing decisions of the EFGDCC and complying with the decisions and directives of the NBCC and EFGDCC, and reporting to the EFGDCC once every six months.

(D) Linkage among the NBCC, EFGDCC and EFLGVCC/EFLGMCC

NBCC will serve as the overall lead and coordinating body for development and implementation of policies, plans and programmes related to biodiversity management. It will also facilitate and monitor works of the EFGDCC and DFCC. The EFGDCC will undertake coordination and monitoring of biodiversity related programmes, projects and activities at the district level. It will also be responsible for implementing the decisions of the NBCC and comply with the directives of the NBCC and reporting to the NBCC on quarterly basis.

EFLGVCC and EFLGMCC will be responsible for coordination and monitoring of biodiversity related plans, programmes, projects and activities in respective VDCs and municipalities. They will also be responsible for implementing decisions of the EFGDCC; complying with the decisions and directives of the NBCC and EFGDCC; and reporting to the EFGDCC once every six months. There will, therefore, be direct vertical linkage among the three levels of institutional entities (Figure 21), which is expected to ensure smooth and effective implementation of the NBSAP.

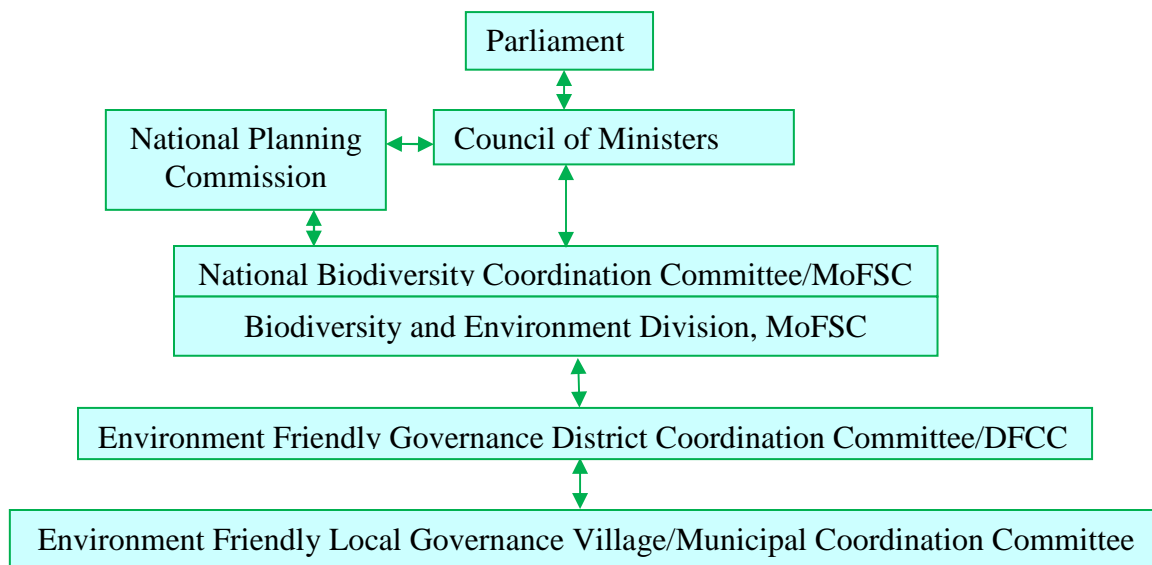


Figure 21: Agencies involved in coordination and monitoring of NBSAP implementation

6.1.3 Role of Conservation and Development Partners

- Financially and technically support implementation, monitoring and evaluation of the NBSAP and LBSAPs.
- Respect and support the decisions and initiatives taken by NBCC and EFGDCC.
- Mainstream conservation and sustainable use of components of biodiversity and prevention and control the loss of biodiversity and degradation of ecosystems in the decision-making process of donor coordination committees.

- Integrate biodiversity considerations into different development programmes and projects supported by them.
- Discourage any policy, plan, programme or project, which is likely to have significant adverse impact on conservation and sustainable use of biodiversity.
- Report to the NBCC about the biodiversity-related programmes and activities.
- Development and implementation of plan for sharing relevant data and information with the NBIMS and CHM.

6.2 Capacity Enhancement

There is an urgent need for assessment of the current capacity building activities implemented by different agencies at different levels before preparing a national capacity building strategy and action plan. A tentative list of national strengths, and gaps or constraints compiled from review of literature and consultations are presented in Table 24, and needs for priority actions are highlighted in Table 25.

Table 24: Strengths and gaps in national capacity for biodiversity management

Strengths	
1	Supportive national sustainable development framework
2	Nepal is one of the most progressive developing countries in terms of formulating environmental policies
3	Models of good forest and protected area management, and approaches for community based management of agrobiodiversity exist in the country
4	Possibility of implementing REDD+ in community-managed forests
5	Increased interest and involvement of I/NGOs and donors in biodiversity conservation
6	Increased awareness and media support for conservation
7	Biodiversity is being increasingly incorporated in academic curricula at all levels
8	Increased exposure of policy-makers and professionals to new technologies and exchange of information with international stakeholders through participation in international meetings and conferences
Gaps/Constraints	
1	Lack of coherent strategy to effectively communicate the value of biodiversity and impact of its loss
2	Lack of strategy to activate local bodies for biodiversity conservation
3	Poor level of harmony and connection, and in some cases, contradictions among biodiversity related policies and legislations
4	Inadequate translation of policies into plans and programmes, inadequate law-enforcing capacity, and inadequate inter-agency cooperation and complement
5	Lack of effective monitoring and evaluation system
6	Inadequate capacity of MoFSC (CBD Focal Agency) to coordinate and monitor biodiversity related plans, policies and programmes across sectors
7	Inadequate research funds, monitoring programmes, equipment and facilities
8	Lack of comprehensive guides on floral and faunal species
9	No system of using biodiversity indicators
10	Inadequate funds, technology and human resources for forest and protected area

	management, and inadequate programmes for sustainable management of rangelands and wetlands
11	Inadequate quarantine and detecting capacity to control introduction of IAS
12	Lack of a national vision, strategy and programme for <i>ex-situ</i> conservation
13	Inadequate capacity for biosafety research and inspection of GMOs
14	Incomplete knowledge of genetic resources
15	Lack of a comprehensive database on biodiversity, and weak data/information sharing platform
16	Lack of coordination of NGOs activities
17	Awareness in the civil society is generally high (and increasing) for the right but low with regard to accountability and responsibility
18	Inadequate participation and empowerment of farmers and local communities

Table 25: Capacity Needs for successful implementation of the NBSAP

SN	Needs	Main Responsibility	Time Frame
1	Development of a coherent strategy and mechanism to effectively communicate the value of biodiversity and impact of its loss	MoFSC	2016
2	Linking biodiversity with poverty reduction	NPC, MOFALD, MoFSC, MOAD	2020
3	Involving local governments in biodiversity conservation	MOFALD,	2016
4	Enhancing capacity of actors through training to law enforcement officials, community groups, NGOs, CSOs, private sector, media persons and other stakeholders at various levels on different aspects of biodiversity	MoFSC, MOFALD, MOAD, I/NGOs	2014-2020
5	Organizing periodic orientation and refresher training to technical staff of government line agencies, such as protected area, district forest, district agriculture, and district livestock office to enhance their capacity.	MoFSC, MOFALD MOAD	2014-2020
6	Conducting targeted capacity building activities to enhance capacities of disadvantaged social groups such as women, <i>dalit</i> , <i>janajati</i> and indigenous peoples to support their livelihoods and conserve biodiversity.	MoFSC, MOFALD MOAD and I/NGOs	2014-2020
7	Filling the policy and legislative gaps, including formulation of access to genetic resources and benefit sharing, and domestication of wild animals acts, and policies and acts related to prevention of invasive alien species, IPR etc.	MoFSC, MOAD, MLJPA	2016
8	Establishment of a mechanism for regular monitoring of biodiversity	MoFSC, NPC, MOAD and other relevant agencies	2015
9	Setting up of effective monitoring and evaluation mechanism	NBCC/MoFSC, NPC	2016

10	Enhancement of national coordination mechanism; increasing interagency cooperation	MoFSC and all relevant agencies	2016
11	Enhancing capacity of law enforcement agencies and professionals	MoFSC, and relevant departments	2018
12	Strengthening the MEA Focal Points of concerned Ministries	BED/MoFSC and NPC	2016
13	Enhancement of national research capacity	NPC, universities, MoFSC, MOAD, NARC etc.	2014-2020
14	Training and developing new pool of competent research professionals in required fields	Universities	2014-2020
15	Setting up mechanisms for exchange and sharing of research findings	BED/MoFSC	2016
16	Systematizing biodiversity monitoring, including development and use of biodiversity indicators	MoFSC and partner organizations	2017

6.3 Technology Needs Assessment

6.3.1 Brief Overview of Current Situation of Technology Development, Acquisition and Use

The significance of technologies for conservation and sustainable use of biodiversity is well established. In case of plant genetic resources (PGR), the available technologies for development, acquisition and use relate to: (a) seed conservation (short term), (b) in-vitro techniques, (c) regeneration and characterization, (d) seed testing, (e) improved forage species and varieties, (f) molecular techniques, (g) genetic enhancement and base broadening techniques, (h) conventional breeding, (i) value addition through breeding and non-breeding techniques, (j) identification of suitable forage species/varieties, and (k) forage conservation (hay and silage). The technologies for protecting species and genetic diversity (both forestry and horticulture) from adverse impacts of modern technologies are gene bank, field gene bank, and orchard management.

In case of animal genetic resources (AnGR), the available technologies for development and acquisition are cryo-preservation (semen conservation); characterization (biochemical level); semen production of cattle, buffalo and fish; and hatchling of gharial from collected egg. Similarly, the technologies for acquisition and use are improved livestock breeds and semen; vaccines and medicines for prevention and control of diseases. For protecting biodiversity from adverse impacts of modern technologies in case of AnGR, the available technologies are cryo-bank (semen); maintenance and management of local livestock at *in-situ* (by the community), and value addition including product diversification.

Although climate change has posed a serious challenge on socio-ecological systems, exploring appropriate technologies and knowledge to address negative impact of climate change is still at nascent stage. So far, climate change adaptation and mitigation are being treated as separate components. Nepal has developed NAPA to address urgent and immediate issues on climate change and the government is in the process of developing low carbon economic development strategy, which will formally introduce the possibility of synergizing adaptation and mitigation together while addressing climate change concerns. There have also been some other initiatives such as

climate compatible development to address development, adaptation and mitigation needs of the country. Some useful climate change tools and technologies related to biodiversity include: (i) climate change and ecosystem modeling at the local and national scales, (ii) long-term ecosystem monitoring, and (iii) climate change and disaster risk assessment.

6.3.2 Technology Needs for Biodiversity Management

A simple action plan for technology development, acquisition and use is summarized in Table 26.

Table 26: Action plan for technology development, acquisition and use

Areas of Technology	Activities to be Implemented During 2014-2020	Main Implementing Agency	Supporting Agencies
Conservation of forest biodiversity	Genetic conservation and mapping of threatened fauna and flora; establishment of Gene Bank, strengthening the Forensic Laboratory; development and use of technologies for controlling IAS, and automated tracking devices and other modern techniques for monitoring landscape changes, and community and population dynamics.	DOF, DNPWC, DPR, DSCWM, DFRS, NTNC, Forensic Lab	NARC, NAST, Universities, Conservation NGOs
Development, acquisition and use in PGR	DNA sequencing; molecular marker based technology; microorganism bank; insect bank	NARC, Universities	DOA, NGOs, Universities, CGIAR, companies
Access of PGR from international system	Genetic enhancement base broadening techniques; facilitating implementation of SMTA	Gene Bank	DOA, NGOs, Universities, CGIAR, Community Seed Banks
Bio prospecting	Design and implementation of bio prospecting strategy and action plan	DPR, NARC, Academic Institute	DOF, DOA, Academic Institutes, companies
Protecting biodiversity from adverse impacts of modern technologies	GMO testing technologies	Quarantine, NARC, DPR	DOA, Universities
Development and use in AnGR	Characterization at DNA level; identification of local breeds for disease and parasites resistance	NARC, Universities	DLS, INGOs, CGIAR/ University
Acquisition and use in AnGR	Establishment of techniques for semen production in pigs and goats; microorganism bank; package for integrated rangeland management; genetic enhancement base broadening	NARC, Universities	DLS, INGOs, CGIAR, Universities

Protecting biodiversity from adverse impacts of modern technologies in AnGR	Semen production techniques for pigs and goats; quality semen (tested) of cattle, buffalo, pigs and goats; carpet type sheep breeds; seed for vaccines and medicines; suitable forage species; improvement of local breeds; value addition through breeding; capacity enhancement for assessing the effects antibiotics, growth promoters and others on human health	NARC, DLS	Universities, CGIAR, Private companies
<i>Ex-situ</i> conservation of aquatic fauna, focusing on endemic, native and threatened species	Identification of endemic and native fish and other species for disease and parasite resistance; induced breeding techniques for propagating indigenous species in hatchery.	NARC, DLS	INGOs, CGIAR, Universities
Protecting genetic diversity from hazardous hybridizations in fish	Genetic confirmation of pure line before stocking in the natural ecosystem.	NARC, DOA	INGOs, CGIAR, Universities
Exploration and use in fisheries	Technology of testing the chemical properties and value addition of different fish species used for medicinal purposes	NARC, DOA	INGOs, CGIAR, Universities
Conserving fish diversity	Technology for in and <i>ex-situ</i> conservation of valuable fish resources and their sustainable utilization	NARC,DOA	INGOs, CGIAR, Universities
Protecting herpeto fauna	Drugs extraction technology and value addition from different amphibians and reptiles which are traditionally used in medicinal practices	NARC, DOA, DNPWC, DOF	INGOs, CGIAR, Universities, Conservation NGOs
Geospatial techniques	Geospatial technologies, specifically, satellite imageries, Geographic Information System and Global Positioning System	MoFSC, MOAD, NARC, Universities	

6.4 Communication, Extension and Outreach

6.4.1 Communication Framework

There is a need for a holistic Communication, Extension and Outreach (CEO) strategy and its dissemination framework for promoting conservation education, which is required for successful implementation of the NBSAP. This section attempts to analyze various key elements of the communication process in order to achieve communication objectives and presents mechanisms to promote CEO in the management of biodiversity. This is expected to enable relevant institutions for effective sharing of knowledge, suggest measures for building capacity, present goals, provide link between and among people doing similar works, and build links between national and international networks.

NBSAP recognizes that successful implementation of the strategy is reliant upon the development of a cooperative partnership among all the key stakeholders, including the government, community groups, farmers, business sector, and academic institutions. Communication networks and extension services are fundamental to achieve this goal. Communication and education will provide the basis for continued responsiveness to major biodiversity related issues. Establishment and operationalization of the national Clearing House Mechanism is another key component of the CEO strategy as it provides a platform to share knowledge, information and data related to biodiversity through one window system. The CEO will ensure that the actions of all government and non-government stakeholders involved in biodiversity conservation are consistent with Nepal's commitment to CBD's outreach programme, which aims at increasing knowledge and understanding of biodiversity values and benefits.

The overall goal of this framework is to enable the NBCC Secretariat to implement its CEO activities effectively and engage target audiences with biodiversity conservation goals. This is to be achieved through use of different messages, communication tools and platforms for different levels of audiences (Table 27; Table 28).

Table 27: Communication, extension and outreach framework

Key Target Audiences	Explanation	Expected Outcomes
Government agencies and conservation organizations	Provide advice, advocacy and information on issues involving biodiversity conservation	<ul style="list-style-type: none"> • Awareness, understanding and appreciation of biodiversity developed. • International cooperation and synergy among relevant multilateral environmental agreements promoted. • On-site lecturing, demonstration and interpretation infrastructure in selected protected areas and Ramsar sites developed.
Policy makers (politicians and senior bureaucrats)	Responsible for developing enabling policies, plans and legislations	Biodiversity conservation will get due priority in the country's environmental agenda.
CBOs, traditional	Natural resources	<ul style="list-style-type: none"> • Awareness, understanding and appreciation of

institutions and local user groups	dependent communities	the role of forest, wetlands and landscapes developed. <ul style="list-style-type: none"> • Collaboration with tourism entities, such as the Nepal Tourism Board established.
Educational Institutions	Schools located close to protected areas and Ramsar sites, and other relevant institutions	Greater awareness, understanding and appreciation of the role the national parks, Ramsar sites and other natural sites developed.
Tourism entrepreneurs	Organizations and individuals engaged in tourism business	Nature based tourism is further promoted.

Table 28: Messages, communication tools and communication platforms

Messages to be Communicated	Communication Tools	Communication Platforms
<ul style="list-style-type: none"> • Importance of biodiversity in balancing conservation and development • Role of different line agencies (MoFSC, MOFLD, MOAD, DDC, VDC), CBOs, user groups, individuals including women, <i>dalits</i> and indigenous peoples in conservation of biodiversity • Sustainable use of the biodiversity and equitable sharing of benefits • Possible impact of biodiversity loss on human well-being • Relationship between biodiversity and climate change • Socioeconomic impacts and livelihoods of local farmers and communities • Policy, legislation and governance systems needed to address the biodiversity threats 	<ul style="list-style-type: none"> • Technical publications (technical documents, scientific publications, brochures, posters) • Popular versions of technical publications • Popular versions of posters and brochures in the local Languages • Training manuals • Policy briefs • Websites • Television, radio • Social electronic media • Multimedia (images, photos, videos, postcards) • Email messages • Mobile phones, SMS messages • Print media (newspapers and magazines) • Journal publications 	<ul style="list-style-type: none"> • Clearing House Mechanism (CHM) • Dialogue • Field visits • Field trainings • Workshops • Exhibitions • Forest user groups • Farmer groups • DDC Councils • Municipal Councils • VDC Councils

Note: Different communication tools and platforms will be used based on the target audience.

6.4.2 Communication, Extension and Outreach Plan

The plan for implementation of the CEO strategy is summarized in Table 29. Status of its implementation will be monitored on a quarterly basis using performance indicators, and adjusted accordingly.

Table 29: Communication, Extension and Outreach Implementation Action Plan

Actions	Target Audiences	Lead Role
Production of brochures on biodiversity conservation	All	NBCC Secretariat
Scientific publications	Professionals	Universities, research organizations
Publications targeting the general public	General public	NBCC Secretariat
Publication of journal articles	Policy makers, scientific community	Universities and individual scholars
Preparation of training manuals	Technical staff of line agencies	Educational institutions, relevant government agencies
Reviewing policies and regulations and preparing policy briefs	Policy makers	Relevant ministries and departments
Development of mechanism to incorporate local knowledge, practices of indigenous peoples and local communities	Local communities, VDC officials, NGOs, CBOs	DOF, DNPWC, DOA, DLS, MOSTE, MOFLD
Production of manuals on controlling Invasive Alien Species	Local people, VDC, CBO, government line agencies	NAST; NARC; DFRS; TU and government departments
Promotion of eco-tourism	Staff, visitors, local communities	DNPWC, Nepal Tourism Board,
Improvement in awareness about the role of protected areas	General public	DNPWC
Promotion of alternative livelihoods to control illegal fishing, hunting and harvest and trade of timber	General public, Local communities, CBOs	DNPWC, DOA
Awareness raising and capacity building	CFUGs, LFUGs	DOF, DFO
Awareness raising on conservation friendly management of biological corridors	FUGs, CBOs, NGOs	DNPWC, DOF
Entrepreneurship development training in business planning, improved storage, market analysis, technical and market aspect of value added processing of medicinal and aromatic plants.	FUGs, CBOs, NGOs	DPR, DFRS
Awareness campaign on conservation of rangeland biodiversity	Communities, CBOs, NGO	DLS, DOF
Capacity building pastoral development and management	Professionals, Local communities	NARC, academic institutions

Awareness and capacity building to prevent extinction of threatened species.	Professionals, local communities	NBCC, academic institutions, NARC
Understanding of the importance of biodiversity conservation enhanced	Students	Schools Colleges and graduate schools
Production of posters	General public	Line agencies/project, NGOs
Production of brochures of technical information	All	Concerned line agencies
Press releases	General public	Concerned line agencies
Production of video, documentaries	All	NBCC Secretariat
Posting/updating biodiversity information on websites	National and international	NBCC Secretariat
Presentations/Exhibitions	Local leaders and communities	Concerned line agencies
Face to face talks and advice	Local leaders and communities	Concerned line agencies
Presentations at local and international workshops	Local and international audience	Concerned line agencies
Engagement of mass media	General public	Concerned line agencies
Testing training curricula and manual	Students	Concerned line agencies
Sending messages to emails and mobile	Selected opinion leaders	IT teams
Phones of selected stakeholders and opinion leaders	Selected opinion leaders	Concerned line agencies
Talk shows on FM	All	Concerned line agencies
Field schools on wise use of biological resources	Local communities	Concerned line agencies
Conducting stakeholder workshops on importance of wetland and their conservation	All	Concerned line agencies
Awareness campaign on the endemic and endangered species	Local communities	DOF, DNPWC
Training on impact of dams on biodiversity and its mitigative measures	CBOs, NGOs, professional associated with water resource development projects	Academic institutions
Production of annual report	Policy makers, local leaders, donors, local communities	Concerned line agencies
Enhancement of the capacity of local bodies, different stakeholders, women and socially disadvantaged groups	CBOs, NGOs, local communities	Line agencies, INGOs
Raising awareness for mainstreaming gender equality and social inclusion agenda in biodiversity	Professionals, DDC, VDC, local communities	Biodiversity Focal Points

6.5 Fund Generation and Mobilization

6.5.1 Current Situation of Funding for Biodiversity Management

In Nepal, biodiversity management activities of government agencies are usually integrated into sectoral (such as forestry, agriculture) development programmes and projects. There is no system of keeping separate records of the costs related to management of biodiversity, and there is no separate budget code dedicated to biodiversity. Lack of disaggregated data makes it very difficult to assess the actual level of funding and cost of biodiversity management in the country.

An analysis of the programme budget allocated for the MoFSC during the last decade shows that bulk of the funds (i.e. 84.4%) came from the government source. Ploughing back part of the revenue generated by respective protected areas (30-50%) remained an important source of funding for implementing conservation programmes in buffer zones and conservation areas. Foreign assistance contributed 15.6 percent of the total cost. The REDD programme, FRA project, *Chure* conservation programme and the Multi-stakeholder Forestry Programme made substantial contributions to forestry sector funding in recent years. Funds of the NTNC, CFUGs and NGOs/INGOs, which are not included in the government's Red Book, were some other internal sources of funding. NTNC uses its funds mainly to manage Conservation Areas under its management. Corporate bodies' contributions relate to the payments made for implementing mitigation measures as prescribed in EIA reports of development projects. It is even more challenging to assess the funding available for management of biodiversity by other sectors.

6.5.2. Constraints and Gaps

Conservation and sustainable use of biodiversity is yet to become a priority programme in Nepal. One of the main reasons behind is the absence of a system to account for the roles of biodiversity and ecosystems in sustainable development of the country. The current national accounting system does not value the services provided by protected areas, forests, wetlands and other natural ecosystems.

The agriculture policy of the government is oriented to commercialization to increase production with little attention on conservation and sustainable utilization of the large pool of local crop, horticulture and livestock varieties and breeds, which are usually less productive than hybrid varieties and breeds. While this can be considered a right approach towards enhancing food security and livelihoods of farmers, it presents a serious risk of losing the precious local species and varieties before their full economic potentials are realized. The need for conservation of local and indigenous varieties and breeds is necessary especially in the context of changing climate conditions and associated threats. Another major gap relates to the negligible funding available for research, monitoring, reporting, and biodiversity information management.

6.5.3. Funding Required for Successful Implementation of NBSAP and Possible Sources

A preliminary estimate of costs based on the recommended priority actions and past trends of funding, indicates that around USD 673 million (NPR 67,268 million) will be required for successful implementation of the NBSAP over the 2014-2020 period (Table 30).

Table 30: Year and theme-wise estimation of the NBSAP costs (USD ‘000)⁹

Fiscal Year	A	B	C	D	E	F	G	Total
2014/15	57,163	476	812	5,310	11,760	13,209	5,445	94,176
2015/16	61,246	510	870	5,690	12,600	14,153	5,834	100,903
2016/17	65,330	544	928	6,069	13,440	15,096	6,224	107,630
2017/18	69,413	578	986	6,448	14,280	16,039	6,612	114,356
2018/19	73,496	612	1,044	6,827	15,120	16,983	7,001	121,083
2019/20	81,662	680	1,160	7,586	16,800	18,870	7,779	134,537
Total	408,310	3,400	5,800	37,930	84,000	94,350	38,895	672,685

A = Forest biodiversity (protected area and outside), B = Rangelands biodiversity, C = Wetland biodiversity, D = Agro-biodiversity, E = Mountain biodiversity, F = Climate change adaptation (biodiversity), G = Other cross-cutting themes.

The government will be the main source of funding for implementation of the NBSAP. Some of the specific sources of internal funding include: (i) recycling of revenue collected from biodiversity-related products and services (such as wood and non-wood forest products, tourism, trekking, mountaineering fees), (ii) donations by private sectors, (iii) contributions by I/NGOs and CBOs, (iv) investment by private sectors (e.g. ecotourism, micro-hydropower), and (v) in-kind cooperation by local communities. Entry fee collected from visitors will be one of the main sources of funding for management of Conservation Areas. Technical assistance and bilateral and multi-lateral grants received from international agencies and donors, and loan from international community is expected to be the main external sources of funding (Table 31).

Table 31: Major sources of funding for implementation of the NBSAP (USD ‘000)

Fiscal Year	GON	Donors	I/NGO	Private Sector	Other*	Total
2014/15	51,797	23,544	9,418	1,884	7,534	94,177
2015/16	55,496	25,226	10,090	2,018	8,072	100,902
2016/17	59,196	26,907	10,763	2,153	8,610	107,629
2017/18	62,896	28,589	11,436	2,287	9,149	114,357
2018/19	66,595	30,271	12,108	2,422	9,687	121,083
2019/20	73,995	33,634	13,454	2,691	10,763	134,537
Total	369,975	168,171	67,269	13,455	53,815	672,685
Percent	55	25	10	2	8	100

*Including the community based user groups managing natural resources

Of the total amount required, about 15.2 percent (USD 102.4 million) has already been committed by jointly by the DFID, Government of Finland and SDC, under the Multi-stakeholder Forestry Programme, and an additional USD 26 million has been committed by INGOs for the 2014-2016 period (MOF, 2013). The Forest Carbon Partnership Facility, under the Emission Reduction Programme, is expected to be an important new source of funding for implementing climate change adaptation programmes and projects in near future. The Satoyama initiative could be another potential source of funding in near future, particularly for implementing the LBSAP.

⁹The table provides only a rough, preliminary estimate of the costs. Respective agencies implementing the priority actions will prepare their own estimates of the annual budget required for implementation of the NBSAP priority actions under their responsibilities.

The NBCC can decide on appropriate mechanism for funding the NBSAP activities, including establishment and operationalization of a separate trust fund for biodiversity by pulling financial resources from diverse stakeholders, including the government, I/NGOs, private sector and donors.

6.6 Monitoring and Evaluation

A monitoring and evaluation sub-committee will be established within the NBCC for improving and strengthening the monitoring and evaluation systems. The sub-committee will comprise of representatives from government ministries, NGOs, academic and research institutions and experts as identified by the NBCC. The MoFSC's Biodiversity and Environment Division will also serve as the secretariat for the M&E sub-committee.

The M&E sub-committee will ensure effective monitoring and evaluation by devising mechanisms for regular monitoring and periodic assessment of biodiversity related interventions at various levels. The M&E sub-committee will co-ordinate with government and non-government agencies to get progress status, outcomes and learning from their biodiversity related projects and programmes, annually. The sub-committee will meet at least twice a year to assess overall progress and draw lessons, and submit a report to the NBCC annually. The NBCC will then report to parliamentary committee and National Planning Commission and makes the information available for public. The NBCC will allocate adequate resources, approve plans and regularly supervise activities of the M&E sub-committee. A simple hierarchical reporting mechanism for M&E is presented in Figure 22.

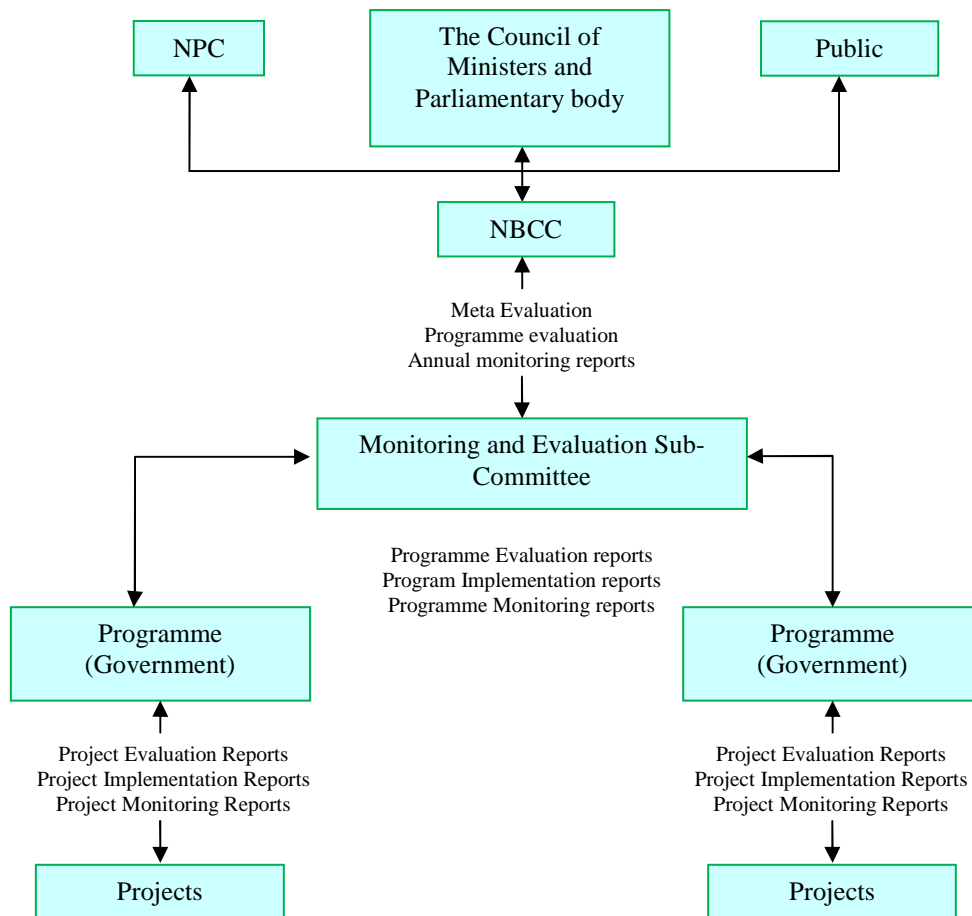


Figure 22: Monitoring, evaluation and reporting mechanism

Some of the specific tasks of the M&E sub-committee include: (i) developing a robust monitoring and evaluation system by 2015, (ii) carrying out meta evaluation two times (preferably in 2016 and 2019) and programme evaluations two times (preferably in 2015 and 2019), and (iii) conducting regular monitoring, sharing and capacity building, activities.

CHAPTER 7: FRAMEWORK FOR LOCAL BIODIVERSITY STRATEGY AND ACTION PLAN

7.1 Introduction

It is envisaged that the NBSAP vision and goal cannot be fully achieved without effective management of biodiversity at the local level. Preparation and implementation of the Local Biodiversity Strategy and Action Plan (LBSAP) is the first step towards initiating and systematizing the efforts of local bodies towards meeting the NBSAP objective. The LBSAP is expected to help translate the NBSAP's vision, and relevant principles, strategies and priority actions at local level by: (i) effectively communicating the NBSAP to local level stakeholders, (ii) mainstreaming biodiversity across various sectors at the grassroots level, (iii) decentralizing the biodiversity planning process, and (iv) systematically engaging the local level stakeholders in the management of local biodiversity.

The LBSAP framework is prepared for use as a guide by relevant VDCs and municipalities to prepare and implement their own LBSAP with support of the DDC and EFGDCC. Although the LBSAP will be developed and implemented by VDCs and municipalities, involvement of relevant DDC in the process is required to effectively link the central and local level efforts and ensure its smooth implementation. The LBSAP approach is in tune with the provisions of the Environment Friendly Local Governance Framework (EFLGF) in which the government has made its commitment to conserve biodiversity and use biological resources on a sustainable basis in cooperation with the local governments.

In the first phase (i.e. by the year 2020), the LBSAP initiative will be implemented in 30 selected VDCs and municipalities located in 15 districts across Nepal, including Ilam, Taplejung, Morang, Udayapur, Dhanusha, Makawanpur, Chitwan, Rasuwa, Kaski, Mustang, Surkhet, Kalikot, Bardiya, Kailali and Doti. These are the districts consulted during the process of NBSAP development. The specific VDCs or municipalities within each of the districts (two in each district) will be selected by respective DDCs. Although the DDCs are free to select any VDCs and municipalities, it would be appropriate for them to select the VDCs and municipalities where some local communities have already been sensitized in conservation and sustainable use of biodiversity during the NBSAP development process (refer to Annex 1, Table 33).

While developing and implementing the LBSAP under the leadership and through support of EFGDCC and DDC, the VDCs and municipalities are expected to: (i) follow multi-stakeholder and participatory approaches in designing and implementation of conservation programmes and projects, and (ii) comply with the relevant national legislation and policy prescriptions.

7.2 Objectives

The general objective of the LBSAP framework is to encourage and enable VDCs and municipalities to develop and implement an action plan that promotes conservation and sustainable use of biodiversity. The following are the specific objectives:

1. Full integration of biodiversity conservation into the institutional and planning frameworks, governance and regulatory processes and policies at the VDC and municipality level.
2. Conservation and sustainable utilization of local terrestrial and aquatic biodiversity assets and promotion of equitable sharing of the benefits among the local people including women, indigenous peoples, *dalits* and poor.
3. Community appreciation and active participation of women, *dalits*, indigenous and local communities for the conservation of local biodiversity.
4. Enhanced human well-being and poverty reduction through mainstreaming biodiversity conservation into the local economy.
5. Recognition and incorporation of traditional knowledge, innovations and practices in the management of local biological resources.

7.3 LBSAP Development Process

The LBSAP development process includes five major phases. The concerned VDC or municipality will prepare its LBSAP under the leadership and with the support of EFGDCC and DDC, by following certain sequential phases or steps as a guideline (Figure 23).

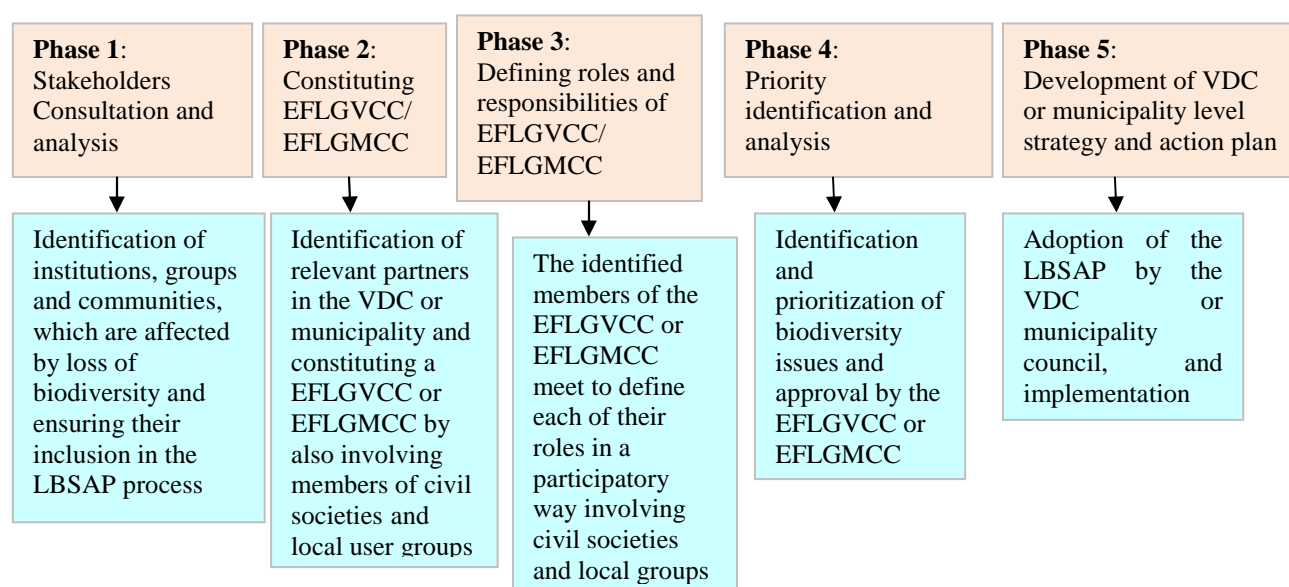


Figure 23: Process for development of Local Biodiversity Strategy and Action Plan

Phase 1: Stakeholders Consultation and Analysis

The respective VDCs and municipalities will first identify the institutions, agencies, communities and group of people that have been affected or are likely to be affected by loss of biodiversity. The objectives of such consultations, among other, include: (i) identification of priority issues, (ii) knowing how core functions of various stakeholders’ impact on biodiversity (positive and negative), (iii) identification of interventions aimed at the direct and indirect conservation and promotion of biodiversity at VDC and Municipality level which have the potential to be complemented and built on through the ongoing NBSAP process, (iv) soliciting inputs from stakeholders on initiatives they would like to see incorporated into the LBSAP, (v) identifying opportunities for collaboration.

Phase 2: Constituting EFLGVCC, EFLGMCC and Thematic Sub-committees

A. Constituting EFLGVCC and EFLGMCC

Planning for biodiversity is underpinned by the fundamental principle that the process needs to involve a wide range of sectors, organizations and individuals. The development of an effective village coordination committee and a working partnership is essential for the successful implementation of the objectives and targets of LBSAP. It is also essential for effective action at the local level. Therefore, the respective VDC and municipality will constitute an EFLGVCC or EFLGMCC from among the stakeholders identified in Phase 1 and as per the provisions of the recently developed Environment Friendly Local Governance Framework (2013).

The EFLGVCC and EFLGMCC will be headed by the chairperson and Mayor of the VDC and municipality, respectively. Memberships will include representatives of the local level government line agencies, such as the forest range post, agriculture service center, and livestock service center. Representatives of the local NGOs and CBOs, forest user groups and buffer zone committees will be some other members of the Committee. The VDC secretary and the Chief of the Environment, Energy and Climate Change Section or the officer nominated by the municipality will serve as the member secretary for the EFLGVCC and EFLGMCC, respectively. The powers and functions of the EFLGVCC and EFLGMCC will be as specified in the Environment Friendly Local Governance Framework (2013) and Chapter 6 of this NBSAP document.

B. Constituting Thematic Sub-committees

Thematic sub-committees, such as those regarding forest, agriculture, women, indigenous peoples, urban forestry, youth etc., can be constituted per need. The sub-committees so formed will look at specific issues of importance to biodiversity in respective VDCs and municipalities. Members of the sub-committee will be nominated by the VDC or municipality from among the local indigenous communities, teachers, women, youth and social workers and community leaders. The sub-committees will work in close cooperation with the EFLGVCC and EFLGMCC and their local level line agency offices and staff, NGOs, local groups, youth clubs, mother groups in preparation of annual plan preparation, fund generation, plan implementation and monitoring. The sub-committees will also collaborate in local level capacity building, extension and awareness activities.

Phase 3: Defining Roles and Responsibilities of EFLGVCC, EFLGMCC and Sub-committees

Implementation of actions depends on a range of factors, and therefore each member of the EFLGVCC and EFLGMCC and their thematic sub-committees will have a particular role to play. In order to define their roles, the respective VDC and municipality will have to involve all of the partner institutions and sub-committee members mentioned in Figure 23 in planning and implementation of LBSAP. This process will help respective VDC and municipality to identify roles of each of the stakeholders.

Phase 4: Biodiversity Priority Identification and Analysis

The stakeholders consultation described in Phase 1 should aim at identifying major issues and their solutions. The issues need to be prioritized prior to developing local biodiversity strategic and action planning. The biodiversity priority identification and analysis will include an assessment of causal factors underlying the priority issues, stakeholder interventions already in place or imminently planned, potential support and partnership opportunities and possible actions that can be implemented to address the priority issues. Some of the indicative local level issues, threats and challenges are highlighted below, which can be adapted by the concerned VDCs and municipalities based on their needs and priorities.

- Absence of institutional mechanism for biodiversity conservation at the local level
- Weak institutional capacity to effectively manage biological resources and broader environment
- Inadequate awareness and gap in biodiversity-related knowledge
- Overharvesting and overuse of biodiversity
- Appearance of alien and invasive species
- Excessive use of chemicals (pesticides, insecticides, fertilizers) and fishing by poisoning and explosives
- Loss of freshwater ecosystem and wetland habitats
- Lack of mainstreaming biodiversity into local economic development

Phase 5: Biodiversity Action Planning

The preparation of the LBSAP should start by developing a vision, mission and principles, which need to be in line with the NBSAP. Some of the possible local level biodiversity strategies, action points and funding sources have been identified based on the indicative issues, threats and challenges identified in Phase 4 (Table 32), which could serve as a guideline to identify action points by respective VDC and municipalities. It is the responsibility of the respective VDC or municipality to implement the strategy and action plan.

Table 32: Strategies, actions and funding sources for implementation of LBSAP

Strategies	Actions	Funding source
1. Developing an effective biodiversity conservation mechanism and capacity of VDC and municipality to effectively manage biodiversity and broader environment.	<ul style="list-style-type: none"> • Constitute an EFLGVCC and EFLGMCC and network of local stakeholders to support biodiversity conservation activities in VDC and municipality area. • Define role and responsibilities of stakeholders. • Assign biodiversity conservation work to one of the VDC and municipality members, who would be acting as a focal point at the VDC and municipality. 	<ul style="list-style-type: none"> • VDC and municipality block grant • Social mobilization funds of DDC
2. Integrating	<ul style="list-style-type: none"> • Initiate discussion to integrate 	<ul style="list-style-type: none"> • Co-funding from

biodiversity considerations into VDC and municipality level plan and programmes.	<p>biodiversity considerations into VDC and municipality level plan and programmes.</p> <ul style="list-style-type: none"> • Advocate for support of the LBSAP • Allocate at least 10 percent of the VDC and municipality budget for biodiversity conservation. 	<p>district and national government</p> <ul style="list-style-type: none"> • Local Governance Community Development Programme (LGCDP)
3. Creating an awareness of the importance of conserving biodiversity through targeted programmes	<ul style="list-style-type: none"> • Biodiversity awareness campaigning • Organize plantation programme in degraded areas • Organize exposure programme to biodiversity hotspots areas • Identify new species and plants recently appeared in VDC and municipality areas • Discourage work against pollution and damage of biodiversity. 	<ul style="list-style-type: none"> • LGCDP fund • DDC, VDC and municipality and/or environment related funds
4. Controlling overharvest and overuse of biological resources	<ul style="list-style-type: none"> • Domestication of locally threatened high value species • Support to establish community gene bank and seed promotion programme • Encourage plantation of local species 	<ul style="list-style-type: none"> • DADO and DLS Office programme funds • District Forest Office programme funds
5. Eradicating or controlling invasive alien species that are impacting negatively on local biodiversity	<ul style="list-style-type: none"> • Promote use of invasive plant species in making bio-briquette, where feasible • Involve local people in eradicating or controlling invasive species • Use invasive species such as <i>Mikania micrantha</i> as feedstock for livestock 	<ul style="list-style-type: none"> • Subsidies from national parks and wetland projects • Seek funding from conservation agencies
6. Reducing excessive use of chemicals and ban on use of explosives and poisoning of fish	<ul style="list-style-type: none"> • Promote organic pesticide • Training on compost making • Strict enforcement of laws against explosive use and poisoning 	<ul style="list-style-type: none"> • District Agriculture Development Office program funds • NGOs/ civil societies
7. Conserving aquatic ecosystems through sustainable use and management of water resources	<ul style="list-style-type: none"> • Micro-watershed management • River embankments • Spring conservation by planting water conserving tree species • Establish local conservation committee and groups 	<ul style="list-style-type: none"> • Seek funding from conservation agencies • District Soil Conservation Office program funds
8. Link biodiversity conservation to job creation and entrepreneurship	<ul style="list-style-type: none"> • Skill and entrepreneurship training • Provide support to establish small scale cottage industry • Domestication of locally threatened high value plant species (NTFP/MAPs) 	<ul style="list-style-type: none"> • DDC, VDC and municipality basket funds • National parks and wildlife reserves

7.4 Progress Monitoring

The EFGDCC, in collaboration with respective VDC and municipality, will make periodic monitoring and evaluation of the LBSAP implementation. The strategic objective of the monitoring and evaluation should comply with the objectives and principles of the NBSAP. Detailed outcome indicators will be developed by the concerned VDC and municipality with participation of member organizations. The monitoring will be focused to assess whether the biodiversity considerations have been effectively integrated into the VDC and municipality planning processes.

REFERENCES

- Acharya, D. P., Bajimaya, S. and Ferguson, A., 2010. Mid-term Evaluation of Western Terai Landscape Complex Project. United Nations Development Programme, Nepal. Available online at: www.undp.org/content/.../WTLCPC_MTE_Final_Report_Nov_30th.doc (accessed on 03 Nov. 2013)
- Acharya, K.P. and Dhakal, M. (eds.), 2012. Biodiversity Conservation in Nepal: A Success Story. Department of National Parks and Wildlife Conservation, Babarmahal, Kathmandu.
- ADB and ICIMOD, 2006. Environment Assessment of Nepal: Emerging Issues and Challenges. Asian Development Bank (ADB), Manila and International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- Adhikari, K., 2012. "Nepal: Innovative Mechanism for putting Farmers' Rights into Practice," *In*: Ruiz, M. and Vernooy, R. (eds.). *The Custodians of Biodiversity: Sharing Access to and Benefits of Genetic Resources*, Earthscan, New York.
- Adhikari, M. K., 2000. *Mushrooms of Nepal*. P. U. Printers, Kathmandu, Nepal.
- Archer, A. C., 1990. Pasture and Fodder Development in High Altitude Zone: Project Findings and Recommendations. NEP/85/007, UNDP/FAO, Rome, Italy
- Argumedo, A., 2013. Collective Trademarks and Biocultural Heritage. International Institute for Environment and Development, London.
- Baidya, A. P. and Devkota, H. R., 2011. Breeding performance of indigenous fishes for conservation of wild population. A paper presented in Consultative Workshop on Fish Conservation in Nepal held on 04 July, 2011. Fisheries Research Division, NARC, Lalitpur, Nepal.
- Baral, H. S. and Inskipp, C., 2009. The birds of Shukla Phanta Wildlife Reserve, Nepal. *Our Nature* 7: 56-81. Available online at: <http://www.nepjol.info/index.php> (accessed on 22 October 2013).
- Baral, H.S. and Shah, K.B. (2008). Wild Mammals of Nepal. Himalayan Nature. Kathmandu.
- Baral, N., Stern, M. J. and Bhattarai, R., 2008. Contingent valuation of ecotourism in Annapurna Conservation Area, Nepal: Implications for sustainable park finance and local development. *Ecological Economics*, 66:218-227.
- BCN and DNPWC, 2011. The State of Nepal's Birds 2010. Bird Conservation Nepal (BCN) and Department of National Parks and Wildlife Conservation (DNPWC), Kathmandu.

- Belbase, N., and Thapa L. B., 2007. Environmental Justice and Rural Communities, Nepal. *In:* Moore, P. and Pastakia, F. (eds.). Environmental Justice and Rural Communities, Studies from India and Nepal. IUCN, Gland, Switzerland.
- Bhandari, B., 1998. An Inventory of Nepal's Terai Wetlands, IUCN Nepal, Kathmandu.
- Bhandari, B., 2009. Preliminary Inventory of Nepal's Wetlands, IUCN Nepal, Kathmandu.
- Bhatta, M.R., Joshi, B. K. and Gauchan, D., 2012. National Gene Bank, Multilateral System and Community Seed Banks for Conservation and Utilization of Agricultural Genetic Resources. Paper presented in National Workshop on Community Seed Bank, held during 28-30 June, Pokhara, Nepal.
- Bista, M., 2006. Gymnosperms of Nepal. *In:* Jha, P. K., Chaudhary, R. P., Karmacharya, S. B. and Prasad, V. (eds.). Environment and Plants: Glimpses of Research in South Asia. Ecological Society, Kathmandu.
- Biodiversity Profile Project, 1995. Biodiversity Profile of the Midhills Physiographic Zone. Technical Publication No. 13, Government of Nepal, Ministry of Forest and Soil Conservation and Government of the Netherlands, Ministry of Foreign Affairs.
- Budha, P. B., 2012. Review of freshwater and terrestrial Molluscan studies in Nepal: Existing problems and future research priorities. Paper presented at the Entomological Review Workshop organized by Nepal Agriculture Research Council, Khumaltar during 4-6 March, 2012.
- Bunker, D. E., DeClerck, F., Bradford, J. C., Colwell, R. K., Perfecto, I., Phillips, O. L., Sankaran, M. and Naeem, S., 2005. Species Loss and Aboveground Carbon Storage in a Tropical Forest. *Science* 310:1029-1031.
- CBD, 2010. Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets. Secretariat of the Convention on Biological Diversity, Montreal. Available online at: <http://www.cbd.int/decision/cop/?id=12268> (accessed on 21 April 2013).
- CBS, 2008. Environmental Statistics of Nepal 2008. Central Bureau of Statistics (CBS), Kathmandu.
- CBS, 2011. Third Nepal Living Standards Survey 2010-11. Statistical Report (in two volumes). CBS, Kathmandu.
- CBS, 2012. Environment Statistics of Nepal, 2011. CBS, Kathmandu. Available online at: http://cbs.gov.np/wp-content/uploads/2012/03/environment_book_final.pdf (accessed on 25 August 2013).
- Chapagain, D. and Dhakal, J., 2003. CITES Implementation in Nepal. Department of National Parks and Wildlife Conservation and WWF Nepal, Kathmandu.

- Christie, M., Hanley, N., Warren, J., Murphy, K., Wright, R., and Hyde, T., 2006. Valuing the diversity of biodiversity. *Ecological Economics*, 58: 304–317.
- Conway, K.W. and Mayden, R. L., 2010. *Balitora eddsi*, a new species of hill stream loach from Nepal (Ostariophysi: Balitoridae). *Jour. of Fish Biology*.78:1210-1216.
- Conway, K.W., Edds, D.R., Shrestha, J. and Mayden, R.L., 2011. A new species of gravel-dwelling loach (Ostariophysi: Nemacheilidae) from the Nepalese Himalayan foot-hills. *Jour. of Fish Biology*, 79:1746-1759.
- CSUWN, 2010. Wetland-Resource Book. Conservation and Sustainable Use of Wetlands in Nepal (CSUWN) Project, Ministry of Forest and Soil Conservation, Kathmandu.
- Dale, V. H., Polasky, S. 2007. Measures of the effects of agricultural practices on ecosystem services. *Ecological Economics* 64(2): 286- 296.
- Dangi, R., 2012. REDD+: Issues and challenges from a Nepalese perspective. *In: Devkota, D.C., Uprety, B.K. and Bhattarai, T.N. (eds.). Climate Change and UNFCCC Negotiation Process.* Ministry of Environment, Science and Technology, Kathmandu.
- Deams, G. and Dumont, H.J., 1974. Rotifers from Nepal with description of a new species of *Scaridium* and a discussion of the Nepalese representatives of the genus *Hexarthra*. *Biol. Jb. Dodnaea*, 42: 61-81.
- DFRS/FRISP, 1999. Forest Resources of Nepal (1987-1998), Publication No. 74. Department of Forest Research and Survey/Forest Resource Information System Project (DFRS/FRISP). Government of Nepal and FRISP, the Government of Finland.
- DNPWC, 2000. Rhino Count 2000 Initial Report. Department of National Parks and Wildlife Conservation (DNPWC), Kathmandu.
- DNPWC, 2005. Annual Progress Report 2004-2005. DNPWC, Kathmandu.
- DNPWC, 2009. The Status and Distribution of the Greater One-Horned Rhino in Nepal. DNPWC, Kathmandu.
- DNPWC, 2011. Annual Progress Report 2010-2011. DNPWC, Kathmandu.
- DNPWC, 2012. Annual Report 2011-2012 (in Nepali). DNPWC, Kathmandu.
- DNPWC, 2013. Tiger Count 2013 (unpublished office record). DNPWC, Kathmandu.
- Dobremez, J.F., 1970. Biogéographie du Centre Népal. *Bull. Ass. Géographes*, (France), 379-380:79-90.

- Dobremez, J. F., 1976. *Le Népal: Écologie et Biogéographie* [Ecology and Biogeography of Nepal]. Centre Nationale de la Recherche Scientifique, Paris, France.
- DOF, 2005. Forest Cover Change Analysis of the Terai Districts (1990/91-2000/01). Department of Forests (DOF), Babarmahal, Kathmandu.
- DOF, 2012. Summary of forest encroachment until 2068-2069 BS (2011-2012). DOF, Babarmahal, Kathmandu (unpublished office record in Nepali).
- DOF 2013a. CFUG Database Record Available in MIS (unpublished). DOF, Babarmahal, Kathmandu.
- DOF, 2013b. Hamro Ban 2011/2012 (Annual Progress Report in Nepali). DOF, Babarmahal, Kathmandu.
- DOF, 2013c. Forestry Database (unpublished data available on request). DOF, Babarmahal, Kathmandu.
- DOR, 2010. Statistics of Strategic Road Networks (2009/10). Department of Roads (DOR), Kathmandu.
- DOFD, 2012. Annual Progress Report 2011. Directorate of Fisheries Development (DOFD), Kathmandu.
- DPR, 2000. *Pteridophytes of Nepal*. Bulletin No. 19, Department of Plant Resources (DPR), Kathmandu.
- DPR, 2007. Global Taxonomic Initiative (GTI): Nepal (unpublished draft). DPR, Kathmandu.
- DPR, 2013a. Plants of Nepal: Fact Sheet. DPR, Kathmandu.
- DPR, 2013b. CITES-listed Plants from Nepal. DPR, Kathmandu.
- Dutfield, G., 2011. Intellectual Property Tools for Products Based on Biocultural Heritage: A legal review of geographical indications, trademarks and protection from unfair competition. International Institute for Environment and Development, London.
- FAO, 2010. Global Forest Resources Assessment 2010: Main Report. Food and Agriculture Organization of the United Nations (FAO), Rome. Available online at: <http://www.fao.org/docrep/013/i1757e/i1757e.pdf> (accessed on 29 August 2013)
- FRA/DFRS. 2014. Terai Forests of Nepal (2010 – 2012). Forest Resource Assessment Nepal Project/Department of Forest Research and Survey, Babarmahal, Kathmandu.

- Gautam, A. P., 2006. Combining geomatics and conventional methods for monitoring forest conditions under different governance arrangements. *Journal of Mountain Science*,3(4): 325-333.
- Gautam, A. P., 2007. "Biodiversity". In: Robbins, P. (ed.).*Encyclopedia of Environment and Society*, p. 118-121. Sage Publications, Thousand Oaks, California, USA.
- Gautam, A. P., 2009.Equity and Livelihoods in Nepal's Community Forestry. *International Journal of Social Forestry* 2(2): 101-122.
- Gautam, A. P., Webb, E. L. and Eiumnoh, A., 2002. GIS assessment of land use-land cover changes associated with community forestry implementation in the Middle Hills of Nepal. *Mountain Research and Development* 22(1): 63-69.
- Gautam R., Subedi, A., Shrestha, P.K. and Sthapit, B.R., 2007. Home Gardens: On-farm agrobiodiversity conservation unit and source of dietary diversity of rural farmers of Nepal. *Acta Horticulturae* 752:509-512.
- GON, 2001. Nepal Gazette (31 December 2001). Government of Nepal, Kathmandu.
- GON/UNDP-GEF, 2007. Conservation and Sustainable Use of Wetlands in Nepal Project (NEP/05/G01) Project Document (unpublished). Government of Nepal (GON) and United Nations Development Programme and Global Environment Facility (UNDP-GEF), Kathmandu.
- Gupta, R., 1997. Diversity of Parasitic Helminth Fauna in Nepal. Research Division, Tribhuvan University, Kirtipur, Kathmandu, Nepal.
- Hagen, T., 1998. Nepal- the Kingdom in the Himalaya (4th edition). Himal Books, Lalitpur, Nepal.
- Haruta, T., 2006 (ed.). Moths of Nepal (vol. 1-6).TINEA, Japan Heterocerist's Society, Tokyo.
- Hickel, B., 1973a. Limnological Investigation in Lake of the Pokhara Valley, Nepal. *Int. Rev. Ges. Hydrobiol*,58:659-672.
- Hickel, B., 1973b. Phytoplankton in two ponds in Kathmandu Valley, Nepal. *Int. Rev. Ges. Hydrobiol*, 58: 835-842
- Hirano, M., 1955. Freshwater Algae. Freshwater Algae. In: Fauna and Flora of Nepal Himalaya: Scientific Result of the Japanese Expedition to Nepal Himalaya (Vol. 1), Kyoto University, Japan.
- Honey, M., 2002. Ecotourism and Certification: Setting Standards in Practice. UN Intergovernmental Panel on Climate Change (IPCC), Island Press, Washington, DC. Available online at: www.grida.no/climate/ipcc/aviation/069.htm (accessed on 03 August 2013).

- ICIMOD, 2004. Biodiversity and Livelihoods in the Hindu Kush Himalayan Region. International Centre for Integrated Mountain Development (ICIMOD) Newsletter, No. 45, Kathmandu.
- ICIMOD, 2011. Framework for Valuing Ecosystem Services in the Himalayas. ICIMOD, Kathmandu.
- ICIMOD, 2013. Kailash Sacred Landscape. ICIMOD, Kathmandu. Available online at: <http://www.icimod.org/?q=9457> (accessed on 15 October 2013).
- ICIMOD and MOEST, 2007. Nepal Biodiversity Resource Book: Protected Areas, Ramsar Sites and World Heritage Sites. ICIMOD and Ministry of Environment, Science and Technology (MOEST), Kathmandu in cooperation with UNEP Regional Office for Asia and the Pacific, Bangkok, Thailand.
- IPCC, 2007. Climate change 2007: Impacts, adaptation, and vulnerability. *In*: Parry, M.L., Canziani, O. F., Palutikof, J.P., van der Linden, P. J. and Hanson, C. E. (eds.) 2007. Climate Change 2007: Impacts, Adaptation, and Vulnerability. Report of the IPCC. Cambridge University Press, Cambridge, U.K.
- IFPRI, 2013. 2013 Global Hunger Index: The Challenge of Hunger: Building Resilience to Achieve Food and Nutrition Security. International Food Policy Research Institute (IFPRI), Washington DC (in collaboration with Concern Worldwide and Welthungerhilfe). Available online at: <http://www.ifpri.org/publication/2013-global-hunger-index> (accessed on 18 October 2013).
- Inskipp, C. and Inskipp, T., 1991. A Guide to the Birds of Nepal. Croom Helm, London, UK.
- IUCN, 2004. A review of the status and threats to wetlands in Nepal. IUCN Wetland and Water Resources Programme. IUCN, the World Conservation Union, Gland Switzerland.
- IUCN, 2013. IUCN Red List of Threatened Species. Available online at: www.iucnredlist.org (accessed on 20 September 2013).
- Jairam, K.C., 1999. The freshwater fishes of the Indian Region. Narendra Publishing House, Delhi, India.
- Jha, P. K., Shrestha, K. K., Upadhyay, M. P., Stimart, D. P. and Spooner, D. M., 1996. Plant Genetic Resources of Nepal: a Guide for Plant Breeders of Agricultural, Horticultural and Forestry Crops. *Euphytica*, 87:189-210.
- Jnawali, S.R., Baral, H.S., Lee, S., Acharya, K.P., Upadhyay, G.P., Pandey, M., Shrestha, R., Joshi, D., Lammichhane, B.R., Griffiths, J., Khatiwada, A. P., Subedi, N., and Amin, R. (compilers), 2011. The Status of Nepal Mammals: The National Red List Series. DNPWC, Kathmandu.

- Joshi, G.R. and Bauer, S., 2007. Cultivation and the Loss of Rice Landraces in the Terai region of Nepal, *Genetic Resources: Conservation and Utilization*, 5(1), Pp 1-7.
- Joshi, B.K. 2013. A Brief Overview of Community Seed Bank Initiatives in Nepal. *In: Shrestha P., R. Vernon And P. Chaudhary (eds.). Community Seed Banks in Nepal: Past, Present, Future. Proceedings of a National Workshop, LI-BIRD/USC Canada Asia/Oxfam/The Development Fund/IFAD/Bioversity International, 14-15 June 2012, Pokhara, Nepal. Pp 41-46.*
- Kanel, K.R. and Kandel, B. R., 2006. Achievements and Challenges of Community Forest. Hamro Ban (in Nepali), Ministry of Forests and Soil Conservation, Kathmandu.
- Kuwar, B. S., Neopane, S. P. and Kharel, M., 2003. Genetic Evaluation of Nepalese Hill Goats. *Proceedings of International Seminar on Mountains, held during March 6-8, 2002 in Kathmandu. Royal Nepal Academy of Science and Technology, Kathmandu, Pp 632-637.*
- LI-BIRD. 2013. Annual Report 2012-13. Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Pokhara, Nepal.
- Lele, S., Springate-Baginski, O., Lakerveld, R., Deb, D. And Dash, P., 2013. Ecosystem Services: Origins, Contributions, Pitfalls, and Alternatives. *Conservation & Society*, 11(4): 343-358. Available online at: <http://www.conservationandsociety.org/article.asp?issn=0972-4923>.
- Limbu, D. K., Koirala, M. and Shang, Z., 2012. A survey of Himalayan rangeland weeds in Tinjure-Milke-Jaljale area, eastern Nepal. *Nepalese Journal of Biosciences*, 2:24-30.
- LRMP, 1986. Land Utilization Report. Land Resources Mapping Project (LRMP), Kenting Earth Sciences Limited, Government of Nepal and Government of Canada.
- McGeoch, M.A., Butchart, S.H.M., Spear, D., Marais, E., Kleynhans, E.J., Symes, A., Chanson, J. and Hoffmann, M., 2010. Global indicators of biological invasion: species numbers, biodiversity impact and policy responses. *Diversity and Distributions*, 16(1): 95–108.
- Menon, A.G. K., 1962. A distribution list of fish of the Himalayas. *Jour. Zool. Soc. of India*, 14(1):23-32.
- Millennium Ecosystems Assessment, 2005. Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC.
- Miller, D. J., 1987. Yaks and Grasses. Pastoralism in the Himalayan Countries of Nepal and Bhutan and Strategies for Sustained Development. University of Montana, USA.
- Mittermeier, R. A., Giles, P. R., Hoffman, M., Pilgrim, J., Brooks, T., Mittermeier, C. G., Lamoreaux, J. and Da Fonseca, G. A. B. (eds.). 2004. Hotspots Revisited. Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions. CEMEX/Agrupacion Sierra Madre, Mexico City, Mexico.

- MOSTE, 2010. National Adaptation Programme of Action to Climate Change. Ministry of Science Technology and Environment (MOSTE), Kathmandu.
- MOEST, 2008. Nepal-National Capacity Self-Assessment Report and Action Plan. Ministry of Environment, Science and Technology (MOEST), Kathmandu.
- MOF, 2013. Statement of Technical and Other Assistance for FY 2013/14 (Bilateral and Multilateral Sources including Assistance from INGOs. Ministry of Finance, Kathmandu.
- MOFALD, 2013. Environment Friendly Local Governance Framework 2013. Ministry of Federal Affairs and Local Development (MOFALD), Kathmandu.
- MoFSC, 2002. Nepal Biodiversity Strategy. Ministry of Forest and Soil Conservation (MoFSC), Kathmandu.
- MoFSC, 2005. Nepal's Thematic Report on Mountain Biodiversity submitted to the CBD Secretariat (unpublished). MoFSC, Kathmandu.
- MoFSC, 2006a. Nepal Biodiversity Strategy Implementation Plan 2006-2010. MoFSC, Kathmandu.
- MoFSC, 2006b. Nepal: Third National Report to the Convention on Biological Diversity. MoFSC, Kathmandu.
- MoFSC, 2006c. Sacred Himalayan Landscape - Nepal Strategic Plan (2006-2016): Broad Strategy Document. MoFSC, Kathmandu.
- MoFSC, 2007. Forest Sector Gender and Social Inclusion Strategy (unofficial translation). MoFSC, Kathmandu.
- MoFSC, 2009. Nepal: Fourth National Report to the Convention on Biological Diversity. MoFSC, Kathmandu.
- MoFSC, 2010. Nepal's Readiness Preparation Proposal: REDD 2010-2013. MoFSC, Kathmandu.
- MoFSC, 2013a. Persistence and Change: Review of 30 Years of Community Forestry in Nepal. MoFSC, Kathmandu.
- MoFSC, 2013b. Country Report on the State of Forest Genetic Resources - Nepal. MoFSC, Kathmandu.
- MoFSC, 2013c. Conservation and Sustainable Use of Wetlands in Nepal, 2013: Good Practices and Lesson Learned from the Conservation and Sustainable Use of Wetlands in Nepal Project. MoFSC, Kathmandu.
- NARC, 2011. Annual Report, 2067/68. Pasture and Fodder Division, Nepal Agricultural Research Council (NARC), Lalitpur, Nepal.

- Neopane, S. P., 2006. Characterization of Indigenous Animal Genetic Resources of Nepal. Proceedings of the 6th National Workshop on Livestock and Fisheries Research. NARC, Kathmandu.
- Neopane, S. P. and Kadel, R., 2008. Indigenous Pigs of Nepal. NARC, Lalitpur, Nepal.
- Neopane, S. P. and Pokharel, P. K., 2005. Indigenous Cattle of Nepal. Animal Breeding Division, NARC, Lalitpur, Nepal.
- Neopane, S. P. and Pokharel, P. K., 2008. Indigenous Goats of Nepal. NARC, Lalitpur, Nepal.
- Neopane, S. P., Gorkhali, N. A. and Pokharel, P. K., 2008. Indigenous Sheeps of Nepal. NARC, Lalitpur, Nepal.
- Nepal, G., 2012. Climate Finance and Nepalese Perspective. *In*: Devkota, D. C., Uprety, B. K. and Bhattarai, T. N. (eds.). Climate Change and UNFCCC Negotiation Process. Ministry of Science, Technology and Environment, Kathmandu.
- Nesemann, H. and Sharma, S., 2005. Checklist of the Aqualitic Molluscs (Gastropoda, Bivalvia) from Nepal. *Pol. Res.*, 24(4):842.
- Ng, H. H., 2006. The identity of *Pseudecheneis sulcata* (M'Clelland, 1842), with descriptions of two new species of rheophilic catfish (Teleostei: Sisoridae) from Nepal and China. *Zootaxa*, 1254: 45-68.
- Ng, H. H. and Edds, D. R., 2004. *Batasio macronotus*, a new species of Bagrid Catfish from Nepal (Teleostei: Bagridae). *Ichthyological Exploration of Freshwaters*, 15(4):295-300.
- Ng, H. H. and Edds, D. R., 2005. Two new species of Erethestoides (Telosti: Erethistidae) from Nepal. *Ichthyological Exploration of Freshwaters*, 16(3):239-248.
- Niraula, R. R., Gilani, H., Pokharel, B. K. and Qamer, F. M., 2013. Measuring impacts of community forestry program through repeat photography and satellite remote sensing in the Dolakha district of Nepal. *Journal of Environmental Management*, 126:20-29.
- NPC, 2007. Three-Year Interim Plan (2064/65-2066/67). National Planning Commission (NPC), Kathmandu.
- NPC, 2011. Nepal Status Paper - United Nations Conference on Sustainable Development 2012 (Rio+20) Synopsis. NPC, Kathmandu.
- NPC/UNDP, 2005. Nepal Millennium Development Goals: Progress Report 2005. National Planning Commission (NPC) and United Nations Development Programme (UNDP), Nepal.
- NPC/UNDP, 2010. Millennium Development Goals Needs Assessment for Nepal 2010. National Planning Commission (NPC) and United Nations Development Programme (UNDP), Nepal.

- NPC/UNDP, 2013. Millennium Development Goals Progress Report 2013. National Planning Commission (NPC) and United Nations Development Programme (UNDP), Nepal.
- NPRP, 2011. National Potato Research Programme (NPRP) Annual Report, 2010/2011. National Agriculture Research Council (NARC), Lalitpur, Nepal.
- Olson, D.M., Dinerstein, E., Wikramanayake, E.D., Burgess, N.D., Powell, G.V.N., Underwood, E.C., D'Amico, J.A., Itoua, I., Strand, H.E., Morrison, J.C., Loucks, C.J., Allnutt, T.F., Ricketts, T.H., Kura, Y., Lamoreux, J.F., Wettengel, W.W., Hedao, P. and Kassem, K.R., 2001. Terrestrial ecoregions of the world: New map of life on earth. *Bioscience*, 51(11):933-938.
- Oxfam, 2014. Climate change adaptation finance in Nepal. Oxfam Nepal Country Office, Kathmandu.
- Pande, R. S., 2009. Review: Status of Rangeland Resources and Strategies for Improvements in Nepal. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources. Available online at: <http://www.rameshworpandey.blogspot.com/2011/03/21-review-status-of-rangeland-resources.html> (accessed on 15 October 2013).
- Pant, K. P., 2009. Price-based Valuation of Rice Genetic Diversity in Nepal. Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China.
- Paudel, N. S., Khatri, D. B., Khanal, D. R. and Karki, R., 2013. The context of REDD+ in Nepal: Drivers, agents and institutions. Occasional Paper 81. Center for International Forestry Research, Indonesia.
- Perry, C. (Rapporteur), 2012. Strengthening International Environmental Governance: System-Wide Responses. International Peace Institute, New York.
- Poudel, D. and Johnsen, F. H., 2009. Valuation of crop genetic resources in Kaski, Nepal: Farmers' willingness to pay for rice landraces conservation. *Journal of Environmental Management*, 90: 483-491.
- Practical Action, 2009. Temporal and Spatial Variability of Climate Change Over Nepal (1976-2005). Practical Action, Kathmandu.
- Pradhan, N. and Joshi, S. D., 2009. Liverworts and hornworts of Nepal: a synopsis. *J. Plant Sci.*, 6:69-75.
- Prasad, V. 2013. Biodiversity: Algae. In: Jha, P.K., Neupane, F.P., Shrestha, M.L. and Khanal, I. P. (eds.). Biological Diversity and Conservation. Nepal Academy of Science and Technology, Lalitpur, pp. 97-103.

- Press, J. R., Shrestha, K.K. and Sutton, D.A., 2000. Annotated Checklist of the Flowering Plants of Nepal. The Natural History Museum, London and Tribhuvan University, Kathmandu.
- Rai, R. K. and Scarborough, H., 2012b. Valuing the Damage Caused by Invasive Plant Species in a Low-income Community in Nepal. SANDEE Working Papers, ISSN 1893-1891; WP 74–12. ISBN: 978-9937-596-03-9.
- Rajbhandari, M. K. and Adhikari, K. R., 2009. Endemic flowering plants of Nepal (Vol.1). Department of Plant Resources (DPR), Kathmandu.
- Rajbhandari, K. R. and Dhungana, S. K., 2011. Endemic flowering plants of Nepal (Vol.2).DPR, Kathmandu.
- Rajbanshi, K.G., 2002. Zoogeographical distribution and the status of cold water fish in Nepal. *In*: Petr T. and Swar, D.B. (eds.). Coldwater Fishes in the trans- Himalayan Countries. FAO Fisheries Technical Paper. No. 431, Rome, Italy.
- Rajbanshi, K.G., 2013. Biodiversity and Distribution of Freshwater Fishes of Central Nepal Himalayan Region. Nepal Fisheries Society, Kathmandu.
- Rijal, D. K., Upadhyay, M. P., Rana, R. B., Chaudhary, P., Tiwari, R. K., Sthapit, B. R. and Gauchan, D., 2003. Community biodiversity register: developing community based databases for genetic resources and local knowledge of Nepal. *In*: B.R. Sthapit, M. P. Upadhyay, B.K. Baniya, A Subedi and B.K. Joshi (eds.). On-farm Management of Agricultural Biodiversity in Nepal. Proceedings of a National Workshop, 24-26 Apr 2001, Lumle, Nepal. IPGRI, LI-BIRD and NARC, Kathmandu, Nepal.
- Regmi, B. R., Kafle, G., Adhikari, A., Subedi, A., Suwal, R and Poudel, I., 2009. Towards an innovative approach to integrated wetland management in Rupa Lake Area of Nepal. *Journal of Geography and Regional Planning*, 2(4):080-085.
- Shah, K. B., 2013. Biodiversity: Amphibians and Reptiles. *In*: Jha, P.K., Neupane, F.P., Shrestha, M.L. and Khanal, I. P. (eds.). Biological Diversity and Conservation. Nepal Academy of Science and Technology, Lalitpur, Nepal, pp 52-62.
- Shah, K.B. and Tiwari, S., 2004. Herpetofauna of Nepal: A conservation Companion. IUCN, Nepal.
- Schleich, H. and Kastle, W., 2002. Amphibians and Reptiles of Nepal. A. R. G. Gantner Verlag, K. G. Germany.
- Serchand, L. and Pradhan, S. L., 1998. Domestic Animal Genetic Resource Management and Utilization in Nepal. National Biodiversity Action Plan, Department of Livestock Services, Ministry of Agriculture and Cooperatives, Singha Durbar, Kathmandu.
- Shah, K. B. and Tiwari, S., 2004. Herpetofauna of Nepal: A Conservation Companion. IUCN -The World Conservation Union, Nepal. VII + 237 pp.

- Sharma, L. R., 1995. Enumeration of the Lichens of Nepal. *In: Biodiversity Profiles Project, Publications No. 14. Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.*
- Sharma, L. N., Vetaas, O. R., Chaudhary, R. P. and Maren, I. E., 2013. Pastoral Abandonment, Shrub Proliferation and Landscape Changes: A Case Study from Gorkha, Nepal. *Landscape Research*, DOI:10.1080/01426397.2013.773299.
- Shrestha, J. 1981. Fishers of Nepal. Tribhuvan University, Kathmandu.
- Shrestha, T.K., 2008. Fish diversity of Nepal and potential of indigenous fishes for further development of aquaculture. Proceedings of Workshop on Indigenous Fish Stock and Livelihood. Organized by Fisheries Research Division, NARC; Directorate of Fisheries Development, DOA and Nepal Fisheries Society in Kathmandu.
- Shrestha, J. 2013. Biodiversity: Fish. *In: Jha, P. K., Neupane, F. P., Shrestha, M. L. and Khanal, I. P. (eds.). Biological Diversity and Conservation. Nepal Academy of Science and Technology, Lalitpur, pp 69-81.*
- Shrestha, P., Gautam, R., Rana, R.B. and Sthapit, B., 2004. Home gardens in Nepal: Status and scope for research and development. *In: Eyzaquirre, P.B. and Linares, O.F. (eds.). Home Gardens and Agrobiodiversity. Smithsonian Books, Washington DC.*
- Shrestha, P., Subedi, A., Rijal, D. K., Singh, D., Sthapit, B. R. and Upadhyay, M. P., 2005. Enhancing local seed security and on-farm conservation through community seed bank in Bara district of Nepal. *In: B.R. Sthapit, P.K. Shrestha, M.P. Upadyay and D Javris (eds.). On-farm conservation of agricultural biodiversity in Nepal. Vol II: Managing diversity and promoting its benefits. Proceedings of the Second National Workshop, 25-27 August 2004, Nagarkot, Nepal, IPGRI, Rome, Italy.*
- Shrestha, T.B. and Joshi, R. M., 1996. Rare, Endemic and Endangered Plants of Nepal, WWF Nepal.
- Shrestha, P., Sthapit, S. and Paudel, I., 2013. Community Seed Banks: A Local Solution to Increase Access to Quality and Diversity of Seeds. *In: Shrestha P., Vernooy, R. and Chaudhary, P. (2013). Community Seed Banks in Nepal: Past, Present, Future. Proceedings of a National Workshop, LI-BIRD/USC Canada Asia/Oxfam/The Development Fund/IFAD/Bioersivity International, 14-15 June 2012, Pokhara, Nepal. Pp 61-75.*
- Shrestha, U. B., Shrestha, S., Chaudhary, P. and Chaudhary, R. P., 2010. How Representative is the Protected Areas System of Nepal? *Mountain Research and Development*, 30(3):282-294.
- Spence, M., 2007. Intellectual Property. Oxford University Press, Oxford.
- Stainton, J.D.A., 1972. Forests of Nepal. John Murray, London.

- Subedi, A., Devkota, R., Poudel, I, Subedi, S., Shrestha, P., Bhandari, B and Sthapit, B.R., 2011. Community Biodiversity Registers: Empowering community in management of agricultural biodiversity. *In: Padulosi, S., N. Bergamini and T. Lawrence (eds.). On-farm conservation of neglected and underutilized species: Status, trends and novel approaches to cope with climate change. Proceedings of the International Conference, Friedrichsdorf, Frankfurt, 14-16 June, 2011*
- Surana, R., Subba, B. R. and Limbu, K. P., 2005. Community structure of zooplanktonic group of Chimdi Lake, Sunsari, Nepal. *Our Nature*, 3:81-82.
- Swar, D. B., 2002. The status of cold water fish and fisheries in Nepal and prospects of their utilization for poverty reduction. *In: Petr, T. Swar D.B. (eds). Cold Water Fishes in the Trans-Himalayan Countries. FAO Fisheries Technical Paper. No. 431 Rome, FAO. P 376.*
- Swar, D. B. and Gurung, T. B., 1988. Introduction and cage culture of exotic carps and their impact on fish harvested in Lake Begnas, Nepal. *Hydrobiologica*, 166:277-283.
- Takeda, K., Satoh, M., Neopane, S. P., Kuwar, B. S., Joshi, H. D., Shrestha, N. P., Fujise, H., Tasai, M., Tagami, T. And Hanada, H., 2004. Mitochondrial DNA Analysis of Nepalese Domestic Dwarf Cattle Lulu. *Animal Science Journal*, 75:103-110.
- Terashima, A. 1984. Three new species of Cyprinid Genus-Schizothorax from Lake Rara, North-Western, Nepal. *Japanese Journal of Ichthyology*, 31(2): 122-135.
- Timsina, B., Shrestha, B. B., Rokaya, M. B. and Münzbergová, Z., 2011. Impact of *Parthenium hysterophorus* L. invasion on plant species composition and soil properties of grassland communities in Nepal. *Flora*, 206:233-240
- TISU, 2013. An Overview of Tree Improvement and Silviculture Unit's Activities in Nepal. Department of Forests, Tree Improvement and Silviculture Unit (TISU), Kathmandu.
- Tiwari, R. B. and Chhetry, P., 2009. Diversity of zooplankton in Betna Wetlands, Belbari, Morang. *Our Nature*, 7:236-237.
- Thapa, V.K. 1997. An Inventory of Nepal's Insects (vol. 1). IUCN-Nepal, Kathmandu.
- UNDP, 2013. Human Development Report 2011. United Nations Development Programme (UNDP), New York, USA.
- UNEP, 2010. Integrated Solutions for Biodiversity, Climate Change and Poverty. UNEP Policy Series 1, Ecosystem Management. Available online at: <http://www.unep.org/policyseries/> (Accessed 20 October 2013).
- UNEP-WCMC, 2004. *Species Data* (Unpublished). World Conservation Monitoring Centre of the United Nations Environment Programme (UNEP-WCMC), Cambridge, England. Available online at: <http://www.unep-wcmc.org> [accessed on 5 January 2014]

- UNEP-WCMC, 2012. Promoting Synergies within the Cluster of Biodiversity-related Multilateral Environmental Agreements. UNEP-WCMC, Cambridge, UK.
- UNEP-WCMC, 2013. UNEP-WCMC Species Database: CITES-Listed Species. UNEP-WCMC, Cambridge, UK. Available online at: <http://www.cites.org/eng/resources/species.html> (Accessed on 23 September 2013).
- Upadhaya, M. P. and Joshi, B. K., 2003. Plant genetic resources in SAARC countries: Their conservation and management: Nepal chapter. *In: Rigyal and Akhter, N. (eds.). Status of Plant Genetic Resources in SAARC Countries: Their Conservation and Management.* SAARC Agriculture Information Center, Dhaka. Pp. 297-422.
- Upadhyay, M. P. and Subedi, A., 2001. Good practices for managing *in-situ* conservation of agrobiodiversity on-farm. *In: Sthapit, B. R., Upadhyay, M. P., Baniya, B. K., Subedi, A. and Joshi, B. K. (eds.). On-farm Management of Agricultural Biodiversity in Nepal. Proceedings of the National Workshop, 24-26 April 2001, Lumle, Nepal.*
- USAID, 2010. Hariyo Ban Nepalko Dhan (Hariyo Ban) Programme. United States Agency for International Development (USAID), Kathmandu.
- USAID, 2012. Nepal Biodiversity and Tropical Forestry Analysis: Prosperity, Livelihoods and Conserving Ecosystems (PLACE) IQC Task Order # Aid-367-To-12-00001. USAID Nepal Office, Kathmandu.
- Vetaas, O. R. and Grytnes, J. A., 2002. Distribution of vascular plant species richness and endemic richness along the Himalayan elevations gradient in Nepal. *Global Ecology and Biogeography*, 11(4): 291-301.
- WECS, 2010. Energy Sector Synopsis Report 2010. Water and Energy Commission (WECS) Secretariat, Kathmandu.
- WECS, 2011. Water Resources of Nepal in the Context of Climate Change. WECS, Kathmandu.
- Wikramanayake, E. D., Dinerstein, E., Loucks, C. J., Olson, D. M., Morrison, J., Lamoreux, J., McKnight, M. and Hedao, P., 2002. *Terrestrial Ecoregions of the Indo-Pacific: A Conservation Assessment.* Island Press, Washington DC.
- Williams, N., 2005. On the trail of Nepal's flora. *Current Biology*, 15(24): R977-R978.
- Wilson, E.O. 1988. The Current State of Biological Diversity. In Wilson, E.O. and Peter, F.M. (eds.) *Biodiversity*, pp 3-18. National Academy Press, Washington, D.C.
- Wilson, E.O. 1992. *The Diversity of Life.* W.W. Norton & Company, New York, London.
- World Bank, 2008. Nepal - Country Environmental Analysis: Strengthening Institutions and Management Systems for Enhanced Environmental Governance. The World Bank,

Washington, DC. Available online at:
<https://openknowledge.worldbank.org/handle/10986/7996> (accessed on 22 April 2013).

WWF, 2012. WWF Nepal Strategic Plan 2012 – 2016. WWF Nepal, Kathmandu.

WWF, 2013. Chitwan-Annapurna Landscape: A Rapid Assessment. Hariyo Ban Program, WWF Nepal, Kathmandu.

ANNEXES

Annex 1: Methodology used in development of National Biodiversity Strategy and Action Plan

The main methodological steps involved in the development of the National Biodiversity Strategy and Action Plan (NBSAP) are shown in Figure 1.1a. The steps are briefly described in the following paragraphs.

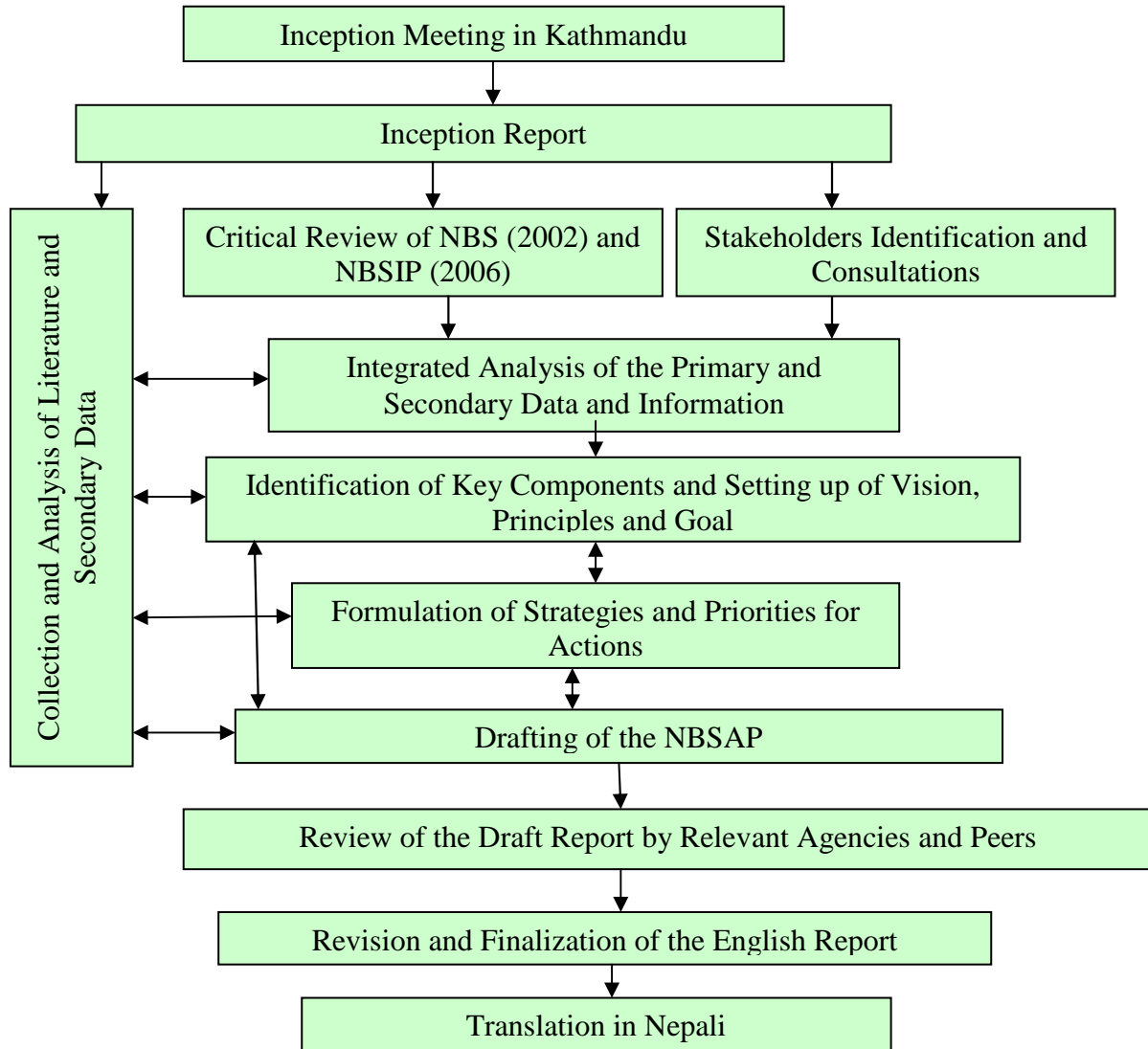


Figure 24: Methodology used in development of NBSAP

A. Inception Meeting

An inception meeting with relevant experts and key stakeholders was organized in Kathmandu on 03 May 2013. The meeting had three inter-related objectives: (i) review and validation of the methodological approach for consultations at the national, regional, district and field levels, (ii) enhancing mutual understanding of the tasks associated with the assignment between the NBSAP

drafting team and key stakeholders, and (iii) gaining greater insights into the process of revising the NBSAP and drafting Fifth National Report to CBD. A total of 61 individuals representing 25 diverse organizations and expertise participated in the half-day event, which was chaired by the Secretary, Ministry of Forest and Soil Conservation.

B. Review and Analysis of Relevant Literature

Relevant literature, including agencies' reports and reliable material available on the internet were collected and reviewed to take stock of the existing status of the country's biodiversity; key threats; efforts to manage biodiversity and outcomes; and existing gaps, issues and challenges; and trends of funding for management of biodiversity. One of the specific focuses of the review was to explore the status of implementation of the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006-2010) and gaps. Available literature related to biodiversity-livelihoods linkages, gender and social inclusion, and impacts of climate change on biodiversity were also collected and reviewed. Recent CBD COP decisions, guidelines and other relevant international developments were some other key areas covered by the review.

C. Collection and Analysis of Secondary Data

Available secondary data relevant to the task were collected and used as appropriate. Recent spatial data available with different agencies; periodic census data on flagship wildlife species (rhino, tiger etc.) available with the Department of National Parks and Wildlife Conservation; and community, leasehold and collaborative forest handover and forest encroachment data available with the Department of Forests are example of such data acquired and used.

D. Consultations

Consultations with relevant stakeholders were carried out at the national, regional, district and community levels. Efforts were made to make the consultations gender-balanced and socially inclusive. Checklists were used to make the consultation meetings efficient and objective oriented. A total of 1,664 individuals, including 459 (26.7%) women and 1,205 (73.3%) men were consulted during the process.

D1. National Level Consultations

Consultations in Kathmandu involved interactions with relevant government ministries and departments; Kathmandu-based INGOs and national NGOs; Civil Society groups; natural resources users' federations and networks; Nepal Federation of Indigenous Nationalities; and research and academic institutions. Interaction meetings were also organized with the professionals' teams involved in revision of forestry sector strategy, and formulation of national REDD+ strategy with the objective of bringing harmony among the different strategies that were being prepared simultaneously. Separate meetings were organized with some focus groups (e.g. women professionals working in different agencies). Independent experts were consulted to enquire on theoretical and technical aspects of the subject.

A sharing cum consultation meeting was organized with the chair and members of the national steering committee overseeing the revision of the NBSAP on 11 July 2013. Senior officials of the MoFSC and departments under it also participated in the meeting. Two rounds of sharing cum consultation meetings were organized with high ranking NPC officials, and a meeting was held with a Ministry of Finance official looking after the foreign aid portfolio. A total of 41 government and

non-government agencies that are directly related to biodiversity management, and a few individual experts with long experience and expertise on the subject were consulted during May-September 2013.

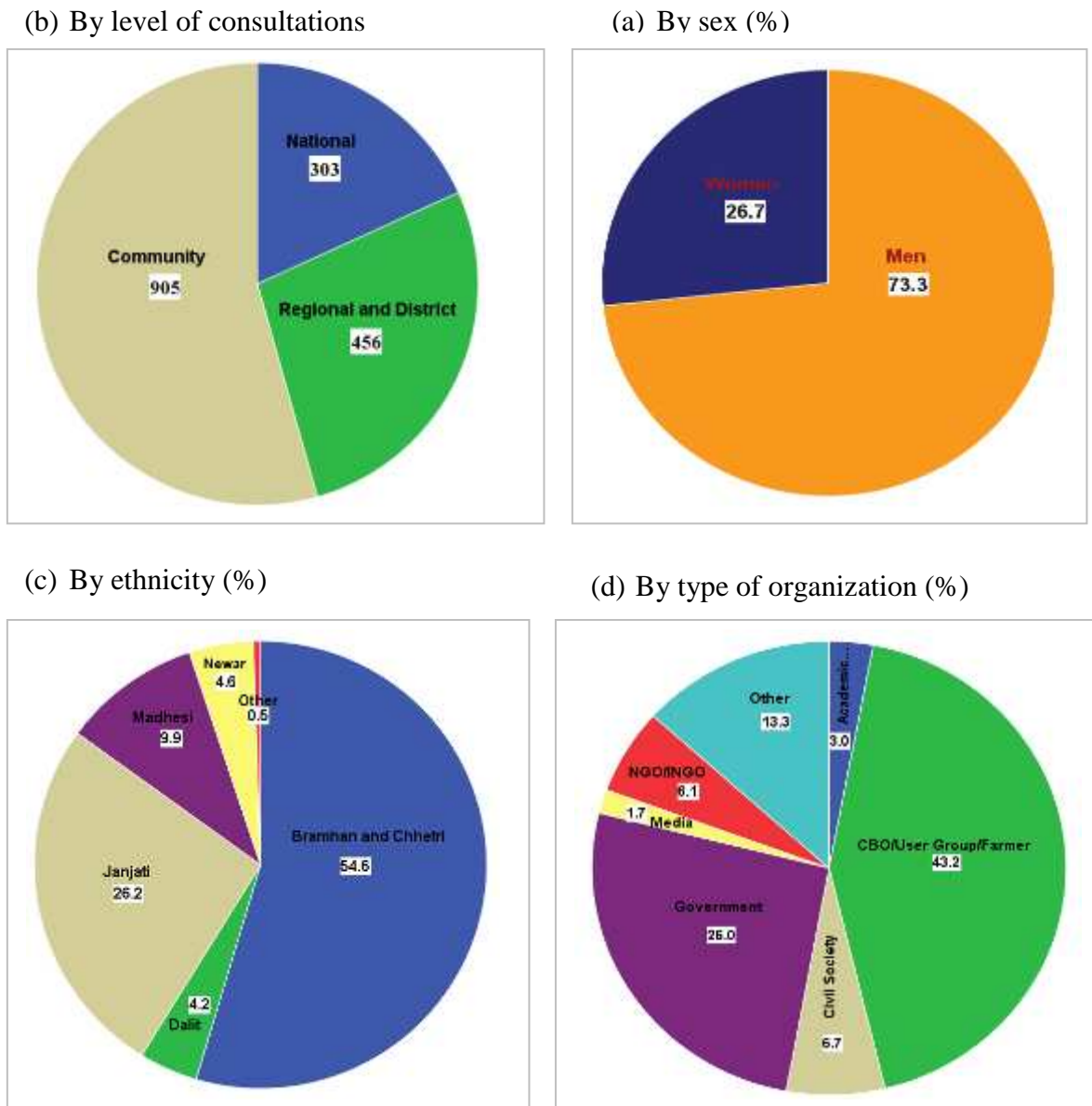


Figure 25: Individuals consulted as part of the NBSAP development process

In addition to the planned meetings described in the preceding paragraphs, consultations were also done in some other relevant events, organized by the FECOFUN, NEFIN, and ForestAction Nepal. Those participations provided opportunities to inform the diverse stakeholders about the NBSAP work and get their comments and suggestions.

D-2. Regional and District Level Consultations

Regional level government and non-government stakeholders, and district level government line agencies, NGOs, Civil Society groups and other relevant agencies and individuals were consulted by organizing a day-long consultation workshop at each of the five development regions, and selected 15 districts across Nepal (Figure 26).

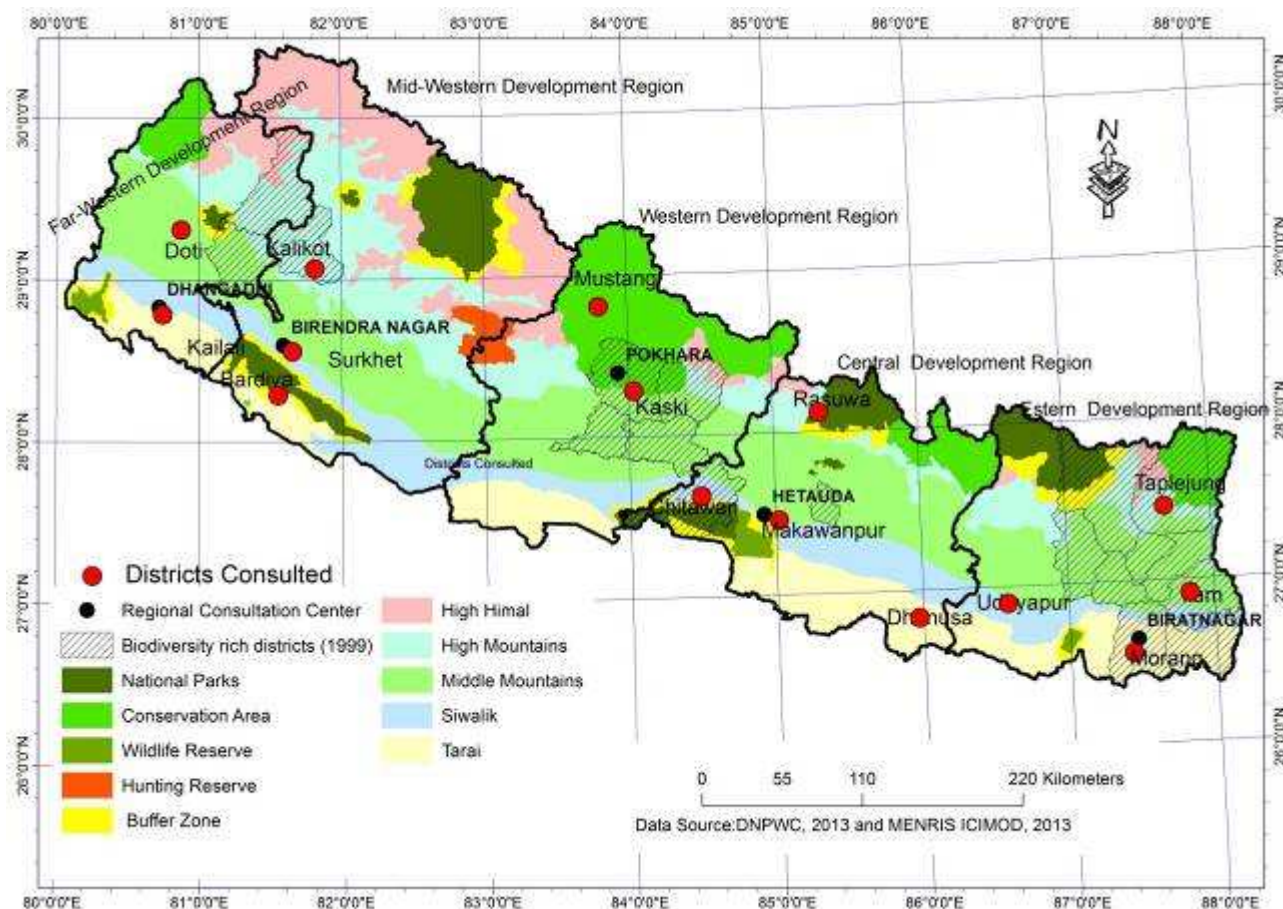


Figure 26: Location of the regional and district level consultation workshops

The districts for the consultations were selected purposively based on predefined criteria, including: (i) representation of the physiographic zones, (ii) representation of the development regions, (iii) status of biodiversity, (iv) spatial linkage to the existing protected areas, and (v) state of development (i.e. HDI). The selection was reviewed and validated by the participants of the Inception Meeting. Five of the district level consultation workshops were combined with the region level workshops organized in those district (and regional) headquarters (Table 33).

Table 33: Description of the regional and district level consultation workshops

Region/District	Date (M/D)	Venue	Participants		
			M	W	Total
Eastern/Morang	05/20	Regional Forestry Training Center (RFTC), Biratnagar	30	1	31
Western/Kaski	05/23	Nagar Bikas Training Center, Pokhara	39	4	43
Ilam	05/23	NCDC, Ilam	17	6	23

Taplejung	05/27	DDC, Taplejung	22	1	23
Mustang	05/27	DDC Hall, Jomsom	27	6	33
Udaypur	06/02	Karmachari Milan Kendra, Gaighat	16	2	18
Mid-western/Surkhet	06/03	RFTC, Surkhet	35	1	48
				3	
Dhanusha	06/05	Family Plan. Asso. Hall, Janakpur	26	2	28
Kalikot	06/07	DADO Training Hall, Manma	35	3	38
Central/Makwanpur	06/09	BISEP-ST Training Center, Hetauda	28	4	32
Chitwan	06/11	District Forest Office, Bharatpur	22	1	23
Bardia	06/12	DADO Training Hall, Gularia	26	6	32
Rasuwa	06/16	DDC, Rasuwa	22	1	23
Far-western/Kailali	06/16	RFTC, Dhangadhi	36	1	37
Doti	06/19	DADO Training Hall	20	4	24
Total			401	5	456
				5	

M = men; W = women; All dates in 2013.



Photo ©: Ambika P. Gautam

The regional and district level workshops were useful in providing general overview of the plans, programmes, issues, challenges and opportunities related to conservation and sustainable use of biodiversity in the regional and district, identification and ranking of biodiversity threats, biodiversity-livelihood linkages, perceived and evidence-based impacts of climate change on biodiversity and local livelihoods, and identification of opportunities, challenges and threats associated with biodiversity conservation. Identification of biodiversity-rich areas, high-threat areas, biological corridors, important wetlands, and potential climate refugia was another important activity in each of the workshops. Part of the day in each workshop was allocated for more structured focus group discussion on specific subjects, such as gender and social inclusion, the contents of the Local Biodiversity Strategy and Action Plan framework and identification and validation of biodiversity indicators.

D-3. Community Level Consultations and Visits

Field level interaction meetings were organized in 30 sites within the 15 selected districts with the objectives of collecting information on local level conservation issues, challenges and opportunities. Each site included one or more community forest user groups and other community-based organizations. The sites were selected in consultation with the district level key stakeholders (DFO and DADO). A total of 905 individuals, including 335 women and 570 men participated in the community level consultation meetings (Table 34).

Table 34: Description of the community level consultation meetings

SN	Communities	Location	Date (M/D)	Participants		
				M	W	Total
1	Betana Wetland Management Committee and CFUG; Belbari Ilaka Forest Office	Belbari, Morang	05/21	32	8	40
2	Rajghat Janakalyan Manch, bio-engineering site, Rajghat Vegetables Production Group	Rajghat, Morang	05/21	11	12	23
3	Danabari and Sukhani CFUGs; Gajurmukhi Ilaka Forest Office	Sukhani, Ilam	05/22	27	6	33
4	Bhalukateri, Tapu and Madhav CFUGs; Maipokhari Religious Forest Management Committee and Suryodaya Rangepost	Maipokhari, Ilam	05/24	15	3	18
5	Rupatal Rehabilitation and Fishery Cooperative, Pratigyan Cooperative and Farmer to Farmer	Sundari Danda, Lekhnath-11, Kaski	05/24	7	3	10
6	Samudre Dandapari CFUG	Kuvinde, Kaski	05/24	13	4	17
7	Bamthumki, Tokmedanda and Tarebhir CFUGs, and Bamthumki Mother Group	Dokhu, Taplejung	05/26	42	20	62
8	Conservation Area Management Committee (CAMC), Muktinath Youth Club, and Mothers' Group	Jharkot, Muktinath	05/27	20	16	36
9	CAMC members and farmers	Lete, Mustang	05/28	20	4	24
10	Hangdewa, Sayapatri, Yamabung, Deurali Bhitri, Tiring and Fawa Khola CFUGs	Deurali, Taplejung	05/28	34	7	41
11	Raksaha CFUG, and Deuri Rangepost Lalpatta	Hardiya, Udaypur	06/01	30	11	41
12	Joginipakha CFUG, and Rampur Rangepost	Rampur-Thokshila, Udaypur	06/03	23	11	34
13	Namuna Vegetable Product Group	Naya Gaun, Sukhet	06/04	7	27	34
14	Bhairam CFUG	Birendranagar, Surkhet	06/04	35	57	92
15	Parshuram Lake Management Committee and Local Farmers	Mithileshwor-Nikas, Dhanusha	06/06	31	0	31

16	Dhanushadham Protected Forest and Religious Site Users	Dhanushadham, Dhanusha	06/06	25	0	25
17	Jaljale Biregda, Palta Mahadev and Pujaimalika CFUGs	Tadi, Kalikot	06/06	18	13	31
18	Microenterprise Agriculture Group, Kelakhet Agriculture Group	Garuwa, Kalikot	06/06	9	8	17
19	Ramanthali Leasehold FUG	Padampokhari, Makwanpur	06/08	1	17	18
20	Rani CFUG	Chaughada, Makwanpur	06/10	10	10	20
21	Janapragati, Jharana, Nibuwater and Sampyang CFUGs; Shaktikhor Rangepost	Shaktikhor, Chitwan	06/10	18	4	22
22	Kalpabrikshya Fewa, Sagamatha Women, Kalpabrikshya Fish, Chandra Fewa, Laligurans Fewa and Hariyali Fewa Agriculture Groups	Jagatpur, Bardia	06/11	15	27	42
23	Madhuban CFUG	Dhodhari, Bardiya	06/11	10	3	13
24	Barandabhar Buffer Zone CFUG	Gitanagar, Chitwan	06/12	14	1	15
25	Sitapur Agro, Kanchan United Farmers', Srijana, Laligurans, Sayapatri Women Farmers, Chaudhary Women Farmers, Chameli and Seed Production Agriculture Groups; Mothers' Groups	Tikapur, Kailali	06/13	23	5	28
26	Tenuwa, Komal Hariyali, Mohannyal, Tribeni, Brinda and Ghotaili CFUGs, and Ghodaghodi Wetlands Project Office	Ghodaghodi, Kailali	06/13	29	17	46
27	Nangrang and Panchgore CFUGs; Goljung Rangepost	Goljung, Rasuwa	06/17	18	4	22
28	Laligurans CFUG; LIBIRD and other local groups	Gaira, Doti	06/17	11	4	15
29	Syaubari Buffer Zone CFUG, Rasuwa	Laharepauwa	06/18	12	8	20
30	Mathillo, Bajhokol, Kalika, Chunepai, Bhaluodar, Kerabari, Gorkheodar and Chaupato CFUGs	Pulut, Doti	06/19	10	25	35
Total				570	335	905

M = men; W = women; All dates in 2013.



Photo ©: Ambika P. Gautam

Community level consultation meeting, Raksaha Community Forest, Udaypur

Community forest user groups, buffer zone community forest user groups, conservation area management committees, leasehold forest user groups, community based on-farm biodiversity management groups, relevant local NGOs, CBOs and eco-clubs, mother groups, representatives of indigenous and local communities, local micro-enterprises operators, and progressive farmers were some of the main groups consulted through the community level meetings. Group discussions, key informants interviews and other participatory rapid appraisal techniques were used to collect data and information on trends of changes in biodiversity, opportunities and threats to biodiversity, local perceptions on meaning, importance and drivers of biodiversity loss, impacts of climate change and adaptation strategies of communities and households, governance, and gender and social inclusion related information relevant to the management of community forests, protected areas and other natural resources. Where appropriate, separate focus group meetings were organized for women and other disadvantaged social groups.

While in the field, the team of experts also directly observed and took notes and pictures of features and events of interest, such as invasion of alien species, land use and natural resource management practices, forest encroachments, and status of wetlands in and around the travel routes and visited communities and places. These activities greatly helped enhance the NBSAP drafting team members' understanding of the field realities with regard to status of conservation, threats and challenges in conservation and sustainable use of local biodiversity.

E. Reports Preparation

Using the data and information collected through the methods described in the preceding sections, the NBSAP report was drafted.

Annex 2: Ramsar sites in Nepal

SN	Name	Designation Date	Area (ha.)	Elevation (m)
1	Koshi Tappu	12/17/1987	17,500	80
2	Beeshazar and Associated Lakes	08/13/2003	3,200	286
3	Ghodaghodi Lake Complex	08/13/2003	2,563	205
4	Jagadishpur Reservoir	08/13/2003	225	197
5	Gokyo and Associated Lakes	09/29/2007	7,770	4,710-4,950
6	Gosaikunda and Associated Lakes	09/29/2007	1,030	4,054-4,620
7	Phoksundo Lake	09/29/2007	494	3,611
8	Rara Lake	09/29/2007	1,583	2,900
9	Mai Pokhari	10/27/2008	90	2,100

Annex 3: Major cropping patterns in different physiographic zones

Zone	Land Type	Cropping Pattern
<i>Tarai</i>	Irrigated Rain-fed	Rice –wheat; rice-rice-wheat; rice-rice/legumes; rice-maize; rice-vegetables. Rice/legumes; maize/finger millet-wheat; rice-fallow; rice-grain legumes.
<i>Siwalik</i>	Irrigated Rain-fed	Rice-wheat; rice-maize; rice-vegetables; rice-potato-potato. Maize+soybean-mustard/fallow; maize/millet-wheat; maize+upland rice-fallow.
Middle Mountains	Irrigated Rain-fed	Rice-wheat; rice-naked barley, rice-vegetables; rice-potato-potato; maize+soybean-mustard/fallow; maize+upland rice-lentil or fallow. Maize/fingermillet-fallow; maize-buckwheat
High Mountains	Irrigated Rain-fed	Naked barley; wheat; potato-buckwheat or mustard or vegetables; maize/fingermillet-naked barley; maize-wheat; buckwheat-wheat or naked barley, buckwheat-mustard. Potato –fallow; buckwheat-fallow; naked barley –fallow.
High Himal		Limited agriculture (terminal point for crops)

Source: Adapted from Upadhyay and Joshi (2003)

Annex 4: Endemic bamboo and tree species of Nepal

S N	Botanical Name	Family	Plant Form	Occurrence	
				Average Elevation (m)	Region
1	<i>Borinda chigar</i>	Poaceae	Bamboo	3,000	Western, Central
2	<i>Borinda emeryi</i>		Bamboo	3,000	Central
3	<i>Bromus nepalensis</i>	Poaceae	Bamboo	3,000	Western
4	<i>Himalayacalamus asper</i>	Poaceae	Bamboo	2,000	Central
5	<i>Himalayacalamus cupreus</i>	Poaceae	Bamboo	2,500	Central
6	<i>Himalayacalamus fimbriatus</i>	Poaceae	Bamboo	1,200	Western, Central
7	<i>Himalayacalamus porcatus</i>	Poaceae	Bamboo	2,270	Central
8	<i>Persea tomentosa</i>	Lauraceae	Tree		Central
9	<i>Persea blumei</i>	Lauraceae	Tree	1,350	N/A
10	<i>Prunus himalaica</i>	Rosaceae	Tree	3,900	Central
11	<i>Prunus jajarkotensis</i>	Rosaceae	Tree	950	Western
12	<i>Sorbus sharmae</i>	Rosaceae	Tree	3,170	Central
13	<i>Salix nepalensis</i>	Salicaceae	Tree	3,870	Western
14	<i>Wendlandia appendiculata</i>	Rubiaceae	Tree	1,400	Central

Sources: Rajbhandari and Adhikari (2009); Rajbhandari and Dhungana (2011)

Annex 5: Major plant species found in different types of rangelands

Tropical Savannas
<i>Andropogon pumilus</i> , <i>Bothriochloa intermedia</i> , <i>Bothriochloa odorata</i> , <i>Chrysopogon aciculatus</i> , <i>Cynoden dactylon</i> , <i>Desmostachys bipinnata</i> , <i>Hymenachne pseudointerrupta</i> , <i>Imperata cylindrica</i> , <i>Ischaemum timorense</i> , <i>Narenga porphyrocoma</i> , <i>Panicum natatum</i> , <i>Paspalum conjugatum</i> , <i>Phragmites karka</i> , <i>Saccharum arundinaceum</i> , <i>Saccharum bengalense</i> , <i>Saccharum spontaneum</i> , <i>Sclerostachya fusca</i> , <i>Sporobolus indicus</i> , <i>Vetiveria zizaniodes</i>
Sub-tropical Rangelands
<i>Andropogon pumilis</i> , <i>Apluda mutica</i> , <i>Arundinella bengalensis</i> , <i>A. nepalensis</i> , <i>Bothriochloa intermedia</i> , <i>B. decumbens</i> , <i>B. pertusa</i> , <i>Chrysopogon fulvus</i> , <i>C. gryllus</i> , <i>C. jwarancusa</i> , <i>Capillipedium parviflorum</i> , <i>Cymbopogon microtheca</i> , <i>C. stracheyi</i> , <i>Cynodon dactylon</i> , <i>Dimeria fuscescens</i> , <i>Digitaria setigera</i> , <i>D. cruciata</i> , <i>Eragrostiella leioptera</i> , <i>Eragrostis nigra</i> , <i>Eulaliopsis binata</i> , <i>Eleusina indica</i> , <i>Heteropogon contortus</i> , <i>Imperata cylindrica</i> , <i>Isachna globosa</i> , <i>Ischaemum baratum</i> , <i>Oplismenus compositus</i> , <i>Paspalidium flavidum</i> , <i>Paspalum dilitatum</i> , <i>P. scrobiculatum</i> , <i>Penisetum clandestinum</i> , <i>P. pedicellatum</i> , <i>Perotis hordeiformis</i> , <i>Polygonum spp.</i> , <i>Sporobolus fertilis</i> , <i>Thysanolaena maxima</i>
Temperate Rangelands
<i>Agropyron canaliculatum</i> , <i>Agropyron semicostatum</i> , <i>Agrostis canina</i> , <i>Agrostis falipus</i> , <i>Agrostis micrantha</i> , <i>Agrostis muriantha</i> , <i>Agrostis pilosula</i> , <i>Anaphalis contorta</i> , <i>Andropogon pumilus</i> , <i>Andropogon tritis</i> , <i>Arundenella hookerii</i> , <i>Brachypodium sylvaticum</i> , <i>Bromus ramorus</i> , <i>Bothriochloa bladhii</i> , <i>Calamagrostis epigejos</i> , <i>Calamagrostis emodensis</i> , <i>Calamagrostis pseudophragmites</i> , <i>Chrysopogon gryllus</i> , <i>Cymbopogon distans</i> , <i>Cymbopogon microtheca</i> , <i>Danthonia jacqnemontii</i> , <i>Deschampsia caespitosa</i> , <i>Deyeuschia scabrescens</i> , <i>Digitariai spp.</i> , <i>Eragrostis nigra</i> , <i>Erigeron alpinus</i> , <i>Elymus caninus</i> , <i>Eulalia mollis</i> , <i>Festuca gigantea</i> , <i>Festuca ovina</i> , <i>Festuca rubra</i> , <i>Helictotrichon asperum</i> , <i>Keoheria cristata</i> , <i>Muhenbergia spp.</i> , <i>Miscanthus nepalensis</i> , <i>Oryzopsis aequiglumis</i> , <i>Paspalum spp.</i> , <i>Pennisetum flaccidum</i> , <i>Poa pratensis</i> , <i>Poa alpina</i> , <i>Poa annua</i> , <i>Polygonum spp.</i> , <i>Seteria pallidefusca</i> , <i>Schizachyrium delarvayi</i> , <i>Stippa concinna</i> , <i>Taraxacum officinale</i> , <i>Themeda quadrivalis</i> , <i>Thymus serphyllum</i> , <i>Trisetum spicatum</i> , <i>Trisetum micans</i> . Major legumes are <i>Desmodium spp.</i> , <i>Medicago denticulata</i> , <i>Medicago lupinina</i> , <i>Pretopis cytosoides</i> , <i>Trigonella emodi</i> , <i>Vicia spp.</i>
Sub-alpine Rangelands
<i>Agrostis inaequiglumis</i> , <i>Agrostis pilosula</i> , <i>Agrostis tenuis</i> , <i>Anthoxanthum hookerii</i> , <i>Arrhanatherum elatius</i> , <i>Bromus himalaicus</i> , <i>Calamagrostis emodensis</i> , <i>Calamagrostis pulchella</i> , <i>Crotalaria albida</i> , <i>Danthonia schneideri</i> , <i>Duthiea nepalensis</i> , <i>Elymus canaliculatus</i> , <i>Elymus dehuricus</i> , <i>Elymus nuleris</i> , <i>Elymus schrenleianus</i> , <i>Festuca eumminsii</i> , <i>Festuca leptopogon</i> , <i>Festuca omina</i> , <i>Helictotrichon virescens</i> , <i>Medicago lupina</i> , <i>Poa alpina</i> , <i>Poa ludens</i> , <i>Poa polycolea</i> , <i>Stipa concinna</i> , <i>Stipa duthiea</i> , <i>Stipa koelzei</i> , <i>Stipa regeliana</i> , <i>Stipa seliria</i> , <i>Triluria oreophilia</i> , <i>Trisetum spicatum</i>
Major legumes found in the regions are <i>Medicago lupina</i> , <i>Vicia tetrasperma</i> and others. Major Shrubs: <i>Berberis</i> , <i>Caragana</i> , <i>Junipers</i> , <i>Potentiall</i> , <i>Rosa</i> , <i>Spiraea</i> and others. Major trees: <i>Rhododendron spp.</i> , <i>Juniperus spp.</i> , <i>Betula spp.</i> , <i>Rosa spp.</i> , <i>Potentilla spp.</i> , <i>Berberis</i>

spp., *Medicago lupina*, *Vicia tetrasperma*

Alpine Meadows and Steppe

Agrostis pilosula, *Androsace lehmani*, *Carex* spp., *Cortia depressa*, *Elymus nutans*, *Kobrasa hookerii*, *Kobresia nepalensis*, *Poa alpina*, *Poa attenuata*, *Potentilla argyrophylla*, *Andropogon tritis*, *Aristida* spp., *Calamagrostis* spp, *Crysopogon stelleri*, *Cymbopogon stracheyi*, *Danthonia cachemyriana*, *Deyeuxia holciformis*, *Deyeuxia pulchella*, *Festuca ovina*, *Melica jacquemontii*, *Melica scaberrima*, *Orinus thordii*, *Oryzopsis lateralis*, *Pennisetum flaccidum*, *Poa alpigena*, *Poa pagophila*, *Poa poophagorum*, *Rumex nepalensis*, *Stippa* spp. Major legumes are *Medicago falcata* and others.

Sources: Miller (1987), Archer (1990), Pande (2009)

Annex 6: Freshwater fish species reported from Nepal

1	<i>Notopterus notopterus</i> (Pallas)	116	<i>B. dario</i> (Hamilton)
2	<i>Chitala chitala</i> (Hamilton)	117	<i>B. histrionica</i> (Blyth)
3	<i>Anguilla bengalensis</i> (Gray)	118	<i>B. lohachata chaudhuri</i>
4	<i>Neoanguilla nepalensis</i> sp. Nov.	119	<i>B. geto</i> (Hamilton)
5	<i>Moringua raitaborua</i> (Ham)	120	<i>Neoeucirrhichthys maydelli</i> Banarescu & Nalbant
6	<i>Gudusia chapra</i> (Hamilton)	121	<i>Acantophthalmus pangio</i> (Hami)
7	<i>G. variegata</i> (Day)	122	<i>Semileptes gongota</i> (Hamilton)
8	<i>Setipinna phasa</i> (Hamilton)	123	<i>Lepidocephalus annadalei</i> Chaudhuri
9	<i>Securicula gora</i> (Hamilton)	124	<i>Lepidocephalus guntea</i> (Hamilton)
10	<i>Salmonstoma acinaces</i> (Valenciennes)	125	<i>L. menon</i> Pillai & Yazdani
11	<i>S. bacaila</i> (Hamilton)	126	<i>Rita rita</i> (Hamilton)
12	<i>S. phulo phulo</i> (Hamilton)	127	<i>Batasio batasio</i> (Hamilton)
13	<i>Aspidoparia jaya</i> (Hamilton)	128	<i>B. tengana</i> (Hamilton)
14	<i>A. morar</i> (Hamilton)	129	<i>B. macronotus</i> sp. nov. Ng & Edds
15	<i>Barilius barila</i> (Hamilton)	130	<i>Mystus bleekeri</i> (Day)
16	<i>B. barna</i> (Hamilton)	131	<i>M. cavasius</i> (Hamilton)
17	<i>B. bendelisis</i> (Hamilton)	132	<i>M. gulio</i> (Hamilton)
18	<i>B. radiolatus</i> Gunther	133	<i>M. menoda</i> (Hamilton)
19	<i>B. shacra</i> (Hamilton)	134	<i>M. tengara</i> (Hamilton)
20	<i>B. tileo</i> (Hamilton)	135	<i>M. vittatus</i> (Bloch)
21	<i>B. vagra vagra</i> (Hamilton)	136	<i>Aorichthys aor</i> (Hamilton)
22	<i>B. modestus</i> (Day)	137	<i>A. seenghala</i> (Sykes)
23	<i>B. bola</i> (Hamilton)	138	<i>Ompok bimaculatus</i> (Bloch)
24	<i>B. guttatus</i> (Day)	139	<i>O. pabda</i> (Hamilton)
25	<i>Chela cachius</i> (Hamilton)	140	<i>O. pabo</i> (Hamilton)
26	<i>Chela laubuca</i> (Hamilton)	141	<i>Wallago attu</i> (Schneider)
27	<i>Esomus danricus</i> (Hamilton)	142	<i>Ailia coila</i> (Hamilton)
28	<i>Danio aequipinnatus</i> (McClelland)	143	<i>Pseudeutropius atherinoides</i> (Bloch)
29	<i>D. dangila</i> (Hamilton)	144	<i>P. murius batarensis</i> Shrestha
30	<i>D. devario</i> (Hamilton)	145	<i>Clupisoma garua</i> (Hamilton)
31	<i>Brachydanio. Rerio</i> (Hamilton)	146	<i>Clupisoma montana</i> Hora
32	<i>Rasbora daniconius</i> (Hamilton)	147	<i>Eutropiichthys murius</i> (Hamilton)
33	<i>Bengana elanga</i> (Hamilton)	148	<i>E. vacha</i> (Hamilton)
34	<i>Amblypharyngodon mola</i> (Hamilton)	149	<i>E. goongware</i> (Sykes)
35	<i>A. micropelis</i> (Bleeker)	150	<i>Silonia silonia</i> (Hamilton)
36	<i>Tor putitora</i> (Hamilton)	151	<i>Pangasius pangasius</i> (Hamilton)
37	<i>Tor tor</i> (Hamilton)	152	<i>Amblyceps mangois</i> (Hamilton)
38	<i>Tor mosal</i> (Hamilton)	153	<i>Bagarius bagarius</i> (Hamilton)
39	<i>Naziritor cheilnoides</i> (McClelland)	154	<i>B. yerrellii</i> Sykes
40	<i>Neolissochilus hexagonolepis</i>	155	<i>Gagata cenia</i> (Hamilton)

41	<i>Osteobrama cotio cotio</i> (Hamilton)	156	<i>G. gagata</i> (Hamilton)
42	<i>O. neilli</i> (Day)	157	<i>G. sexualis</i> Tilak
43	<i>Cyclocheilichthys. Apogon</i> (Cuvier & Valenciennes)	158	<i>Nangra nangra</i> (Hamilton)
44	<i>Chagunius chagunio</i> (Hamilton)	159	<i>N. viridescens</i> (Hamilton)
45	<i>Oreichthys cosuatis</i> (Hamilton)	160	<i>N. assamenisis</i> Sen
46	<i>Puntius chola</i> (Hamilton)	161	<i>Erethistes pussilus</i> Muller & Troschel
47	<i>P. conchoni</i> (Hamilton)	162	<i>Erethistoides montana montana</i> Hora
48	<i>P. gelius</i> (Hamilton)	163	<i>E. ascita</i> sp. nov. Ng & Edds
49	<i>P. guganio</i> (Hamilton)	164	<i>E. cavatura</i> sp. nov. Ng & Edds
50	<i>P. phutunio</i> (Hamilton)	165	<i>Hara hara</i> (Hamilton)
51	<i>P. sophore</i> (Hamilton)	166	<i>H. jerdoni</i> Day
52	<i>P. ticto</i> (Hamilton)	167	<i>Conta conta</i> (Hamilton)
53	<i>P. clavatus clavatus</i> (McClelland)	168	<i>Glyptosternum maculatum</i> (Regan)
54	<i>P. sarana sarana</i> (Hamilton)	169	<i>G. reticulatum</i> McClelland
55	<i>P. terio</i> (Hamilton)	170	<i>Laguvia ribeiroi</i> Hora
56	<i>Semiplotus semiplotus</i> (McClelland)	171	<i>L. kapuri</i> Tilak & Hussain
57	<i>Cirrhinus mrigala</i> (Hamilton)	172	<i>Glyptothorax annandalei</i> Hora
58	<i>C. reba</i> (Hamilton)	173	<i>G. cavia</i> (Hamilton)
59	<i>Catla catla</i> (Hamilton)	174	<i>G. conirostris conirostae</i> (Steindacher)
60	<i>Labeo angra</i> (Hamilton)	175	<i>G. gracillis</i> (Gunther)
61	<i>L. bata</i> (Hamilton)	176	<i>G. indicus</i> Talwar & Jhingran
62	<i>L. boga</i> (Hamilton)	177	<i>Glyptothorax kashmirensis</i> Hora
63	<i>L. calbasu</i> (Hamilton)	178	<i>G. pectinopterus</i> (McClelland)
64	<i>L. dero</i> (Hamilton)	179	<i>G. telchitta telchitta</i> (Hamilton)
65	<i>L. fimbriatus</i> (Bloch)	180	<i>G. trilineatus</i> (Blyth)
66	<i>L. gonius</i> (Hamilton)	181	<i>G. alaknandi</i> Tilak
67	<i>L. pangusia</i> (Hamilton)	182	<i>G. garhwali</i> Tilak.
68	<i>L. rohita</i> (Hamilton)	183	<i>G. botius</i> (Hamilton)
69	<i>L. caeruleus</i> (Day)	184	<i>Euchiloglanis hodgarti</i> (Hora)
70	<i>L. dyocheilus dyocheilus</i> (McClell.)	185	<i>Coraglanis kishinouyei</i> (Kimura)
71	<i>Schismatorhynchus</i> (Nukta) <i>nukta</i> (Sykes)	186	<i>Myersglanis blythii</i> (Day)
72	<i>Schizothorax richardsonii</i> (Gray)	187	<i>Exostoma labiatus</i> (McClelland)
73	<i>S. sinuatus</i> (Heckel)	188	<i>Pseudechenesis sulcatus</i> (McClelland)
74	<i>Schizothoraichthys curvifrons</i> (Heckel)	189	<i>P. crassicaudata</i> sp. nov. Ng & Edds
75	<i>S. ecocinus</i> (Heckel)	190	<i>P. serracula</i> sp. nov. Ng & Edds
76	<i>S. niger</i> (Heckel)	191	<i>P. eddsi</i> sp. nov. Ng
77	<i>S. labiatus</i> (McClelland)	192	<i>Sisor rhabdophorus</i> (Hamilton)
78	<i>S. progastus</i> (McClelland)	193	<i>Sisor rheophilus</i> Ng
79	<i>Schizothoraichthys macrophthalmus</i> (Terashima)	194	<i>Clarius batrachus</i> (Linnaeus)
80	<i>S. nepalensis</i> (Terashima)	195	<i>Heteropneustes fossillis</i> (Bloch)

81	<i>S. raraensis</i> (Terashima)	196	<i>Chaca chaca</i> (Hamilton)
82	<i>Dipticus maculatus</i> Steindachner	197	<i>Olyra longicaudata</i> McClelland
83	<i>Crossocheilus latius latius</i> (Hamilton)	198	<i>Sicamugil cascasia</i> (Hamilton)
84	<i>Garra annandalei</i> Hora	199	<i>Rhinomugil corsula</i> (Hamilton)
85	<i>G. gotyla gotyla</i> (Gray)	200	<i>Xenentodon cancila</i> (Hamilton)
86	<i>Garra lamta</i> (Hamilton)	201	<i>Hyporhamphus limbatus</i> (Valenciennes)
87	<i>G. lissorhynchus</i> (McClelland)	202	<i>Aplocheilus panchax</i> (Hamilton)
88	<i>G. mullya</i> (Sykes)	203	<i>Monopterus cuchia</i> (Hamilton)
89	<i>G. nasuta</i> (McClelland)	204	<i>Macragnathus aral</i> (Bloch & Schneider)
90	<i>G. rupecula</i> (McClelland)	205	<i>M. pancalus</i> (Hamilton)
91	<i>Psilorhynchus balitora</i> (Hamilton)	206	<i>M. zebrinus</i> (Blyth)
92	<i>P. sucatio</i> (Hamilton)	207	<i>Mastacembelus armatus</i> (Lacepede)
93	<i>P. gracillis</i> Rainboth	208	<i>Chanda nama</i> (Hamilton)
94	<i>P. nepalensis</i> (Conway & Mayden)	209	<i>Parambassis baculis</i> (Hamilton)
95	<i>Psilorhynchoides</i> . Homaloptera Hora & Mukherji	210	<i>P. ranga</i> (Hamilton)
96	<i>P. pseudocheneis</i> Menon & Datta	211	<i>P. lala</i> (Hamilton)
97	<i>Homaloptera bilineata</i> (Blyth)	212	<i>Johnius coiter</i> (Hamilton)
98	<i>Balitora brucei</i> Gray	213	<i>Daysciaena albida</i> (Cuvier)
99	<i>B. eddsi</i> sp. Nov. conway & Mayden	214	<i>Badis badis</i> (Hamilton)
100	<i>Acanthocobitis botia</i> (Hamilton)	215	<i>Nandus nandus</i> (Hamilton)
101	<i>Nemacheilus. Corica</i> (Hamilton)	216	<i>Glossogobius giuris</i> (Hamilton)
102	<i>Turcinomacheilus himalaya</i> (Banarescu & Nalbant)	217	<i>Brachyamblyopus burmanicus</i> (Hora)
103	<i>Schistura beavani</i> Gunther	218	<i>Anabas testudineus</i> (Bloch)
104	<i>S. devdevi</i> Hora	219	<i>A. cobojus</i> (Hamilton)
105	<i>S. multifaciatius</i> Day	220	<i>Ctenops nobilis</i> (McClelland)
106	<i>S. rupecola rupecula</i> (McClelland)	221	<i>Colisa fasciatus</i> (Bloch & Schneider)
107	<i>S. rupecula englishi</i> (Hora)	222	<i>C. lala</i> (Hamilton)
108	<i>S. savona</i> (Hamilton)	223	<i>C. sota</i> (Hamilton)
109	<i>S. scaturigina</i> (McClelland)	224	<i>C. barca</i> (Hamilton)
110	<i>S. sikamaiensis</i> (Hora)	225	<i>C. marulius</i> (Hamilton)
111	<i>S. prashadi</i> (Hora)	226	<i>Channa orientalis</i> (Bloch & Schneider)
112	<i>S. horai</i> (Menon)	227	<i>C. punctatus</i> (Bloch)
113	<i>S. himachalensis</i> (Menon)	228	<i>C. stewartius</i> (Playfair)
114	<i>Aborichthys elangatus</i> (Hora)	229	<i>C. Striaraus</i> (Bloch)
115	<i>Botia almorhae</i> Gray	230	<i>Tetradon cutcutia</i> (Hamilton)

Source: Rajbanshi (2013)

Annex 7: Some phytoplankton species reported from Nepal

1	<i>Microcystis aeruginosa</i>	27	<i>Paulschulzia Pseudovolvox</i>	53	<i>Scenedesmus opoliensis</i>	78	<i>Staurodesmus extensus</i>
2	<i>Microcystis</i> sp.	28	<i>Pandorina morum</i>	54	<i>Scenedesmus brevispina</i>	79	<i>Staurodesmus conatus</i>
3	<i>Chroococcus</i> sp.	29	<i>Chlorococcales:</i>	55	<i>Scenedesmus ecornis</i>	80	<i>Staurodesmus pachyrhynchus</i>
4	<i>Lyngbya</i> sp.	30	<i>Pediastrum duplex</i>	56	<i>Scenedesmus acuminatus</i>	81	<i>Staurastrum protectum var. rangoonense</i>
5	<i>Oscillatoria</i> sp.	31	<i>Pediastrum duplex var. subgranulatum</i>	57	<i>Tetrallantos lagerheimii</i>	82	<i>staurastrum</i> spp.
6	<i>Oedogonium</i> sp.	32	<i>Pediastrum boryanum</i>	58	<i>Crucigenia lauterbornii</i>	83	<i>Staurastrum tohopekaligenese</i>
7	<i>Cymbella</i> sp.	33	<i>Pediastrum clathratum</i>	59	<i>Crucigenia tetrapedia</i>	84	<i>Staurastrum rosei</i>
8	<i>Anabaena</i> sp.	34	<i>Pediastrum simplex</i>	60	<i>Apiculata</i>	85	<i>Staurastrum chaetoceras</i>
9	<i>Aphanothece</i> sp.	35	<i>Pediastrum tetras</i>	61	<i>Apiculata quadrata</i>	86	<i>Staurastrum sexangulare</i>
10	<i>Spirulina gigantea</i>	36	<i>Pediastrum angulosum</i>	62	<i>Coelastrum microporum</i>	87	<i>Staurastrum diptilum</i>
11	<i>Coelosphaerium natans</i>	37	<i>Sphaerocystis schroeteri</i>	63	<i>Coelastrum intermedium</i>	88	<i>Xanthidium hastiferum var. javanicum</i>
12	<i>Merismopedia</i> sp.	38	<i>Botryococcus braunii</i>	64	<i>Ankistrodesmus falcatus</i>	89	<i>Teilingia granulate</i>
13	<i>Ceratium hirundinella</i>	39	<i>Botryococcus protuberans</i>	65	<i>Conjugatophyceae:</i>	90	<i>Spondylosium nitens var. triangular f. javanicum</i>
14	<i>Gymnodinium</i> sp.	40	<i>Dictyosphaerium ehrenbergianum</i>	66	<i>Closterium gracile</i>	91	<i>Sphaerosozomaubertianum</i>
15	<i>Peridinium inconspicuum</i>	41	<i>Dictyosphaerium pulchellum var. ovatum</i>	67	<i>Actinotaenium globosum</i>	92	<i>Spondylosium planum</i>
16	<i>Peridinium</i> sp.	42	<i>Westella botryoides</i>	68	<i>Cosmarium monoliforme</i>	93	<i>Trachelomonas volvocina</i>
17	<i>Mallomonas</i> sp.	43	<i>Eutetramorus planctonica</i>	69	<i>Cosmarium luetkemulleri</i>	94	<i>Trachelomonas acanthophora</i>
18	<i>Dinobryon sertularia</i>	44	<i>Oocystis borgei</i>	70	<i>Cosmarium</i> sp.	95	<i>Trachelomonas globularis</i>
19	<i>Dinobryon divergens</i>	45	<i>Oocystis solitaria</i>	71	<i>Cosmarium pseudophaseolus var. tithophoroides</i>	96	<i>Trachelomonas mirabilis</i>
20	<i>Centritractus belonophorus</i>	46	<i>Oocystis</i> sp.	72	<i>Cosmarium javanicum</i>	97	<i>Trachelomonas hispida</i>
21	<i>Milosira islandica f. spiralis</i>	47	<i>Monoraphidium conrotutum</i>	73	<i>Cosmarium obsoletum</i>	98	<i>Trachelomonas armata</i>
22	<i>Milosira granulata</i>	48	<i>Nephrocytium</i> sp.	74	<i>Cosmarium margispinatum</i>	99	<i>Trachelomonas megalacantha var. crenulatocollis</i>
23	<i>Diatoma elongatum</i>	49	<i>Nephrocytium agardhianum</i>	75	<i>Staurodesmus phimus</i>	100	<i>Euglena oxyuris var. charkowiensis</i>
24	<i>Synedra ulna</i>	50	<i>Kirchneriella obesa</i>	76	<i>Staurodesmus leptodermus</i>	101	<i>Phacus longicauda</i>
25	<i>Volvocales:</i>	51	<i>Kirchneriella lunaris</i>	77	<i>Staurodesmus O'Mearii</i>	102	<i>Phacus</i> spp.

Sources: Hirano (1955); Hickel (1973a); Hickel (1973b)

Annex 8: Some zooplankton species reported from Nepal

A) Rotifer		60	<i>Conochiloides dossuarius</i> (Hudson, 1885)
1	<i>Lecane ceylonensis</i> (Chengalath and Fernando, 1973)	61	<i>Tetramastix opoliensis</i> (Zacharias, 1898)
2	<i>Lecane crepida</i> (Harring, 1914)	B) Cladocera	
3	<i>Lecane curvicornis</i> (Murray, 1913)	62	<i>Diaphanosoma excisum</i> (Sar, 1884)
4	<i>Lecane curvicornis</i> var. miamiensis (Myers, 1941)	63	<i>Diaphanosoma saroi</i> (Richard, 1894)
5	<i>Lecane curvicornis</i> var. nitida (Murray, 1913)	64	<i>Daphma similis</i> (Clans, 1876)
6	<i>Lecane elegans</i> (Harring, 1914)	65	<i>Daphma lumhothis</i> (Sars, 1885)
7	<i>Lecane hastata</i> (Murray, 1913)	66	<i>Daphma tibetana</i> (Sars, 1903)
8	<i>Lecane hornemanni</i> (Ehrenberg, 1881)	67	<i>Daphma pulex</i> (de Geer), 1978
9	<i>Lecane leontina</i> (Turner, 1892)	68	<i>Daphma longis pina</i> (Muller, 1785)
10	<i>Lecane ludwigii</i> (Eckstein, 1883)	69	<i>Simocephalno vetulus</i> (Muller, 1776)
11	<i>Lecane luna</i> (Muller, 1776)	70	<i>Ceriodaphnia cornuta</i> (Sars, 1885)
12	<i>Lecane papuane</i> (Murray, 1913)	71	<i>Ceriodaphnia cornuta</i> (Sars, 1885)
13	<i>Lecane ploenensis</i> (Voigt, 1902)	72	<i>Ceriodaphnia retientata</i> (Jurme, 1820)
14	<i>Lecane subtilis</i> (Harring and Myers, 1926)	73	<i>Ceriodaphnia pulchella</i> (Sars, 1862)
15	<i>Lecane ungulata</i> (Gosse, 1887)	74	<i>Ceriodaphnia quadrangulia</i> (Muller, 1787)
16	<i>Lecane sympoda</i> (Hauer, 1929)	75	<i>Micrura</i> spp. (Kurne, 1874)
17	<i>Lecane undulata</i> (Hauer, 1938)	76	<i>Bosmina longirostris</i> (Muller, 1885)
18	<i>Lecane bulla</i> (Gosse, 1851)	77	<i>Eubrsmia coregoni</i> (Baird, 1857)
19	<i>Lecane closteroerca</i> (Schmarda, 1859)	78	<i>Macrothrex laticornis</i> (Jurine 1820)
20	<i>Lecane decipiens</i> (Murray, 1913)	79	<i>Echinisca triseridis</i> (Brady, 1886)
21	<i>Lecane lunaris</i> (Ehrenberg, 1832)	80	<i>Eurycercus</i> spp.
22	<i>Lecane perpusilla</i> (Hauer, 1929)	81	<i>Pleuroxus aduncus</i> (Jurine, 1820)
23	<i>Lecane pyriformis</i> (Daday, 1905)	82	<i>P. Similis</i> (Vavra, 1900)
24	<i>Lecane quadridentata</i> (Ehrenberg, 1832)	83	<i>P. laevis</i> (Sars, 1862)
25	<i>Lecane stenroosi</i> (Meissner, 1908)	84	<i>Alonella nana</i> (Baird, 1850)
26	<i>Lecane thienemanni</i> (Hauer, 1938)	85	<i>Alonella excisa</i> (Fischer, 1954)
27	<i>Lecane Unguitata</i> (Fadeev, 1925)	86	<i>Exigua</i> spp.
28	<i>Brachionus angularis</i> (Gosse, 1851)	87	<i>Chyrodus sphaerns</i> (Muller, 1887)
29	<i>Brachionus calyciflorus</i> (Pallas, 1766)	88	<i>Chydorus barrolisi</i> (Richard, 1894)
30	<i>Brachionus caudatus</i> (Barrois and Daday, 1894)	89	<i>Chydus eurynotuseury</i> (Sars, 1911)
31	<i>Brachionus leydigii</i> (Cohn, 1862)	90	<i>Chydus parvus</i> (Daday, 1898)
32	<i>Brachionus patulus</i> (Muller, 1786)	91	<i>Dunhavedisa crana</i> (King, 1853)
33	<i>Brachionus quadridentatus</i> (Hermann, 1783)	92	<i>Leydigia ciliata</i> (Gauthier, 1939)
34	<i>Brachionus urceolaris</i> (Muller, 1773)	93	<i>Alona quadrangularis</i> (Muller, 1785)
35	<i>Keratella cochlearis</i> (Gosse, 1851)	94	<i>A. reclangulla</i> (Sars, 1863)
36	<i>Keratella procurva</i> (Thorpe, 1891)	95	<i>A. costata</i> (Sars, 1862)
37	<i>Platyias quadricornis</i> (Ehrenberg, 1832)	96	<i>A. pulchella</i> (King, 1853)
38	<i>Colurella colurus</i> (Ehrenberg, 1830)	97	<i>A. guttata</i> (Sars, 1862)
39	<i>Lepadella acuminata</i> (Ehrenberg, 1834)	98	<i>G. testudinars</i> (Fischer, 1851)

40	<i>Lepadella ovalis</i> (Muller, 1786)	99	<i>Biaperturs pseudoverrucosa</i> (Laydig, 1860)(Sars, 1901)
41	<i>Lepadella patella</i> (Muller, 1773)	100	<i>B. karna</i> (King, 1985)
42	<i>Lepadella rhomboides</i> (Gosse, 1886)	101	<i>Oxyurella singalensis</i> (Daddy, 1898)
43	<i>Dicranophorus robustus</i> (Harring and Myers, 1928)	C) Copepoda	
44	<i>Lophocharis salpina</i> (Ehrenberg, 1834)	102	<i>Ectocyclops phaleratus</i> (Koch, 1838)
45	<i>Mytilina bisulcata</i> (Lucks, 1912)	103	<i>Paracyclops fimbriatus</i> (Fischer, 1853)
46	<i>Mytilina ventralis</i> (Ehrenberg, 1832)	104	<i>Tropocyclops prasinus</i> (Fischer, 1860)
47	<i>Dipleuchlanis propatula</i> (Gosse, 1886)	105	<i>Eucyclops leuckarti</i> (Fischer, 1851)
48	<i>Euchlanis dilatata</i> (Ehrenberg, 1832)	106	<i>Mesocyclops leuckarti</i> (Claus, 1857)
49	<i>Tripleuchlanis plicata</i> (Levander, 1894)	107	<i>Thermocyclops crassus</i> (Fischer, 1853)
50	<i>Cephalodella forficula</i> (Ehrenberg, 1832)	108	<i>Microcyclops varicans</i> (Sars, 1863)
51	<i>Trichocerca capucina</i> (Wierzejski and Zacharias, 1893)	109	<i>Ergasilus philippinensis</i> (Velasquez, 1951)
52	<i>Trichocerca rattus</i> (Muller, 1776)	110	<i>Elaphoidella sewelli</i> (Chappuis, 1928)
53	<i>Macrochaetus collinsi</i> (Gosse, 1867)	111	<i>Elaphoidella grandidieri</i> (Guerne and Richard, 1893)
54	<i>Tricho tria tetractis</i> (Ehrenberg, 1830)	112	<i>Filipinodiptomus insulanus</i> (Wright, 1928)
55	<i>Asplanchnopus multiceps</i> (Schrank, 1793)	113	<i>Monglodiaptomus birulai</i> (Rylov, 1924)
56	<i>Polyarthra vulgaris</i> (Carlin, 1943)	114	<i>Tropodiptomus gigantoviger</i> (Brehm, 1933)
57	<i>Testudinella patina</i> (Hermann, 1783)	115	<i>Tropodiptomus vicinus</i> (Kiefer, 1936)
58	<i>Sinantherina spinosa</i> (Thorpe, 1893)	116	<i>Tropodiptomus australis</i> (Kiefer, 1936)
59	<i>Hexarthra intermedia</i> (Wisniewski, 1929)		

Sources: Deams *et al.* (1974); Surana *et al.* (2005); Tiwari and Chhetri (2009)

Annex 9: Mollusk species reported from Nepal

Family: Amblemidae				Family: Pleuroceridae	
1	<i>Parreysia corrugata</i>	2	<i>Parreysia sikkimensis</i>	61	<i>Paludonmus conica</i>
3	<i>Parreysia triembolus</i>	4	<i>Parreysia viridula</i>	62	<i>Paludomus blanfordiana</i>
5	<i>Parreysia favidens</i>	6	<i>Radiatula bonneaudi</i>	Family: Pomatiopsidae	
7	<i>Radiatula caerulea</i>	8	<i>Radiatula lima</i>	63	<i>Erhaia chandeshwariensis</i>
9	<i>Radiatula occata</i>	10	<i>Radiatula shurtleffiana</i>	64	<i>erhaia banepaensis</i>
11	<i>Radiatula pachysoma</i>	12	<i>Radiatula gandichaudi</i>	65	<i>Erhaia sugurensis</i>
Family: Corbiculidae		Family: Sphaeriidae		66	<i>Tricula montana</i>
13	<i>Corbicula striatella</i>	14	<i>Musculium goshaitanensis</i>	67	<i>Tricula godawariensis</i>
15	<i>Chandanbariensis</i>	16	<i>Pisidium atkinsonianum</i>	68	<i>Tricula mahadevesis</i>
17	<i>Musculium indicum</i>	18	<i>Pisidium nevilleianum</i>	Family: Thiaridae	
19	<i>Pisidium clarkeanum</i>	20	<i>Pisidium annansalei</i>	69	<i>Brotia costula</i>
21	<i>Pisidium casertanum</i>	22	<i>Pisidium kuiperi</i>	70	<i>Melanoides tuberculatus</i>
23	<i>Pisidium (Afropisidium) ellisi</i>	24	<i>Prasongi</i> sp.	71	<i>Thiara (Tarebia) scabra</i>
Family: Unionidae				72	<i>Thiara (tarebia) granifera</i>
25	<i>Lamellidens jenkinsianus</i>	26	<i>Lamellidens corrianus</i>	73	<i>Melanoides pyramis</i>
27	<i>Lamellidens mainwaringi</i>	28	<i>Lamellidens narainporensis</i>	74	<i>Thiara lineata</i>
29	<i>Lamellidens marginalis</i>	30	<i>Lamellidens consobrinus</i>	75	<i>Bellamya bengalensis</i>
Family: Apullariidae				Family: Viviparidae	
31	<i>Pila theobaldi</i>	32	<i>Pila globosa</i>	76	<i>Idiopoma dissimilis</i>
Family: Bithyniidae				77	<i>Mekongia crassa</i>
33	<i>Digoniostoma cerameopoma</i>	34	<i>Gabbia orcula</i>	78	<i>Polygramma</i> sp.
35	<i>Gabbia stenothyroides</i>	36	<i>Digoniostoma pulchella</i>	79	<i>Viviparus</i> sp.
Family: Lymnaeidae					
37	<i>Lymnaea acuminata</i>	38	<i>Glabia truncatula</i>		
39	<i>Galba simulans</i>	40	<i>Radix ovalis</i>		
41	<i>Radix luteola</i>	42	<i>Radix persica</i>		
43	<i>Radix brevicauda</i>	44	<i>Radix hookeri</i>		
45	<i>Lymnaea andersoniana</i>	46	<i>Pseudosuccinea</i>		
Family: Neritidae		47	<i>Neritina violacea</i>		
Family: Physidae					
48	<i>Physa acuta</i>	49	<i>Physa (Haitia) mexicana</i>		
Family: Planorbidae		50	<i>Gyraulus convexiusculus</i>		
51	<i>Indoplanorbis exustua</i>	52	<i>Comptoceras lineatum</i>		
53	<i>Hippeutis umbilicalis</i>	54	<i>Gyraulus labiatus</i>		
55	<i>Segmentina calatha</i>	56	<i>Segmentina trochidea</i>		
57	<i>Ferrissia verruca</i>	58	<i>Gyraulus euphraticus</i>		
59	<i>Planorbarium corneus</i>	60	<i>Ferrissia baconi</i>		

Sources: Neseemann and Sharma (2005); Budha (2012)

Annex 10: Some amphibians reported from Nepal

	Species	Common Name	Range (m)	Status	Remarks
Family: Salamandridae					
1	<i>Tylototriton verrucosus</i> (Anderson, 1971)	Crocodile salamander	1200-2150	Fairly common	
Family: Bufonidae					
2	<i>Bufo himalayanus</i> (Gunther, 1894)	Himalayan toad	1300-2744	Fairly common	
3	<i>Bufo melanostictus</i> (Schneider, 1799)	Black spine toad	Below 2500	Fairly common	
4	<i>Bufo microtypanum</i> (Boulenger, 1982)	Small ear toad	1300-2500	Common	
5	<i>Bufo stomaticus</i> (Lutken, 1862)	Marbled toad	130-1880	Fairly common	Smallest species
Family: Microhylidae					
6	<i>Microhyla ornata</i> (Dumeril and Biborn, 1841)	Ornate rice frog	Below 1980	Common	Smallest frog of Nepal
7	<i>Kaloula pulchra</i> (Gray, 1831)	Painted bullfrog	Below 300	Unknown	
8	<i>Kaloula taprobanica</i> (Parker, 1934)	Sri lanka bull frog	Below 300	Rare	
9	<i>Upeodon globulosus</i> (Gunther, 1864)	Gray ballon frog	Below 300		
10	<i>Uperodon systomus</i> (Schneider, 1799)	Marbled ballon frog	Below 200	Unknown	
Family: Megophryidae					
11	<i>Megophrys parva</i> (Boulenger, 1893)	Myanmar pelobatid toad	970-2440	Fairly common	
12	<i>Megophrys robusta</i> (Boulenger, 1908)	Robust spadefoot toad	1600-240	Rare	
13	<i>Scutiger boulengeri</i> (Bedriaga, 1898)	Boulenger's high altitue toad	Above 3000	Common	Recorded from upper Mustang
14	<i>Scutiger napalensis</i> (Dubois, 1974)	Khaptad pelobatid toad	2920-3100		Endemic to Nepal
15	<i>Scutiger nyingchiensis</i> (Fei, 1977)	Nyingchi high altitue toad	2730-4560	Unknown	
16	<i>Scutiger sikkimensis</i> (Blyth, 1854)	Sikkimise pelobatid toad	1260-4116	Common	Tibeto Himalayan sp.
Family: Ranidae					
17	<i>Amolops formosus</i> (Gunther, 1875)	Beautiful stream frog	1190-2896	Rare	Medicine
18	<i>Amolops marmoratus</i> (Blyth, 1855)	Meghalaya stream frog	842-2896	Common	
19	<i>Amolops monticola</i> (Anderson, 1871)	Montane stream frog	1067-2350	Common	
20	<i>Amolops nepalicus</i> (Yang, 1991)	Nepalese stream frog		Unknown	Possibly endemic to Nepal
21	<i>Chaparana sikimensis</i> (Jerdon, 1870)	Sikkimise frog	1210-2500	Fairly common	
22	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Tic-Tike pha	Below 2000		
23	<i>E. hexadactylus</i> (Lesson, 1834)	Indian green frog			
24	<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	Jerdon's bull frog	Below 300	Common	Traditional medicine

25	<i>H. tigrinus</i> (Daudin, 1802)	Indian bull frog	Below 1600	CITES II	Medicinal value
26	<i>Limnonectes nepalinsis</i> (Dubois, 1975)	Nepalese cricket frog	1350-1580	Common	
27	<i>Limnonectes pierrei</i> (Dubois, 1975)	Jhapa frog	170-500	Common	Endemic to Nepal
28	<i>Limnonectes syhadrensis</i> (Annandale, 1919)	Syhadra frog	Below 1980	Fairly common	
29	<i>Limnonectes teraiensis</i> (Dubois, 1984)	Nepalese terai frog	Below 400	Fairly common	Endemic to Nepal
30	<i>Nanorana parkeri</i> (Stejneger, 1927)	Parker's high altitue frog	Above 2000	Common	Reported from Mustang
31	<i>Paa annandalii</i> (Boulenger, 1920)	Annandale's frog	1650-2650	Common	
32	<i>Paa blanfordii</i> (Boulenger, 1882)	Blanford's paa frog	1800-2920	Rare	
33	<i>Paa ercepeae</i> (Dubois, 1974)	Bhajang frog	2200-2650	Unknown	Endemic to Nepal
34	<i>Paa liebighii</i> (Gunther, 1860)	Liebig's frog	1525-3360	Common	Health benefits and food value
35	<i>Paa minica</i> (Dubois, 1975)	Tiny frog	1000-2000	Common	
36	<i>Paa polunini</i> (Smith, 1951)	Langtang frog	2100-3990	Common	Food and medicinal value
37	<i>Paa rarica</i> (Dubois and Matsui, 1983)	Rara frog	2900-3020	Rare	
38	<i>Paa rostandi</i> (Dubois, 1974)	Mustang frog	2230-3500	Common	Food and medicinal value
39	<i>Rana chitwanensis</i> (Das, 1998)	Chitwan frog	200	Unknown	
40	<i>Rana humeralis</i> (Boulenger, 1897)	Burmese frog	100-250	Unknown	
41	<i>Rana nigrovittata</i> (Blyth, 1855)	Black-spotted frog	100-250	Rare	
42	<i>Rana tyleri</i> (Theobald, 1868)	Taipeh frog	100-250	Common	
43	<i>Sphaerotheca breviceps</i> (Schneider, 1799)	Indian burrowing frog	150-2100	Rare	
44	<i>S. maskeyi</i> (Schleich and Anders, 1998)	Maskey's burrowing frog	200-800	Rare	
45	<i>S. rolandae</i> (Dubois, 1983)	Rolanda's burrowing frog	126	Unknown	
46	<i>Sphaerotheca swani</i> (Myers and Leviton, 1956)	Sawn's burrowing frog	250-1560	Rare	
Family: Rhacophoridae					
47	<i>Philautus annandalii</i> (Boulenger, 1906)	Annandale's bush frog	1250-2250	Common	
48	<i>Polypedates leucomystax</i> (Gravenhorst, 1829)	Java whipping frog	<210	Rare	
49	<i>Polypedates maculatus</i> (Gray, 1834)	Common Indian tree frog	150-2500	Common	
50	<i>Polypedates taeniatus</i> (Boulenger, 1906)	Six-lined tree frog	150-250	Rare	
51	<i>Polypedates zed</i> (Dubois, 1987)	Nepalese tree frog	310	Rare	
52	<i>Rhacophorus maximus</i> (Gunther, 1858)	Large tree frog	1150-1585	Rare	
Family: Ichthyophidae					
53	<i>Ichthyophis sikkimensis</i> (Taylor, 1960)	Sikkimese	1550	Rare	

Source: Shah and Tiwari (2004)

Annex 11: Fish species endemic to Nepal

SN	Name	Location	Reference
1	<i>Myersglanis blythii</i>	Pharping, Kathmandu Valley	Jairam (1999)
2	<i>Psilorhynchus pseudechenies</i>	River Dudhkoshi	Menon (1962)
3	<i>P. nepalensis</i>	Rivers Rapti, Seti, Narayani	Conway and Mayden (2010)
4	<i>Pseudeutropius murius batarensis</i>	Batar, Trishuli	Shrestha (1981)
5	<i>Schizothoraichthys macropthalmus</i>	Rara Lake	Terashima (1984)
6	<i>S. nepalensis</i>	Rara Lake	Terashima (1984)
7	<i>S. raraensis</i>	Rara Lake	Terashima (1984)
8	<i>Batasio macronotus</i>	River Koshi	Ng and Edds (2004)
9	<i>Pseudecheneis crassicaudata</i>	Mewa Khola (River Tamor)	Ng and Edds (2005)
10	<i>P. serracula</i>	Rivers Seti, Kali Gandaki, Narayani, Mahakali and Karnali	Ng and Edds (2005)
11	<i>P. eddsi</i>	Mahesh Khola (R. Trishuli)	Ng (2006)
12	<i>Erethistoides ascita</i>	Rivers Mechi, Kankai, Trijuga, and Koshi	Ng and Edds (2005)
13	<i>E. cavatura</i>	Rivers Dhungra, Rapti and Narayani	Ng and Edds (2005)
14	<i>Balitora eddsi</i>	River Karnali	Conway and Mayden (2010)
15	<i>Neoanguilla nepalensis</i>	Chitwan	Shrestha (2008)
16	<i>Turcinoemacheilus himalaya</i>	Rivers Indrawati, Koshi, Kali Gandaki and Narayani	Conway, <i>et al.</i> (2011)

Annex 12: Common crops, fruits and vegetable species grown in Nepal

Crops	Fruits	Vegetables
Tarai		
Rice, kodo millet, pigeon pea, grass pea, chick pea, horse gram, potato, sweet potato, sesame, wild relatives of rice	Mango, litchi, pineapple, jackfruit, tomato, guava, jujube, gooseberry, watermelon, natal plum, black plum, tamarind, pineapple	Drumstick, tomato, brinjal, okra, radish, onion, garlic, taro, bottle gourd, sponge gourd, cowpea, snake gourd, ash gourd, pumpkin, cucumber, cauliflower, cabbage, potato
Siwalik		
Rice, maize, finger millet, foxtail millet, black gram, horse gram, soybean, sweet potato, taro, yams, mustard, perilla, niger	Mango, papaya, banana, guava, gooseberry, jujube, rasp berry, pineapple	Yam, taro, chayote, tomato, okra, radish, onion, garlic, taro, cowpea, snake gourd, pumpkin, cucumber, cauliflower, cabbage, potato
Middle Mountains		
Rice, maize, finger millet, foxtail millet, proso millet, amaranths, soybean, rice bean, faba bean, beans, taro, yams, mustard, perilla, niger, buckwheat	Citrus, rasp berry, bay berry, pear, plum, hog plum	Yam, taro, chayote, balsam apple, chathel gourd, okra, radish, onion, garlic, cowpea, broadleaf mustard, pumpkin, cucumber, cauliflower, cabbage, beans, potato
High Mountains		
Cold tolerant rice, maize, potato, rice bean, buckwheat	Walnut, pear, plum, apricot, apple, sea buckthorn	Beans, pumpkins, broad leaf mustard
High Himal		
Terminal point for food crop diversity	Sea buckthorn	Potato, buckwheat

Source: Upadhyay and Joshi (2003)

Annex 13: Livestock breeds found in different physiographic zones

	Local Breeds/Genotypes	Transboundary Breeds
Tarai		
Cattle	<i>Tarai</i> cattle	Sahiwal, Hariana, Jersey, <i>Holstein-Friesian</i>
Buffalo	<i>Tarai</i> buffalo	Murrah
Goats	<i>Tarai</i> goat	Jamunapari, Barbari, Beetal, Boer, Ajmeri
Sheep	Lampuchhre	None
Pigs	Hurrah	Yorkshire, Landrace, Hampshire, Duroc
Poultry	Sakini	New Hampshire, White leghorn, Black Australorp, Giriraja, Several synthetic layers and broilers
Duck		Mescavi, Peking white
Siwaliks		
Cattle	Pahadi cattle, Achhami	Jersey, <i>Holstein-Friesian</i> , Brownswiss
Buffalo	Lime, Parkote	Murrah
Goat	Khari	Jamunapari, Barbari
Sheep	Kage	Polwarth, Rambouillet, Border Leceister, Romney Marsh
Pigs	Chwanche	Yorkshire, Landrace, Duroc
Poultry	Sakini	New Hampshire, White leghorn, Black Australorp, Giriraja, Several synthetic layers and broilers
Middle Mountains		
Cattle	Pahadi cattle, Achhami, Khaila	Jersey, <i>Holstein-Friesian</i> , Brown Swiss
Buffalo	Lime, Parkote, Gaddi	Murrah and its cross
Goats	Khari	Jamunapari, Barbari
Sheep	Kage, Baruwal	Polwarth, Rambouillet, Border Leicester, Romney Marsh
Pigs	Chwanche	Pakhribas pigs, Saddle back, Yorkshire, Tamworth
Poultry	Sakini	New Hampshire, Black Australorp, Giriraja, Several synthetic layers and broilers
High Mountains		
Cattle	Yak, Lulu	Brown Swiss
Goats	Sinhal	None
Sheep	Baruwal	Merino, Polwarth
Poultry	Sakini	None
High Himal		
Cattle	Yak, Lulu	None
Goat	Chyangra	None
Sheep	Bhyanglung	None

Source: Neopane (2006)

Annex 14: Nationally-assessed status of wild mammals in Nepal

IUCN Category	Species
Critically Endangered (CR)	Blackbuck (<i>Antilope cervicapra</i>), Brown Bear (<i>Ursus arctos</i>), Csorba's Mouse-eared Myotis (<i>Myotis csorbai</i>), Great Evening Bat (<i>la io</i>), Grey Wolf (<i>Canis lupus</i>), Indian Chevrotain (<i>Moschiola indica</i>), Ganges River Dolphin (<i>Platanista gangetica</i>), Tibetan Gazelle (<i>Procapra picticaudata</i>)
Endangered (EN)	Alpine Musk Deer (<i>Moschus chrysogaster</i>), Asian Elephant (<i>Elephas maximus</i>), Bengal Tiger (<i>Panthera tigris tigris</i>), Black Giant Squirrel (<i>Ratufa bicolor</i>), Chinese Pangolin (<i>Manis pentadactyla</i>), Clouded Leopard (<i>Neofelis nebulosa</i>), Dhole (<i>Cuon alpinus</i>), Fishing Cat (<i>Prionailurus viverrinus</i>), Greater One-horned Rhino (<i>Rhinoceros unicornis</i>), Harlequin Bat (<i>Scotomanes ornatus</i>), Himalayan Black Bear (<i>Ursus thibetanus</i>), Himalayan Field Mouse (<i>Apodemus gorkha</i>), Himalayan Pika (<i>Ochotona himalayana</i>), Himalayan Water Shrew (<i>Chimarrogale himalayica</i>), Hispid Hare (<i>Caprolagus hispidus</i>), Hog Deer (<i>Axis porcinus</i>), Indian Pangolin (<i>Manis crassicaudata</i>), Red Panda (<i>Ailurus fulgens</i>), Sloth Bear (<i>Melursus ursinus</i>), Smooth-coated Otter (<i>Lutrogale perspicillata</i>), Snow Leopard (<i>Panthera uncia</i>), Spotted Linsang (<i>Prionodon pardicolor</i>), Striped Hyena (<i>Hyaena hyaena</i>), Swamp Deer (<i>Rucervus duvaucelii</i>), Water Buffalo (<i>Bubalus arnee</i>)
Vulnerable (VU)	Assam Macaque (<i>Macaca assamensis</i>), Axis Deer (<i>Axis axis</i>), Barking Deer (<i>Muntiacus vaginalis</i>), Bengal Fox (<i>Vulpes bengalensis</i>), Common Leopard (<i>Panthera pardus</i>), Crab-eating Mongoose (<i>Herpestes urva</i>), Gaur (<i>Bos gaurus</i>), Kiang (<i>Equus kiang</i>), Leopard Cat (<i>Prionailurus bengalensis</i>), Lynx (<i>Lynx lynx</i>), Mandelli's Mouse-eared Bat (<i>Myotis sicarius</i>), Nilgai (<i>Boselaphus tragocamelus</i>), Sambar Deer (<i>Rusa unicolor</i>), Short-winged Pipistrelle (<i>Philetor brachypterus</i>)
Near Threatened (NT)	Andersen's Leaf-nosed Bat (<i>Hipposideros pomona</i>), Blyth's Horseshoe Bat (<i>Rhinolophus Lepidus</i>), Eurasian Otter (<i>Lutra lutra</i>), Ghoral (<i>Naemorhedus goral</i>), Himalayan Tahr (<i>Hemitragus jemlahicus</i>), Large Indian Civet (<i>Viverra zibetha</i>), Tibetan Tube-nosed Bat (<i>Murina aurata</i>)

Source: Jnawali *et al.* (2011)

Annex 15: Threatened tree species found in the mountains of Nepal

Botanical Name	Local Name	Elevation Range (m)	Region of Occurrence	IUCN Threat Category	Reference
<i>Abies pindrow</i>	Thingre salla	2100-3600	West	Rare	Press <i>et al.</i> (2000)
<i>Alnus nitida</i>	Utis	1800-2500	West-Central	Rare	Shrestha and Joshi (1996); Press <i>et al.</i> (2000)
<i>Choerospondias axillaris</i>	Lapsi	1200-1500	Central-East	Rare	Shrestha and Joshi (1996)
<i>Cinnamomum glaucescens</i>	Sugandhak okila	2000-2500	West-East	Rare (GON protected)	Press <i>et al.</i> (2000)
<i>Crataeva unilocularis</i>	Siplikan	1200-1800	Central-East	Rare	Shrestha and Joshi (1996)
<i>Elaeocarpus sphaericus</i>	Rudrakchhya	650-1700	Central-East	Vulnerable	
<i>Larix griffithiana</i>	Dhingre sallo	1100-4000	East	Rare	
<i>Larix himalaica</i>	Langtang sallo	2400-3600	Central	Rare	Shrestha and Joshi (1996); Press <i>et al.</i> (2000)
<i>Magnolia globosa</i>		3200-3400	East	Rare	Shrestha and Joshi (1996)
<i>Michelia champaca</i>	Champ	600-1300	Central-East	Endangered	
<i>Michelia kisopa</i>	Champ	1400-2800	West-East	Endangered	Shrestha and Joshi (1996); Press <i>et al.</i> (2000)
<i>Olea ferruginea</i>	Olive tree	500-2600	West	Rare	Shrestha and Joshi (1996)
<i>Oroxylum indicum</i>	Tatelo	200-1400	West-East	Vulnerable	Shrestha and Joshi (1996); Press <i>et al.</i> (2000)
<i>Podocarpus neriifolius</i>	Gunsi	800-1500	Central-East	Endangered; CITES Appendix III	
<i>Talauma hodgsonii</i>	Bhalu kath	900-1800	Central-East	Endangered; CITES III	Shrestha and Joshi (1996); Press <i>et al.</i> (2000)
<i>Taxus wallichiana</i>	Lauth sallo			CITES II	Press <i>et al.</i> (2000)
<i>Tetracentron sinense</i>		2150-3200	East	Rare; CITES III	Shrestha and Joshi (1996)
<i>Ulmus wallichiana</i>		1800-3000	West-Central	Rare/Endangered	

Annex 16: Threatened wetland-dependent animal species of Nepal

SN	Scientific Name	Local Name	IUCN Red List Category	CITES Appendix
Mammals				
1	<i>Bubalus bubalis</i>	Asiatic wild buffalo	Endangered	I
2	<i>Rhinoceros unicornis</i>	One-horned rhinoceros	Endangered	I
3	<i>Platanista gangetica</i>	Gangetic dolphin	Vulnerable	I
4	<i>Cervus duvauceli duvauceli</i>	Swamp deer	N/A	I
5	<i>Lutrogale perspicillata</i>	Indian smooth-coated otter	N/A	N/A
6	<i>Lutra Perspicillata</i>	Common otter	N/A	N/A
7	<i>Prionailurus viverrinus</i>	Fishing cat	N/A	N/A
Birds				
1	<i>Rhodonessa caryophyllacea</i>	Pink-headed duck	Crit. Endangered	N/A
2	<i>Leptoptilos dubius</i>	Greater adjutant	Endangered	N/A
3	<i>Sypheotides indica</i>	Lesser florican	Endangered	N/A
4	<i>Anas formosa</i>	Baikal teal	Vulnerable	N/A
5	<i>Francolinus gularis</i>	Swamp francolin	Vulnerable	N/A
6	<i>Aythya baeri</i>	Baer's pochard	Vulnerable	N/A
7	<i>Pelecanus philippensis</i>	Grey pelican	Vulnerable	N/A
8	<i>Grus antigone</i>	Sarus crane	Vulnerable	N/A
9	<i>Rynchops albicollis</i>	Indian skimmer	Vulnerable	N/A
10	<i>Grus nigricollis</i>	Black-necked crane	Vulnerable	N/A
11	<i>Leptoptilos javanicus</i>	Lesser adjutant	Vulnerable	N/A
12	<i>Haliaeetus leucoryphus</i>	Band-tailed fish-eagle	Vulnerable	N/A
Reptiles				
1	<i>Kachuga kachuga</i>	Red crowned river turtle	Crit. Endangered	N/A
2	<i>Kachuga dhongoka</i>	Dhond roofed turtle	Endangered	N/A
3	<i>Gravialis gangeticus</i>	Gharial	Endangered	N/A
4	<i>Crocodylus palustris</i>	Mugger crocodile	Vulnerable	I
5	<i>Hardella thurjii</i>	Crowned river turtle	Vulnerable	N/A
6	<i>Aspideretes gangeticus</i>	Soft shell turtle	Vulnerable	I
7	<i>Morenia petersi</i>	Indian eyed turtle	Vulnerable	N/A
8	<i>Geoclemys hamiltonii</i>	Black pond turtle	Vulnerable	N/A
Amphibians				
1	<i>Hoplobatrachus tigerinus</i>	Bull frog	N/A	II
2	<i>Paa rostandi</i> (endemic to Nepal)	Mustang frog	N/A	N/A
Fishes				
1	<i>Tor putitora</i>	Sahar	Endangered	N/A
2	<i>Clupisoma garuwa</i>	Jalkapoor	Endangered	N/A
3	<i>Ompak bimaculatus</i>	Jalkapoor	Endangered	N/A
4	<i>Neolissocheilus hexagonolepis</i>	Katle	Vulnerable	N/A
5	<i>Chagunius chagunio</i>	Rewa	Vulnerable	N/A
6	<i>Tor tor</i>	Sahar	Vulnerable	N/A
7	<i>Schizothorax plagiostomus</i>	Buchhe Asla	Vulnerable	N/A
8	<i>Schizothorax richardsoni</i>	Asala Soal	Vulnerable	N/A
9	<i>Schizothoraichthys progastus</i>	Chuche Asala	Vulnerable	N/A
10	<i>Psilorhynchus pseudocheneis</i>	Tite machha	Vulnerable	N/A
11	<i>Anguilla bengalensis</i>	Rajabam	Vulnerable	N/A
12	<i>Danio rerio</i>	Zebra machha	Vulnerable	N/A
Insect				
1	<i>Epiophlebia laidlawi</i>	Himalayan Dragonfly	Vulnerable	N/A

Source: Compiled from various sources; N/A – Not Available

Annex 17: Plant species protected in Nepal

<i>Scientific Name</i>	<i>Common English Name</i>	<i>Local Name</i>	<i>IUCN Red List Status</i>	<i>CITES Appendix Status</i>
<i>Species Banned for Collection, Use, Sale, Distribution, Transportation and Export</i>				
Angiosperms				
<i>Juglans regia</i>	Walnut	Okhar		
<i>Dactylorhiza hatagirea</i>		Panch aunle		
<i>Picrorhiza scrophulariiflora</i>	Gentian	Kutki		<i>II</i>
<i>Species Banned for Export Except for Processed with Permission of Department of Forests</i>				
Angiosperms				
<i>Cinnamomum glaucescens</i>		Sugandakokila		
<i>Cordyceps sinensis</i>		Yarsagumba		
<i>Rauvolfia serpentina</i>	Serpentine	Sarpagandha	<i>VU</i>	<i>II</i>
<i>Valeriana jatamansi</i>	Spike nard	Jatamansi		
<i>Valeriana wallichii</i>	Valerian	Sugandhawal		
Gymnosperms				
<i>Abies spetabilis</i>	Fir	Talis Patra	<i>NT</i>	
<i>Taxus buccata</i>	Himalayan yew	Loth salla	<i>EN</i>	<i>II</i>
<i>Taxus wallichiana</i>	East Himalayan yew			
<i>Taxus contorta</i>	West Himalayan yew			
Bryophyte				
<i>Parmelia spp.</i>	<i>Lichen</i>	<i>Jhyau</i>		
<i>Species Banned for Harvest, Transportation and Export for Commercial Purposes</i>				
Angiosperms				
<i>Acacia catechu</i>	Cutch tree	Khayer		
<i>Bombax malabaricum</i>	Silk cotton tree	Simal		
<i>Dalbergia latifolia</i>	Rose wood	Satisal	<i>VU</i>	
<i>Michellia champaca</i>	Magnolia	Champ		
<i>Pterocarpus marsupium</i>	Indian kino tree	Bijaysal		
<i>Shorea robusta</i>	Common sal	Sal		

Source: Nepal Gazette, 31 December 2001; IUCN (2013). Note: Protection of Walnut is from National Forest only.

Annex 18: Animal species protected in Nepal

<i>Scientific Name</i>	<i>Common English Name</i>	<i>Local Name</i>	<i>IUCN Red List Status</i>	<i>CITES Appendix Status</i>
Mammals				
<i>Macaca assamensis</i>	<i>Assam Macaque</i>	<i>Asami Rato Bandar</i>	VU	II
<i>Manis pentadactyla</i>	<i>Chinese Pangolin</i>	<i>Kalo Salak</i>	EN	II
<i>Manis crassicaudata</i>	<i>Indian Pangolin</i>	<i>Tame Salak</i>	EN	II
<i>Caprolagus hispidus</i>	<i>Hispid Hare</i>	<i>Laghukarna Kharayo</i>	EN	I
<i>Canis lupus</i>	<i>Grey Wolf</i>	<i>Bwanso</i>	CR	I
<i>Ursus arctos</i>	<i>Brown Bear</i>	<i>Himali Rato Bhalu</i>	CR	I
<i>Ailurus fulgens</i>	<i>Red Panda</i>	<i>Habre</i>	EN	I
<i>Prionodon pardicolor</i>	<i>Spotted Linsang</i>	<i>Silu Biralo</i>	EN	
<i>Felis bengalensis</i> (<i>Prionailurus bengalensis</i>)	<i>Leopard Cat</i>	<i>Chari Bagh</i>	VU	I
<i>Felis lynx</i> (<i>Lynx lynx</i>)	<i>Lynx</i>	<i>Pahan Biralo</i>	VU	II
<i>Neofelis nebulosa</i>	<i>Clouded Leopard</i>	<i>Dwanse Chituwa</i>	EN	I
<i>Panthera tigris</i>	<i>Royal Bengal Tiger</i>	<i>Pate Bagh</i>	EN	I
<i>Panthera uncia</i> (<i>Uncia uncia</i>)	<i>Snow Leopard</i>	<i>Hiun Chituwa</i>	EN	I
<i>Elephas maximus</i>	<i>Asian Elephant</i>	<i>Hatti</i>	EN	I
<i>Rhinoceros unicornis</i>	<i>Greater One-horned Rhino</i>	<i>Gainda</i>	EN	I
<i>Sus salvanius</i>	<i>Pygmy Hog</i>	<i>Pudke Bandel</i>	RE	I
<i>Moschus chrysogaster</i>	<i>Alpine Musk Deer</i>	<i>Kasturi Mriga</i>	EN	I
<i>Cervus duvauceli</i>	<i>Swamp Deer</i>	<i>Bahrasingha</i>	EN	I
<i>Bos gaurus</i>	<i>Gaur</i>	<i>Gauri Gai</i>	VU	I
<i>Bos grunniens</i>	<i>Wild Yak</i>	<i>Chauri Gai</i>		I
<i>Bubalus arnee</i>	<i>Wild Water Buffalo</i>	<i>Arna</i>	EN	III
<i>Ovis ammon</i>	<i>Great Tibetan Sheep</i>	<i>Nayan</i>	DD	I
<i>Pantholops hodgsoni</i>	<i>Tibetan Antelope</i>	<i>Chiru</i>	DD	I
<i>Antelope cervicapra</i>	<i>Blackbuck</i>	<i>Krishnasar</i>	CR	III
<i>Tetraceros quadricornis</i>	<i>Four-horned Antelope</i>	<i>Chauka</i>	DD	III
<i>Hyaena hyaena</i>	<i>Striped Hyaena</i>	<i>Hundar</i>	EN	
<i>Platanista gangetica</i>	<i>River Dolphin</i>	<i>Shons</i>	CR	I
Birds				
<i>Buceros bicornis</i>	<i>Giant Hornbill</i>	<i>Raj Dhanes</i>	R	I
<i>Catreus wallichii</i>	<i>Cheer Pheasant</i>	<i>Cheer</i>	R	I
<i>Houbaropsis bengalensis</i> (<i>Eupodotis bengalensis</i>)	<i>Bengal Florican</i>	<i>Khar Mayur</i>	R	I
<i>Lophophorus impejanus</i>	<i>Impeyon Pheasant</i>	<i>Danphe</i>		I
<i>Ciconia nigra</i>	<i>Black Stork</i>	<i>Kalo Bhundiphor</i>	WV	II
<i>Ciconia ciconia</i>	<i>White Stork</i>	<i>Seto Bhundiphor</i>		I
<i>Tropan satyra</i>	<i>Crimson-horned Pheasant</i>	<i>Munal</i>	R	III
<i>Sypheotides indica</i> (<i>Eupodotis indica</i>)	<i>Lesser Florican</i>	<i>Sano Khar Mayur</i>	R	II
<i>Grus antigona</i>	<i>Saras Crane</i>	<i>Saras</i>	R	II
Reptiles				
<i>Gavialis gangeticus</i>	<i>Gharial Crocodile</i>	<i>Gharial Gohi</i>	EN	I
<i>Python molurus</i>	<i>Asiatic Rock Python</i>	<i>Ajingar</i>	VU	I
<i>Varanus flavescens</i>	<i>Golden Monitor Lizard</i>	<i>Sun Gohoro</i>	I	I

Sources: Chapagain and Dhakal (2003); IUCN (2013); BCN and DNPWC (2011).

Annex 19: Forest tree species with seed stands

Species Name		Number of Plots	Area (hectares)	Location (District)
Botanical	Local			
<i>Abies spectabilis</i>	Talis patra	1	2.5	Solokhumbu
<i>Acacia catechu</i>	Khayar	3	10.9	Siraha, Chitwan, Kapilvastu
<i>Aegle marmelos</i>	Bel	1	0	Sarlahi
<i>Aesandra butyracea</i>	Chiuri	5	18.5	Syangja, Palpa, Arghakhanchi, Pyuthan
<i>Albizia procera</i>	Seto siris	1	48.5	Bara
<i>Alnus nepalensis</i>	Uttis	8	18.2	Sindhuli, Kathmandu, Lalitpur, Gorkha, Kaski, Myagdi, Palpa
<i>Anthocephalus chinensis</i>	Kadam	1	1.5	Morang
<i>Artocarpus chaplasha</i>	Latahar	1	0	Jhapa
<i>Azadirachta indica</i>	Neem	1	0	Kapilvastu
<i>Bauhinia mlabarica</i>	Amil tanki	1	0	Tanahu
<i>Bauhinia purpurea</i>	Tanki	1	5	Dhading
<i>Betula alnoides</i>	Saur	1	2.5	Makwanpur
<i>Bombax ceiba</i>	Simal	1	1.5	Chitawan
<i>Castanopsis spp.</i>	Katus	4	11.3	Lalitpur, Tanahu, Kaski & Syangja
<i>Cedrus deodara</i>	Deodar	1	0	Dadeldhura
<i>Choerospondias axillaris</i>	Lapsi	1	10	Sindhupalchowk
<i>Cinnamomum tamala</i>	Tej pat	2	4.5	Udayapur & Kaski
<i>Dalbergia latifolia</i>	Satisal	2	21.1	Morang, Bara
<i>Dalbergia sissoo</i>	Sissoo	10	40.4	Jhapa, Dhanusa, Sarlahi, Bara, Parsa, Makwanpur, Nawalparasi, Kapilvastu, Kailali
<i>Eucalyptus spp.</i>	Masala	1	2.2	Mahottari
<i>Ficus auriculata</i>	Nimaro	1	0	Sindhupalchowk
<i>Hippophae salicifolia</i>	Ashuk/ Khurpu	1	1.5	Mustang
<i>Juglans regia</i>	Okhar	2	10	Sindhupalchowk & Kavrepalanchowk
<i>Michelia champaca</i>	Champ	1	10	Palpa
<i>Olea cuspidate</i>	Jaitun	1	0	Dolpa
<i>Pinus patula</i>	Pate salla	5	16.4	Dolkha, Sindhupalchowk, Kavrepalanchowk & Kathmandu

<i>Pinus roxburghii</i>	Khote salla	21	100.4	Ramechhap, Dolakha, Sindhupalchowk, Kavrepalanchowk, Bhaktapur, Kathmandu, Nuwakot, Makwanpur, Dhading, Parbat, Syangja, Palpa, Arghakhanchi, Dadeldhura, Baitadi
<i>Pinus wallichiana</i>	Gobre salla	5	24.2	Dolakha, Makwanpur, Baglung, Mustang
<i>Pterocarpus marsupium</i>	Bijayasal	1	6.5	Kapilbastu
<i>Pterocarpus santalinus</i>	Rakta chandan	1	2.5	Syangja
<i>Quercus lanata</i>	Banjh	2	17.9	Lalitpur, Dadeldhura
<i>Quercus semicarpifolia</i>	Kharsu	5	14.5	Dolkha, Lalitpur, Makwanpur, Lamjung
<i>Sapindus mukarassi</i>	Ritha	1	*	Sallyan
<i>Schima wallichii</i>	Chilaune	6	14.2	Kathmandu, Nuwakot, Gorkha, Tanhu, Kaski, Syangja
<i>Syzygium cumini</i>	Jamun	2	7.3	Nawalparasi, Kailai
<i>Tectona grandis</i>	Sagvan	5	18.8	Dhanusa, Sarlahi, Parsa, Rupandehi
<i>Terminalia bellirica</i>	Barro	1	1.5	Bardia
<i>Zanthoxylum armataum</i>	Timur	1	*	Myagdi

Source: TISU (2013). * Scattered on farmland

Annex 20: Diversity of plant genetic resources in different locations

Location	Physiographic Zone	Level of Diversity	Degree of Intervention	Targeted Crops
Jumla	High Mountains	Moderate-High	Low	Rice, millet, barley, buckwheat, cucumber
Kaski	Middle Mountains	Moderate-High	Medium	Rice, millet, taro, sponge gourd, cucumber
Bara	<i>Tarai</i>	Low-Moderate	High	Rice, millet, sponge gourd, cucumber, pigeon pea

Source: Upadhyay and Joshi (2003)

Annex 21: Brief description of the global terrestrial ecoregions found in Nepal

(1) Eastern Himalayan Broadleaf Forests [IM0401]

This ecoregion is comprised of the temperate broadleaf forests found to the east of Kali Gandaki River between 2000-3000 m. The ecoregion is globally outstanding for both species richness and levels of endemism, especially for its flora. It contains several localized areas of floral richness and endemism floral hotspots, which are especially rich in rhododendrons and oaks. Red panda (*Ailurus fulgens*), clouded leopard (*Neofelis nebulosa*), Himalayan black bear (*Selenarctos thibetanus*) are some flagship mammals found in this ecoregion. The forests are also home to hundreds of bird species, many of which are endemic to this region. The ecoregion also plays an important role in maintaining altitudinal connectivity between different habitats types found in the region.

(2) Eastern Himalayan Conifer Forests [IM0501]

The Eastern Himalayan Conifer Forests are typically found on steep, rocky, north-facing slopes between 3,000-4,000 m in eastern Nepal. It represents the transition from the forested regions to treeless alpine meadows. The forests are dominated by fir (*Abies spectabilis*), larch (*Larix griffithii*), hemlock (*Tsuga dumosa*), and *Juniperus* spp. Several colourful species of rhododendrons grow profusely in the understory, along with other broadleaf species such as *Viburnum grandiflorum* and *Betula utilis*.

(3) Eastern Himalayan Alpine Shrub and Meadows [PA1003]

This ecoregion extends eastwards from the gorge of Kali Gandaki River. The ecoregion supports one of the world's richest alpine floral diversities (Mittermeier et al., 2004). The meadows display spectacular colorful flowers of alpine herbs during the spring and summer. The main scrub vegetation in this region includes varied associations of *Rhododendron* spp. and *Juniperus* spp. The region is also very rich in faunal diversity. The endangered snow leopard, Himalayan goral (*Naemorhedus baileyi*), serow (*Capricornis sumatraensis*) and Himalayan tahr (*Hemitragus jemlahicus*) are some of the important mammals found in this region.

(4) Himalayan Subtropical Broadleaf Forests [IM0115]

The ecoregion extends between 500 to 1,000 m across the *Siwaliks*, forming a critical link in the chain of country's interconnected ecosystems that extend from the Terai-Duar grasslands along the foothills to the high alpine meadows. The dry *Shorea robusta* forests and moist mixed deciduous forests are the dominant vegetation types found in the ecoregion. It houses several threatened species of mammals, including the tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), smooth-coated otter (*Lutrogale perspicillata*), and gaur (*Bos gaurus*). The ecoregion also hosts numerous species of birds, including globally threatened white-winged wood duck (*Carina scutulata*) and hornbill species (BirdLife International, 2004).

(5) Himalayan Subtropical Broadleaf Forests [IM0115]

This ecoregion covers a large area in between 1,000 m-2,000 m. The natural vegetation is primarily comprised of dry chir pine (*Pinus roxburghii*) forests. The ground is covered by grass species such as *Arundinella setosa*, *Imperata cylindrica* and *Themeda anathera*. The Kali Gandaki valley bisects the ecoregion, dividing it into a drier, western conifer forest dominated by chir pine and a wetter and richer eastern conifer forest.

(6) Western Himalayan Subalpine Conifer Forests [IM0502]

The Western Himalayan Subalpine Conifer Forests occurs on elevations between 3,000 and 3,500 to the west of the Kali Gandaki River. The forest types include pure fir forest (*Abies spectabilis*), mixed oak-fir forest

(*Quercus semecarpifolia* and *A. spectabilis*), mixed rhododendron, fir, and birch forest (*Rhododendron campanulatum*, *A. spectabilis*, and *Betula utilis*), and mixed coniferous forest (*A. spectabilis*, *Pinus wallichiana*, and *Picea smithiana*). Cypress (*Cupressus torulosa*) and deodar (*Cedrus deodara*) are common above 2,400 m (Shrestha and Joshi, 1997). The ecoregion is home to snow leopard, Himalayan tahr, blue sheep (*Pseudois nayaur*), and hundreds of bird species including several species of pheasants.

(7) Western Himalayan Broadleaf Forests [IM0403]

This ecoregion represents the temperate broadleaf forests of western Nepal, between 1,500 m to 2,600 m. It is less species-rich than the eastern temperate forests but nevertheless harbors several important species of mammals, including the black bear (*Ursus thibetanus*), leopard (*Panthera pardus*), and the Himalayan tahr (*Hemitragus jemlahicus*).

(8) Western Himalayan Alpine Shrub and Meadows [PA1021]

This lies between 3,000 m and 5,000 m elevations in western Nepal. The ecoregion has large areas of habitat suitable for conserving viable populations of the high-altitude Himalayan predator, including the snow leopard (*Uncia uncia*), and the large montane ungulates such as blue sheep (*Pseudois nayaur*), Himalayan tahr (*Hemitragus jemlahicus*), Himalayan musk deer (*Moschus chrysogaster*), and serow (*Capricornis sumatraensis*). The rich meadow flora is dominated by herbaceous plants, such as Anaphalis, Aster, Cynanthus, Jurinea, Morina, Potentilla, Gentiana, Delphinium, Gentiana, Meconopsis, Pedicularis, Anemone, Aster, Polygonum, Primula, and Saussurea (Shrestha and Joshi, 1997).

(9) Upper Gangetic Plains Moist Deciduous Forests [IM0166], and (10) Lower Gangetic Plains Moist Deciduous Forests (IM0120)

These ecoregions occur in the *Tarai* region. In ancient times the region harbored tropical moist deciduous forests dominated by sal (*Shorea robusta*) and impressive populations of several large mammals including tiger (*Panthera tigris*), rhino (*Rhinoceros unicornis*), Asian elephants (*Elephas maximus*), and gaur (*Bos gaurus*). Currently, the region is densely populated, and the fertile plains have largely been converted to intensive agriculture, with only a few enclaves of forest remaining. The riparian forests are characterized by an *Acacia-Dalbergia* association. The ecoregion harbors numerous species of birds including two globally threatened species, the Bengal florican and the lesser florican (*Eupodotis indica*).

(11) Tarai-Duar Savannas and Grasslands [IM0701]

This ecoregion is characterized by a mosaic of tall riverside grasslands (*Saccharum* sp.), savannas and evergreen and deciduous forests. The grasslands and marshlands of the Chitwan Valley and adjoining lowlands are examples. *Eugenia jambolana*, *Bombax* sp., *Trewia nudiflora*, and *Mallotus philippensis* are some of the common tree species that grow in association with the grass species. Sal (*Shorea robusta*) dominated deciduous forests occur in drier and higher elevation areas. These savannas and grasslands are excellent habitat for several endangered species of mammals and reptiles, including the Bengal Tiger (*Panthera tigris*), Rhino (*Rhinoceros unicornis*), and Gharial crocodile (*Gavialis gangeticus*). Grasslands in Shukla Phanta and Chitwan are habitats for internationally important populations of some globally threatened grassland birds (BCN and DNPWC, 2011).

(12) Rock and Ice

This ecoregion covers a significant proportion of the high elevation areas in the northernmost belt of the Himalayas.

Source: Compiled from various sources including Olson *et al.* (2001) and Wickamanayake, *et al.* (2002)

Annex 22: Invasive alien fish species found in Nepal

S N	Scientific Name	Common Name	Native	Invaded Habitat
1	<i>Oreochromis mosambicus</i> ,	Tilapia		
2	<i>O. niloticus</i>			
3	<i>Clarias gariepinus</i>	Catfish	Africa	Lakes, ponds, streams, rivers
4	<i>Aristichthys nobilis</i>	Crap fish	China, Russia	Lakes, ponds, streams, rivers
5	<i>Hypop-thalmicthys molitrix</i>			
6	<i>Cteno-pharyngodon ideallus</i>	Common carp	Hungary, Israel	Ponds, lakes
7	<i>Cyprinus carpio</i>			
8	<i>Pangasius hypothalmus</i>	Pangasia	Bangladesh, India	Ponds
9	<i>P. suchi</i>			
10	<i>Puntius gonototus</i>	Silver barb	Thailand	Ponds
11	<i>Onchorhynchus mykiss</i>	Rainbow trout	Japan	Raceways
12	<i>Macrobrachium rosenbergii</i>	Prawn	Thailand	Ponds

Source: CSUWN (2010)

Annex 23: Biodiversity related cross-sectoral policies, strategies, and regulatory framework developed since 2002

SN	Policy/ Legislation	Biodiversity related Key Provision(s)
1	The Tenth Plan (2002-2007) [Poverty Reduction Strategy Paper]	<ul style="list-style-type: none"> • Internalized the concept of sustainable development in national development planning. • Emphasized sustainable forest and watershed management and biodiversity conservation through public participation to help economic activities and enhance livelihood opportunities. • Recommended putting biodiversity at the center during conservation, promotion, management and utilization of the forest resources. • Promoted landscape approach to biodiversity conservation. • Integrated conservation and development of rare and endangered plants • Set target to increasing forest cover to 40 percent
2	National Foundation for Development of Indigenous Nationalities Act (2002)	<ul style="list-style-type: none"> • The objectives of the Foundation are to preserve and promote the language, culture, literature, arts, traditional skill, technology and special knowledge and provide assistance for its vocational use; and provide assistance in building an equitable society by social, economic, religious and cultural upliftment and development of Indigenous Nationalities, among others. • The powers and functions of the Foundation include formulation and implementation of policy necessary for the promotion and preservation of traditional skill and technology of Indigenous Nationalities; and protection of the technology, skill and special knowledge that have been traditionally practiced by Indigenous Nationalities as intellectual property rights of the concerned Indigenous Nationalities subject to and as prescribed by the prevailing law.
3	Sustainable Development Agenda for Nepal (2003)	<ul style="list-style-type: none"> • Environmental conservation to be an integral component of poverty alleviation and sustainable economic growth. • Emphasized the need for more effective management of forests, ecosystems and biodiversity in order to achieve the goal of sustainable development. • Recommended promoting people's participation in forestry resource development, and enhancing economic benefits to local people from protected areas.
4	Science and Technology Policy (2005)	<ul style="list-style-type: none"> • Sustainable use of natural resources through the use of science and technology. • Need of education, research, training, and development in various sectors including agriculture, forest, water resource, environment, and biotechnology.
5	Biotechnology Policy (2006)	Has envisioned increasing production and productivity by means of research and development of biotechnology as well as transfer of technology, and improve the living standard of Nepali people by achieving a significant progress in the field of public health and environment.
6	Nepal Biodiversity Strategy Implementation Plan (2006)	<ul style="list-style-type: none"> • The overall goal was to contribute to achieve the goals and objectives of NBS (2002) through its successful implementation for the conservation of biodiversity, the maintenance of ecological processes and systems and equitable sharing of the benefits accrued. • Identified and planned for implementation of 13 priority projects for the 2006-2010 periods.
7	National Bio-safety Framework (2006)	Objective is to protect biodiversity and human health from the unfavorable impacts of imports, production and use of GMOs
8	Interim Constitution of Nepal (2007)	<ul style="list-style-type: none"> • Guarantees the fundamental right of every person to live in a clean environment. • Requires the state to make arrangements for the special protection of the environment and of rare wildlife and provide for the protection of forest, vegetation and biodiversity, its sustainable use and for equitable distribution of the benefit derived from it. • Obliges the state to pursue a policy aimed at identifying and protecting traditional knowledge, skills and practices.
9	Three-year Interim Plan	<ul style="list-style-type: none"> • Emphasized maintenance of balanced environment by scientific management of forest, plants, watersheds, biodiversity and protected areas and ensuring the access and rights

	(2007-2010)	<p>of poor and disadvantaged communities over forest products.</p> <ul style="list-style-type: none"> • Prioritized the implementation of Biodiversity Implementation Plan, among others. • Emphasized the protection, restoration and wise use of natural environment; and ensuring individual's right to live in a clean environment; and effective implementation of national and international environmental management commitments. • Prioritized formulating and implementation of action plans of environmental conventions to which Nepal is party.
10	Three-year Plan (2010-2013)	<ul style="list-style-type: none"> • Emphasized development and expansion of adaption to climate change by conserving and utilizing agrobiodiversity and organic farming. • Highlighted increasing the productivity of forest by promoting ecosystem services through scientific, inclusive and participatory, management of forest heritage. • Promoted research, development and sustainable management of forest, plants, watersheds, protected areas and biodiversity through participatory system. • Emphasized adoption of preventive and controlling measure for protecting forest from forest fire through participatory system. • Provided basis for formulation and implementation of a new national forest strategy with long term perspective in participation of relevant stakeholders. • Stressed maintaining a balance between livelihoods and biodiversity conservation by achieving public support and participation in the management of protected areas. • Committed to refine and internalize the NBS and NBSIP and implementing them. • Committed to promote the concept of green development by making human activities and development works environment-friendly to minimize the adverse effect of climate change and adaption to climate change impacts.
11	Climate Change Policy (2011)	<ul style="list-style-type: none"> • The goal is to improve livelihoods by mitigating and adapting to the adverse impacts of climate change, adopting a low-carbon socio-economic development path and supporting and collaborating in the spirits of country's commitments to national and international agreements related to climate change. • Provisions allocating more than 80 percent of the total climate change fund for field level activities.
12	National Land Use Policy (2012)	<ul style="list-style-type: none"> • Has envisioned achieving sustainable social, financial and environmental development. • The objectives include maintaining a balance between development and environment. • Categorizes land into seven types for optimum use of land and the land resources. • Emphasizes identification and protection of environmentally sensitive areas; conservation and promotion of biodiversity by maintaining balance among land, environment and development; and execution of developmental activities by taking into account the principle of sustainable development and impacts of climate change.
13	Environment Friendly Local Governance Framework (2013)	<ul style="list-style-type: none"> • The objectives are to mainstream environment, climate change, and disaster management in the local planning process; make the local governance system environment-friendly; make every person responsible for environment-friendly sustainable development; encourage coordination and collaboration in environment and development; and increase the local ownership.

Annex 24: Biodiversity related sectoral policies, strategies, and regulatory framework formulated since 2002

S N	Policy/ Strategy/ Legislation	Biodiversity related Provision
1	Nepal Biodiversity Strategy (2002)	<ul style="list-style-type: none"> • The goal was to provide a strategic planning framework for the conservation of biological diversity, maintenance of ecological processes and systems, and equitable sharing of the benefits accrued.
2	Water Resource Strategy (2002)	<ul style="list-style-type: none"> • The goal is to improve living conditions of Nepali people in a sustainable manner. • Sustainable management of watersheds and aquatic ecosystems is one of the strategic outputs.
3	Mountaineering Expedition	<ul style="list-style-type: none"> • Requires the mountaineering expedition team to comply with different conditions such as preventing damage or destruction of any tree, and other forest heritage and

	Regulations (2002)	<p>environmental cleanliness existing in the adjoining area or on mountaineering expedition route.</p> <ul style="list-style-type: none"> • Imposes a responsibility on the liaison officer to carry out necessary work relating to environmental cleanliness and solid waste management. • Makes it mandatory to the mountaineering team to re-export to the country of origin wastes such as used oxygen bottles, used battery, equipment necessary for mountaineering or personal goods used for climbing.
4	Leasehold Forest Policy (2002)	<ul style="list-style-type: none"> • Clarifies the ambiguities in the then existing forest polices on the leasehold forest handover process.
5	National Agricultural Policy (2004)	<ul style="list-style-type: none"> • One of the objectives is conservation, promotion and proper utilization of natural resources, environment and biodiversity. • Encourages <i>in-situ</i> conservation and provides basis for establishment of gene banks and participatory biodiversity parks. • Emphasizes promoting agroforestry.
6	Herbs and Non-Timber Forest Products Development Policy (2006)	<ul style="list-style-type: none"> • Aims at establishing Nepal as a storehouse of medicinal plants and other NTFPs by 2020.
7	Rural Energy Policy (2006)	<ul style="list-style-type: none"> • One of the goals is to reduce dependency on traditional energy and conserve environment by increasing access to clean and cost effective energy in the rural areas. • Emphasizes development of environment-friendly rural energy technologies. • Highlights the promotion, research and development of technologies related to micro and small hydropower; biogas; fuel wood, charcoal, briquette, biomass energy, biomass gasification; solar energy; wind energy; improved cook stove; improved water mill; and rural electrification.
8	Agrobiodiversity Policy (2007)	<ul style="list-style-type: none"> • Emphasizes conservation, promotion and sustainable use of agro-biodiversity. • Provides basis for conservation and promotion of the rights, interests traditional knowledge, skill, innovation, technology, and practices of the farmers; • Makes policy arrangements for equitable distribution of opportunities and benefits arising from access to and utilization of agro-genetic resources and materials; • Provides some substantive rights such as ownership of traditional and local agricultural genetic resources to the farmers.
9	Plant Protection Act (2007)	<ul style="list-style-type: none"> • Provisions for prevention of the introduction, establishment, prevalence and spread of pests while importing and exporting plants and plant products, promoting trade in plants and plant products. • Requires entry permit for importing plants, plant products, biological control agents, beneficial organisms or means of growing plants such as soil, moss and pit. • Imposes a duty to undertake pest risk analysis and determine controlled pests. • Requires seizing and destroying the infected plants or plant products, biological control agents, beneficial organisms or other articles to be imported or transported, are still found to be infected despite treatment.
10	Tourism Policy (2009)	<ul style="list-style-type: none"> • The objectives are to develop Nepal as a major tourism destination by conserving, promoting and developing tangible and intangible natural, cultural, and biological heritages; and conserve and sustainably use environmental resources while utilizing natural resources during development and construction of tourism infrastructure. • Emphasizes formulation and implementation of a separate environment protection and solid waste management guidelines for the sustainable management and environmental cleanliness of tourism activities.
11	Plant Protection Rules (2010)	<ul style="list-style-type: none"> • Has provisions for dealing with GMOs; outlines duties and powers of National Plant Protection Organization
12	Forest Fire	<ul style="list-style-type: none"> • It has four pillars for forest fire management in Nepal, namely: i) policy, legal and

	Management Strategy (2010)	institutional development and improvement; ii) education, awareness raising, capacity building and technology development; iii) participatory (involving local community) fire management and research; and iv) coordination and collaboration, international cooperation, networking, and infrastructure development.
13	Industrial Policy (2011)	<ul style="list-style-type: none"> • One of the main objectives is to establish industrial entrepreneurship as a sustainable and reliable sector by utilizing latest technology and environment friendly production process. • Provides basis for technical and financial assistance to the industries that use environment-friendly and energy saving technology on their own costs. • Emphasizes special measures to be taken to promote green industries and to make the established industries pollution-free and zero carbon emission. • Provides basis for deduction of the capital expenses and technology and process for installation of a system for pollution control and less impact in environment may be deducted for the purpose of income tax.
14	Rangeland Policy (2012)	<ul style="list-style-type: none"> • One of the objectives is to help maintain ecological balance by conserving, promoting, and sustainable utilization of rangeland biodiversity. • Emphasizes sustainable utilization of biodiversity and natural resources and protection of such commodities by bringing them under the ambit of intellectual property rights legislation. • Highlights studying and developing record/data of biodiversity and genetic differences of rangelands and updating it regularly. • Promotes <i>in-situ</i> and <i>ex-situ</i> conservation of rangeland-based resources that are rare and on the verge of extinction. • Plans carrying out research to learn the contribution of rangelands in carbon sequestration. • Sets up a 13 member Steering Committee at the central level and a 15 member District Coordination Committee.
15	National Wetlands Policy (2012)	<ul style="list-style-type: none"> • Envisions healthy wetlands for sustainable development and environmental balance. • Aims at conserving and managing wetlands resources sustainably and wisely. • Objectives are to conserve biodiversity and protect environment by conservation of wetlands, involving local people in the management of wetlands, and conservation, rehabilitation and effective management of wetland areas; supporting the wellbeing of wetland dependent communities; and enhancing the knowledge and capacity of stakeholders along with maintaining good governance in management of wetland areas. • Emphasizes identification and prioritization of wetlands on the basis of ecological, social and economic importance and conservation, rehabilitation and management of such areas; identification, respect and utilization of traditional knowledge and skills of wetland dependent communities; making provisions for equitable distribution of the benefits arising from the utilization of wetland based resources; and promoting good governance. • Provides working polices for conservation, restoration, and effective management of wetland areas; wise use of wetlands; and promoting good governance in the management of the wetlands. • Establishes a high-level National Wetlands Committee.
16	Forest Encroachment Control Strategy (2012)	<ul style="list-style-type: none"> • Emphasizes on achieving 40 percent forest coverage through avoidance and control of forest encroachment and reclaiming of the encroached forest areas.
17	Wildlife Damage Relief Guidelines (2012)	<ul style="list-style-type: none"> • Aims at reducing the conflict between protected area management and the people as result of the damage caused by the wildlife.

18	Irrigation Policy (2013)	<ul style="list-style-type: none"> • Promotes implementation of strategy relating to management of climatic risks, and mitigation and adaptation to the effects of climate change. • Highlights construction of irrigation projects/systems in a manner that the negative environmental effects are least. • Commits to using only the remaining water for irrigation from any river/rivulet for irrigation purpose after discharging minimum water in the same river/rivulet.
----	--------------------------	---

Annex 25: Selected biodiversity related international conventions, treaties, agreements that Nepal has signed and the progress

Name of Convention	Date	Major Obligation	Achievements
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar) (1971)	17 Apr. 1988	Conservation, management and wise use of migratory waterfowl and promotion of wetland conservation. Formulation and implementation of measures to make wise use of wetlands.	Formulation of National Wetland Policy (2003; 2012). Declaration of nine wetlands as Ramsar sites. EIA has been made mandatory to hydro power and irrigation projects.
Convention on the International Trade in Endangered Species of Wild Fauna and Flora (1973)	16 Sep. 1975	Protection and regulation in the trade of wild fauna and flora and their products Legal protection to all species threatened with extinction with appropriate measures and trade regulation	NPWC Act (1973); Forest Act (1993) MOFSC has declared protected plants and animals of Nepal Establishment of CITES section in the DNPWC
The Convention on the Conservation of Migratory Species of Wild Animals (1979)	N/A	Protection of migratory species of wild animals that live within or pass their national jurisdiction.	N/A
Convention for the Protection of the World's Cultural and Natural Heritage (1972)	20 Sep. 1978	Each party is required to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated on its territory; and ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory	Ten cultural and natural heritage sites (including two national parks) have been listed on the List of World Heritage Sites Several relevant Acts promulgated. GON, in collaboration with IUCN-Nepal, is carried out monitoring of World Heritage Sites since 2002
Convention on Biological Diversity (1992)	21 Feb. 1994	Conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources	A number of policies, strategies and acts formulated and implemented Substantial progress made in in-situ and ex-situ conservation of biodiversity
United Nations Framework Convention on Climate Change (1992)	31 Jul. 1994	Adoption of precautionary measures to prevent or minimize the release of greenhouse gases and mitigate effects of climate change.	Formulation and implementation of Climate Change Policy, NAPA, LAPA, R-PP, Environment Protection Act (1997). Preparation of Nepal vehicle pollution standard (1999).
United Nations Convention to Combat Desertification (1994)	13 Jan. 1997	Adoption of measures to combat desertification Addressing the physical, biological, and socio economic aspects of the processes of desertification and drought	Preparation of national action plan to combat desertification Preparation and presentation of three national reports on land degradation
Kyoto Protocol to the UNFCCC (1997)	14 Dec. 2005	Formulate, implement, publish and regularly update national and, where appropriate, regional s containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change	The government has developed a number of criteria and indicators for environmental protection and sustainable development. Some of the indicators that are directly related to biodiversity are: (i) maintaining

			sustainability of local ecological functions, and (ii) maintaining genetic, species, and ecosystem diversity and not permitting any genetic erosion.
Plant Protection Agreement for the South East Asia and Pacific Region (1956)	12 Aug. 1965	Prevent introduction into and spread of destructive plant diseases and pests Regulate trade in plants and plant products	Not available
Agreement on the Network of Aquaculture Centers in Asia and the Pacific (1988)	04 Jan. 1990	Promotion of aquaculture development for increasing production, improving rural income and employment Strengthening institutional capacity Promotion of exchange of information	Not available
International Tropical Timber Agreement (1983)	03 Jul. 1990	Ensure conservation and sustainable use of timber Implement activities for forest management and any decisions on timber trade	Not available
Millennium Summit (2000) Millennium Development Goals (MDGs)	N/A	Ensure environmental sustainability. Target 7 B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	N/A
Cartagena Protocol on Bio-safety to the CBD (2000)	N/A	Contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biodiversity	Plant Protection Act 2007 Biosafety Guidelines (2005) National Bio-safety Framework Policy (2007)
The World Trade Organization	23 Apr. 2004	Protection of intellectual property over plant varieties through development of a patent regime (TRIPs agreement) Make legal regime compatible with the WTO Comply with all WTO trade rules latest by the end of 2006	Patent, Design and Trade Mark Act 2006, Copyright Act 2002, Competition Promotion and Market Protection Act 2007, Foreign Investment And Technology Transfer Act 2001
Global Tiger Forum	N/A	Effective protection of wild population of Royal Bengal Tiger, its prey base and habitat in the country	N/A

Annex 26: Protected Areas of Nepal

S.N	Protected Area	Year Established	Area (sq.km.)	Elevation (m)	Conservation Significance
National Parks					
1	Chitwan (World Heritage Site 1984)	1973	932	150-815	The Park houses over 50 species of mammals including one-horned rhinoceros, Royal Bengal tiger and bison; Important Bird Area; 539 species of birds that include migrant birds like paradise flycatcher, Indian pitta, parakeets and several species of waterfowl; and many species of amphibians and reptiles including the endangered gharial, marsh mugger crocodile and python. The habitat comprises of deciduous broadleaf forest with over 600 plant species, savannas and wetlands.
2	Langtang	1976	1,710	792-7,245	The habitat types range from sub-tropical forests below 1,000 m to alpine shrubs and grasslands. Musk deer and red panda are at the focus of conservation. Many other mammals such as snow leopard, wild dog, Himalayan black bear, Himalayan tahr, ghoral, serow, rhesus monkey and langur monkey, and over 370 species of birds including tragopan and impeyan pheasant (danphe) are found.
3	Rara	1976	106	1,800-4,048	Rara has many animal species including endangered red panda and musk deer. Three species of snow trout are found in the lake. During winter over 270 species of birds including coots, great-crested grebe, black-necked grebe, red crested pochard, mallard, common teal, merganser and gulls, and migrant water fowls can be seen. Coniferous forests, primarily of blue pine forms the dominant vegetation. Rhododendron, juniper, spruce, oak and cypress are found around 3,000 m while spruce and fir are more common at higher elevations.
4	Sagarmatha (World Heritage Site 1979)	1976	1,148	2,800-8,848	The Park is famous for the scenic beauty of the Himalayas (including Mount Everest), musk deer, red panda, bear and snow leopard. Nearly 200 species of birds including impeyan pheasant, blood pheasant, red-billed chough, yellow-billed chough, snow cock, and snow pigeon are found. The forest vegetation comprises of pine and hemlock forests at lower elevations, and silver fir, birch, rhododendron and juniper at higher elevations (i.e. above 3,500 m).
5	Shey-Phoksundo	1984	3,555	2,000-6,885	Wild goat (ghoral), blue sheep, musk deer, and the Shey-Phoksundo lake are some of the main attractions. Over 200 species of birds including yellow throated marten, Tibetan partridge, wood snipe, white-throated tit, wood accentor and crimson-eared rose finch, impeyan pheasant, cheer pheasant, chough, raven, Tibetan snow cock, Tibetan twit and Himalayan griffon; and 29 species of butterflies are found. Pine, walnut, willow, oak, cypress are dominant trees in the lower elevations and pine, spruce, juniper and birch at higher elevations. Alpine range is comprised of meadows and shrubs of berberis, wild rose and caragana.
6	Khaptad	1984	225	1,000-3,276	The Park is famous for medicinal plants. Over 220 species of medicinal plants are recorded. Wildlife includes barking deer, wild boar, ghoral, Himalayan black bear, yellow-throated marten, rhesus monkey and langur monkey, and around 270 species of birds are found. Vegetation is mainly comprised of grasslands and subtropical,

					temperate and sub alpine forests. This is also a famous spiritual site.
7	Bardia	1988	968	152-1,494	Mammals such as Royal Bengal tiger, one-horned rhinoceros, elephant, swamp deer, black buck, and reptiles such as gharial, marsh mugger crocodile are the main species. Fresh-water Gangetic dolphin is found in the Karnali River. Bengal florican, lesser florican, silver-eared mesia and sarus crane are some of 400 species of birds found in the Park that is dominated by sal forest and savannahs.
8	Makalu Barun	1991	1,500	435-8,463	The Park is an important habitat for endangered red panda and snow leopard, and several species of endangered plants. Above 80 varieties of fish including salmon are reported in the Arun River. Wren babbler and olive ground warbler are some of the 400 species of birds found in the Park. Forest vegetation ranges from sub-tropical forests to sub-alpine and alpine vegetation as the elevation increases. The park is also famous for rhododendrons and orchids. Twenty-five (out of 30 found in Nepal) varieties of rhododendrons, 48 species of orchids, 87 species of medicinal herbs, 48 species of primroses and 86 species of fodder trees are reportedly found in the Park.
9	Shivapuri-Nagarjun	2002	159	1,366-2,732	Conservation of watershed that drains the Kathmandu Valley is a major objective. Around 19 species of mammals including Himalayan black bear, leopard, barking deer, wild boar, wild cat, rhesus monkey and langur monkey, 177 species of birds, 102 species of butterflies, and 129 varieties of mushrooms are reported.
10	Banke	2010	550	360-480	Conservation of endangered wildlife and strengthening of transboundary biological corridor are some of the main objectives. Includes eight natural ecosystems, and houses 124 species of plants, 34 mammals, more than 300 birds, 24 reptiles, seven amphibians, and 58 fish species.
Wildlife Reserves					
1	Shuklaphanta	1976	305	90-270	Major wildlife consists of swamp deer, wild elephant, tiger, several species of deer, wild boar, leopard, and monkeys. Marsh mugger crocodile, cobra, and python are common reptiles. Important Bird Area; Sarus crane, swamp francolin, grass owl, warblers, flycatchers, Bengal florican are the common birds found in the sub-tropical sal forest and open grasslands.
2	Koshi Tappu (Ramsar Site, 1987)	1976	175	80-100	Wild buffalo and Siberian migratory birds are the main focus of conservation. Vegetation consists of grasslands with patches of scrub and deciduous riverine forests. Many other species of mammals (such as wild elephants, wild boar, hog deer, spotted deer, blue bull and jackal); Important Bird Area; 479 species of birds, and reptiles are found. Gangetic dolphins are found in the Koshi River.
3	Parsa	1984	499	150-815	Wildlife species including wild elephant, tiger leopard, sloth bear, and gaur; reptiles including king cobra, common cobra, krait, rat snake and python; over 370 species of birds including the endangered great hornbill are reported. Natural vegetation consists of tropical and sub-tropical sal forests. Chir pine, khair, and sissoo trees are found on the hilly parts.
Hunting Reserve					

1	Dhorpatan	1987	1,325	2,850-7,000	The reserve is famous for blue sheep, which is open for regulated trophy hunting.
Conservation Area					
1	Annapurna	1992	7,629	1,000-8,092	Endemic plants and mountains are the main characteristics. Over 100 species of mammals including blue sheep and endangered snow leopard; 39 species of reptiles; 22 species of amphibians; Important Bird Area (IBA); 474 species of birds including multi-colored impeyan pheasant, kokla and blood pheasant are reported. Many species of orchids and rhododendrons are found.
2	Kanchanjunga	1997	2,035	1,200-8,598	Mammals including endangered snow leopard, Himalayan black bear, musk deer, red panda, blue sheep, rhesus monkey; 252 species of different birds including impeyan pheasant, red-billed blue magpie, ashy drongo; 20 indigenous gymnosperms, 15 among Nepal's 23 endemic flowering plants, 30 varieties of rhododendrons and 48 varieties of orchids are reported.
3	Manasula	1998	1,663	1,360-8,163	Snow leopard, musk deer and Himalayan Tahr are among the 33 species of mammals found in the conservation area. Over 110 species of birds and 1,500-2,000 species of flowering plants are reported.
4	Gaurishankar	2010	2,179	1,000-7,200	(to be completed)
5	Khairapur	2010	16	120-230	The first organized effort to conserve the endangered blackbuck (<i>Antelope cervicapra</i>).
6	Api Nampa	2010	1,903	539-7,132	Snow leopard, musk deer, clouded leopard, ghoral, Himalayan black bear and Himalayan tahr are found in the area.
Buffer Zones					
1	Chitwan NP	1996	750		
2	Bardia NP	1996	327		
3	Langtang NP	1998	420		
4	Shey-phoksundo NP	1998	1,349		
5	Makalu Barun NP	1999	830		
6	Sagarmatha NP	2000	275		
7	Suklaphanta WR	2004	243.5		
8	Koshi Tappu WR	2004	173		
9	Parsa WR	2005	298.17		
10	Rara NP	2006	198		
11	Khaptad	2006	216		
12	Banke NP	2010	343		

Annex 27: Tree species having breeding seedlings orchards

Species Name		Number of Plots	Area (ha.)	Location of the Plots
Botanical	Local			
<i>Acacia catechu</i>	Khayar	1	1	Siraha
<i>Aesandra butyracea</i>	Chiuri	2	1.9	Makwanpur, Palpa
<i>Albizzia lebbeck</i>	Kalo siris	1	1	Chitawan
<i>Anthocephalus cadamba</i>	Kadam	1	1.5	Sarlahi
<i>Artocarpus chaplasha</i>	Latahar	1	2.0	Jhapa
<i>Artocarpus lakoocha</i>	Badahar	2	1.8	Chitawan, Kaski
<i>Azadirachta indica</i>	Neem	1	0.9	Sunsari
<i>Bauhinia purpurea</i>	Tanki	1	0.4	Chitawan
<i>Bauhinia variegata</i>	Koiral	1	0.9	Dhading
<i>Bombax ceib</i>	Simal	2	2.2	Nawalparasi, Rupandehi
<i>Cassia fistula</i>	Rajbrikshya	1	1.0	Rupandehi
<i>Choerospondias axillaris</i>	Lapsi	2	2.3	Kathmandu, Nuwakot
<i>Cinnamomum tamala</i>	Tejpat	2	1.6	Sunsari, Kaski
<i>Dalbergia latifolia</i>	Satisal	1	2.1	Chitwan
<i>Dalbergia sissoo</i>	Sissoo	7	11.4	Sunsari, Siraha, Chitwan, Kapilbastu, Banke, Kanchanpur,
<i>Ficus semicordata</i>	Raikhanyu	1	1.4	Kaski
<i>Gmelina arborea</i>	Khamari	1	0.9	Sarlahi
<i>Juglans regia</i>	Okhar	1	1.4	Makwanpur
<i>Leucaena spp.</i>	Ipil Ipil	3	0.5	Chitwan, Kapilbastu
<i>Madhuca indica</i>	Mahuwa	1	1.0	Nawalparasi
<i>Michelia champaca</i>	Champ	1	1.4	Kathmandu
<i>Phyllanthus emblica</i>	Amala	2	1.1	Chitwan, Kaski
<i>Pterocarpus marsupium</i>	Bijayasal	1	2.6	Kanchanpur
<i>Sapindus mukarassi</i>	Ritha	1	0.9	Tanahu
<i>Tamarindus indica</i>	Imli	1	1.0	Nawalparasi
<i>Tectona grandis</i>	Sagvan	1	1.0	Rupandehi
<i>Zanthoxylum armataum</i>	Timur	1	1.0	Myagdi
Total (27 spp.)		41	46.1	18 Districts

Source: TISU (2013)

Annex 28: Status of implementation of the Nepal Biodiversity Strategy (2002) and Nepal Biodiversity Strategy Implementation Plan (2006)

Section	Strategies	Implementation Status				
		VG	G	P	NI	U
5 STRATEGIES TO CONSERVE BIODIVERSITY						
5.1	Cross-Sectoral Strategies					
5.1.1	Landscape planning approach	√				
5.1.2	Integrating local participation	√				
5.1.3	Institutional strengthening		√			
5.1.4	In-situ conservation	√				
5.1.5	Strengthening the National Biodiversity Unit				√	
5.1.6	Increasing support for biodiversity research and conservation			√		
5.1.7	Endorsing indigenous knowledge and innovations				√	
5.1.8	Cross-sectoral co-ordination and implementation of policies			√		
5.1.9	Enhancing national capacity		√			
5.1.10	Ex-situ conservation and biotechnology		√			
5.1.11	Securing intellectual property and farmer property rights			√		
5.1.12	Biodiversity prospecting			√		
5.1.13	Environmental impact assessment		√			
5.1.14	Women in biodiversity conservation		√			
5.1.15	Developing eco-tourism		√			
5.1.16	Increasing conservation awareness	√				
5.1.17	Biodiversity registration			√		
<i>Sub-total</i>		4	6	5	2	
5.2	Sectoral Strategies					
5.2.1	Protected areas					
5.2.1.1	New models of protection and management	√				
5.2.1.2	Coordination		√			
5.2.1.3	Capacity enhancement		√			
5.2.1.4	Representation of all ecosystems in protected areas			√		
5.2.1.5	Biodiversity inventories			√		
5.2.1.6	Exchange of information			√		
5.2.1.7	Species conservation plan		√			
5.2.1.8	Management of protected area tourism	√				
<i>Sub-total</i>		2	3	3		
5.2.2	Forests					
5.2.2.1	Forest rehabilitation	√				
5.2.2.2	Inventory of flora and fauna			√		
5.2.2.3	Ecosystem network and representation			√		
5.2.2.4	Understanding forest resilience and biodiversity			√		
5.2.2.5	Local participation	√				
5.2.2.6	Strengthening management practices		√			
5.2.2.7	Sustainable harvesting		√			

5.2.2.8	Non-timber forest products		√			
5.2.2.9	Religious forests management			√		
<i>Sub-total</i>		2	3	4		
5.2.3	Rangelands					
5.2.3.1	Need for a national rangeland policy	√				
5.2.3.2	Conservation of rangeland biodiversity (focusing on 11 specific actions)			√		
5.2.3.3	Pastoral development and management in the Himalayas (focusing on 10 specific actions)			√		
5.2.3.4	Forage development through integrated management planning (focusing on 19 specific actions)			√		
<i>Sub-total</i>		1		3		
5.2.4	Agro-biodiversity					
5.2.4.1	Participatory plant breeding	√				
5.2.4.2	Participatory variety selection	√				
5.2.4.3	Gene Bank		√			
<i>Sub-total</i>		2	1			
5.2.5	Wetlands					
5.2.5.1	Management of wetlands (focusing on nine specific actions)		√			
5.2.6	Mountain biodiversity					
5.2.6.1	National mountain policy			√		
5.2.6.2	Integrated management	√				
<i>Sub-total</i>		1		1		
5.3	Commitments to Address the Most Serious Threats to Biodiversity					
	Formulation of an implementation plan (NBSIP)	√				
	District Biodiversity Committee (DBC) will be established on a trial basis in each of selected districts			√		
<i>Sub-total</i>		1		1		
6 MECHANISMS FOR ACTION						
6.1	The Role of Government					
	Overall responsibility for implementing the NBS will lie with the MOFSC		√			
	Relevant ministries and departments are responsible for implementation of their sectoral biodiversity plans		√			
	MOPE to apply Environment Protection Act, 1996, and Regulations, 1997 for biodiversity conservation. The Ministry needs to put more emphasis on enforcement of mitigation measures as prescribed in the EIA reports and monitoring such activities, and taking action against those violating the prevailing laws			√		
	DOPR and DOFRS will continue to conduct flora and fauna inventories and research e.g. on biodiversity assessment and monitoring.		√			
	The NBS will be implemented through project activities		√			

	outlined in the periodic NBSIPs					
<i>Sub-total</i>			4	1		
6.2	Organisational Structure for Implementation of the Strategy					
6.2.1	The National Biodiversity Co-ordination Committee	√				
6.2.2	Thematic Sub-committees	√				
6.2.3	National Biodiversity Unit		√			
6.2.4	Biodiversity Coordinator				√	
6.2.5	District Biodiversity Coordination Committee			√		
6.2.6	The role of NGOs	√				
6.2.7	The role of universities and research institutes		√			
<i>Sub-total</i>		3	2	1	1	
6.3	Public Participation					
6.3.1	The role of the public		1			
6.3.2	Essential elements of public participation		1			
6.3.2.1	Rights and responsibilities			1		
6.3.2.2	Public participation policy		1			
6.3.2.3	Framework for participation		1			
6.3.2.4	Protected areas and buffer zone management		1			
6.3.2.5	Ecosystem landscape management			1		
6.3.2	Involving NGOs and civil society		1			
<i>Sub-total</i>			6	2		
6.4	Financial Resources					
6.4.1	Nepal Trust Fund for Biodiversity				√	
6.4.2	Other funding mechanisms		√			
<i>Sub-total</i>			1		1	
6.5	Monitoring and Progress Indicators					
6.5.1	Biodiversity monitoring			√		
6.6	Transparency and Accountability					
	All those involved in its implementation will be accountable to the NBCC, which, through its open procedures and public annual reports, is accountable to government and the People of Nepal					√
2	PRIORITY PROJECTS (NBSIP)					
CS1	Institutionalization of Biodiversity Conservation in Nepal			√		
PA3	Establishment of Kanchenjunga Tri-national Peace Park				√	
RL1	Integrated Rangelands Management			√		
AG1	Agrobiodiversity Conservation through Community Participation		√			
AGI1	Conservation and Management of Pollinators for Sustainable Agriculture through an Ecosystem Approach	√				
CS2	Landscape Level Biodiversity Conservation	√				
PA1	Species Conservation and Habitat Management (in PAs)		√			
FO2	Rhododendron Conservation Programme in Tinjure-Milke-Jaljale				√	

PA2	Poverty Reduction through Biodiversity Conservation		√			
FO3	Phulchoki-Chandragiri Biodiversity Conservation Programme				√	
WL1	Integrated Wetland Management	√				
MO1	National Mountain Policy and Research Network			√		
FO1	Forests Biodiversity Conservation through Community Participation (outside PAs)		√			
<i>Sub-total</i>		3	4	3	3	

VG = Very Good ($\geq 80\%$); G = Good (50-80%); P= Poor (<50%); NI = Not Implemented; U = Unknown

Annex 29: Strategic Plan for Biodiversity and Aichi Biodiversity Targets

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services,

are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.

Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011-2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.