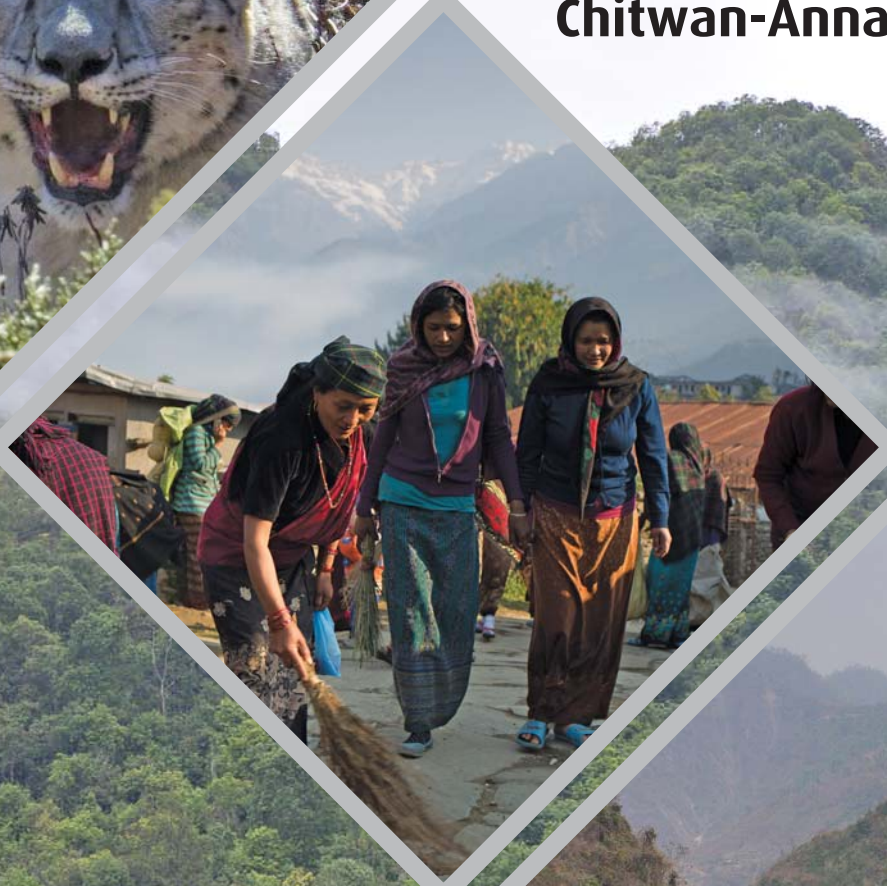
Strategy and Action Plan 2016-2025

Chitwan-Annapurna Landscape, Nepal



Government of Nepal
Ministry of Forests and Soil Conservation

Strategy and Action Plan 2016-2025 | Chitwan-Annapurna Landscape, Nepal

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Message

Nepal has pioneered landscape-scale conservation in the region. Our conservation models, starting from species conservation, through ecosystem conservation and then landscape level conservation have proved immensely successful and been much appreciated by the global conservation community. Over 44 percent of the country's land mass is covered by forest area including a network of protected areas. The protected areas alone occupy 23.6 percent, harboring globally significant wildlife species including tiger, rhinoceros and elephant in the southern lowland, and snow leopard, red panda and musk deer in the high mountains.

Our commitment in conservation is clearly exhibited through our Constitution 2015, National Parks and Wildlife Conservation Act 2029, Forest Act 2051, National Biodiversity Strategy and Action Plan 2014, Forest Policy 2015, Forest Sector Strategy 2015 and other related regulations, species conservation plans, and active engagement of local communities where they become the custodians of our valuable biological resources. Our landscape level conservation efforts are not just an exercise in stewardship of natural resources; they are essential to ensure that human communities thrive and Nepal's economic goals are sustained, for many people depend on forest resources and the streams and rivers that flow from the catchment areas.

The Chitwan-Annapurna Landscape (CHAL) covers all of the Gandaki river basin in Nepal. This Strategy is developed to ensure the ecological integrity of the landscape, enhance the socio-economic wellbeing of the people living there, and promote harmonization with economic development that will contribute to the national economy. CHAL is part of South Asia's water tower and river basins in the landscape are critical for meeting the need for water and maintaining upstream and downstream linkages. The effective implementation of this Strategy and its Action Plan depends on close, effective, and efficient partnerships and coordination among key stakeholders, from a range of relevant government institutions to civil society organizations and local communities. The Ministry of Forests and Soil Conservation is committed to lead this endeavor. Together we can succeed.

I would like to thank all the people who helped to develop this Strategy and Action Plan. I am confident that their successful implementation over the next ten years will conserve and enhance the ecological integrity of the CHAL, improve the lives of the people who make it their home, and enhance the conservation landscape's contribution to the national economy.

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Acknowledgements

The Chitwan-Annapurna Landscape (CHAL) covers 32,090 km^2. Over 4.5 million people with diverse ethnicity and culture inhibit in this landscape. CHAL was first conceived as a north-south ecological link between the protected areas in the north and south. It is clear that conservation in the CHAL is not just an exercise of stewardship of natural resources, but it is also essential to ensure that human communities thrive and prosper, and that Nepal's economic goals are achieved. Many people in the landscape still depend on the forest resources for livelihoods, but all are dependent on sustained water supplies, while hydropower is a very high priority on Nepal's economic development agenda. The rivers in the Gandaki basin form a central unifying network in the landscape, connecting natural and human ecosystems. But this important natural resource-water should be used carefully, balancing the various uses and needs of many stakeholders. This CHAL landscape-scale conservation and management Strategy and Action Plan strives to promote this. .

This Strategy would not have been possible without contributions from many institutions and individuals. The Ministry of Forests and Soil Conservation (MoFSC) would like to thank ICIMOD, IUCN NTNC, UNDP and WWF Nepal; and the members of the CHAL Strategic Plan Core Team formed under the leadership of Mr. Krishna P. Acharya, Chief of Planning Division, MoFSC, representing several governmental and non-governmental organizations. Mr. Pashupati Koirala, Under Secretary, MoFSC, coordinated the overall process of developing the Strategy and Action Plan. We would also like to thank Dr. Shant Raj Jnawali, Judy Oglethorpe, Eric Wikramanayake and Suman Dhakal who helped to bring this document to this level. Prof. Ram Prasad Chaudhary, Prof. Khadga Basnet, Dr Ram Krishna Timalsena, Dr. Yadav Upreti, Dr. Gobinda Basnet and other experts who tirelessly helped MoFSC to develop this strategy. Mr. Gokarna J. Thapa and Mr. Saroj Koirala helped on GIS work. We thank WWF Nepal and USAID funded Hariyo Ban Program for providing financial and technical support to prepare this strategy and Action Plan.

We have attempted to climate-smart this Strategy to tackle climate vulnerabilities to both ecological as well as human communities, and adopted a river basin landscape management approach. We strongly believe that this Strategy will be a guiding document for CHAL to undertake landscape level conservation and environment friendly development. I believe this strategy and action plan will provide strategic guidance to maintain the ecological and social integrity of CHAL, ensuring upstream-downstream linkages.

Uday Chandra Thakur
Secretary

Acronyms and Abbreviations

ACA	Annapurna Conservation Area
asl	Above Sea Level
BZ	Buffer Zone
BZUC	Buffer Zone User Committee
CA	Conservation Area
CAMC	Conservation Area Management Committee
CAPA	Community Adaptation Plans for Action
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CCC	Chitwan-Annapurna Landscape Coordination Committee
CDM	Clean Development Mechanism
CHALWG	Chitwan-Annapurna Landscape Working Group
CFUG	Community Forest User Group
CHAL	Chitwan-Annapurna Landscape
CIB	Central Investigation Bureau
DADO	District Agriculture Development Office
DDC	District Development Committee
DFO	District Forest Office
DFSCC	District Forestry Sector Coordination Committee
DHM	Department of Hydrology and Meteorology
DLSO	District Livestock Service Office
DNPWC	Department of National Parks and Wildlife Conservation
DoF	Department of Forests
DPR	Department of Plant Resources
DRR	Disaster Risk Reduction
DSCO	District Soil Conservation Office
DSCWM	Department of Soil Conservation and Watershed Management
EIA	Environmental Impact Assessment
EFGDCC	Environment Friendly Governance District Coordination Committee
EFLGMCC	Environment Friendly Local Governance Municipal Coordination Committee
EFLGVCC	Environment Friendly Local Governance Village Coordination Committee
FRA	Forest Resource Assessment
FECOFUN	Federation of Community Forest Users Nepal
GLA	Government Line Agency
GLOF	Glacial Lake Outburst Flood
GoN	Government of Nepal
HDI	Human Development Index
HPI	Human Poverty Index
ICIMOD	International Centre for Integrated Mountain Development

IEE	Initial Environmental Examination
IPA	Important Plant Area
IRBM	Integrated River Basin Management
IUCN	International Union for the Conservation of Nature
LAPA	Local Adaptation Plans for Action
LDOF	Landslide Dam Outburst Flood
LFUG	Leasehold Forest User Group
MAP	Medicinal and Aromatic Plant
MIS	Management Information System
MoAD	Ministry of Agriculture Development
MoFALD	Ministry of Federal Affairs and Local Development
MoFSC	Ministry of Forests and Soil Conservation
MoSTE	Ministry of Science, Technology and Environment
NBCC	National Biodiversity Coordination Committee
NGO	Non-governmental Organization
NP	National Park
NPC	National Planning Commission
NR	Nepali Rupee
NRM	Natural Resource Management
NTFP	Non-timber Forest Product
NTNC	National Trust for Nature Conservation
PA	Protected Area
PES	Payment for Ecosystem Services
PPP	Purchasing Power Parity
RD	Regional Directorate
REA	Rapid Environmental Assessment
REDD	Reduced Emissions from Deforestation and Forest Degradation
SEA	Strategic Environmental Assessment
TAL	Terai Arc Landscape
USD	US Dollar
VDC	Village Development Committee
WCCB	Wildlife Crime Control Bureau
WEC	Water and Energy Commission
WECS	Water and Energy Commission Secretariat
WTO	World Trade Organization
WWF	World Wildlife Fund

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Executive Summary

Management of biodiversity and natural resources at landscape scale has emerged as a strategy that promotes conservation and natural resource use in sustainable and equitable ways. The Chitwan-Annapurna Landscape (CHAL) in western-central Nepal comprises all of the Gandaki River Basin lying in Nepal, and this ten-year Strategy and Action Plan are intended to guide the future course of conservation and development interventions in this river basin. The landscape ranges from the plains of the Terai a few hundred meters above sea level, through the mid-hills to Himalaya peaks over 8,000 m asl, with the rain shadow area of Mustang and Manang districts. The landscape has immense natural and cultural wealth, with high potential to contribute to the overall social and economic development of the country. The recent recognition of CHAL as a landscape and the development of this Strategy come at a critical time when the landscape faces many challenges, including recovery and reconstruction following the 2015 earthquake, and the ongoing advance of climate change. It is also a time of great social, economic and political change, including continuing out-migration of the male work force; rapid infrastructure development; the Constitution 2015; and development of a federal system.

CHAL Vision

Biodiversity thrives and human communities prosper in co-existence through integrated, climate-smart conservation and sustainable development in the Chitwan-Annapurna Landscape in Nepal.

CHAL Strategic Goal

The Chitwan-Annapurna Landscape is managed through an integrated, river basin planning approach which is built on the foundation of climate-smart conservation and sustainable development practices to promote persistence of biodiversity, and sustainable management of natural resources for continued provision of ecosystem services that support equitable and inclusive economic prosperity.

Guiding Principles and Approach

The CHAL Strategy and Action Plan 2016-2025 are based on:

1. A *river basin approach,* since it best captures and mostly contains the critical ecosystem services and processes of the CHAL. The Gandaki river system links people living upstream and downstream
2. *Accountability* of people having a stake in natural resource conservation and management, who should also be accountable for actions leading to degradation
3. *Economic prosperity* through conservation of natural resources and sustainable development in the CHAL that will improve people's livelihoods and economic status in an equitable manner, and also contribute to national development, helping people to prosper while ensuring sustainability for long term resource availability
4. *In-situ conservation* complemented by ex-situ conservation when the latter can contribute to sustainable harvesting, or adaptation to climate change
5. *Integrated, participatory and adaptive management* in order to integrate climate change and its inherent uncertainties, and address emerging issues
6. *Synergy and harmonization* between development and conservation plans
7. *Strengthening multiple stakeholders' capacities* through an iterative process of identifying capacities and weaknesses, and providing opportunities to strengthen and institutionalize them
8. *Respecting local decision making* by recognizing and adopting appropriate local decisions that will enhance local communities' ownership of conservation and development processes

Outcomes

Six major outcomes are expected from the implementation of this strategy and action plan:

1. Forests and biodiversity is conserved, including viable populations of key species, representative ecosystems and their structural and functional integrity, with upstream-downstream linkages with desired environmental flows.
2. Social and cultural well-being and economic prosperity of local communities are enhanced, especially among women and disadvantaged groups.
3. Good governance is practiced and contributes to strong inter-sectoral coordination, with meaningful gender and social inclusion and strong multi-stakeholder capacities.
4. Risks and vulnerabilities to climate change, natural disasters, human induced activities, and infrastructure development are reduced.
5. Long-term socio-ecological and environmental monitoring, knowledge management, and communication systems are established and functioning.
6. Innovative sustainable financing mechanisms including public-private partnerships are developed and institutionalized.

Strategies

Sixteen strategies, each with specific strategic actions, have been developed to achieve the goal and expected outcomes. These strategies fall under four thematic areas:

1. Ecosystem services and ecological processes

Strategy 1.1. Promotion of integrated water use and management through river basin and sub-basin scale plans that balance multiple uses of water including hydropower generation for sustainable economic development, and desired environmental flows and services.

Strategy 1.2. Promotion of watershed conservation for healthy ecosystem services.

Strategy 1.3. Promotion of forest conservation and restoration of degraded areas for sustaining ecosystem services including carbon sequestration.

2. Forests and other land uses

Strategy 2.1. Securing forests and other terrestrial natural ecosystems (grasslands and rangelands) especially in ecologically sensitive areas for conservation and sustainable management.

Strategy 2.2. Ensuring conservation and sustainable use of aquatic ecosystems to provide desired environmental flows.

Strategy 2.3. Promotion of sustainable farming and pastoralism, including traditional and evolved pastoral and agricultural practices, for better land and water management.

Strategy 2.4. Managing and planning built-up area development to minimize impacts on natural and agricultural areas, and aquatic systems.

3. Species of special concern

Strategy 3.1. Strengthening mechanisms that link protected areas (PAs) and biodiversity rich forest areas outside PAs, enhancing wildlife health management, reduction in human-wildlife conflict, community stewardship, and the national anti-poaching/illegal trade control strategy for better coordination to address poaching and illegal trade.

Strategy 3.2. Development of climate smart management plans for protected areas, buffer zones, corridors, protection forests, and critical watersheds to guide conservation management.

Strategy 3.3. Enhancing conservation and maintenance of habitat linkages and corridors for ecological connectivity necessary for threatened, endangered and migratory species inside and outside PAs.

Strategy 3.4. Conservation of endemic, rare and threatened plant species, critical habitats for endemic species and habitat specialists.

Strategy 3.5. Management of plant species with non-timber forest product (NTFP)/medicinal and aromatic plant (MAP) values.

Strategy 3.6. Conservation of native fish species, indigenous and traditional crop varieties and livestock.

4. Economic prosperity

Strategy 4.1. Promotion of both innovative and traditional livelihood opportunities based on sustainable resource use, tourism, and green enterprises for economic prosperity, equity and social justice.

Strategy 4.2. Reducing climate change and natural disaster risks.

Strategy 4.3. Protection and restoration of important cultural and religious heritage.

Enabling conditions and cross cutting themes

Eight cross-cutting themes have been identified, that support the main thematic areas, each with specific strategic actions. They are: policy and governance; institutional arrangement for integrated river basin planning and management; gender equality and social inclusion; climate change; multi-stakeholder capacity strengthening; infrastructure; knowledge management and communication; and sustainable financing. The strategic actions of these cross-cutting themes can overlap with the strategic actions of the main thematic areas.

CHAL ten-year targets

Targets for conservation of ecosystem services and ecological processes

Targets for conservation of ecosystem services and ecological process are by 2025 to:

- Maintain environmental flows for ecosystem functions, while allocating water for development needs (e.g., energy, irrigation, drinking water), livelihood and socio-cultural needs.
- Maintain and manage forests under the reduced emissions from deforestation and forest degradation (REDD+) covenants as recommended by the REDD+ strategy.
- Develop and implement valuation of ecosystem services and payments for ecosystem services (PES).

Targets for conservation of forests and other land uses

Targets for these areas are by 2025 to:

- Maintain current forest cover and manage forests through climate change integrated management plans.
- Address the drivers of deforestation and forest degradation in the CHAL, in particular the pressure from fuelwood demand, by promoting use of clean energy sources including hydropower.
- Maintain ecological connectivity in river systems.
- Manage critical wetland ecosystems for sustainable water provision and habitat for aquatic life.
- Sustainably manage lowland grassland as wildlife habitat and alpine rangelands for wildlife, livestock, and MAPs.
- Promote conservation friendly agriculture practices.
- Mainstream green and climate smart infrastructure into development planning and plans.

Species targets

Targets for species of special concern are by 2025 to:

- Control poaching and illegal trade of animals and plants.
- Develop and implement climate change integrated conservation action plans for endemic threatened and rare plants *(Meconopsis regia, Saussurea kanaii, Michelia champaca, Magnolia globosa, Podophyllum hexandrum, Larix himalaica, Aconitum heterophyllum)* and high value MAPs and NTFPs (Panchaunle *Dactylorhiza hatagirea,* Kutki *Picrorhiza kurroa* and Jatamasi *(Nardostachys jatamansi)*.
- Maintain north-south 'climate-smart' ecological linkages and corridors for migratory species of animals, including mammals, birds, fishes and butterflies.
- Maintain lateral ecological and demographic connectivity of snow leopard populations in the CHAL by maintaining habitat links between adjacent alpine areas.
- Protect the populations of red panda and musk deer in the mid-hills of the CHAL.
- Conserve biodiversity important areas in the landscape.
- Implement proactive measures to mitigate human-wildlife conflict.
- Develop sustainable fisheries based on indigenous species that promote fish conservation.
- Mainstream indigenous and traditional crop varieties and livestock breeds in agriculture practices.

Targets for socio-economic prosperity

Targets for economic prosperity are by 2025 to:

- Enhance the socio-economic well-being and achieve prosperity of CHAL communities through sustainable use of natural resources.
- Achieve sustainable, climate-smart economic development that is harmonious with conservation of biodiversity and essential ecosystem services.
- Reduce disaster risks and improve disaster preparedness among communities.

Implementation

The strategic plan will be implemented directly by the relevant institutions under the Ministry of Forests and Soil Conservation (MoFSC) and other intra-and inter-sectoral institutions, with support from conservation and development partners. A multi-sectoral CHAL Coordination Committee will function as the convergence point to coordinate activities undertaken, proposed, or funded by the multiple actors for strategic implementation. The CHAL Coordination Committee will also be responsible for coordinating with the district forest sector coordination committees (DFSCCs) for planning, implementation, and monitoring.

Monitoring and evaluation

Progress on the strategy implementation will be reviewed after three years and a final review will be done at the end of the strategy period. The mid-term review will propose adaptive actions, depending on progress and extenuating circumstances that warrant changes. For this, a monitoring and evaluation plan for the CHAL Strategy and Implementation Plan will be developed and implemented.

Budget

A budget of Nepali Rupees (NRs) 35,902 million (US$ 359.02 million) has been estimated to implement the activities in the Action Plan over a period of ten years (2016-2025).

Chapter

I

Chitwan-Annapurna Landscape

1.1. General overview

The Chitwan-Annapurna Landscape (CHAL) was conceived in 1999 as a landscape to maintain north-south ecological connectivity through the range of eco-physiographic zones of the Nepal Himalaya, from Chitwan National Park in the south to Manaslu, Langtang and Annapurna in the north. The CHAL covers 32,090 km^2, which is almost 22% of Nepal's land area in 19 districts (Arghakhanchi, Gulmi, Palpa, Baglung, Parbat, Myagdi, Mustang, Syangja, Kaski, Tanahun, Lamjung, Gorkha, Manang, Rasuwa, Nuwakot, Dhading, Nawalparasi, Chitwan and Makwanpur) (Figure 1.1). It covers all of the Gandaki river basin in Nepal and includes its confluent rivers, namely: Kali Gandaki, Seti, Marsyangdi, Daraundi, Budhi Gandaki, Trishuli, and Narayani/East Rapti. A small part of the Gandaki basin headwaters lies outside CHAL. Altitudinally, the CHAL extends from the tropical lowland Terai (200m above sea level) to alpine high mountains and the cold and dry Trans-Himalayan region (above 4,000 m), and the high peaks exceed 8,000 m (Figure 1.2). The CHAL has six protected areas including three national parks (Langtang, Chitwan and Shivpuri-Nagarjun), one wildlife reserve (Parsa), and two conservation areas (Annapurna and Manaslu).

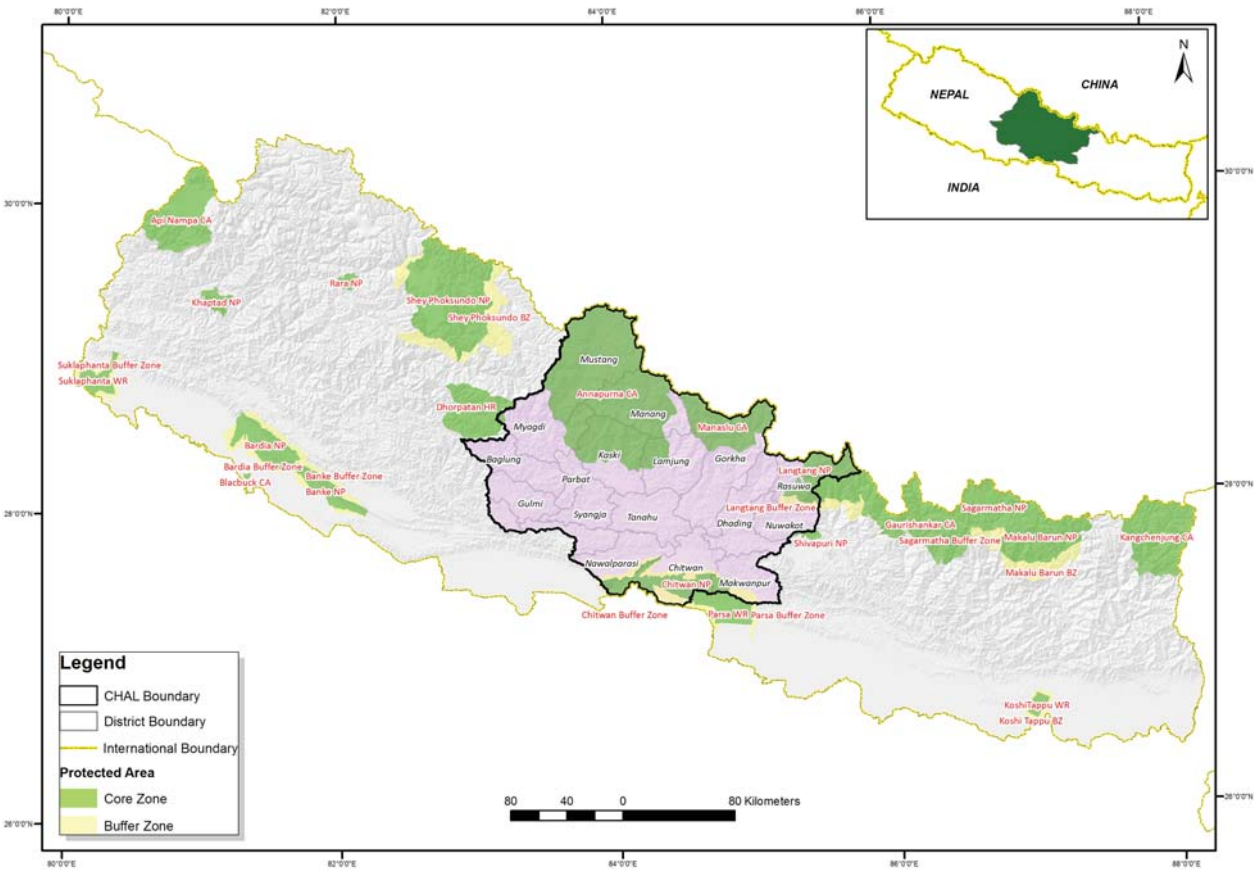

Figure 1.1: Location of CHAL in central-western Nepal

The steep and fragile geomorphology of the CHAL makes it vulnerable to natural disasters, and the Gorkha earthquake 2015 caused many landslides in four of the worst affected districts that fall within the CHAL boundary: Gorkha, Rasuwa, Nuwakot and Dhading. Climate change is also causing environmental and ecological change, with hazards such as unpredictable and more extreme rainfall patterns and increasing temperatures, with resulting impacts for local communities, ecosystem processes, and species range shifts or extinctions (Panthi et al. 2015). Greater impacts are expected as climate change advances, sometimes exacerbating natural disasters. Climate change can result in changes in land use patterns as people respond and adapt.

Box 1. Characteristic Features of CHAL

- The Gandaki river system is one of the largest river systems in Nepal and has the highest hydropower potential; its rivers are critical corridors for conservation.
- The landscape is rich in biodiversity including charismatic fauna species (e.g. tiger, elephant and rhino in the Tarai, and snow leopard, red panda and musk deer in the mountains), and 3,430 plant species with high species endemism and genetic diversity of angiosperms (e.g. species of *Saxifraga, Pedicularis & Meconopsis*).
- The Kali Gandaki tributary drains through the deepest gorge in the world, which divides the Eastern and Western Himalaya with distinctly different biodiversity. The gorge is a trans-Himalayan migratory corridor for many bird species, including cranes, ducks and geese.
- CHAL has complex and highly varied topography that provides meso- and micro- refugia to buffer impacts of climate change.
- More than 40% of the landscape is covered by forests with six protected areas, three protection forests, and three Wetlands of International Importance (Ramsar sites), including globally recognized conservation models like Chitwan National Park and Annapurna Conservation Area.
- The Gandaki river system links people living upstream and downstream in Nepal, as well as communities downstream in India. For a long time, people in different elevation zones were linked by the salt trade. Local communities are heavily dependent on ecosystem services, natural resources, cultural relationships, and employment and trade.
- The landscape exhibits rich social and cultural diversity. There is a mosaic of ethnic diversity, with Tharu in the plains; Gurung, Magar, Chhetri and Brahmin in the middle; and Thakali, Tamang, Loba, Manangi, Sherpa among others in the upper reaches. The upper areas are sparsely populated whereas the southern plains are densely populated. Famous Buddhist and Hindu monuments have high spiritual significance for people both within and far beyond the landscape.
- Pockets of productive land occur with agricultural and horticultural crops and animal husbandry, with surviving traditional landraces of rice such as batissara,

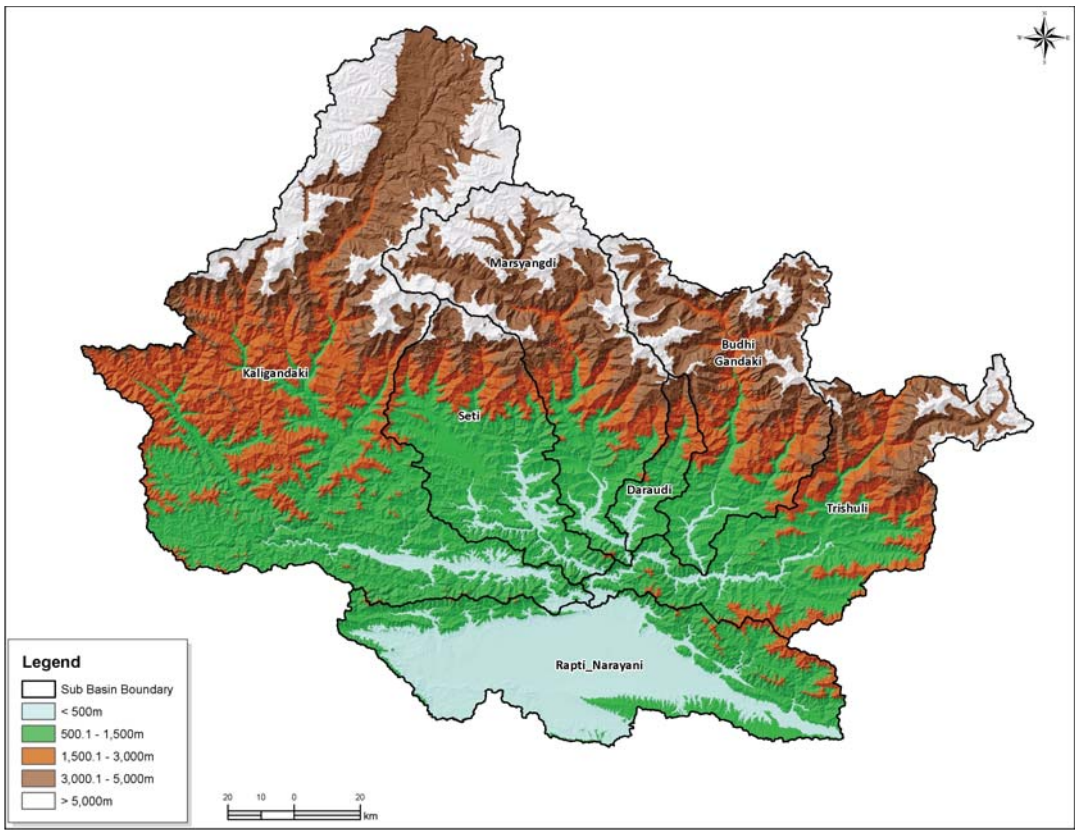

Figure 1.2: Elevation gradient of CHAL

CHAL and Terai Arc Landscape (TAL) overlap in part of Nawalparasi, Chitwan, Makwanpur and Palpa districts with an overlap area of 3,986.99 km^2 (Figure 1.3).

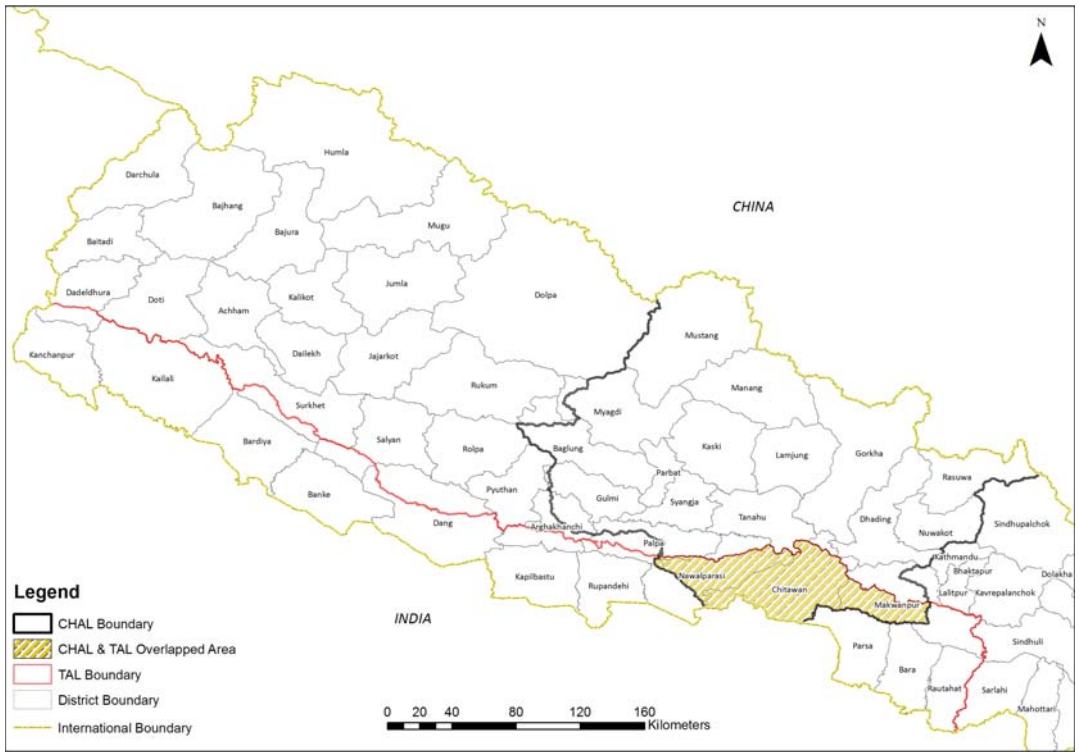

Figure 1.3: Map showing overlap areas of CHAL and TAL

1.2. Biodiversity

1.2.1. Fauna

CHAL is rich in biodiversity, with several charismatic megavertebrates such as elephant *(Elephas maximus)*, rhinoceros *(Rhinoceros unicornis)* and tiger *(Panthera tigris)* in Chitwan National Park in the lowland, and snow leopard *(Uncia uncia)*, grey wolf *(Canis lupus)*, and brown bear *(Ursus arctos)* in the alpine areas of the High Himal zone. The forests in the mid-hills support other threatened species such as clouded leopard *(Neofelis nebulosa)*, common leopard *(Panthera pardus)*, Eurasian lynx *(Lynx lynx)*, musk deer *(Moschus species)*, and red panda *(Ailurus fulgens)*. These species are flagships of Nepal's biological heritage, but also require specialized and connected habitats. Other species such as the Himalayan field mouse *(Apodemus gurkha)* are endemic to the upper temperate forests of Nepal. Overall, more than 104 mammal species have been recorded in the Gandaki basin (Bhuju et al. 2007), of which more than 18 are protected by the National Parks and Wildlife Conservation Act 1973.

Over 500 species of birds have been recorded in the landscape, including some restricted range bird species; the landscape contains several important bird areas (Baral and Inskipp 2005; Bhuju et al. 2007). Many of the bird species are altitudinal or trans-Himalayan migrants (e.g., Ruddy Shelduck, Common Merganser, Lesser Whistling Duck and Little Grebe) that use the deep river valleys of the Gandaki basin as flyways (Grimmett et al. 2000; Baral and Inskipp 2005). These migrant birds thus require habitat connectivity to facilitate seasonal movements.

Other taxonomic groups such as reptiles, amphibians and invertebrates have not been well documented, but known species include some endemic or habitat specialist species. Rivers support important fish fauna. Several fish species (Annex II) are habitat specialists with narrow hydrological or hydraulic habitat requirements, or need ecological connectivity to maintain spawning migrations. The latter include large cyprinids such as sahar *(Tor species)*, katle *(Neolissochilus hexagonolepis)* and snow trout *(Schizothoraichthys and Schizothorax species)*. Many fishes of the Gandaki river system are vulnerable (Biodiversity Profiles Project 1995a) and need protection. These include katle *(Neolissochilus hexagonolepis)*, rewa *(Chagunius chagunio)*, mahasheer *(Tor putitora)*, sahar *(Tor tor)*, zebra macha *(Danio rerio)*, buchhe asala *(Schizothorax plagiostomus)*, asala soal *(Schizothorax richardsonii)*, chuche asala *(Schizothoraichthys progastus)*, Tite macha *(Psilorhynchus pseudecheneis)*, and raja bam *(Anguilla bengalensis)* (Swar 2002).

1.2.2. Flora

More than 3,430 plant species have been recorded in the landscape (Biodiversity Profiles Project 1995b). These include almost 100 endemic species for Nepal (Rajbhandari

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and Adhikari 2009; Rajbhandari and Dhungana 2010 and 2011). However, the available information is scant, and studies to document the spatial distribution of species are necessary, especially given the impacts of climate change that could result in species range shifts and local extinctions. This information is critical for conservation management of the landscape.

The Upper Kali Gandaki valley and the Annapurna Himal complex in Kaski, Myagdi, and Mustang districts lie within the Annapurna Conservation Area, and have high endemism (Shrestha and Joshi 1996). More than 80 endemic species of flowering plants have been recorded in CHAL districts including Mustang, Kaski, Manang, Gorkha, Lamjung, Rasuwa, Myagdi, Baglung, Arghakhanchi and Chitwan (Rajbhandari and Adhikari 2009; Rajbhandari and Dhungana 2010 and 2011). These plants include species of *Carex, Codonopsis, Draba, Eria, Kobresia, Meconopsis, Oxytropis, Pedicularis, Saxifraga, Saussurea, Silene and Taraxacum.*

The CHAL also harbors several threatened and rare plant species such as *Acacia catechu, Aconitum* species, *Alnus nitida, Alstonia* species, *Arisaema utile, Beaumontia grandiflora, Butea monosperma, Ceratostigma ulicinum, Dalbergia latifolia, Dioscorea* species, *Elaeocarpus sphaericus, Gnetum montanum, Helicia nilagirica, Hydrobryum griffithii, Larix himalaica, Lilium wallichianum, Michelia* species, *Nardostachys grandiflora, Neopicrorhiza scrophulariiflora, Olea ferruginea, Oroxylum indicum, Paris polyphylla, Passiflora nepalensis, Podocarpus neriifolius, Podophyllum hexandrum, Prunus carmesina, Rauvolfia serpentina, Rheum nobile, Swertia chirayita, Talauma hodgsonii, Tylophora belostemma, Ulmus wallichiana* and *Wallichia densiflora* (Shrestha and Joshi 1996). These taxa are threatened by anthropogenic activities that now act in synergy with climate change.

1.2.3. Forests and other ecosystems

The major natural ecosystems of CHAL are forests, grasslands and rangelands, wetlands/rivers, and cryosphere. The agro-ecosystems represent an extensive anthropogenic matrix of land uses. Despite land conversion for anthropogenic use, the high mountains, mid hills and Chure regions still retain 62.6%, 48% and 60% forest cover, respectively (Table 1.1). However, these forests are becoming increasingly fragmented.

Table 1.1: Land use/land cover in different physiographic zones of CHAL (Km^2)

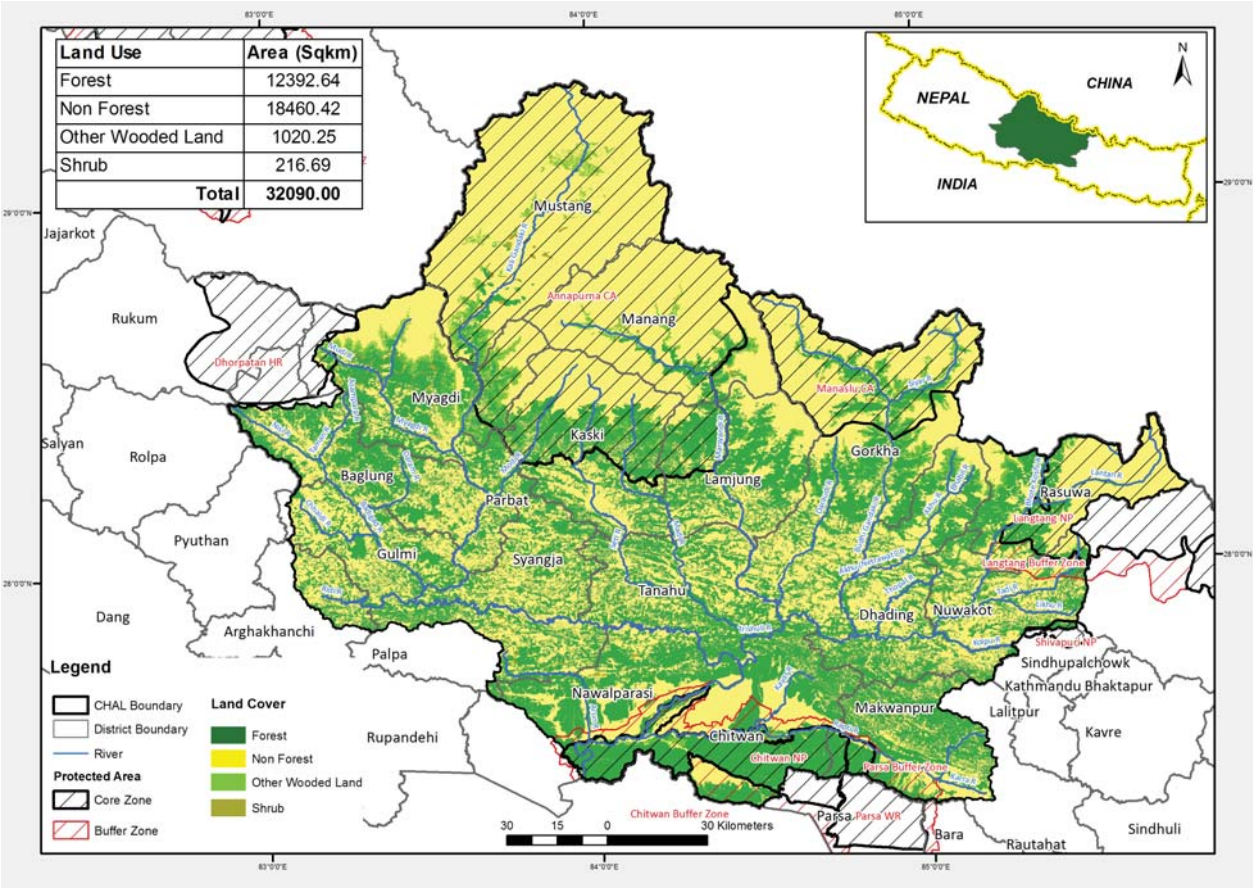
	Chure	%	Mid hill	%	High Mountain	%	High Himal	%
Forest	2192.4	60.0	5820.9	48.0	3749.5	62.6	629.8	6.1
Non-Forest	1380.5	37.8	6188.0	51.0	1805.6	30.2	9086.3	88.1
Other Wooded Land	79.1	2.2	30.5	0.3	347.1	5.8	563.6	5.5
Shrub			94.6	0.8	86.4	1.4	35.7	0.3
Total	**3652.0**		**12134.0**		**5988.6**		**10315.4**	

Source: Forest Research Assessment (FRA) 2015

Land use and land cover in landscape for the period 2015 is given in Table 1.2 and Figure 1.4.

Table 1.2: Area under different land use/land cover in 2015

Land Use	Total (Km^2)	%
Forest	12392.7	38.6
Non-Forest	18460.4	57.5
Other Wooded Land	1020.3	3.2
Shrub	216.7	0.7
Total	**32090**	**100**



Source: FRA 2015

Figure 1.4: Land use/land cover map in CHAL

Forests: The forest in the CHAL in the Churia at elevations below 1,000m is dominated by *Shorea robusta, Dalbergia sissoo, Terminalia species, Adina cordifolia, Lagerstroemia parviflora, Bombax ceiba, Albizia species, Eugenia jambolana, Anogeissus latifolia, and Acacia catechu.* The vegetation in the alluvial floodplains include grasslands and savannas, dominated by grasses such as species of *Saccharum, Narenga, Themeda and Phragmites.* The riparian trees include *Trewia nudiflora, Mallotus philippensis, Bombax ceiba, Dalbergia sissoo and Acacia catechu.* Important medicinal plants and NTFPs found in the Churia and its foothills include *Justicia adhatoda, Curcilago orchioides, Rauvolfia serpentina, Calamus acanthospathus, Terminalia bellerica, Terminalia chebula, Phyllanthus emblica, Cassia fistula, Tinospora sinensis and Piper longum.*

Subtropical broad-leaved forests between 1,000 and 2,000 m are mainly dominated by *Schima wallichii* and *Castanopsis indica,* mixed with *Cedrella toona* and *Alnus nepalensis* along the streams and moist places. Subtropical conifer forest is dominated by *Pinus roxburghii* and occurs mainly on the southern dry slopes. Important NTFPs and medicinal plants found in sub-tropical broad-leaved forests include *Acorus calamus, Berberis asiatica, Berberis aristata, Dioscorea deltoidea, Myrica esculenta, Syzygium cumini, Thysanolaena maxima, Rubia manjith and Prinsepia utilis.*

Temperate forests between 2,000 and 3,000 m are mainly comprised of lower temperate mixed broad-leaved forests dominated by *Quercus lamellosa, Castanopsis tribuloides,* and species of Lauraceae; and upper temperate broad-leaved forests of *Quercus semecarpifolia, Acer species,* and *Rhododendron* species. Temperate conifer forests are dominated by *Pinus wallichiana, Abies spectabilis* and *Tsuga dumosa,* with *Larix himalaica* forest in Langtang and Budhi Gandaki valleys. Important NTFPs and medicinal plants found in this vegetation type include *Heracleum nepalense, Mahonia napaulensis, Swertia chirayita, Arundinaria falcate, Zanthoxylum armatum, Bergenia ciliata, Daphne bholua, Girardinia diversifolia, and Valeriana jatamansi.*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Subalpine forests occur between 3,000 and 4,100 m and are mainly comprised of *Abies spectabilis, Betula utilis,* and *Rhododendron species.* Important NTFPs and medicinal plants found in this vegetation type include *Allium wallichii, Paris polyphylla, Dactylorhiza hatagirea, Rheum australe, Aconitum spicatum, and Nardostachys grandiflora.*

These forests are under different management regime: 1) protected areas, 2) government-managed forests, 3) protection forests, and 4) community-based management regime (community forests, leasehold forests and buffer zone community forests). CHAL includes 5,884 community forests with a total area of 3,787 km^2; and has three protection forests: Panchase, Madane and Barandabhar. Community forests play a critical role in biodiversity conservation and addressing climate vulnerabilities. Private forests are also important in the landscape, and fulfill household subsistence needs (Gautam et al. 2002), however, their contributions to conservation in the CHAL, especially from a landscape perspective, are yet to be assessed. Twenty-nine percent of the forests in the landscape fall under the three community-based management regimes.

Alpine Grasslands and Rangelands: The alpine ecosystems above the treeline include scrub and grasslands. Most of the alpine grasslands are rangelands, grazed by domestic livestock. The alpine scrub comprises various associations of *Juniperus* and *Rhododendron* species. *Caragana versicolor, Lonicera spinose, Rosa sericea* and *Sophora moocroftiana* are common shrubs in the north of the Dhaulagiri-Annapurna massif (Stainton 1972). The alpine grasslands, or rangelands, are characterized by a variety of grasses such as *Festuca, Poa, Carex* and *Agrostis* species mixed with herbs such as *Artemisia, Potentilla, Primula* and *Saussurea* species. Several species are endemic, and are valued for their medicinal or aromatic properties. Important NTFPs in this vegetation type include *Allium carolinianum, Allium oreoprasum, Saussurea gossypiphora, Neopicrorhiza scrophulariiflora.*

Wetlands and rivers: There are two broad categories of wetland ecosystems in the CHAL: (i) natural wetlands such as lakes and ponds, riverine floodplains, swamps and marshes, and (ii) man-made wetlands for water storage and wet agricultural lands. Natural wetlands such as Gosainkunda and associated lakes in Langtang; Beeshazari

in Chitwan; and the cluster of nine Pokhara valley lakes (Phewa, Begnas, Rupa, Kamalpokhari, Kaste, Gunde, Neureni, Dipang and Maidi) are designated Ramsar sites. Tilicho lake in Manang District is the highest altitude lake in Nepal, 4,919 m above sea level. *Trapa quadrispinosa, Typha angustifolia* and *Acorus calamus* are among the important NTFPs found in the wetlands.

The Gandaki river system (Figure 1.5) is the central aquatic feature of the CHAL. The main stem, the Kali Gandaki river, rises in the Trans-Himalayan area from the Nhubine Himal Glacier in the Mustang region of Nepal at an elevation of 6,268 meters. It flows south between the Dhaulagiri and Annapurna ranges, through the deepest gorge in the world. The Kali Gandaki, Seti, Marsyangdi, Daraundi, Madi, Budhi Gandaki, Trishuli and East Rapti-Narayani are the major rivers in the Gandaki river system (Figure 1.4). This complex system of rivers is very important for CHAL. This river basin has high drainage density, and is considered to be the most important river system of Nepal in terms of the population served.

The water resources of the Gandaki River basin are key for sustainable social and economic development in the CHAL and thus in Nepal. Sustainable development requires the utilization of ecosystem goods and services provided by healthy ecosystems. Ecosystems may be seen as essential and dynamic 'factors of production' for social and economic development (Folke 1997), and the ecosystems are essentially water dependent. The basin has huge potential for hydropower, but this needs to be developed and managed so as to minimize adverse impacts on the environment including the ecosystems in the river basin. Watershed protection and good land management alone are not enough; hydropower projects need to be strategically located, designed and operated in such a way as to ensure continued ecosystem goods and services for the people in CHAL.

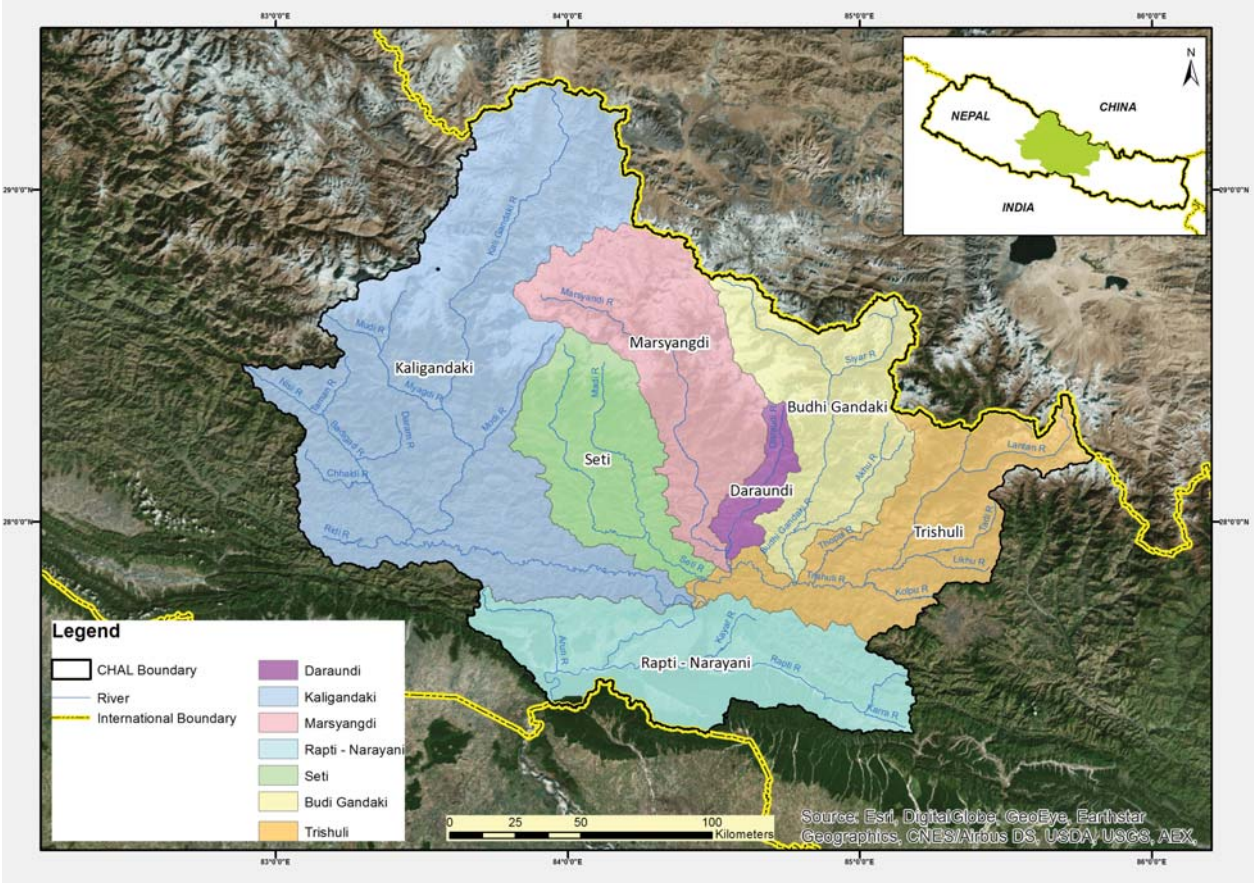

Figure 1.5: Gandaki basin and sub-basins

Table 1.3: Major sub-basins of the Gandaki River Basin

River/Sub-basin	Catchment Area (km^2)	Main characteristics
Kali Gandaki	11847.33	Originates from Nhubine Himal glacier in Mustang region in Nepal. Total length in Nepalese territory is about 300 km, passes through the deepest gorge in the world in the high mountain zone and biogeographically separates the eastern and western Himalaya. Exhibits high fluctuation in average annual flow. Major tributaries are the Myagdi, Modi, Andhi khola and Budiguard.
Seti	2951.55	Originates from glaciers in the Annapurna range and flows through Pokhara city in a gorge. Total length is 112.7 km; joins the Trishuli River at Gaighat.
Marsyangdi	4210.86	Originates from the south-eastern flank of Muktinath Himal as Jargung khola and joins the Trishuli River at Mugling. Total length is 145 km.
Budhi Gandaki	3641.64	Originates in Tibet and flows south-west and then south-east as Siringi Khola, draining the eastern slopes of Manaslu and the Ganesh Himal. Total length is 145 km. It joins the Trishuli River upstream from Mugling.
Trishuli	4125.41	Originates in Tibet and enters Nepal through the Rasuwa Pass; total length before joining the Kali Gandaki at Devghat is 130 km.
Daraundi	618.96	Originates from Narad pokhari located between Manaslu and Bouddha Himal at the southern slope of Manaslu range. After 67 km it joins the Marsyangdi river near Aabhukhaireni.
Rapti-Narayani	4694.25	This sub-basin includes the lower part of the Gandaki basin between Devghat (Kali Gandaki-Trishuli confluence) and Tribeni at the India-Nepal border, and the East Rapti sub-basin.

Cryosphere: The Kali Gandaki, Seti, Marsyangdi, Budhi Gandaki and Trishuli sub-basins are glaciated at high altitudes. International Centre for Integrated Mountain Development (ICIMOD) (2014) recorded 1,340 glaciers in the Gandaki basin with a total surface area of 1,665 km^2, and estimated ice reserves of approximately 135 km^3. In comparison, Mool et al. (2001a) recorded 1,025 glaciers in the basin with a surface area of 2,030.15 km^2 and an estimated ice reserve of 191 km^3. The difference in these two sets of figures demonstrates significant loss in ice volume and glacial surface area, which may be due to climate change. The increase in the number of glaciers may be due to previously connected glacial valleys becoming separated as glaciers retreat, and later recorded as separate glaciers. The number of glaciers is reported to have increased by 12% over the 30 year period, with the greatest increase between 2000 and 2010. The glacier area and the ice reserves, on the other hand, have been reported to decrease by 22% (461 km^2) and 27% (51 km^3) respectively, with the greatest change between 1980 and 1990 (ICIMOD 2014).

Corridors and biodiversity important areas: Kali Gandaki, Seti, Marsyangdi, Daraundi, Budhi Gandaki and Trishuli rivers are naturally occurring river corridors and serve as migratory routes for aquatic fauna and flyways for migratory birds (Sharma 2013; Figure 1.6). The forest corridor between Barandabhar in the south that extends along the lower Trishuli and Seti-Madi rivers has the highest potential to link Annapurna Conservation Area (CA) with Chitwan National Park (NP) and Valmiki Tiger Reserve to the south in India. Forest corridor stretched between Nawalparasi and Annapurna has also been identified as a potential linkage although this does not follow river valleys and crosses rugged terrain. In addition, this corridor is fragmented in several places. However, this could be important for species shift due to climate change. Forest patch in the foothill of Ganesh Himal is intact and connects Langtang NP with Manaslu CA. Similarly, forest and pasture lands stretched between Manaslu CA and Annapurna CA are also in good condition to maintain linkage between these two conservation areas. The biological richness of these areas are poorly understood and need further study.

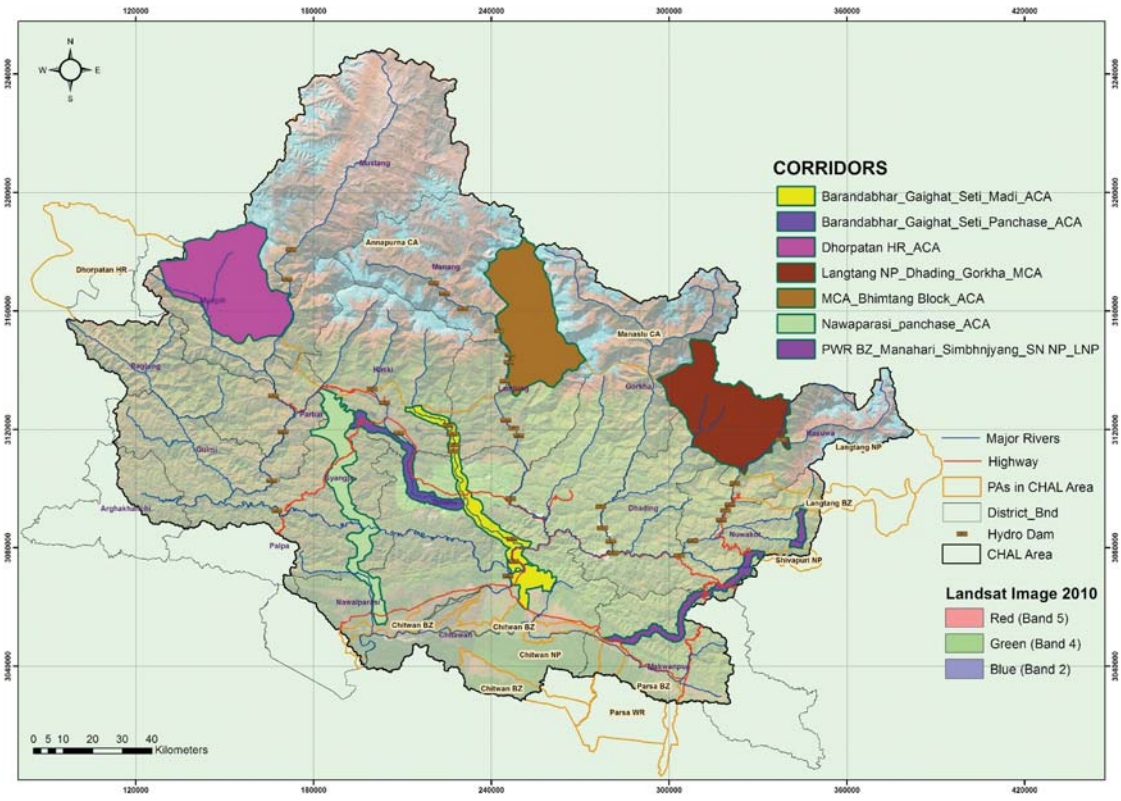

Figure 1.6: Biodiversity corridors in CHAL

The landscape also includes biodiversity important areas including protected areas and protection forests (Gautam et al. 2013). These areas provide refuge for globally significant wildlife species, endemic flora and serve as watersheds and micro-refugia (Figure 1.7).

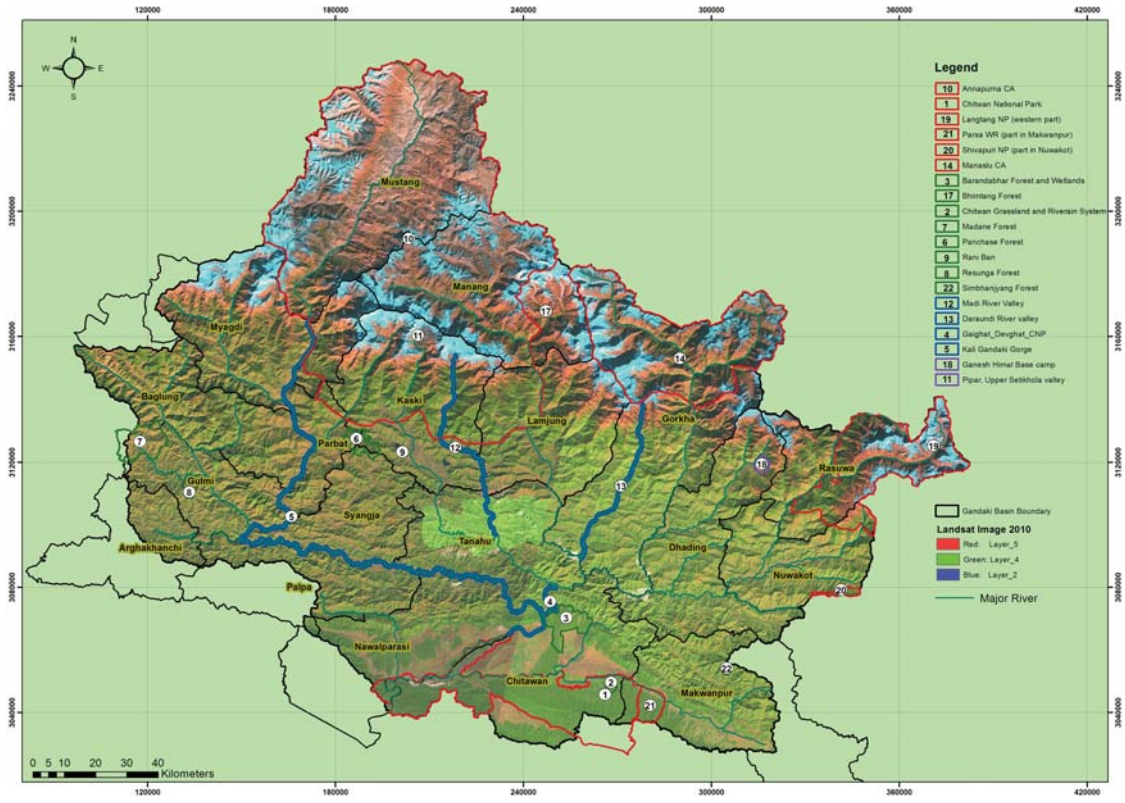

Figure 1.7: Biodiversity Important Areas in CHAL

1.2.4. Ecosystem processes

Ecosystem processes are the ecological dynamics and links that maintain the integrity of ecosystems. These range from interspecific interactions, such as predator-prey, pollination and fruit and seed dispersal relationships, to nitrogen, carbon, and water cycles. Decoupling these links can disrupt ecosystem integrity, and make the ecosystems and people of the CHAL more vulnerable to the impacts of climate change. The CHAL was first conceived as a corridor to sustain and support large-scale ecosystem processes such as species migrations and hydrological flows, especially between the protected areas in the north and south. The Narayani, Kali Gandaki, Marsyangdi, Madi, Seti and Trishuli valleys link protected areas in the north with Chitwan National Park in the south, and are important migratory routes for various animal species. Some mammals, migratory birds, aquatic vertebrates (e.g., otter, amphibians, and fish) with large vertical distribution ranges utilize these corridors during their seasonal migrations (Basnet et al. 1999). Among these corridors, the Kali Gandaki valley is the main route for trans-Himalayan bird species migrants.

Many of these ecosystem processes have important economic and social functions, and some help reduce climate vulnerability of people and nature. Hence maintaining them will be very important as development proceeds in CHAL, and as climate change advances.

1.2.5. Ecosystem goods and services

The ecosystems in the CHAL offer a range of ecosystem goods and services that benefit people and make a major contribution to national economic development. The six protected areas, three protection forests and three Ramsar sites and other areas are important for maintaining ecological processes and ecosystem goods and services in CHAL. These include provisioning services such as food and water supplies; regulating services such as flood, landslide and disease control; cultural services such as spiritual, recreational and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth (Millennium Ecosystem Assessment 2005). People living in CHAL are highly dependent on forests, rangelands, and the river/wetland ecosystem services for their subsistence and well-being.

There have been some studies to assess the various ecosystem services in CHAL; however, the assessment of regulating services (climate regulation, disease control, water regulation and purification, pollination, etc.) and supporting services (soil formation, nutrient cycling, primary production, etc.) has not been done. Such assessment will enable improved, science-based conservation and sustainable management of critical ecosystem goods and services, especially vis-a-vis development endeavors (Millennium Ecosystem Assessment 2005).

Water is essential to support and sustain life and livelihoods, and the river system provides life-giving water to the millions of people living within CHAL and far downstream. Firewood, forage, fodder, timber and poles, and non-timber forest products are other major forest resources. Major timber species of CHAL are *Castanopsis* species, *Engelhardtia spicata, Juniperus* species, *Picea* species, *Pinus* species, *Schima wallichii, Shorea robusta, Tsuga dumosa,* and *Quercus* species.

Traditional medicine remains an integral part of the health care system in these areas; medicines are concocted with plants and plant parts sourced from the forests and grasslands (Manandhar 1987; Pohle 1990; Shrestha et al. 1996; Ghimire et al. 1999; Joshi and Joshi 2000; Shakya et al. 2002; Malla et al. 2003; Chaudhary et al. 2007 and Bhattarai et al. 2010). Important medicinal plants include *Aconitum* species, *Hippophae* species, *Dactylorhiza hatagirea* (panchaunle), *Ophiocordyceps sinensis* (yartsa-gunbu), *Paris polyphylla* (satuwa), *Nardostachys grandiflora* (jatamasi), *Neopicrorhiza scrophulariiflora* (kutki), *Rheum australe* (padamchal), *Swertia chirayita* (chirayito), and *Valeriana jatamansi* (sugandhawal). Production from most of these medicinal plants is low volume, high value.

Cultural services are non-material benefits obtained from ecosystems. Sacred forests and wetlands have spiritual and religious value. River confluences are religious sites that are often used for ritual purposes (e.g., Devghat at the confluence of the Kali Gandaki and Trishuli rivers). Many parts of the landscape including hills, mountains, rivers and protected areas have recreational and aesthetic values.

1.3. Socio-economic features

The CHAL has high ethnic and cultural diversity. Brahmin Chhetri, Gurung, Magar, Tamang, Newar, Thakali, Tharu, Bhote and Dalit are the major ethnic groups in the region. The majority of people follow Hinduism and Buddhism. The region hosts renowned religious monuments and sites such as Muktinath, Gosainkunda, and centuries old monasteries in Mustang and Manang that are pilgrimage destinations for Hindus and Buddhists.

1.3.1. Demography

The total population of CHAL, according to the 2011 census (Central Bureau of Statistics (CBS) 2013) is 4,648,346[1], with a male population of 2,138,121 (46%) and the female population of 2,510,225 (54%). The sex ratio in the landscape (number of males per 100 females) is 85, much lower than the national average of 94. It has declined from 91 in 2001, reflecting an increase in male out-migration for work. However, at district level there is considerable variation in sex ratio. Both Manang and Mustang districts have sex ratios greater than 100, with the former being the highest among all districts in Nepal (128). Arghakhanchi district has the lowest sex ratio, at 74 (Figure1.8). With the exception of Manang, all other districts witnessed decline in sex ratio during the previous census decade. The total absentee population in the landscape was recorded at 555,181 in 2011.

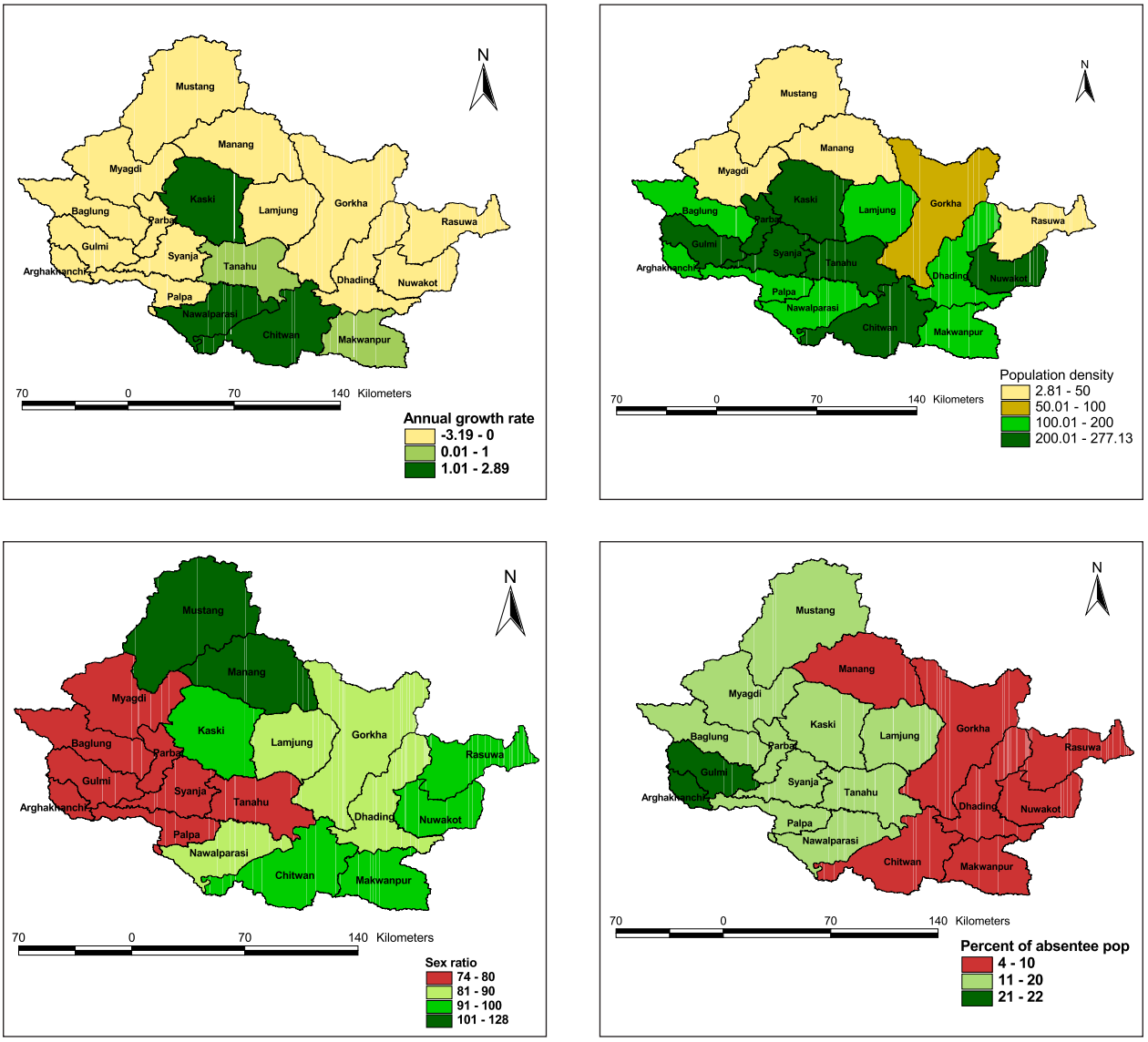

Figure 1.8: Annual population growth rate, population density, sex ratio, and percent of absentee population

1 The population of the districts falling partially within the landscape has been derived by summing the total population of all the village development committees (VDCs) within the landscape, although only part of the area of some VDCs may fall within the landscape.

The highest rate of absentee population was recorded in Arghakhanchi district (22%) followed by Gulmi with 21%. Migration of people, especially males, for foreign employment is rising across the whole landscape. In addition to migration outside the district, migration from rural areas to district headquarters and other market centers within a district is also on the rise, further accentuating the effects of demographic changes. The districts on the western side of the landscape have sex ratios less than 80 (Figure 1.8), with higher percentage absentee population.

The average annual population growth rate for the landscape is 0.38% in the decade 2001-2011. Growth rate varies among the districts, ranging between -3.19% in Manang to 2.89% in Kaski. Fourteen of the 19 districts in CHAL had negative population growth in this decade. Within a district, population decline is more accentuated in rural areas as migration occurs to urban centers. The average household size is 4.21. There is high variation in population density ranging from 2.81 in Manang to 277.13 people per km^2 in Syangja (Figure 1.8). Seven districts have population densities of more than 200 while 4 districts have densities of less than 50. The average male and female literacy rates are 68% and 51% percent respectively (Annex III).

These demographic trends, and especially the negative population growth rates and changing sex ratios, have implications for agriculture, natural resource management, and resource governance. Over the years rural areas have been facing increasing labor shortages especially in the agricultural sector. Land abandonment and increased fallow periods are evidence of this in the mid hills. Male out-migration has created additional workloads for women. However, it has also provided opportunities for women to participate in formal and informal forums, enhancing women's control of resources and access to decision making forums. This shift will require a policy response.

1.3.2 Socio-economic indices

The Human Development Index (HDI)[2] of the CHAL districts varies from 0.461 in Dhading and Rasuwa districts to 0.576 in Kaski. Six districts have a HDI less than the national


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average, 0.490. Manang district has the highest per capita income based on purchasing power parity (PPP) with USD 3,166, and Gulmi has the lowest with USD 752 in 2014, against the national average of USD 1,160 (National Planning Commission/United Nations Development Programme 2014). Only seven districts (Chitwan, Kaski, Lamjung, Manang, Mustang, Syangja, and Rasuwa) have more per capita income than the national average.

The Human Poverty Index (HPI) measures average deprivation in the three basic dimensions of human development: longevity, knowledge and standard of living, with higher numbers indicating greater degree of poverty. The HPI ranges from 16.50 in Kaski to 42. 24 in Dhading district, compared with the national average of 31.12. Of all the districts in the landscape, 14 have HPIs less than the national average, indicating the relative prosperity of the landscape. The five districts with higher HPIs are Dhading, Rasuwa, Nuwakot, Mustang, and Gorkha. In terms of trends, with the exception of Manang and Mustang, all districts experienced declines in poverty rates from 2001 to 2011 (CBS 2013) (Figure 1.9). In Manang and Mustang the proportion of poor increased by 15.7 and 14.2 percent, respectively. These districts have higher rates of poverty despite comparatively higher per capita incomes. The poverty rates range between 4 in Kaski and 40 in Mustang. Out of the 75 districts in the country, the CHAL districts rank between 4 (Kaski) and 63 (Mustang) in terms of poverty rates (Annex III).

2 The Human Development Index is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. Higher HDI values denote better development.

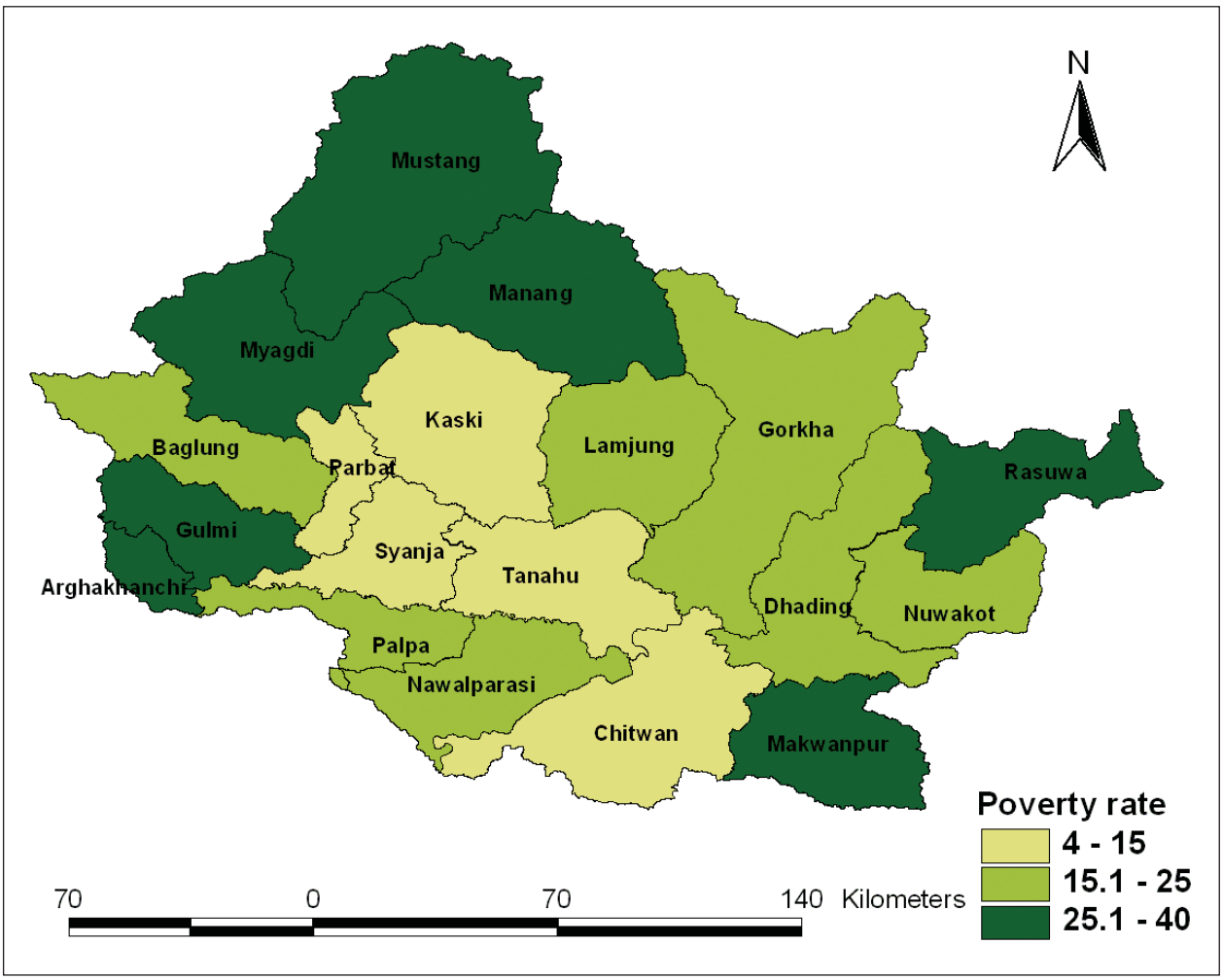


Figure 1.9: Poverty rates in CHAL districts

1.3.3. Local institutions

Communities in CHAL have a long tradition of strong local institutions for managing social affairs and natural resources. Although these institutions vary in structure and modus operandi among different ethnic groups and locations, they play important roles in maintaining socio-ecological systems. Institutions like the *Mukhiya system, Ghempa system, Bhalmansa* and mothers' groups have strong social bases for managing resources like forests, pasturelands, irrigation systems, community assets, and social affairs. Mothers' groups in CHAL not only play a major role in resource governance but they also have been instrumental in empowering women. The religious institutions such as the monasteries and individual abbots are also influential in conservation of resources. Traditional rules are followed in harvesting timber, non-timber forest products and other resources, and in managing pasturelands, often contributing to sustaining the resources. These institutions coexist with formal institutions such as community forest user groups (CFUGs) and village development committees (VDCs). To some extent traditional institutions have helped to fill the vacuum in local level management created by the prolonged absence of elected representatives in the local bodies.

1.4. Livelihoods and economic development

1.4.1. Agriculture

Agriculture and tourism are major economic activities in rural CHAL communities. Generally, agriculture is subsistence, but several pocket areas have developed commercial farming. The climatic and topographic variability allow a wide diversity of agricultural practices, crops and livestock varieties. The principal crops grown are rice, maize, wheat and millet in the mid-hills and Inner Terai, while maize, wheat, barley, buckwheat and potatoes are the main crops in the mountains. There are some areas in the mid-hills and high hill regions where shifting cultivation is a major agricultural practice, especially

on steep slopes. Cultivation of fruit and vegetables for commercial markets is becoming popular, especially in areas with good access to market centers. Improved access in remote areas has helped promote commercial fruit production: for example, apples from Mustang now fetch a premium price in the country. The diversity of climatic conditions at different elevations provides opportunities for vegetable production on commercial scales. Generally, the farming systems at lower elevations are cereal based. Livestock farming is a major economic activity in the mountains, with transhumance being practiced in the higher elevation regions of Gorkha, Manang, Mustang and Dhading districts. In southern districts like Chitwan and Nawalparasi, in addition to cereal production, commercial fish farming, poultry and dairy farming have been increasing.

According to Ministry of Agriculture Development (MoAD) (2014), most of the districts in the landscape produce more cereals than required, thus having food sufficiency or even surplus. However, Chitwan, Manang, Mustang, Makwanpur, and Rasuwa districts do not produce enough cereals to meet their needs.

Recently remittances have become a major source of household income, transforming the rural economy in Nepal. Remittances contributed 28% (NRs 543.3 billion) of total gross domestic product in 2013/2014 (Ministry of Finance 2015). A study conducted by Hariyo Ban Program in 2014 found that about 50% of households sampled in CHAL and TAL receive remittances (Hariyo Ban Program Report unpubl.). Generally, the employment rate is higher in CHAL (45%) compared to the national average of 30% (WWF Nepal 2013a).

Although the agriculture sector has immense potential for transforming the economy and enriching the social life of the whole landscape, over past decade or so the increasingly scarce agricultural labor, combined with other political, social and ecological factors, has led to increased abandonment of agricultural land, especially in the mid and high hills. Increased incidence of crop depredation by wildlife has been emerging as a new challenge. Advancing climate change and increased climate variability are also having serious effects on the agricultural sector and this is likely to get worse in the future, especially through changes in precipitation patterns and intensity; rising temperatures; and changes in water regimes.

1.4.2. Small and medium enterprises

Small and micro enterprises are an important component of the rural economy, including forestry, agriculture, livestock, and off-farm enterprises. Forest based enterprises include: allo (nettle) processing, and production of bamboo baskets, hand-made paper, Lapsi (Hug plum) candies, sea buckthorn juice and timur (Sichuan pepper). Agriculture based enterprises include production of fruit, vegetables, honey and vegetable seeds; and fruit processing (dried fruits, juice and brandy production). Common livestock based enterprises include milk, poultry and pig production; cheese making; and fish farming.

1.4.3. Tourism

CHAL holds immense potential for tourism development, and can make an important contribution to the national economy through tourism. The Annapurna Conservation Area currently managed by National Trust for Nature Conservation (NTNC) has been a pioneering initiative, setting an example for local community engagement in conservation and development and using the resources generated from tourism. The Annapurna Circuit covers the upper reaches of the landscape, and is globally recognized as an outstanding trekking route. The Great Himalaya Trail traverses the landscape east-west. Manaslu Conservation Area and Langtang National Park have outstanding trekking routes. Similarly, Chitwan National Park and the Pokhara valley with Phewa Lake are among the major attractions in the country. The natural beauty enriched by snowcapped peaks, gushing rivers, lakes and ponds, forests, scenic vistas and the rich, diverse cultural heritage with its ethnic mosaic and religious monuments have made the landscape the most popular tourism hub in the country. The travel of Ekai Kawaguchi to Mustang in 1899, and the first successful climb of an 8,000 m peak (Annapurna) by Maurice Herzog in 1950, made the region known to the outside world. The landscape's diverse natural and cultural wealth offers a wide range of tourism activities including trekking, mountaineering, white water rafting, mountain biking, game viewing and bird watching, with opportunities for tourism circuits with a wide range of activities for international, regional and domestic tourists. Homestays are becoming popular and are contributing to rural economies.

However, over the years several developments have emerged as threats to tourism in the region. Some of the major trekking routes have been severely impacted by the construction of rural roads (for example, the east and west sides of the Annapurna circuit; the tourist experience is impaired and tea houses and hotels along these stretches are losing business. The damming of rivers and extraction of water for hydropower on the major rivers of the landscape, including the Marsyangdi and Kali Gandaki, seriously disrupt the potential for white water rafting.

These issues need to be factored into future feasibility studies and environmental impact assessments, and conflicting uses for the landscape should be reconciled as much as possible.

A further impact on tourism was from the 2015 earthquake, which damaged tourism infrastructure (e.g. lodges, tea houses and trails), particularly in Langtang and Manaslu. Tourism plummeted after the earthquake, and was just starting to recover after the monsoon in 2015 when the Indian border blockades started, resulting in fuel shortages which again sent numbers down. Signs are good that tourism is starting to rebound in early 2016 at the time of writing.

1.5. Infrastructure development

The CHAL has several large infrastructure development projects - some are functioning and others are either under construction or at the planning stage. They include roads, airports, railways, hydropower projects, electricity transmission lines, and planned settlements for urban expansion (Figure 1.10). The East-West Highway, Narayan Ghat-Mugling Highway, Prithivi Highway from Mugling to Naubise, and Siddhartha Highway are the major highways. The road connecting Nepal and Tibet through Rasuwagadhi is being upgraded, with big plans for this route as trade with China is accelerated. Access is key for Nepal's development, and road expansion is occurring rapidly. This includes expansion of district and local road networks. However, a major challenge comes when roads are not adequately planned or designed, when initial environmental examinations (IEEs) or environmental impact assessments (EIAs) are inadequate, and when construction is poorly implemented, with inadequate drainage and no restoration of exposed surfaces. The proliferation of local roads in recent years, often opened with bulldozers with no design beforehand, is causing significant fragmentation of forests, loss of forest and agriculture lands through resulting landslides, and loss of ecological connectivity (Scott Wilson Nepal Pvt. Ltd 2014; Basnet et al. 1999, 2015). Increased siltation is occurring in freshwater bodies, affecting aquatic life, hydropower operations, and downstream deposition, river cutting and flooding.

Thirty-six hydropower projects of various scales are operating, under construction or planned on the rivers of the Gandaki river basin (Nepal Electricity Authority 2014), aiming to make a major contribution to the national energy supply, much needed for economic development and wellbeing of Nepal's people. At least 22 of the hydropower stations are major projects (Annex IV and V). Transmission lines of various capacities (Figure 1.10) will add to the linear infrastructure. However, many may disrupt ecological connectivity and environmental flows[3] in the river systems. At the time of writing in 2016 an environmental flows study is being undertaken by Hariyo Ban Program/WWF and Kathmandu University, which will identify the environmental flows needed to maintain critical ecosystem, economic, social and cultural functions that are dependent on stream flow of the rivers. This includes, for example, irrigation, fisheries, white-water rafting industry, sacred and religious sites, and the grasslands and wetlands of Chitwan National Park, which sustain most of Nepal's rhino and tiger population. The assessment should bring together different stakeholders to discuss tradeoffs and scenarios, and seek optimal use of Nepal's rich water resources that contributes to economic development and also maintains important ecological processes and cultural/religious values.

Twenty eight municipalities including 3 sub-metropolitan cities and business centers (Hetauda, Bharatpur and Pokhara) fall within the CHAL. Similarly out of ten planned cities along the Mid-hill Highway, three cities (Dumre-Besisahar in Tanahun district, Ganlcchi Baireni in Dhading district and Burtibang in Baglung district) fall in the CHAL area. A large number of community development works like schools and colleges, hospitals, and temples are growing in many districts of CHAL. Reconstruction, resettlement, and rehabilitation programs, particularly after the April 2015 earthquake, will increase in the next few years as 5 out of the 15 worst affected districts fall within CHAL (Gorkha, Dhading, Nuwakot, Rasuwa and Makwanpur) (National Planning Commission (NPC) 2015 and Figure 1.10). Infrastructure development is important for economic development, but these development initiatives must try to balance conservation of the natural ecosystems that are essential to sustain development through ecosystem goods and services.

3 An environmental flow is the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated. Environmental flows provide critical contributions to river health, economic development and poverty alleviation. They ensure the continued availability of the many benefits that healthy river and groundwater systems bring to society. A distinction may be made between the amount of water needed to maintain an ecosystem in close-to-pristine condition, and that which might eventually be allocated to it, following a process of environmental, social and economic assessment. The latter is the 'environmental flow', and it will be a flow that maintains the ecosystem in a less than pristine condition. (Dyson et al. 2008).

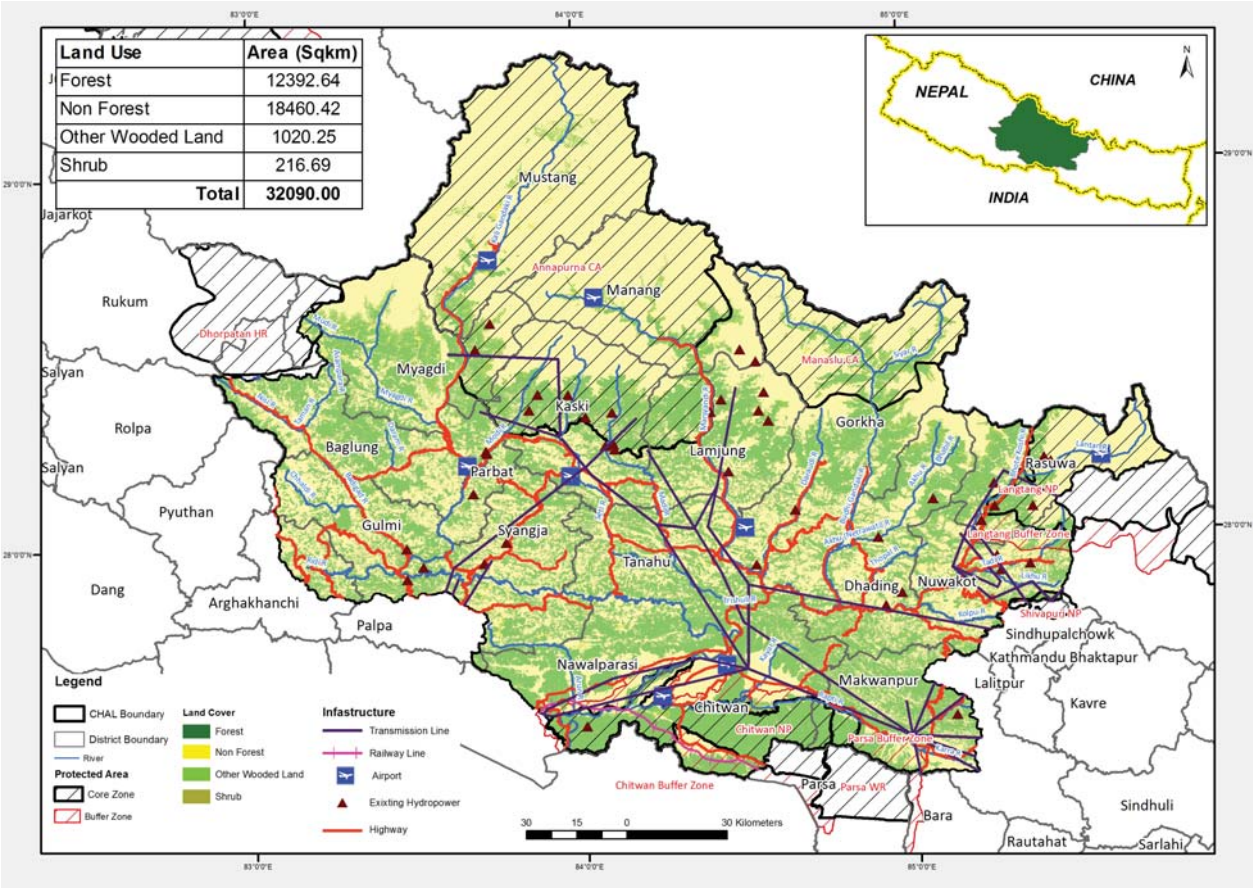


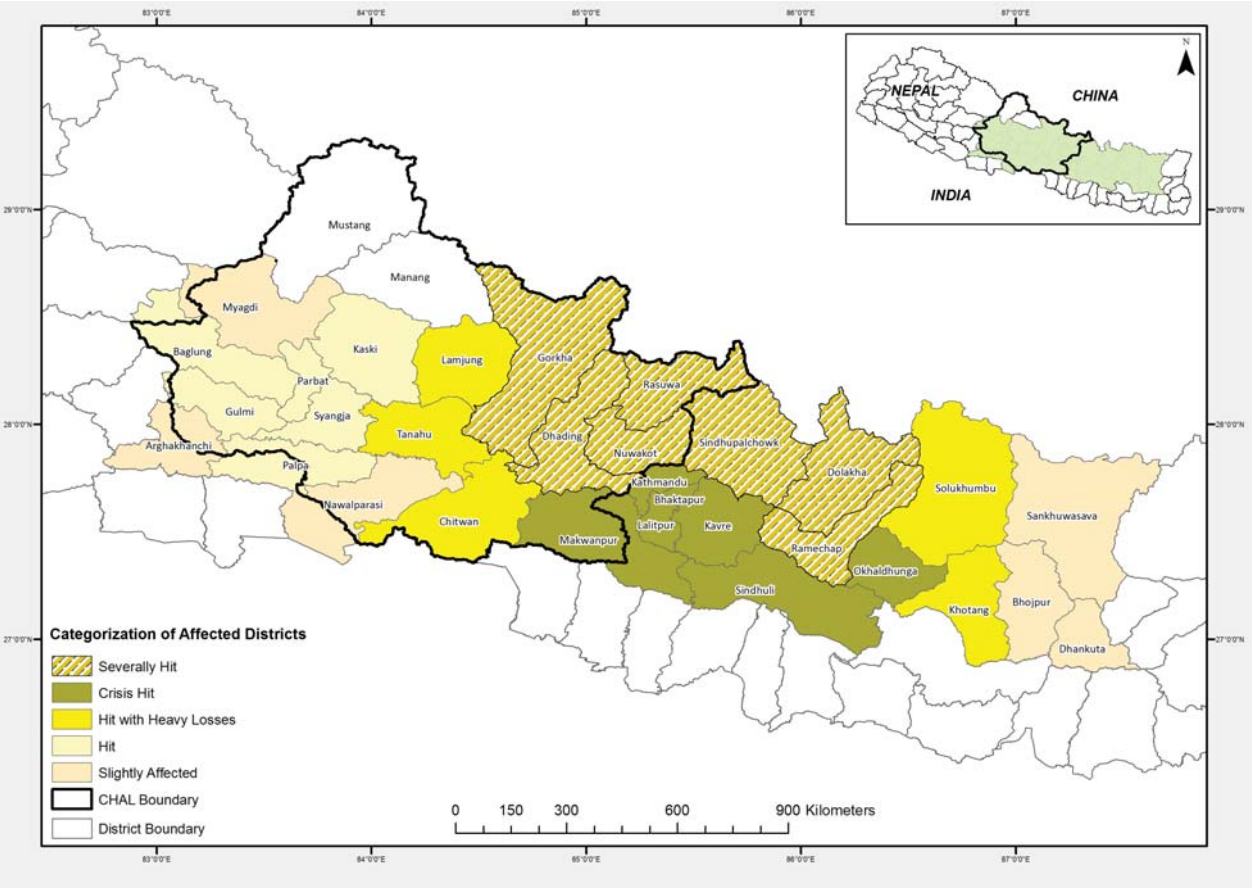
Figure 1.10: Major infrastructures in CHAL

1.6. Effects of the Gorkha earthquake

The epicenter of the Gorkha earthquake was near Barpak in Gorkha district, in the heart of the landscape. The earthquake and its aftershocks affected nearly all districts of CHAL but with particularly severe effects in the north-east in Gorkha, Rasuwa, Dhading and Nuwakot (Figure 1.11 for the degree to which individual districts in the landscape were affected).

The landscape suffered heavy human mortality, with an estimated 2966 human deaths and many more people injured. An estimated 273,422 houses were fully destroyed and 74,641 were partially damaged. Much infrastructure was damaged including roads, hydropower dams, irrigation systems, water supplies and foot trails (NPC 2015), with severe impacts on economic activities. A large number of landslides occurred as a result of the earthquake, particularly in Rasuwa and Gorkha. The Food and Agriculture Organization (in NPC 2015) estimated that 2.2 percent of forests were lost due to landslides in affected districts. A major avalanche in Langtang valley destroyed Langtang village with large loss of life, and wiped out surrounding forests including an area of rare Langtang larch *(Larix himalaica)*. While impacts on wildlife are unknown, a snow leopard and over 50 Himalayan tahr are known to have died (Ministry of Science, Technology and Environment (MoSTE) 2015). Large amounts of sediment entered the rivers and streams of the landscape in the 2015 monsoon from landslides and other earthquake damage, which affected hydropower equipment and irrigation canals. The Kali Gandaki river was temporarily blocked by a landslide in May 2015. It is likely that increased sedimentation downstream in districts like Chitwan and Nawalparasi will have accelerated the rate of sediment deposition, and increased the risk of future flooding and river cutting. After the earthquake dependence on natural systems for resources such as firewood increased when homes were destroyed; firewood demand increased again with the shortage of gasoline later in 2015.

Capacity for forest and biodiversity management was impacted in the severely affected districts. Many community forests were severely affected, with loss of human life, buildings, equipment and records. Many government offices and operations were affected,



Source: GoN/MoHA 2015

Figure 1.11: Categories of earthquake affected districts, 2015

including those of district forest offices, district soil conservation and watershed management offices, and protected areas (NPA 2015).

The north-eastern part of the landscape faces a huge amount of reconstruction in the years to come, and as planned by the new National Reconstruction Authority this is likely to continue for at least five years, half of the period of this CHAL Strategy and Action Plan. There is high potential for many adverse environmental impacts from reconstruction, such as inappropriate extraction of timber, stone, sand and gravel for buildings and infrastructure; resettlement in forests and important biodiversity areas; inappropriate disposal of earthquake waste; damage from hastily reconstructed infrastructure; and damage from reconstruction of water supplies and sanitation facilities. These risks are outlined in the Rapid Environmental Assessment (REA) of the earthquake (MoSTE 2015). At the same time there is a huge opportunity to ensure that building back is not only 'better and safer' but also greener, ensuring healthy ecosystems for disaster risk reduction (DRR) and natural resources for resilient livelihoods and economic development. This requires inputs across different sectors to raise awareness and build capacity to adopt environmentally responsible practices, contributing to a more resilient Nepal. The REA contains an Action Plan for this response. It is very important that sound earthquake recovery is promoted during the implementation of the CHAL strategy, to minimize adverse impacts in the landscape and to help build a resilient economy.

1.7. Policy and enabling environment

The CHAL is explicitly included as a landscape in the National Biodiversity Strategy and Action Plan 2014-2020 (Ministry of Forests and Soil Conservation 2014) and National Assessment and Prioritization of Conservation Landscapes (Ministry of Forests and Soil Conservation 2015b). Several Policies and Acts formulated in different sectors such as forest resources, biodiversity, protected areas, water resources, wetlands, agriculture, and general development create an enabling environment for the development and implementation of landscape programs (Annex VI).

Annexes VI and VII list the Nepal Biodiversity Strategy (Ministry of Forests and Soil Conservation 2002), the Forestry Sector Strategy (Ministry of Forests and Soil Conservation 2016), and other major Policies and Acts that have a direct bearing on conservation and development of landscapes. The Regulations and Directives/Guidelines related to the forestry sector with implications for CHAL Nepal are listed in Annexes VIII-IX.

(i) Major international conventions, treaties and organizations

In addition to formulation of a national policy framework, the GoN is committed to various international conventions, treaties, and agreements for conservation and sustainable development of natural resources (Annex X). As a signatory to these conventions, Nepal is bound to uphold the provisions by enacting national legislation to bring them into effect.

(ii) Bilateral agreements within the region

Two bilateral agreements have been signed in the field of biodiversity conservation between Nepal and China, and between Nepal and India (Department of National Parks and Wildlife Conservation 2010). These two agreements provide a basis for regional as well as transboundary landscape cooperation to protect the environment and conserve biodiversity.

(iii) Gender inclusive conservation and development

There has been an enabling policy framework to promote gender and social inclusive conservation and development practices in national development plans, policies, and strategies since 2002. For example, the Nepal Forest Sector Gender Strategy Framework 2008 recognizes the need to consider gender issues and perspectives while designing and implementing any program related to forestry (Ministry of Forests and Soil Conservation 2008). The Community Forestry and Community-based Conservation Strategies stress the need to include women and socio-economically marginalized groups in forest management, conservation programs and local development processes, and ensure they benefit from them. Nepal's National Biodiversity Strategy and Action Plan 2014-2020 and Forest Policy 2015 identify issues and challenges in addressing gender and social inclusion.

(iv) Inconsistency in the statutory regime, contemporary plans and policies

Despite of all these legal frameworks, there are inconsistencies in the statutory regime, contemporary policies, and plans such as conflicts between existing laws; policy and legislation gaps; poor integration and harmonization of policies and laws; lack of legislation to support a functioning multi-stakeholder approach; gaps in implementation of policies and legislation; and gaps in the implementation of international commitments (Belbase and Thapa 2007). Therefore, some amendments in some existing laws and policies are required.

(v) Constitution of Nepal 2015

The current situation in the country is favorable to implement the CHAL strategy in terms of constitutional and legal perspectives. The Constitution of Nepal 2015 emphasizes equality and equity among the new provinces. It focuses on social security and social justice, prosperity, economic equality, sustainable development and self-governance by internalizing the right to dignified life and environmental justice. It also stresses eliminating regional disparity and poverty, while ensuring a balance between a clean environment and development. A number of freedoms and enforceable socio-economic rights with participatory and inclusive aspects of democracy are clearly stipulated in the Constitution.

Environment friendly governance with sustainable social and economic development are incorporated in the vision of the Constitution. The Constitution gives priority to sustainable use of biodiversity through the conservation and management of forests, fauna and flora, and through minimizing the negative impacts of industrialization and physical development by promoting public awareness on environmental protection and keeping adequate land as forest area in order to strike an environmental balance. An important mandate of the Constitution is maximizing use of the country's natural resources while ensuring inter-generational justice without undermining sustainability. The role of the private sector in economic development is stressed for achieving economic prosperity through sustainable use of available resources. The Constitution stresses prioritizing national investments in water resources based on people's participation and making multiple use of water resources as well as developing and producing renewable energy, ensuring a cheap, easily available and dependable supply of energy to meet the basic needs of the citizens. The state is also directed to formulate and pursue a policy of designing early warning systems, disaster preparedness, rescue, relief work and rehabilitation in order to minimize the risk of natural disasters, including management of river systems.

There are provisions for making special arrangements to ensure the rights of Adivasi Janajatis (indigenous ethnic

groups) to lead to a dignified life, and to maintain the identities and traditional knowledge, skill, experience, culture, and social practices of indigenous and local communities.

Priority has been given to promote and develop environment friendly tourism in support of the national economy by identifying, protecting, promoting, and publicizing the historical, cultural, religious, archaeological and natural heritage sites of the country, and prioritizing local people in the distribution of benefits accruing from tourism.

The Constitution also envisions regional and provincial balance in terms of development. It not only guarantees freedom and rights of the people, but also imposes a duty on citizens to protect and preserve public property.

As per the Constitution the following legislative matters fall under federal responsibility: international treaties and agreements; international boundary rivers; intellectual property (patents, designs, copyrights); preservation of water resources; large hydro-electricity and irrigation projects; national transportation plan; highways; aerospace; mining; environmental management; national forests within provinces; water use; transportation; industry; trade; land use policy; tourism policy; ancient monuments and places of archaeological importance; national parks and reserves; wetlands; forest policy; and carbon services.

Provincial governments will enact laws on the following matters where applicable to them: provincial roads; trade; land management records; mining; research and management; agriculture and livestock development; national forests within provinces; water use; environmental management; transportation; industry and trade.

Local governments are authorized to make laws on the following matters within their jurisdictions: watersheds; wildlife; environmental conservation; biodiversity; mining protection; small hydro projects; alternative energy; disaster management; and environmental issues.

In the federal set up, implementation of the CHAL Strategy and Action Plan requires some central legislation and some provincial laws compatible with the constitutional vision of sustainable development and equitable distribution of the burdens and benefits of natural resources. Under the federal system the respective legislative jurisdictions of local, province and central government need to be identified and developed for the implementation of CHAL strategy and action plan. The Federal Parliament will formulate necessary laws to maintain coordination between the federal, provincial and local levels. Such laws and policies need to adopt gender sensitive and inclusive approaches in implementing the CHAL Strategy. In addition, all laws and policies need to be audited from a constitutional perspective. There must also be inter- and intra-provincial mechanisms to deal with the major issues surrounding the CHAL Strategy (see Articles 231 and 235 of the Constitution of Nepal 2015).

1.8. Administrative and political status of CHAL

The CHAL falls within the Central and Western development regions. The district development committees (DDCs) are responsible for administration of plans and activities at district level with regional directorates at regional levels. The lowest administrative unit is the village development committee (VDC). Although local elections have not been held for several years, representatives of DDCs, VDCs and municipalities should be elected through democratic procedure. All these administrative and political bodies will contribute to implementation of the CHAL Strategy and Action Plan at their respective levels.

Through the recently passed Constitution, the new provincial systems will play key role in the process of the CHAL Strategy implementation. The CHAL is represented by three provinces. These political units need to be coordinated with central government for implementation of the CHAL Strategy, particularly in the areas of river basin/watershed management, management of water and other natural resources, cross-provincial infrastructure development, and benefit sharing. An inter-ministerial coordinating committee is required in order to implement CHAL strategy effectively so that competition between provinces for resources will be minimized by sharing responsibilities.

Chapter

II

Socio-ecological Threats and Opportunities in the CHAL

Forests and other natural resources in CHAL are under immense anthropogenic pressure. The ecological integrity of river systems is also rapidly declining because of serial dams along major rivers that prevent desired environmental flows and cause virtually irreversible ecological change. Effluents from sources ranging from agriculture and industries to municipalities and households pollute and poison water. Natural resources —including timber, plants and firewood — are being harvested at unsustainable rates. Extraction of minerals including local construction materials such as gravel, sand, stone, is having severe environmental impacts in many cases. All these threats and drivers are degrading the CHAL's ecosystems, compromising their ability to deliver life-giving ecosystem services.

The degradation process also increases the vulnerability of both natural and human communities to disasters. Denuded and degraded slopes are vulnerable to erosion and landslides, resulting in loss of nutrient-rich topsoil and silting of rivers. Because the CHAL has very rugged topography and is in a geologically active region, the impacts of severe natural disasters such as earthquakes and landslides become exacerbated when the slope-stabilizing effect of forest cover is removed and the land is poorly managed after that.

Infrastructure development without incorporating good engineering standards and environmental mitigating measures in roads, airports, railways, communications, electricity transmission line structures, hydropower projects, urban settlements and related structures also contributes to environmental degradation. While such infrastructure is integral to economic development, if it is not done in an environmentally sensitive way the development efforts will be self-defeating: e.g. the life of hydropower installations could be significantly truncated if the reservoirs become silted or the equipment becomes damaged because of poor watershed management; roads could collapse if the slopes on which they are built are not stabilized with sound engineering practices. Thus, it is essential that development initiatives should be based on sound engineering practice and good strategic environmental assessments to ensure sustained provision of ecosystem services to minimize and mitigate ecological damage and to minimize adverse socio-cultural impacts. Failure to do so will only compromise the long-term sustainability of national development goals, at great socioecological and economic cost.

Now, climate change has emerged as another overarching threat that can act in synergy with local threats, impinging on the socio-economic well-being of human communities and supporting infrastructure, and the integrity of ecological communities and the biodiversity therein. Climate change will also have an impact on the attainment of national development goals and on governance. Effects of climate change are already manifested as extreme and unpredictable weather events causing more frequent, severe disasters ranging from floods to landslides and forest fires. Changes in precipitation patterns are affecting agriculture and livestock husbandry in the landscape, and resulting in hydrological changes in rivers, altering flows and ecosystem services. Water supplies are changing, and in many places they are drying up. Ecosystems and human communities on the steep Himalayan slopes of the CHAL will be increasingly exposed to climate hazards as climate change advances and interacts synergistically with other changes, increasing vulnerability of people and nature. As the earthquake of April 2015 clearly reminded us, the landscape is prone to a variety of natural disasters. Adaptation and resilience building is necessary to deal with such eventualities.

Mitigating these threats can take advantage of various opportunities, such as promoting REDD+ in order to contribute to mitigating global climate change while bringing payments to Nepal for its actions. Restoration of natural ecosystems and ecosystem process and services can play a big role in reducing disaster risk in the future. The extensive network of government and community-based organizations entrusted with natural resource management; world renowned protected areas with charismatic biodiversity and spectacular mountain

vistas that attracts tourism and revenue; and traditional knowledge of sustainable resource use are a strong base to build on. Thus, conservation of the environmental integrity and the rich repository of biodiversity in the CHAL is important not just from a global responsibility for stewardship of this unique Himalayan ecosystem, but also for the ecosystem goods and services on which the people in the CHAL depend to support their livelihoods, and Nepal depends on to develop the national economy and assure political stability for good governance.

The current and emerging threats to the socio-ecological integrity of the CHAL were assessed in the above context by analyzing information from field surveys, literature reviews, and information gleaned from consultations with stakeholders and experts with knowledge of the socio-ecological and development scenarios of the CHAL to inform strategies to mitigate threats. A climate change impact assessment prepared for the landscape (Hariyo Ban Program Report unpubl.) was reviewed and the recommendations were integrated into this plan.

2.1. Opportunities

The CHAL is undergoing rapid economic growth and development. The hydropower projects on the major rivers, access roads to the Trans-Himalaya, and tourism in the landscape's globally renowned protected areas at both ends of the landscape will contribute to the country's economy, create jobs, and improve livelihoods. But development has to be balanced with maintaining the ecological integrity of the landscape because the goods and services from natural ecosystems are vital to sustain development aspirations and goals. The devastating earthquake of April 2015 is a reality check on the need for careful development planning, with the opportunity to build back better and safer with enhanced disaster risk reduction measures and community resilience. Therefore conservation and sustainable development initiatives should grasp the many opportunities to conserve natural ecosystems and increase socio-economic prosperity for CHAL communities. Some of these opportunities are as follows:

River basin management

- The Government of Nepal has adopted Integrated Water Resources Management at river basin and sub-basin levels as the policy in its national Water Resources Strategy (Water and Energy Commission Secretariat 2002) and has accordingly formulated a National Water Plan (Water and Energy Commission Secretariat 2005). It envisaged reformulation, designation and empowerment of the Water & Energy Commission (WEC) to coordinate national level planning for the entire water sector. It has recognized the Ministry of Forests and Soil Conservation as an important stakeholder in water resources at national level planning, and Department of Forests, Department of Soil Conservation and Watershed Management, and Department of National Parks and Wildlife Conservation at the water plan implementation and operational levels. The National Water Plan 2005 envisions establishing river basin management institutions at basin level with subordinate institutions at sub-basin levels, for each of the major river basins in Nepal. The WEC would have the river basins operating at basin level, working under its administrative command, and would provide techno-economic clearance, which would be mandatory for every water resources development project in a sub-basin/basin. The basin level organization would be responsible for allocating water to developing projects.

- The Water and Energy Commission Secretariat (WECS) is currently in the process of commissioning a study to formulate river basin plans for all the nine major river basins in Nepal, and will subsequently prepare a hydropower development master plan for Nepal based on these river basin plans. In the meantime, the Department of Irrigation has already commissioned a study to prepare an irrigation master plan for Nepal that will complement the river basin plans prepared under the WECS. Hence, there is an opportunity for MoFSC to introduce the ecosystem approach to river basin planning and water allocation when an integrated Gandaki River Basin plan is prepared, harmonizing with other plans including this one. This will ensure that the aquatic ecosystems, ecosystem services, and environmental flows are maintained while hydropower, irrigation and other infrastructure development sectors are developed to achieve the economic development goals of the country.

Industrial development and trade

- The rivers in the CHAL have huge potential for hydropower generation. Hydropower development is an opportunity to reduce unsustainable pressure on forests for domestic firewood supply by providing an alternative energy supply. But this potential must be developed carefully and sustainably, with sound management on a river basin level including coordination of water use for multiple purposes, and maintaining ecosystem functions in the basin.

- There is potential for exploring and extracting metallic (e.g., copper, gold, iron, silver) and non-metallic (e.g., magnesite) mineral resources in CHAL.
- There is good potential to promote sound practices in industrial development – e.g. along the Trishuli corridor, which is likely to become much more industrialized during the period of this plan.
- As the Trishuli corridor develops with improved linkages to China, there is a risk that illegal wildlife and timber trade will increase. There is an opportunity to take early action and promote control mechanisms using traditional means and innovative technology.

Tourism

- The CHAL is renowned for its diversity of internationally renowned tourism attractions. Thousands of tourists visit the protected areas with their abundance of wildlife, trek through the mountains with spectacular vistas, enjoy adventure tourism including globally renowned white water rafting, and experience the diverse cultural heritage.

Churia management

- The Rastrapati Chure-Terai Madhesh Program was initiated with support from the highest levels of government, which recognized the crucial ecological role of the Churia range in sustaining critical ecosystem services and maintaining environmental flows. The northern flanks of the Churia and inner valleys also serve as climate refugia.
- CHAL overlaps with TAL in Nawalparasi, Chitwan, Makwanpur in the south and with Palpa and Arghakhanchi in the south-west. TAL extends between Bagmati river in the east and Mahakali in the west; and conserves globally significant wildlife species such as tiger, greater one-horned rhinoceros, Asian elephant, gharial and dolphin. With the 7.5 million people TAL is a major contributor for Nepal's food production.

Ecosystem goods and services

- The ecosystem goods and services from the CHAL support local economies and livelihoods, and also contribute significantly to the national economy. Most people in the CHAL rely heavily on forests for food, fodder, water, non-timber forest products and timber; thus conservation of forests is a critical component of livelihood improvement and poverty reduction. Water conservation, nutrient cycling, crop pollination, and other ecosystem services contribute significantly to livelihoods and economic development. The CHAL forests can also play important roles in national carbon sequestration initiatives.
- Indigenous people have been living in the CHAL for generations and their cultural and traditional values have evolved in response to their dependency and use of natural resources sourced from natural ecosystems; i.e., forests, grasslands, rivers, and wetlands. These sustainable practices can be adapted to meet landscape-scale conservation objectives.
- There are several successful instances of local level conservation initiatives and livelihood improvement activities within the landscape whose learning could contribute in promoting climate smart conservation and development initiatives.
- There is potential to promote environmentally friendly green enterprises based on forestry, agriculture, livestock, and off-farm micro-enterprises. Since CHAL is still not heavily industrialized there is an opportunity to promote sound practices in industrial development.

Payments for ecosystem services

- There is potential to derive benefits from reduced emissions from deforestation and forest degradation (REDD+). An Emission Reductions Project Idea Note was accepted in 2015 by the World Bank-managed Forest Carbon Partnership Facility's Carbon Fund for the first subnational REDD+ project (in the Terai) through community and collaborative forest management with appropriate safeguards. A similar subnational project should be prepared for CHAL, for which a carbon inventory has already been done. Nepal is currently in the process of developing a REDD+ benefit sharing mechanism that would bring economic benefits to local forest management groups.
- Nepal's Climate Change Policy (2011) aims to establish a national Climate Change Fund with diverse international, public, and private funding; REDD+; and payments for ecosystem services (GoN 2011). The CHAL forests will play a significant role in these initiatives.
- There are many non-carbon related opportunities for payments for ecosystem services in the landscape including payments for good water quality and for reliable water supplies. Pilots are already taking place, e.g. in the Phewa catchment in Kaski.

Biodiversity conservation

- The CHAL links globally renowned protected areas that were established to conserve Nepal's diverse, representative biodiversity and the sources of hydrological services.

Socio-economic trends

- Unlike the lowlands, most of the higher mountain regions are sparsely populated; thus the anthropogenic impacts are relatively low. People are also emigrating out of the mountains, abandoning lands. These lands can be restored and included in landscape-scale restoration plans to stabilize slopes and increase connectivity.
- Access to health, education, and transport has been increasing across the CHAL, enabling easier provision of basic services to local communities to improve socio-economic and cultural conditions, especially among impoverished and underserved communities.
- Women and other marginalized groups have been active in livelihoods, governance and conservation initiatives, especially with the feminization of society due to out-migration of men. Thus, the roles of women can be increased at all levels.

Existing institutions and social connections

- There are many established institutions—from community-based to central government—in the CHAL that can facilitate project and program implementation. This social capital includes mothers' groups, water user groups, traditional institutions, Leasehold Forest User Groups (LFUGs), Buffer Zone Management Committees, Conservation Area Management Committees (CAMCs), CFUGs, Buffer Zone Community Forests User Groups, and cooperatives at the community level. District Forest Offices (DFOs), District Soil Conservation Offices (DSCOs), District Livestock Service Offices, and District Agriculture Development Offices (DADOs) are government service providers and regulators.
- The upstream downstream linkages built traditionally on the salt trade between Tibet and Nepal thrived for centuries. People developed social relations that enhanced access to resources at different elevations, helping them eke out their livelihoods. Although these types of social relations have diminished with the decline of the salt trade, the rich culture of upstream-downstream linkages can be promoted for sustainable resource governance across the ecological belts.

Understanding and awareness of climate change impacts, vulnerability and adaptation actions

- A climate change vulnerability assessment and adaptation plan for the entire landscape has been prepared (WWF in press (b)). At the sub-landscape scale, Local Adaptation Plans of Action (LAPA) and Community Adaptation Plans of Action (CAPA) have also been prepared and implemented. These plans provide information that can be integrated and used to prepare landscape scale plans. Implementation of the local-level plans has already raised some level of awareness and consciousness of climate change among the local communities.

- Conservation education and awareness programs have been implemented. Therefore, many communities are now aware of the need for conservation and climate adaptation.
- The Ecosystem Based Adaptation program was piloted in Panchase Protection Forest. Learning from this program can be used in preparing landscape level plans.

2.2. Threats

The major threats to biodiversity (species, ecosystems, ecosystem goods and services, wetlands, agrobiodiversity), human-use areas and infrastructure, and the potential to achieve socio-economic prosperity were identified and prioritized. The threats were identified by a range of stakeholders, from government and civil-society organization representatives, to non-governmental agencies and experts, and augmented with information from the published and unpublished literature. These threats were then ranked and prioritized using Miradi software.

2.1.1. Threats to ecosystem services and ecological processes

Five major ecosystem services and ecological processes that are important to support and sustain life in the CHAL were identified for the threat assessment. Two services are related to water and one to carbon sequestration. Two others relate to overall watershed integrity, contributing to both water and carbon sequestration.

Environmental flows: Water is a central ecosystem service of the CHAL. Thus, water conservation and maintaining environment flows to support and sustain life is one of the most important conservation and management targets of the CHAL. The current practice of allocating 10 percent of the average minimum monthly flow as the environmental flow is flawed, because minimum flow is not the environmentment flow.

Water recharge and discharge: Maintaining watershed integrity is important to ensure that adequate water is available, and is released in a regulated way to sustain supplies through the year.

Water purification and water quality: In addition to adequate water availability, the quality of water is also important. The river systems in the CHAL are becoming increasingly polluted; thus, managing the CHAL to provide clean water was considered a priority.

Carbon sequestration: Forest conservation for carbon sequestration is considered an important ecosystem service in the CHAL. The Government of Nepal is developing a REDD+ mechanism that will bring economic benefits to local forest management groups. The CHAL forests can play a significant role in this REDD+ mechanism, but it will require strategic conservation, restoration, and management of forests to stop current forest loss and degradation.

Soil stabilization, sediment and nutrient retention: Stable slopes retain nutrient-rich top soils and prevent erosion that results in sediment deposition into the river system. Thus, slope stabilization and good soil management practices are important in the CHAL.

Ten direct threats and five indirect threats to the ecosystem services and ecological processes were ranked and prioritized (Figure 2.1). The overall threat ranking for these ecosystem services and ecological processes was *very high* (Table 2.1). Environmental flows (e-flows) and soil stabilization were ranked as being very highly threatened, while water purification and carbon sequestration were rated as being under high threat (Table 2.1).

Climate change related impacts were ranked as a very high threat. Climate change is expected to change precipitation patterns, with both greater droughts and higher rainfall, resulting in more frequent and intense fires and floods, respectively. Environmental flows will become unpredictable and unreliable. Soil and gravel mining and badly planned and designed infrastructure can act in synergy with climate change to exacerbate and increase soil erosion and land degradation; degrade water recharge and discharge capacities; and water purification; and decrease soil stabilization in watersheds.

Unsustainable use of forest resources and land cover conversion were ranked as high threats, causing steep slopes to become degraded and denuded, making them unstable and prone to landslides and erosion, with loss of nutrient-rich topsoil. Eroding soils will become deposited in the rivers and streams, compromising the water quality of these aquatic systems. If forest conversion and degradation continues unabated, the threat could escalate since run-off will be less regulated. Climate change can exacerbate the threats if extended droughts and forest fires contribute to land cover loss and high rainfall events increase erosion.

Hydropower development was ranked as a high threat. A few large hydropower projects have been built and several more are being planned on every tributary river in the Gandaki basin (Annex IV and V). These projects, when built, would change the hydrology of the rivers and may not only impact the ecosystems but also disrupt the ecological connectivity among the aquatic ecosystems that exist in the Gandaki river system. Reversing the impacts of these large hydropower projects will be virtually impossible; thus, new hydraulic infrastructure development projects should be developed in the Gandaki River basin by following the Integrated Water Resources Management principles at river basin and sub-basin levels, as have already adopted and emphasized by the Government of Nepal in its Water Resources Strategy (2002) and National Water Plan (2005). Plans to develop water resource use and extraction should ensure that necessary water is released downstream to maintain necessary environmental flows to sustain ecosystem functions and services in the CHAL.

The five primary sources of threats to carbon sequestration—unsustainable use of forest resources, forest fires, over grazing, land cover conversion, and climate induced disasters—were ranked high. All these are widespread and intensive in scope, but unsustainable use of forest resources, forest fires, and over grazing can be controlled, and the threats mitigated and reversed with forest restoration and conservation. However, land cover conversion, especially into built-up areas will be irreversible. Forests designated for conservation under REDD+ will have to be carefully managed to prevent degradation or conversion in order to meet the contractual obligations under the covenants.

Unsustainable use of aquatic resources was ranked as a very high threat to water purification properties and as a high threat to environmental flows. Excessive use or extraction of water from the rivers for irrigation and hydropower can alter hydrological flows, compromising the availability of desired environmental flows required to support ecosystems and biodiversity, and reducing the capacity to dilute pollutants and poisons in the river systems from agricultural, industrial, municipality, and household effluents.

Overgrazing was considered a medium level threat overall, but was a high threat to carbon sequestration. In the latter case, overgrazing can prevent forest regeneration and restoration. Even though the threat is widespread

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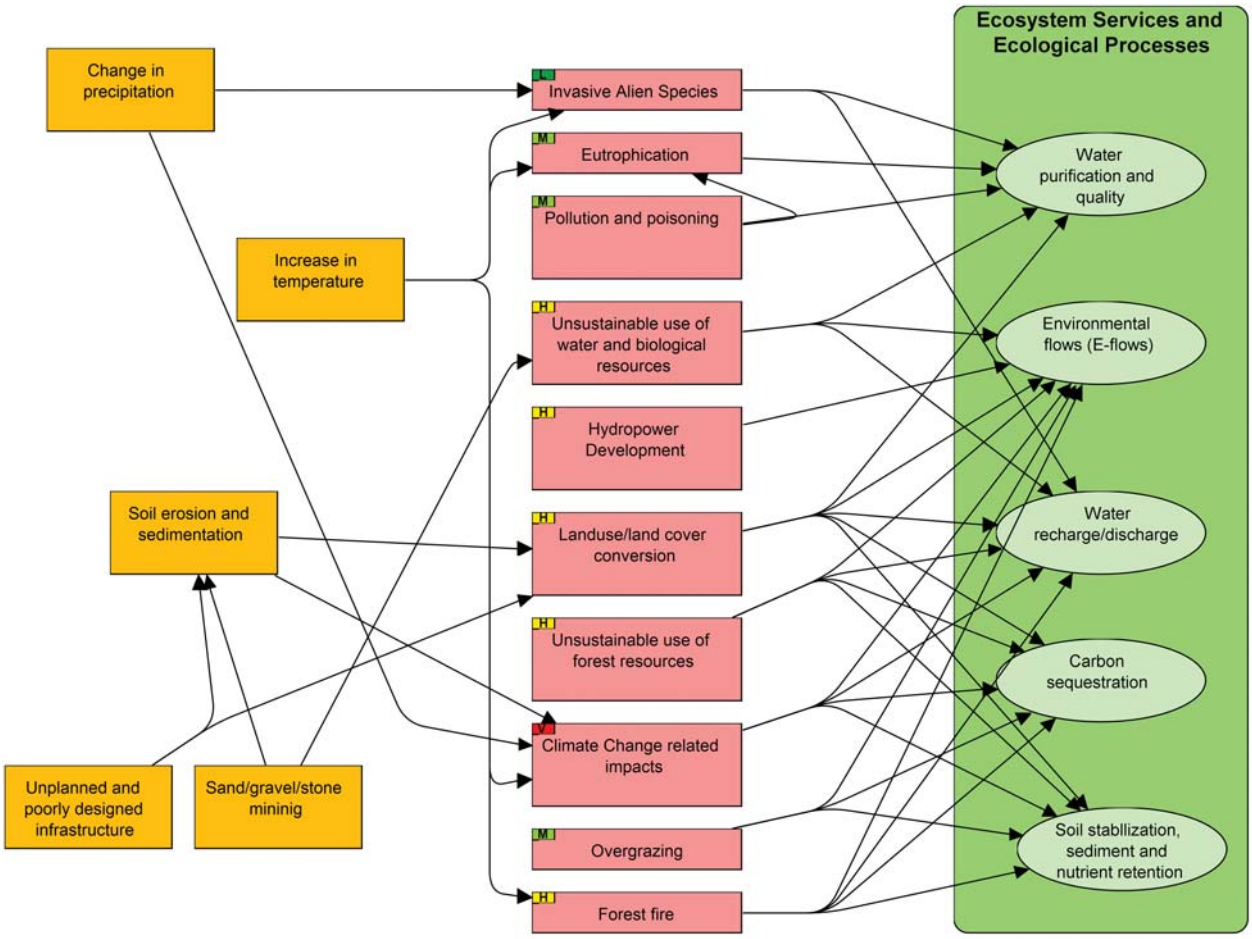

Figure 2.1: Conceptual model of ecosystem services and ecological processes

in the CHAL, it can be controlled and reversed with appropriate interventions. The overall threat rankings for eutrophication and for pollution and poisoning were medium, but they were ranked as high for the aquatic systems. The lentic systems in particular are highly vulnerable to eutrophication due to high nutrient loads, warming temperatures, and low water flows. Priority will be geared towards addressing threats, drivers and climate vulnerabilities that have been ranked very high, high and medium during the implementation of this Action Plan.

2.1.2. Threats to forests and other land uses

Natural ecosystems (forests, aquatic systems, grasslands and rangelands, cryosphere) and anthropogenic systems (agricultural areas and built-up areas) were selected to assess threats to the land cover and land use matrix of the CHAL. The first four represent natural ecosystems and the last two represent anthropogenic systems that are intensely used by people.

Forests: The forests include all representative forests in the CHAL, from tropical broadleaf forests to temperate forests, coniferous forests and shrub lands. Many of these forests are already heavily converted and fragmented, and require urgent conservation interventions. Key drivers of deforestation and degradation include climate induced impacts, unsustainable harvest, infrastructure, overgrazing and invasion of alien plant species.

Grasslands and rangelands: These represent the alluvial grasslands in the Terai and alpine grasslands of the northern CHAL. Almost all of the alpine grasslands are grazed by domestic livestock, and are therefore considered to be rangelands. The conservation and management interventions of the Terai grasslands have been addressed in the Terai Arc Landscape strategic plan (MoFSC 2015a), but interventions to provide the desired environmental flows that maintain these alluvial grasslands have to be addressed and implemented upstream, in the CHAL.

Table 2.1: Threat analysis of ecosystem services and ecological processes in the CHAL

Threats\Targets	Water recharge / discharge	Water purification and quality	Carbon sequestration	Environmental flows (E-flows)	Soil stabilization, sediment and nutrient retention	Summary Threat Rating
Climate Change related impacts	High		High	High	Very High	Very High
Land use / land cover conversion	Medium	Low	High	High	High	High
Forest fire	Low		High	Low	High	High
Unsustainable use of water and biological resources	Medium	Very High		High		High
Unsustainable use of forest resources	Medium		High	High	High	High
Hydropower Development				Very High		High
Eutrophication		High				Medium
Pollution and poisoning		High				Medium
Overgrazing			High	Medium	Low	Medium
Invasive Alien Species	Low	Medium				Low
Summary Target Ratings:	Medium	High	High	Very High	Very High	Overall Rating: Very High

Aquatic systems: These include the extensive river system of the Gandaki and East Rapti Basins, and lakes and other wetlands. The Kali Gandaki River that originates in the trans-Himalaya region is the major river in the CHAL, but forms a complex river system with the confluent rivers, namely Seti, Marsyangdi, Budhi Gandaki, and Trishuli in the Middle Mountain physiographic zone, and then with the East Rapti/Narayani river system in the Siwalik (Churia) zone. The CHAL also has high altitude lakes in the north, lakes in the mid-hills (e.g. Pokhara valley), and lowland wetlands, lakes, and floodplain areas in the Churia foothills, inner Dun valleys, and the Terai. All these aquatic systems are linked by a hydrologic cycle within the river basin. Maintaining seasonal flows and the desired environmental flows in these rivers is critical to maintain the lowland wetlands, including the ox-bow lakes in the Terai that are important habitat for wildlife species.

Cryosphere and barren lands: The cryosphere and the barren, rock outcrops immediately below were identified as an ecosystem requiring conservation attention. There is good evidence of glacial retreat across the Himalayan range attributed to climate change. The high mountain areas also attract adventure tourists and mountaineers, and excess visitation can have negative impacts on the sensitive ecosystems that are slow to recover.

Agricultural areas: Several different types of agricultural methods are practiced in the CHAL; i.e., bari, khet, pakho, irrigated and non-irrigated tar, and floodplain agriculture. Bari and pakho are widely practiced in the middle mountains, where land cover on steep slopes is cleared with little or no terracing, resulting in erosion and loss of top soils. Thus, better agricultural practices are needed to prevent environmental degradation.

Built-up areas: These include settlements—especially the large cities and commercial centers—and other infrastructure, such as hydropower structures, irrigation and transport and communication structures. Unplanned or inadequately designed infrastructure development and operation is already causing severe environmental damage, with consequent negative impacts on socio-economic well-being, jeopardizing chances of socio-economic prosperity.

Nine direct threats and five indirect threats to these natural and anthropogenic systems were identified (Figure 2.2). The overall cumulative threats to all systems was *high*. From among the natural ecosystems, the aquatic systems were ranked *very high*, and the forests and shrub lands were ranked *high*, with the grasslands and rangelands ranked as under a *medium* threat level (Table 2.2). The cryosphere was under *low* threat. Both anthropogenic systems—agricultural areas and built-up areas—were ranked as being under medium-level threats.

The primary threats to the aquatic systems were from unsustainable use of aquatic resources, unsustainable land use, and land cover conversion, all of which can increase sedimentation in the aquatic systems and cause flashfloods if rivers become blocked (Figure 2.2, Table 2.2). Construction of major hydraulic structures for large-scale water withdrawal or diversions can degrade environmental flows. Threats to aquatic systems from climate induced disasters—floods, landslides, and erosion of degraded slopes—and from widespread pollution and poisoning of aquatic systems are also high. The roads constructed along the rivers in CHAL may have major impacts on freshwater due to sedimentation.

The main threats to forests and shrub lands are from unsustainable use of forest products, land cover change, forest fires, and invasive alien species, which were all ranked as high (Table 2.2). Post-earthquake reconstruction is likely to increase pressure for timber in many parts of the landscape, especially in the worst affected areas

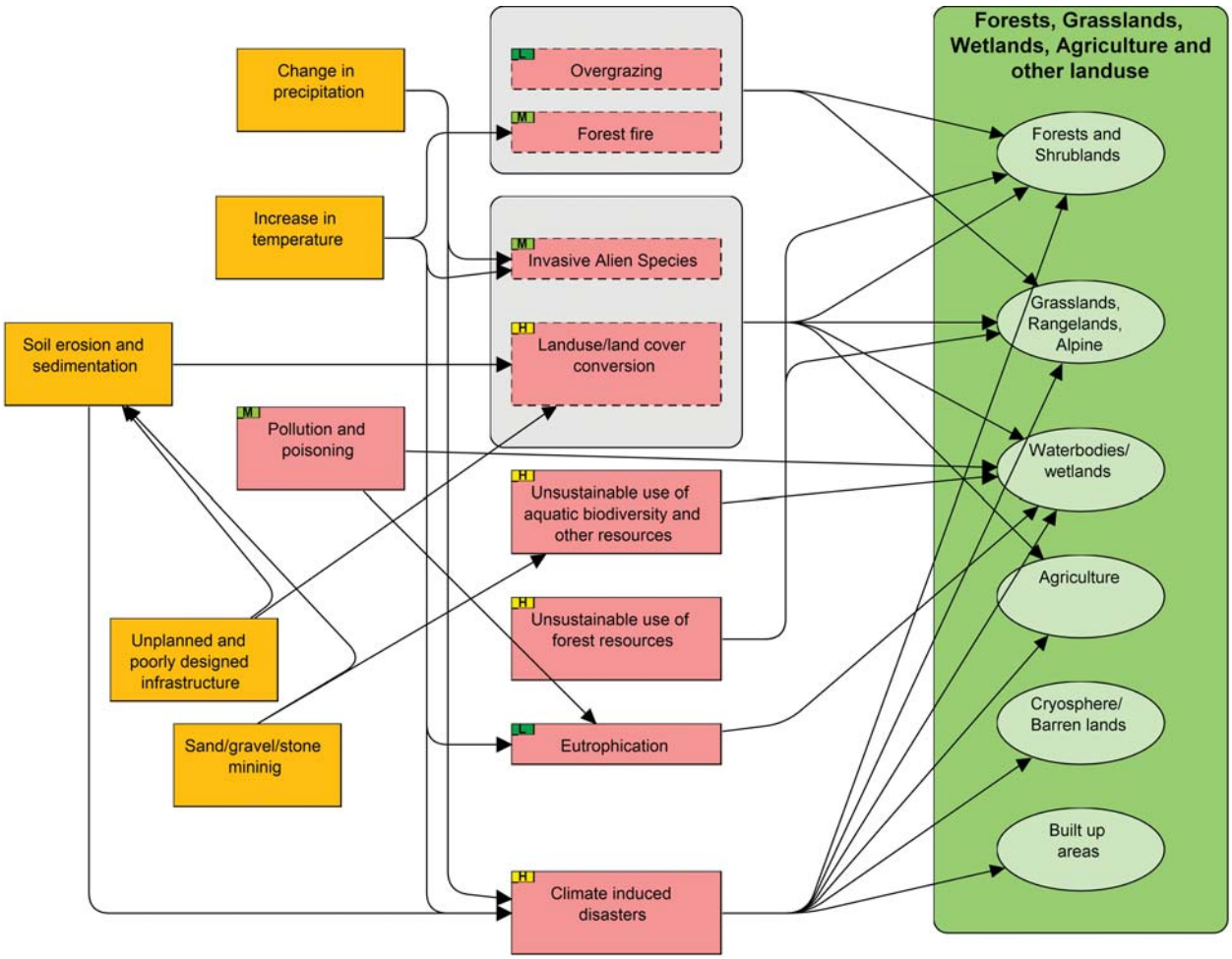

Figure 2.2: Conceptual model of forests and other land uses including grasslands, rangelands, aquatic systems, agriculture and built-up areas

Table 2.2: Threat analysis of forests and other land uses including grasslands, rangelands, aquatic systems, and built-up areas of the CHAL

Threats\Targets	Forests and Shrublands	Built up areas	Water bodies	Grasslands and Rangelands	Cryosphere	Agriculture	Summary Threat Rating
Unsustainable use of forest resources	High			High			High
Unsustainable use of aquatic biodiversity and other resources			Very High				High
Forest fire	High			Low			Medium
Invasive Alien Species	High		Medium	Medium		Low	Medium
Over grazing	Medium			Low			Low
Land use / Land cover conversion	High		High	Medium		High	High
Climate induced disasters	Medium	High	High	Medium	Medium	Medium	High
Polution and poisoning			High				Medium
Eutrophication			Medium				Low
Summary Target Ratings:	High	Medium	Very High	Medium	Low	Medium	Overall Rating: High

(MoSTE 2015). The threats to grasslands and rangelands were in the medium category; the highest threat to these ecosystems is from unsustainable resource use (note that 'forest' resources here include use of grassland resources). Almost all of the alpine rangelands are exploited for medicinal and aromatic plants and for livestock grazing, while grasslands in the lowlands that are outside the protected areas are also heavily grazed by livestock.

Threats from forest fires, invasive alien species, and pollution and poisoning were ranked as medium, while overgrazing of forests and rangelands by livestock and eutrophication of aquatic systems were ranked as low.

Unplanned infrastructure development and unsustainable extraction of river bed sand and gravel are indirect threats that contribute to soil erosion in terrestrial systems, with consequent sedimentation in aquatic systems. Extraction of local construction materials from river beds has severe impacts on aquatic systems, altering river hydrology and hydraulics, contributing to river cutting, changing instream habitats, and causing flashfloods. The threat from rock, sand and gravel extraction is likely to be particularly high in the next few years due to post-earthquake recovery (MoSTE 2015), especially in the most affected areas in the north-east of the landscape. The proliferation of local roads that are opened by bulldozers with inadequate planning and design are another major cause of soil erosion, landslides and sedimentation. However, these threats can be mitigated with proper conservation interventions.

Overgrazing of alpine rangelands and montane forests by domestic livestock and climate-induced disasters are medium-intensity threats (Table 2.2). The unsustainable use of forest resources is extensive across the CHAL, and also very intensive. But the threats can be reduced through appropriate conservation and livelihood interventions. Forest conversion is also high, contributing to forest loss and fragmentation across the landscape.

Unsustainable exploitation of medicinal and aromatic plants is a high threat to grasslands, rangelands, and forests. Although overgrazing was classified as a low or medium threat in grassland and forests respectively, the overall threat can be much higher when combined with unsustainable plant extraction and associated collateral damage by collectors. These threats can, however, be reduced with conservation and management interventions and effective enforcement of regulations, complemented with sustainable use protocols and alternative livelihood promotion that can ease pressure from natural resource extraction.

The primary threat to built-up areas and other infrastructure and to agricultural lands is from climate induced disasters manifested through changing


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temperature and precipitation regimes. Infrastructure development and operation without incorporating sound engineering practice and conservation measures, opening of roads without adequate planning or design, and unregulated extraction and mining can trigger natural disasters by destabilizing the steep-sloped terrain in the mountains. Several agricultural practices in the CHAL are rain-fed, and are on steep slopes, with no terracing to minimize soil erosion and retain water. Proper practices and better management can mitigate the consequent impacts. The agricultural areas could also become susceptible to alien invasive species, although the threat was considered to be low at present. Several agricultural lands are being converted to other land uses, including built up areas as settlements and commercial areas expand in response to market access and demand.

Although threats to the cryosphere were considered low, any changes would be irreversible. Thus, the potential for threats should be monitored closely for mitigation.

Priority will be given to address threats, drivers and climate vulnerabilities that have been ranked very high, high and medium during the implementation of this Action Plan.

2.1.3. Threats to species

The species in the CHAL were assessed in five broad categories based on their ecology and other natural history attributes that require appropriate conservation interventions.

Wide-ranging species: These are species that require large spatial areas of relatively intact habitat. These are usually the large-bodied vertebrates at the top of the food chain, but also include species that migrate seasonally. The conservation strategy for these species in a fragmented landscape such as the CHAL will be to connect the protected core areas with habitat corridors to allow dispersal for metapopulation conservation or to facilitate migration. In the CHAL, these species include the snow leopard, Tibetan wolf, black bear, common leopard, wild dog, several species of vultures, the altitudinal and trans-national migratory birds that use the Kali Gandaki river valley as a migratory flyway, and migratory fishes in the rivers. Some of these species are buchhe asala *(Schizothorax plagiostomus)*, gadela or loach *(Schistura beavani, S. rupecola* and *Acanthocobitis botia),* sahar, kabre (hill-stream catfish, *Pseudecheneis eddsi*), raja bam, katle, and phaketa or hill-trout or minnows (*Barilius bendelisis* and *B. vagra).*

Habitat specialist species: These are species with narrow ecological niches that require habitats with specific structural or ecological community compositions, have specific ecological links to other species or species communities, or require narrow environmental parameters. For instance, some species may require specific temperature or moisture regimes, specific food or host plants, or may have limited ecological links with other species in the habitat or ecosystem. Loss or degradation of these parameters will be detrimental to the survival of the species; thus, they cannot survive outside these habitats, or if the specific habitat conditions are changed. In the CHAL, these include red panda *(Ailurus fulgens)*, goral *(Naemorhedus goral)*, griffons *(Gyps fulvus, Gyps himalayensis)*, some species of orchids, hornbills *(Buceros bicornis, Anthracoceros albirostris)*, pheasants *(Catreus wallichii, Ithaginis cruentus, Lophura leucomelanos, Pucrasia macrolopha)*, riparian and wetland birds, riffle-dwelling and rheophilic fishes (e.g., hill stream loaches in Balitoridae family).

Highly threatened species: These are the species with small or declining populations due to poaching, unsustainable harvesting, or other ecological threats such as extensive habitat loss or degradation and climate change. These species include snow leopard, grey wolf, musk deer, common leopard, pangolin *(Manis species)*, river otter *(Lutra lutra)*, gharial *(Gavialis gangeticus)*, vultures *(*e.g., *Gyps bengalensis, Gyps tenuirostris)*, several carp species in the lowland rivers *(*e.g., *Cyprinus carpio)*, *Ophiocordyceps,* several species of orchids, champ *(Michelia champaca),* walnut *(Juglans regia),* lauth salla *(Taxus wallichiana), Larix himalaica,* satisal *(Dalbergia latifolia),* and several other important NTFPs. Highly threatened species such as Bengal tiger and one-horned rhino also exist in CHAL, in the Terai Arc. Their survival is highly dependent on maintaining environmental flows in the Narayani River as it flows through the Nepal Terai, to maintain floodplains and grasslands that are essential for rhino and for tiger-prey deer species. Their conservation is covered in more detail in the TAL strategy (MoFSC 2015a).

Endemic species: These are irreplaceable species either endemic to Nepal, or more broadly to the Eastern Himalayan region. These include Himalayan field mouse *(Apodemus gurkha),* spiny babbler *(Turdoides nipalensis),* several fishes *(*e.g., *Pseudecheneis eddsi, Erethistes species)*, several species of butterfly *(*e.g., *Parnassius acdestis, Parnassius epaphus, Chaetoprocta odata)*, and several species of alpine plants such as *Saxifraga, Meconopsis,* and *Pedicularis*. It is very likely that there are several other species of endemic animals and plants in the CHAL, but because the area is poorly surveyed and the taxonomy of several groups have not been well documented, the list of endemic species is very likely incomplete. Thus, conservation interventions should focus on securing representative and intact habitats that can support species with limited range distributions; e.g., the Himalayan temperate broadleaf forests.

Indigenous races of agricultural crops and livestock: The indigenous races of agricultural crops and livestock have been traditionally used by the people that live in the CHAL. These include indigenous varieties of rice, pulses, legumes, buckwheat, barley, lulu cow, and yak. Many of these varieties are now being replaced by hybrids or other high-yield crops or livestock breeds. Conservation of the indigenous races is, however, important since many of them are likely to be more resistant to debilitating impacts (especially from diseases, pests, and parasites) than the hybrid varieties.

Overall, eleven direct threats and nine indirect threats to these species groups—biodiversity targets for the CHAL - were identified (Figure 2.3). The overall cumulative threat ranking for these species targets was *very high* (Table 2.3). The threats to wide-ranging and highly threatened species ranked as very high, while the threats to habitat specialists and endemic species were ranked as *high* (Table 2.3).

Habitat loss, degradation and fragmentation; poaching, trade and unsustainable harvesting; human wildlife conflict; settlement expansion; infrastructure development and operation without incorporation of engineering standards and measures for conservation; especially hydraulic structures; and pollution and poisoning were identified as high threats to species targets, especially to wide-ranging species. Habitat loss and fragmentation can result in loss of ecological connectivity and isolation of populations in both aquatic and terrestrial species. In the CHAL, habitat loss and fragmentation takes place because of encroachment into natural forests for various reasons, from illegal settlements to clearing for agriculture. Slash and burn agriculture, which is practiced on the steep slopes, has poor soil and slope management. Most slopes are affected by free-ranging livestock that prevent regeneration and remove the soil-stabilizing understory vegetation, exacerbating erosion.

Changing precipitation patterns can also contribute to habitat degradation by causing landslides and increasing river sedimentation due to rapid water run-off from denuded slopes, or cause vegetation die-offs and encourage forest fires during periods of drought. The

intensity and frequency of forest fires might also increase in the future because of longer dry periods expected to be brought about by global climate change. The alternating periods of extreme rainfall and drought can then result in more landslides, erosion, flashfloods and river sedimentation, resulting in more extensive habitat loss and degradation. High water flows can change river hydrology and hydraulics, resulting in loss of habitats for specialist species and changing river courses.

The extensive distribution of infrastructure development and operation such as roads, airports, railways, hydropower projects, transmission lines, and planned settlements for urban expansion pose high threats to wide-ranging species, habitat specialists (especially fishes), and highly threatened species. Once built, reversing the impacts from infrastructure will be very difficult. Existing infrastructure should include measures to introduce ecological connectivity requirements and this should be mandatory within some time frame and also future infrastructure should be approved on the basis of appropriate strategic environmental assessments, and must integrate ecological connectivity requirements in the design and planning stages. Expansion of settlements and other urban and commercial centers especially along roads (ribbon developments) and opening up road routes to China are also high threats to biodiversity targets as this will increase the risk of illegal trade. Some roads planned through or adjacent to protected areas add additional threats. As settlements increase in numbers and or size and encroach into wildlife habitat, human-wildlife conflict will also inevitably increase.

Pollution is extensive in almost all rivers and wetlands, threatening the survival of aquatic biodiversity. Several fishes (especially the large Labeo species), in the lower reaches of the rivers have already become locally extinct, most likely due to poor water quality and inadequate water in the rivers. These fishes are part of a fishery that sustains livelihoods and conservation of these species is important for human prosperity and well-being. Measures for movement of aquatic animals should be incorporated in the development and operation of dams, barrage, and energy projects. The present 10% minimum average monthly flow downstream from dams is inadequate, and is often not adhered to, resulting severe impact on aquatic life.

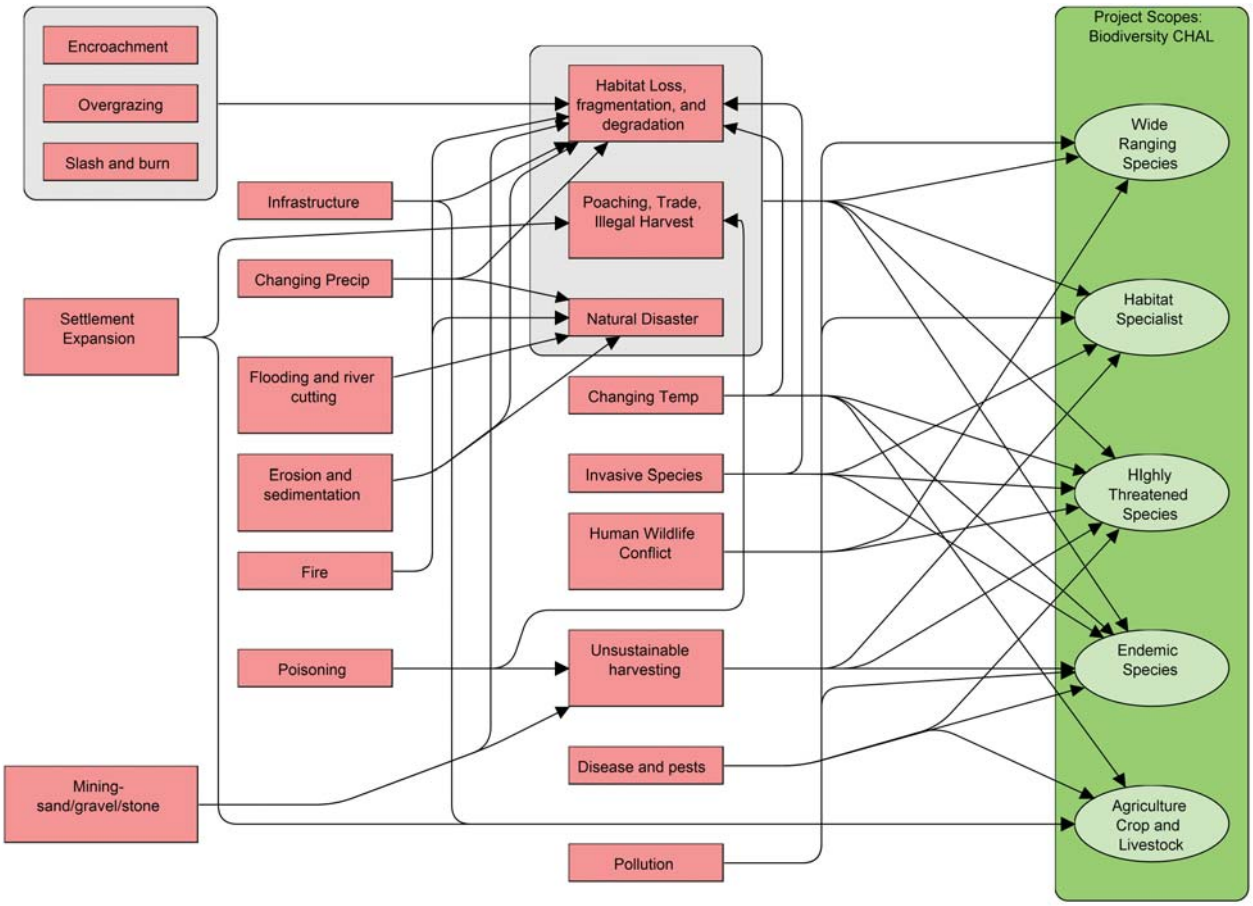

Figure 2.3: Biodiversity conceptual model

Poaching of wildlife and illegal harvesting of NTFPs are also high threats, especially for the highly threatened species. Species such as snow leopard, red panda, musk deer, pangolin, fishes, and several NTFPs such as *Ophiocordyceps sinensis* and a variety of alpine and temperate forest plants are especially affected and at risk. Use of poisons to collect fish or kill Snow leopards and other predators are also widespread, and kill indiscriminately. Human-wildlife conflict is also a high threat to wildlife species. Crop damage by wildlife, especially monkeys and wild boar, has been escalating and so is livestock predation by Common leopards, Snow leopards, Grey wolves and other predators causing retaliatory actions by people.

Unsustainable harvesting, changing temperature regimes, invasive species, and natural disasters were ranked as medium-level threats, while diseases and pests were considered to be low threats (Table 2.3). Although unsustainable harvesting of species is considered to be very high, and is taking place across most of the CHAL, there are opportunities to reverse the threats through appropriate conservation interventions. The impacts of changing temperatures expected due to climate change will also be huge and widespread with global average of 1.5°C rise in temperature (Intergovernmental Panel on Climate Change 2007). Projections for CHAL biodiversity show large shifts in vegetation types and impacts on individual species over the next 50 years (Thapa et al. 2015). However, these are long-term changes and in the next ten years the intensity of impacts may not be high. Moreover, the complex topography of the landscape will provide meso-and micro-refugia, where the impacts of global climate change is expected to be buffered.

The spread of diseases and pests were ranked low, but these could become more significant threats if climate change causes widespread debilitation of indigenous species of animals and plants, or severs important

Table 2.3: Threat analysis of species and biodiversity targets for CHAL

Threats\Targets	Wide Ranging Species	Habitat Specialist	Highly Threatened	Agriculture	Endemic Species	Summary Threat Rating
Pollution	High	High			High	High
Infrastructure	High	High	High	High	Medium	High
Settlement Expansion	High	High	High	Medium	High	High
Human Wildlife Conflict	High		High			High
Poaching, Trade, illegal harvest	High	Medium	High		Low	High
Habital Loss, fragmentation, and degradation	High	Medium	High		Medium	High
Unsustainable harvesting		Medium	Medium		Medium	Medium
Changing Temp. regimes	Low	High	Medium	Medium	Medium	Medium
Natural Disaster	Medium	Medium	Medium		High	Medium
Invasive Species	Medium	Low	Medium		Low	Medium
Disease and pests			Medium	Low	Low	Low
Summary Target Ratings:	Very High	High	Very High	Medium	High	Overall Rating: Very High

ecological links, thus creating favorable conditions for pests and diseases to become established, including new, invasive pathogens and parasites. Therefore, constant monitoring will be necessary to take proactive measures to prevent these threats escalating and being elevated to a higher level. Priority will be given to address threats, drivers and climate vulnerabilities that have been ranked very high and high during the implementation of this plan.

2.1.4. Threats to socio-economic prosperity

Threats to community resilience, especially from climate change induced impacts, were assessed and ranked, along with five other contributors to prosperity of human communities in the CHAL.

Community resilience: As climate change begins to drive environmental change, availability of essential resources on which communities depend can become more unreliable and less accessible or available. Natural disasters could become more frequent and more severe, making the communities more vulnerable. Thus, interventions should asses the threats—including cascading effects and synergies with other threats—and seek to ameliorate these threats by increasing resilience and reducing vulnerabilities by promoting adaptive strategies.

Energy: Energy is an essential resource for communities in the CHAL, and also to achieve Nepal's economic development goals. Household energy in the CHAL is currently sourced primarily from biomass - fuelwood, and agricultural waste – and secondarily from fossil fuels. Nationwide, biomass constitutes 78% of the fuel mix of total energy consumption, while grid electricity and modern renewable energy (mainly solar and micro-hydel) is negligible. A very high percentage of this energy consumption (80%) is for domestic use, predominantly in cooking. This trend is more or less applicable to the CHAL. Most fuelwood is extracted from natural forests and exceeds thresholds of sustainability and thus contributes to forest degradation. But, unless done with foresighted planning, including taking into consideration the environmental impacts and effect of climate change on hydrology, hydropower production may not be sustainable, and the investments in its development may become unsustainable. Moreover, the infrastructure can cause irreversible environmental and socio-economic harm. Thus, intervention to ensure sustainable energy, including a mix of other renewables, was identified as a priority.

Culture: The cultural identities and assets of the diverse ethnic groups in the CHAL contribute to the social fabric of communities in the CHAL. These cultural practices include traditional natural resource governance practices and rituals that have evolved to make resource extraction and land use more sustainable. However, many of these practices are threatened by market forces that threaten environmental and ecological integrity. Also migration, changes in household composition, exposure to other cultures.

Social capital: There are a number of formal and informal social organizations in the CHAL responsible for different natural resource management. The community based institutions such as Mukhiya system practiced in different forms in different ethnic groups, and women's groups have important roles within the social fabric and in sustaining socio-ecological systems. The formal institutions (e.g., CFUGs) also organize themselves as higher-level umbrella organizations for regional and national coordination. Collectively, these organizations form a multi-level network that contributes to the overall resource use in the CHAL. Elite domination, poor governance in CSOs, gender inequality and social injustice, and decreasing representation of youth in CSOs due to outmigration are potential threats to social capital in CHAL.

Financial capital: The financial capital vested within the local communities and community groups are important to manage the natural resources and capital of the CHAL and contribute to socio-economic prosperity.

Physical assets: The physical assets, from property to infrastructure, are important for sustainable development in the CHAL. Infrastructure should be properly designed and made 'climate smart'.

Nine direct threats to the contributory factors of socio-economic prosperity of CHAL communities were identified and ranked (Figure 2.4). The overall, cumulative threat ranking was high (Table 2.4). Community resilience, energy, financial capital, and physical assets were considered to be under high threat, while social capital was ranked as being under medium threat. Cultural assets were ranked as being under low threat.

Improper land use, poor governance and weak enforcement of laws, badly designed infrastructure, and disasters (including the potential for future earthquakes) were ranked as high threats (Table 2.4). Food insecurity and climate-induced disasters such as landslides, floods, fires, droughts, and glacial lake outburst floods (GLOFs) were considered medium-level threats.

The physical assets of communities face high threats from four of the five threats; i.e., improper land use, poor governance, poorly designed infrastructure, and disasters. All are widespread in scope and intensive, but can be reversed with proper management. Climate change induced disasters were more localized, relative to the landscape area, and can be reversed through appropriate rebuilding and adaptive behavior.

High threats to financial capital are primarily from improper land use, especially unsustainable or unproductive agricultural practices. Landslides, including those triggered by earthquakes and poorly constructed roads can also result in financial losses. Poorly designed infrastructure can compromise the potential for generating hydropower if landslides block river flows, or hydrological flows become affected, especially since the rivers are vulnerable to climate change and climate change induced disasters.

Community resilience is impacted by threats to physical assets and financial capital. But community resilience was also considered to be under high threat from poorly designed infrastructure. Poorly constructed roads can destabilize slopes, causing landslides that destroy houses, agricultural lands, and other infrastructure, and placing lives at high risk. If the landslides and rock falls block rivers, there could be flashfloods and widespread flooding that can displace people, destroy property and agricultural fields. Destruction of roads, bridges, and other communications infrastructure can disrupt or sever social connectivity and access to resources, including health services and safe refuges during disasters. Isolated populations will be more vulnerable to cascading threats such as diseases, loss of livelihoods, and psychological problems. Climate change can cause more intense rainfall, alternating with droughts, increasing the threats from disasters. Hydropower generation—from large stations to micro-hydro—are especially susceptible to natural

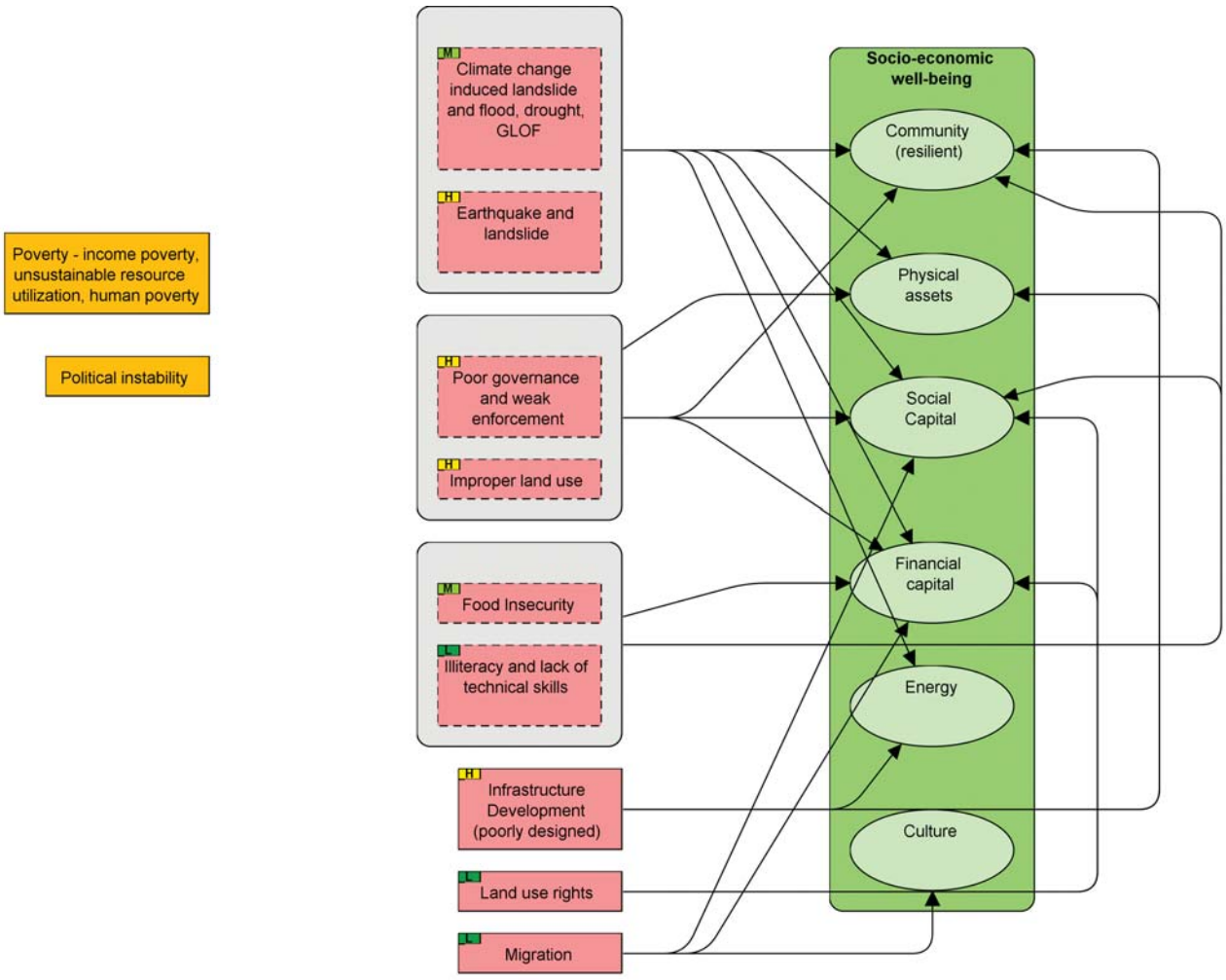

Figure 2.4: Conceptual model of socio-economic well-being

disasters, especially as climate change can exacerbate the disasters related to precipitation regimes, and can threaten energy production and availability. All these consequences can act in synergy to increase vulnerability of communities in the CHAL.

Outmigration of youth, mostly seeking employment opportunities has also seriously affected the availability of labor force for agriculture and community activities. In several places, coupled with several other factors the lack of labor force have led to abandonment of agricultural land. While abandoned farmlands are susceptible to erosion and invasion by exotic species, these lands also present an opportunity for reforestation or afforestation, and improving ecological connectivity.

The negative population growth rate in most of the districts and declining sex ratio have serious implication in the overall resource management and gender role. This has led to feminization of agriculture and resource governance requiring appropriate policy response.

Crop damage by wildlife, especially monkeys and wild boar are also reducing agricultural production, and will require policies to support appropriate mitigation measures.

Inadequate consideration of social and environmental factors and their consequences in infrastructure development has threatened the livelihood opportunities of several communities. For example, some road constructions have impacted the livelihood of several communities along the traditional trekking route. Priority will be given to address threats that are ranked high and medium during the implementation of this plan.

Table 2.4: Threat analysis of socio-economic systems and livelihoods in the CHAL

Threats\Targets	Community resilience	Energy	Culture	Social capital	Financial capital	Physical assets	Summary Threat Rating
Climate change induced land and flood, drought, GLOF	Medium	High		Low	Medium	Medium	Medium
Earthquake and landslide	Medium	Medium		Low	High	High	High
Migration			Low	Low	Medium		Low
Infrasturcture Development (Poorly designed)	High	High				High	High
Illiteracy and lack of technical skills	Low			Low	Low		Low
Poor governance and law enforcement	High			Medium	Medium	High	High
Land and rights				Low	Medium		Low
Improper land use	High			Low	High	High	High
Food Insecurity	High			Medium	Medium		Medium
Summary Target Ratings:	High	High	Low	Medium	High	High	Overall Rating: High

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Chapter

III

Vision, Goal, Strategies, and Strategic Actions

The Chitwan-Annapurna Landscape is an outstanding area with global biodiversity significance. Ranging from the dry Trans-Himalaya and 8,000 m high Himalaya massifs, down through the mid-hills, to the fertile plains of the Terai just a few hundred meters above sea level, it contains immense natural wealth, including endangered species, natural resources, and an important water tower. It is home to over four and a half million people and diverse cultural wealth. It has high potential to contribute to the overall social and economic development of the country. It is also the first landscape in the country to date which comprises a river basin, offering new opportunities for landscape conservation and management.

This landscape Strategy and Action Plan are based on an integrated river basin management approach, promoting the coordinated development and management of water, land and related resources, in order to ensure conservation of biodiversity and natural resources, and maximize the economic and social benefits in an equitable way, without compromising the sustainability of vital ecosystems. It involves working at nested scales of basin, sub-basins, and watersheds, and vertical and horizontal corridors. It brings together stakeholders across different sectors, enabling holistic and multi-sectoral management of basin resources and ecosystems, including upstream-downstream linkages for hydrological and energy flows, ecological processes, conservation, economic development, and disaster risk reduction.

The CHAL strategy comes at a particularly critical time in the basin's history: the ten year period of the Strategy and Action Plan will see further social change, implementation of the 2015 National Constitution and federalization, rapid economic development, and advancing climate change. The strategy needs to be flexible and proactively adapt to the changing economic, social, political and climatic conditions, while maintaining its overall vision, goal and strategic objectives. There is a strong opportunity to develop the landscape as an effective and holistically managed river basin.

At the time of writing this plan, other sectoral plans were also in preparation for the basin (e.g. hydropower, irrigation) or parts of it (e.g. Churia Master Plan). Hence an early activity of this strategy implementation should be a major effort to harmonize the different sectoral plans, promoting collaboration and establishing trade-offs in order to find optimum balance for Nepal's economic development, wellbeing and prosperity of the basin's people, and the conservation and wise use of its natural resources and ecosystems. The Strategy lays a foundation for doing this, including the institutional arrangements for its coordination and implementation.

The CHAL Strategy's objectives are designed to: i) sustain ecosystem services through an integrated river basin approach; ii) conserve and sustainably manage natural ecosystems and human-use systems and land-use areas; iii) conserve the important biodiversity, especially species of special concern; and, iv) build socio-economic prosperity. Several cross-cutting themes, such as developing necessary policy and governance structures, ensuring gender equity and social inclusion, and raising awareness for conservation of natural resources and ecosystems will complement operationalizing the four main objectives.

The formulation of the CHAL Strategy and Action Plan is informed by the National Biodiversity Strategy and Action Plan 2014-2020, Forest Policy 2015, Forestry Sector Strategy 2016-2025, and Climate Change Policy 2011.

3.1. Vision

Biodiversity thrives and human communities prosper in co-existence through integrated, climate-smart conservation and sustainable development in the Chitwan-Annapurna Landscape in Nepal.

3.2. Strategic Goal

The Chitwan-Annapurna Landscape is managed through an integrated, river basin planning approach which is built on the foundation of climate-smart[4] conservation and sustainable development practices to promote persistence of biodiversity, and sustainable management of natural resources for continued provision of ecosystem goods and services that support equitable and inclusive socio-economic prosperity.

3.3. Broad Strategic Themes and Objectives

The following objectives for the CHAL Strategy and Action Plan are based on priority conservation and developmental issues and the need to improve socio-economic prosperity in a sustainable way, and are nested under four thematic areas (see also Table 3.1):

3.3.1. Ecosystem services and ecological processes

Objective 1: To manage the ecosystem services and ecological processes of the CHAL through an integrated river basin planning approach that supports economic development, provides water for local requirements, sustains necessary environmental flows, and contributes significantly to carbon sequestration.

3.3.2. Forests and other land uses

Objective 2: To sustainably manage the natural land cover and anthropogenic land-uses in an ecologically harmonious basin-scale matrix.

3.3.3. Species of special concern

Objective 3: To conserve, and ensure recovery of species of special concern in the CHAL that are: a) representative of the overall biodiversity as umbrella species; or b) require special conservation attention.

3.3.4. Socio-economic prosperity

Objective 4: To improve the well-being of local communities through sustainable, climate-smart natural resource and integrated land and water management and development, to support livelihoods, promote socio-economic prosperity, and protect natural assets of national economic importance from natural disasters.

3.3.5. Cross-cutting themes

Eight cross-cutting themes will support and enable the four major themes:

1. **Policy and Governance:** Policies provide the regulatory enabling conditions to implement the conservation and management interventions. However, river basin-scale management that integrates conservation with development to sustain biodiversity and promote socio-economic prosperity, while reducing climate change vulnerability, is a relatively new initiative for Nepal. This Strategic Plan will have to be implemented against a backdrop of state restructuring and federalization, rapid development that includes large hydropower projects, and climate change adaptation and mitigation programs. Good governance practices with social inclusion and justice is more important than ever to deal with these changes and the uncertainties associated with them. Therefore, filling policy gaps that cut across all themes will be crucial to the successful implementation of this strategic plan.

2. **An institutional arrangement for integrated river basin management:** An institutional framework for good, efficient intra- and inter-sectoral coordination and collaboration at various levels is vital, especially given the multiple institutions engaged in competing land use, conservation, and land and water resources development. At the river basin and sub-basin scales, an integrated river basin planning and management will require a strong body that can bring together all the stakeholders relevant to land and water management to a single platform (or even several closely linked platforms) to discuss and agree on common goals for harnessing water and other resources in the river basin for use in a sustainable and equitable manner. WEC has been envisaged to be reformulated to play this important role (WECS 2002; WECS 2005). This body should be mandated to implement river basin plans for sustainable management of basin resources according to the agreed management plans that ensures conservation of natural resources.

4 **Climate-smart approach** comprises eco-friendly landscape management (e.g. green roads, sustainable energy, and sustainable agricultural and forestry system) using climate resilient technologies, and working through multi-stakeholder platforms that facilitate meeting aspirations of local communities while contributing to the implementation of international agreements.

3. **Gender equality and social inclusion:** Women, marginalized and socially excluded people will be actively engaged to ensure equitable representation in policy and program formulation, and implementation under this strategy. GESI provisions will be mainstreamed in all policies and guidelines and implemented.

4. **Climate change:** Impacts of climate change will be considered for all conservation targets, and strategies and activities will be made climate smart. A climate vulnerability analysis of the CHAL has been conducted, and recommendations for adaptation and resilience building have been made. These recommendations are integrated into the Strategy and Action Plan.

5. **Multi-stakeholder capacity strengthening:** Capacity and understanding of climate-smart landscape-scale conservation and management of natural resources will be developed among stakeholders at all levels. These will include GoN agencies across all relevant sectors, natural resource management (NRM) groups (CAMCs, CFUGs, and buffer zone user committees (BZUCs)), and non-government organizations (NGOs) that will play a key role in landscape conservation.

6. **Infrastructure:** Several infrastructure development initiatives of various scales have been built or are planned in the CHAL, which is an important area for Nepal's economic development. These include several large hydropower and irrigation projects that have already been built, and many more that are proposed on all major rivers in the Gandaki Basin. These will sever river connectivity, change flow regimes, and potentially affect environmental flows, impacting ecological functions/processes and socio-cultural needs of people. Therefore, basin and sub-basin scale integrated water resource development and management plans are needed to ensure equitable water allocation for all sectors including economic development, human well-being, and ecological functions and communities. Poorly planned and designed road construction and urbanization also contribute to environmental degradation that requires appropriate policy, design, and planning to mitigate impacts.

7. **Knowledge management and communication:** Scientific research in many sectors is necessary to develop, revise and update policy instruments, and provide scientific inputs for sound management. Traditional knowledge combined with results of scientific research form the knowledge base for landscape level conservation and development. This knowledge has to be disseminated to raise awareness of stakeholders at different levels of engagement. Awareness and education programs are needed to engage local communities as stewards of conservation and sustainable development. These programs, coupled with formal education, have to be continued to educate new generations and build leadership among them. Programs to raise awareness of policies, rights and responsibilities, and emerging issues such as climate change are necessary and have to be continued as a priority.

8. **Sustainable financing:** Landscape-scale conservation requires short-term and long-term investments across a large spatial scale. Government initiatives have to be streamlined to meet the objectives of landscape conservation and development. Private sector organizations and development partners can play key roles in helping to meet these objectives. Initiatives such as REDD+ and PES create opportunities for sustainable financing.

3.4. Guiding principles and approaches

- **River basin approach:** The spatial scale will be at the river basin, sub-basin and watershed scales for different purposes, and the guiding principle will be the continuity of e-flows throughout the year in the Gandaki River Basin since this best captures and mostly contains the critical ecosystem services and processes of the CHAL.
- **Accountability:** Many people, including policy/decision makers and other relevant stakeholders, have a stake in natural resource conservation and management, but will also be accountable for actions leading to degradation.
- **Social and economic prosperity:** Conservation of natural resources and sustainable development in the CHAL will improve people's livelihoods and economic status helping them to prosper, but sustainable use is essential for long-term resource availability.
- ***In-situ* conservation:** Conservation actions will focus primarily on in-situ conservation. However, ex-situ conservation will be encouraged in certain cases: e.g., to reduce pressure on natural resources, or to promote climate adaptation.
- **Integrated, participatory and adaptive management:** In order to integrate climate change and its inherent uncertainties, and address emerging issues and changing political, economic and social conditions, adaptive management will be practiced to ensure

a flexible and responsive approach, informed by constant monitoring.

- **Synergy:** The CHAL Strategy and Action Plan will be mainstreamed into national development and conservation plans, including into post-earthquake changes, to build synergy in resource use, allocation, and management.
- **Strengthening capacity of multiple stakeholders:** An iterative process of identifying capacities and weaknesses, and providing opportunities to strengthen them will be institutionalized.
- **Respecting local decision making:** Recognition of appropriate local decisions will enhance local community ownership of conservation and development processes.

3.5. Thematic areas, Strategies, and Strategic Actions

Sixteen strategies, nested within the four objectives of the CHAL Strategy, have been identified to achieve the conservation and sustainable development targets set for the CHAL. These strategies and supporting activities are in line with national policies, plans and strategies. Some of the strategic actions proposed are already being implemented by various agencies. These strategic actions should be streamlined towards meeting the overall objectives of the landscape.

3.5.1. Strategies for conservation of ecosystem services and ecological processes

Water is critical for life, and the river system of the CHAL supports the lives and livelihoods of the people within the Gandaki basin and beyond the CHAL boundaries. The upstream-downstream linkages of CHAL are complex due to the extreme altitudinal range associated with the young and fragile geology, extreme seasonal and spatial variation in rainfall, ecological differences and diversity of anthropogenic processes. It is extremely important to work to maintain them during development.

While hydropower development is necessary for meeting the energy demand and is also seen as one of the highest revenue generators for national development, water from the rivers is also essential to support livelihoods and cultural rituals. Water is withdrawn for irrigation in large volumes in the lower reaches of the Gandaki basin. The rivers also support fisheries and a tourism industry based on rafting, kayaking, and trekking along riparian trails. Provision of water for these purposes as well as for drinking and other daily uses has to be balanced with environmental flows that support terrestrial and freshwater species and their habitats. Many of these species also support livelihoods based on nature tourism and use of natural resources. Adopting an ecosystem approach to water allocation for environmental flows at river basin and sub-basin levels is a key strategy for conservation of ecosystem services and ecological processes in the CHAL.

Water scarcity is now becoming apparent due to increasing water demand from various sectors. This is likely to be aggravated as climate change increasingly affects precipitation patterns, and reduces the snow pack that contributes to winter and pre-monsoon river flows. Hydropower projects divert water for power generation, disrupting or modifying streamflow regimes; this effect is generally greater for storage projects than run-of-river projects. Large-scale irrigation projects withdraw significant volumes of water from rivers, reducing streamflow for downstream users including the environmental flow. In the case of inter-basin water transfer projects for hydropower generation or irrigation, e.g. the proposed Kali Gandaki-Tinau Diversion Project, the hydrological regimes of both diverted and receiving rivers can change dramatically, resulting in impacts to aquatic and terrestrial ecosystems. Watershed degradation has to be reversed in order to improve discharge, recharge, and water purification. Conservation of watershed slopes is also important to meet carbon sequestration obligations under REDD+. Forests are also important habitats for pollinators, and for birds and insects that help control agricultural pests. They provide forest resources that many people depend on daily.

Targets for conservation of ecosystem services and ecological processes by 2025 are to:

- Maintain environmental flows for ecosystem functions, while allocating water for development needs (e.g., energy, irrigation, drinking water), livelihood and socio-cultural needs.
- Maintain and manage forests under the REDD+ covenants as recommended by the REDD+ strategy.
- Develop and implement valuation of ecosystem services and PES.

Strategy 1.1. Promotion of integrated water use and management through river basin and sub-basin scale plans that balance multiple uses of water, including hydropower generation for sustainable economic development and desired environmental flows and services

- Conduct studies to identify and prioritize environmental and ecosystem goods and services.
- Conduct environmental flow studies and incorporate results into basin and sub-basin scale water management plans.
- Identify impacts of development interventions on environmental flows and consequences at basin scale, and implement appropriate mitigation to maintain desired flows and ecological connectivity.
- Assess the impacts of climate change on water resource use, and identify vulnerabilities and ecosystem based adaptation strategies for management and disaster risk reduction.
- Promote communication and collaboration among users (e.g. hydropower operators) to ensure more efficient use of resources and reduce risk of disasters.
- Promote alternative or complementary renewable energy.
- Monitor hydrological flows regularly for necessary regulation and release.

Strategy 1.2. Promotion of watershed conservation for healthy ecosystem services

- Strengthen mechanisms to prevent agricultural, industrial, municipality and household effluent flow into aquatic systems.
- Provide economic incentives through PES for better watershed management.
- Raise awareness of the ecological links between terrestrial and aquatic systems to promote better watershed management to sustain clean water supplies.
- Prepare and implement integrated ecosystem based solutions for soil and water management plans, engaging communities in restoration, slope stabilization and controlling erosion.
- Identify vulnerable ecosystems of the watersheds to prioritize ecosystem based approaches to ensure upstream and downstream linkages.
- Promote and protect water use rights among local communities.
- Develop and implement an equitable water use policy.
- Develop sub-basin plans in the context of the Gandaki basin plan to cover critical watersheds, and revise and integrate LAPA/CAPAs relative to basin-scale vulnerability assessments.

Strategy 1.3. Promotion of forest conservation and restoration of degraded areas for sustaining ecosystem services including carbon sequestration

- Reforest or afforest abandoned lands.
- Reduce dependency on forests for domestic fuelwood by promoting renewable/efficient energy sources (hydropower, solar, wind power, biogas, and improved cooking stoves).
- Conserve forest carbon through minimizing anthropogenic pressure on forests, promoting alternatives to forest products.
- Enhance forest carbon through better management of existing forests and restoration of abandoned land through plantation.
- Reduce forest carbon emissions in CHAL though addressing the major drivers of deforestation and forest degradation.
- Develop a REDD+ project at the landscape level that brings benefits to the local communities.
- Raise awareness and engage communities to restore degraded forests and benefit from them.
- Rehabilitate vulnerable forest ecosystems to ensure sustenance of ecosystem services.
- Monitor climate change impacts focusing on forests and forest biodiversity.

3.5.2. Strategies for conservation of forests and other land uses

The Gandaki river system provides the arteries that link all ecosystems of the CHAL and support life throughout the basin. The diverse forest ecosystems are important repositories of biodiversity, and are also critically important to maintain watershed integrity and sustain hydrological flows in the rivers, regulating water recharge and discharge. They stabilize mountain slopes and reduce the risk of landslides. The forests also provide important natural resources for people, including food, fodder, firewood, timber and medicines. People in CHAL are heavily dependent on forests for fuelwood for household cooking and heating, and many depend on forest products to supplement livelihoods. Many previously cultivated lands are being abandoned and need to be restored through natural forest regeneration or by promoting low-input agro-forestry programs. With Nepal's REDD+

covenant, the forests will become an important source of carbon revenue, a part of which will flow to local economies. Thus forest and water conservation is an imperative in the CHAL, and for Nepal.

The grasslands in the south and the alpine rangelands in the north are also important conservation targets. The latter protect the water sources in the high Himalaya, and environmental degradation has impacts downstream, such as reduction of streamflow in the dry season and lower water quality for downstream users.

The aquatic ecosystems in the CHAL are dominated by the rivers that originate in the high Himal regions and support life as they cascade down the mountains. These rivers sustain important fish communities, as well as a myriad insects, amphibians, reptiles, birds, mammals and plants. The flow regimes in the rivers are influenced by the water inflows from the terrestrial systems, but in the lower reaches, the river flow regimes shape and maintain terrestrial and wetland habitats that are critical for the survival of several charismatic mammals, birds and reptiles. These include rhinoceros, tiger and their prey species, migratory water fowl, gharial and mugger crocodiles, and an assemblage of large fishes. The necessary flow regimes have to be maintained by implementing an ecosystem approach to river basin planning, with integrated water resources development and management at river basin and sub-basin levels.

A wide diversity of agricultural crops is grown in CHAL using a range of practices, including bari and pakho in the middle mountains; khet, pakho, and irrigated and non-irrigated tar in the lower hills and Churia; and floodplain agriculture in the lowlands. Unsustainable practices must, however, be replaced or modified for better slope and soil conservation and management, and to increase productivity within the existing agricultural areas. Increasing productivity in existing agricultural lands can also spare natural ecosystems from future conversion to agricultural land.

The CHAL is undergoing rapid economic development. But the expansion of large infrastructure must be well-planned and 'climate-smarted' to prevent irreversible damage to the environment. The change in ecological dynamics resulting from climate change is uncertain, and both development and conservation will have to take these uncertainties into consideration.

Targets for conservation of forests and other land uses by 2025 are to:

- Maintain current forest cover and manage forests through climate-smart management plans.
- Address the drivers of deforestation and forest degradation in the CHAL, in particular the pressure from fuelwood demand, by promoting use of clean energy sources including hydropower.
- Maintain ecological connectivity in river systems.
- Manage critical wetland ecosystems for sustainable water provision and habitat for aquatic life.
- Manage lowland grassland as wildlife habitat and alpine rangelands sustainably for wildlife, livestock, and MAPs.
- Promote conservation friendly agriculture practices.
- Mainstream green and climate-smart infrastructure into development planning and plans.

- Promote strategic planning of district and local road systems, and ensure adequate design, construction and maintenance practices to ensure roads stay open and have minimal adverse impacts.
- Ensure hydropower is planned and operated holistically on a river basin basis, minimizing adverse social and environmental impacts and maintaining environmental flows.

Strategy 2.1. Securing forests and other terrestrial natural ecosystems (grasslands and rangelands) especially in ecologically sensitive areas for conservation and sustainable management

- Secure representative forests, grasslands, and rangelands for conservation through:
  - identification and management of representative forest, grassland, and rangeland ecosystems currently not represented within the protected area system, including them in the landscape-scale conservation planning
  - facilitating and supporting government managed forests, and community, leasehold, collaborative, protection, religious, and private forests
  - identification and conservation of natural forests in ecologically sensitive areas
  - management of natural forests, shrub lands, rangelands and grasslands to reduce vulnerability and ecological stresses from potential climate change impacts
  - support to the implementation of Rastrapati Chure-Terai Madesh Conservation Program.
- Promote scientific forest management in all forest management modalities.
- Build institutional capacity for government institutions for forest management.
- Promote forest management with sustainable resource extraction and harvest regimes in cam for forest management and biodiversity conservation.
- Clarify the roles and responsibilities of the four major actors (central government, local government, community and private sector) in forest management, harvesting/production, marketing, revenue sharing and taxation (if necessary by amending the Forest Regulations).
- Encourage CFUGs to plant threatened indigenous trees, especially champ and okhar.
- Develop climate-adaptive management plans for forests selected for NTFP and timber extraction through:
  - reforestation of vulnerable and abandoned areas with climate adaptive tree species to reduce risk from disasters such as landslides and floods, and increase biodiversity and availability of forest resources
  - integration into Nepal's carbon sequestration strategy and REDD+ benefits to local communities
  - capture of ecological processes and services (e.g., pollination, slope stabilization)
  - preventing forest fires and creating community-based firefighting units
  - preventing forest degradation caused by invasive alien species, overgrazing, etc.
- Conserve and manage NTFPs that have medicinal or aromatic value.
- Engage communities in participatory stewardship of forests, rangelands and grasslands; implement awareness programs.

Strategy 2.2. Ensuring conservation and sustainable use of aquatic ecosystems to provide desired environmental flows

- Undertake an environmental flows assessment in the Gandaki basin and its sub-basins, and ensure an ecosystem approach to water allocation is followed in preparing an integrated river basin plan for the Gandaki basin; monitor and ensure that this plan is implemented as planned.
- Identify rights/duties of upper and lower riparians.
- Protect water sources and their recharge areas, and conserve riparian areas.
- Identify critical watersheds and conserve watershed integrity with necessary restoration interventions, working with upstream and downstream users.
- Maintain river connectivity to sustain ecological processes and services from headwaters to the Terai.
- Conserve river courses including regulating extraction of river bed sand, gravel and boulders.
- Restore flood plain functions including flood control through natural processes; promote bioengineering as appropriate.
- Prepare and update management plans of Ramsar sites including Pokhara valley lake clusters and engage all stakeholders for management.
- Promote water conservation practices/culture among communities including rainwater harvesting, water efficiency, and multiple use of water.
- Engage communities in participatory stewardship of rivers and wetlands.

- Incorporate cultural aspects of water use in water related development initiatives.
- Control pollution from agricultural, industrial, municipality, and household sources and prevent eutrophication.
- Prevent/control invasive alien species, especially in lentic ecosystems.

Strategy 2.3. Promotion of sustainable farming and pastoralism, including traditional and evolved pastoral and agricultural practices, for better land and water management

- Promote traditional sustainable agriculture and pastoralism including promotion of innovative water conservation technologies and climate adaptive and traditional crops and livestock.
- Promote sustainable agricultural practices for sustainable land and soil management.
- Promote sustainable rangeland management, including designated grazing areas to relieve pressure on forests and grasslands.
- Strengthen water management systems (including community managed, jointly managed and agency managed irrigation systems) and promote water conservation technologies and practices to meet the water demand from drinking and other use sectors in a watershed or sub-basin.
- Provide better weather forecasting services for farmers.
- Strengthen government and community capacity and understanding of climate-smart forest, grassland and water management.
- Promote agroforestry practices in private land.

Strategy 2.4. Managing and planning built-up area development to minimize impacts on natural and agricultural areas, and aquatic systems

- Develop and implement basin and sub-basin scale integrated land-use plans following the Land Use Policy to zone areas for development and mainstream these plans into overall conservation and development plans for the districts.
- Mainstream climate change and disaster risk assessments in all development planning and implementation.
- Implement sound garbage, sewerage, and other urban waste management/recycling plans and mechanisms to prevent pollution.
- Promote green infrastructure and earthquake-resistant structural designs to minimize threats to ecosystems, ecosystem services, and enhance well-being of communities.
- Promote post-earthquake infrastructure reconstruction with environmentally responsible practices.

3.5.3. Strategies for conservation of species of special concern

The CHAL spans the biogeographically diverse Gandaki river basin in central Nepal that also represents a longitudinal (east-west) barrier to several species. The landscape also extends from the tropical lowlands in the south to the cryosphere and Trans-Himalayan area in the north, connecting Chitwan National Park and Annapurna Conservation Area. The CHAL was originally designed to provide ecological connectivity between these two core areas, but the landscape also includes important but

unprotected remnants of subtropical and temperate forests and their biodiversity that are representative of globally important ecoregions, and harbor a number of endangered species that are of conservation importance and require special conservation attention.

Several large vertebrates, such as the snow leopard and grey wolf in the alpine areas, the Asiatic wild dog, common leopard and black bear in the mid-hills, and tiger and rhinoceros in the Terai require large, intact habitat to accommodate their ecological needs. Conservation of these 'landscape species', especially in fragmented landscapes, will necessitate providing habitat corridors that link subpopulations ecologically, demographically, and genetically. A suite of birds use the CHAL as a migratory corridor. Some of these species are altitudinal migrants that move vertically in the Himalaya, while some use the deep Kali Gandaki gorge as a flyway to migrate to and from the Tibetan plateau. A number of fishes migrate along the network of rivers to spawn; a notable species being the golden mahseer (Tor putitora). Climate change projections indicate that northward and upslope migrations are likely in the future, and these projections are reinforced by limited field observations in the Himalaya and other mountainous regions across the world. Therefore, landscape-scale corridor delineations should include climate corridors to facilitate such range shifts. In addition, some areas (e.g. north-facing slopes and deep river valleys) are likely to be more resilient to climate change. These refugia should be identified and given special conservation attention.

There are several species endemic to the Himalayas that inhabit the CHAL. Many of these are habitat specialists and have restricted ranges. These species require special conservation attention. Their loss from CHAL would mean that they have lost another fast-disappearing stronghold within their limited range.

Habitat specialists such as the charismatic red panda; musk deer; birds that depend on specific habitat structures (e.g., vultures, hornbills that require large trees in which to nest, and pheasants that require undergrowth as cover); butterflies that depend on specific host plants; fishes that live in riffle habitats with well-oxygenated water; and orchids and ferns that have narrow moisture and temperature thresholds, require special conservation attention to ensure that their habitats are protected and other threats reduced. These species have narrow ecological niches. Loss or degradation of habitat could cause local extinctions. Several of these species make excellent indicators of climate change because of their sensitivity to ecological change.

The people of the CHAL have traditionally used several native cultivars or varieties of crops for agriculture. These species are adapted to local conditions and are, in general, more resistant to pests and diseases. However, market forces have encouraged people to adopt hybrids that are usually more productive, but less resistant to diseases and pests. Cultivating these species require more chemicals that pollute and poison the environment, especially rivers and wetlands, where they may bio-accumulate.

Targets for conservation of species of special concern by 2025 are to:

- Maintain lateral ecological and demographic connectivity of the snow leopard and Tibetan wolf populations in the CHAL by maintaining habitat links between adjacent alpine areas.
- Protect the populations of red panda, musk deer and wild dog in the mid-hills of the CHAL.
- Develop and implement climate–smart conservation action plans for endemic, threatened and rare plants *(Meconopsis regia, Saussurea kanaii, Michelia champaca, Magnolia globosa, Podophyllum hexandrum, Larix himalaica and Aconitum heterophyllum)* and animal species.
- Implement proactive measures to mitigate human-wildlife conflict.
- Control poaching and illegal trade of animals and plants.
- Maintain north-south 'climate-smart' ecological linkages and corridors for migratory species of animals, including mammals, birds, fishes and butterflies; identify and conserve key climate refugia.
- Develop and implement climate-smart ex-situ and in-situ conservation action plans for high value MAPs and NTFPs, including panchaunle *(Dactylorhiza hatagirea)*, kutki *(Picrorhiza kurroa)* and jatamasi *(Nardostachys jatamansi)*.
- Develop sustainable fisheries based on indigenous species to promote fish conservation.
- Mainstream indigenous and traditional crop varieties and livestock breeds in agriculture practices.
- Conserve important biodiversity areas in the landscape.

Strategy 3.1. Strengthening mechanisms that link protected areas (PAs) and biodiversity rich forest areas outside PAs, enhancing wildlife health management, reduction in human-wildlife conflict, community stewardship, and the national anti-poaching/illegal trade control strategy for better coordination to address poaching and illegal trade

- Prevent poaching of wildlife and illegal extraction of plants through stronger protection and smart patrolling.
- Reduce human-wildlife conflict through enhanced protection of people and property, and more effective compensation schemes.
- Engage community and civil society in stewardship and protection across the landscape through livelihood incentives, awareness programs, and self-regulatory mechanisms.
- Strengthen capacity of GoN staff, community members and civil society on protection and monitoring techniques.
- Establish an effective coordination system among all concerned stakeholders, including transboundary coordination with China and India.
- Strengthen and coordinate with the Police and Central Investigation Bureau (CIB), Customs, and Wildlife Crime Control Bureau (WCCB) cells to implement the National Strategy on Illegal Wildlife Trade and Poaching Control for Nepal (2012-22).

Strategy 3.2. Development of climate-smart management plans for protected areas, buffer zones, corridors, protection forests, sub-basins and critical watersheds to guide conservation management

- Update existing management plans for PAs, buffer zones (BZs), corridors, critical watersheds to include climate change impacts and adaptation and habitat restoration; and prepare new management plans for those areas that lack them, using the CHAL strategic plan as a guiding document.
- Strengthen capacity of relevant government agencies and civil society stewards to manage PAs, BZs, protection forests, corridors, sub-basins and critical watersheds by providing necessary infrastructure, training, and human resources.

Strategy 3.3. Enhancing conservation of habitat linkages and corridors for ecological connectivity necessary for threatened, endangered and migratory species

- Adopt ecosystem approach to water allocation in integrated river basin planning and water resources development and management, using the river basin and sub-basins as the units of management.
- Inventory the ecosystem goods and services from each of the four groups of ecosystems in the CHAL and prioritize them for conservation.
- Identify and protect the terrestrial and aquatic corridors that are critical for sustaining priority ecosystem goods and services.
- Connect core areas that harbor viable breeding populations of focal species with habitat corridors to allow dispersal and migration through spatial planning.
- Manage corridors to prevent habitat loss, degradation and fragmentation from encroachment and invasive alien species. Restore critical corridor bottlenecks where necessary.
- Identify climate corridors for species to 'migrate' or shift into suitable areas as climate change advances, and secure these areas. Integrate these climate corridors into the landscape spatial plan.
- Maintain lateral habitat connectivity with habitat and core areas outside the CHAL for landscape species that range outside CHAL boundaries (e.g., snow leopard, Himalayan wolf).
- Create awareness among communities, industry, and government of the importance and need for corridor conservation.
- Coordinate actions within government institutions to mainstream conservation and connectivity into development plans.

Strategy 3.4. Conservation of critical habitats for endemic species and habitat specialists

- Identify and prioritize critical terrestrial and aquatic habitats, and prioritize and locate endemic and endangered species on the verge of extinction (at sub-basin level).
- Identify critical climate-resilient habitats for endemic and habitat specialist species (aquatic and terrestrial) and secure them for conservation.
- Monitor populations, including spatial shifts due to climate change.
- Promote research to understand species biology/ ecology for better management.

- Carry out research to develop a wide range of options for natural ecosystems, anthropogenic systems and for reconciliation between them (at sub-basin level).

Strategy 3.5. Management of plant species with NTFP/MAP value

- Promote sustainable harvest of NTFPs/MAPs through community-regulated sustainable harvesting practices reinforced by regulations and monitoring.
- Strengthen cross-border collaboration to prevent illegal trade.
- Facilitate ex-situ conservation of selected species as identified and approved by the government.
- Document traditional knowledge on NTFPs/MAPs.

Strategy 3.6. Conservation of native fish species, indigenous and traditional crop varieties and livestock

- Identify and document native fish species, traditional crops and livestock races, and management practices.
- Protect and conserve native fish in the CHAL river system.
- Promote cultivation of traditional crops and livestock rearing using organic approaches, and develop value-added niche markets for these crops and products.
- Zone agricultural areas to create a forest-farmland matrix with refuge habitats for pollinators and indigenous bio-control agents, and as sources for organic fertilizers to increase crop productivity and reduce dependency on pesticides and artificial fertilizers.

3.5.4. Strategies for socio-economic prosperity

The CHAL is culturally rich. It is home to over 4 million people representing about 30 different ethnic groups. Over the past decade or more, the mountainous and hilly districts have witnessed a negative population growth rate as people have migrated to the lowlands or for foreign employment. This social shift has consequences on the social and financial capital of the CHAL, and resource use and governance. Thus, interventions to improve the social and financial capital of the landscape by addressing both threats and opportunities presented through these dynamics are needed.

Interventions will also strive to reduce natural disaster risks to the communities, especially since climate change is widely expected to increase the risks. The predominance of women and children in mountain communities in the workforce, in open vulnerable areas, place these groups at greater risk, but also offer them opportunities.

Preservation of the unique cultures and associated rituals is important to maintain the social fabric of the CHAL communities. Their beliefs and practices have evolved over centuries and have strengthened community bonds.

Targets for ensuring socio-economic prosperity for 2025 are to:

- Promote disaster recovery and reconstruction including after the 2015 earthquake, building back better, safer and greener.
- Enhance the socio-economic well-being and achieve prosperity of CHAL communities through sustainable use of natural resources.
- Achieve sustainable, climate-smart economic development that is harmonious with conservation of biodiversity and essential ecosystem services.
- Reduce disaster risk and improve disaster preparedness among communities.

Strategy 4.1. Promotion of innovative and traditional livelihood opportunities based on sustainable resource use, tourism, and green enterprises for economic prosperity, equality and social justice

- Promote and diversify green enterprises (e.g., nature- and adventure-based tourism, value addition to natural and forest-based products) to enhance economic prosperity.
- Promote commercialization of agriculture/livestock and niche products through value addition.
- Develop storage and marketing infrastructure for agriculture products.
- Provide necessary access to resources for local communities and stakeholders, and opportunities for training, skill development, and new knowledge transfer.
- Develop PES mechanisms, and equitable benefit sharing opportunities from genetic resources, and CDM/ REDD+.
- Promote engagement of private sector in entrepreneurship development and scale up credit schemes for small and medium sized enterprise start-ups.
- Promote sustainable fisheries (in-situ and ex-situ).
- Mainstream gender equality and social inclusion, and good governance.

Strategy 4.2. Reducing climate change and disaster risk

- Develop and implement holistic disaster risk reduction and disaster preparedness plans.

- Identify and prioritize low cost soil conservation treatment along with ecological disaster risk reduction solutions for sustainability.
- Build awareness on climate change and expected or possible consequences, with options for adaptation and resilience building.
- Address health and disease issues, especially after disasters, extreme weather events and climate change, with contingencies and emergency response procedures.
- Develop early warning systems for disasters such as floods (including GLOFs/landslide dam outburst floods (LDOFs), uncontrolled fires and landslides.
- Integrate LAPAs/CAPAs in basin-scale vulnerability assessments.
- Monitor climate change impacts focusing on forests, freshwater systems, biodiversity, and human systems, and the linkages among them.
- Support implementation of DRR plans and LAPA/CAPAs.

Strategy 4.3. Protection and restoration of important cultural and religious heritage

- Conserve, and restore where possible or necessary, cultural and religious heritage and heritage sites.
- Preserve the multi-ethnic cultural identities of people in CHAL.

3.6. Enabling conditions and cross-cutting themes

3.6.1. Policy and governance

- Manage water resources in an integrated manner at river basin and sub-basin scales; adopt ecosystem approach to allocate water for environmental flows in river basin planning and development.
- Implement Land Use Policy effectively and efficiently.
- Formulate policies to address emerging issues related to climate change and disaster risk mitigation.
- Facilitate landscape-scale resource management, and land and resource governance, especially with respect to decentralization and the new roles and needs of provinces.
- Strengthen good, transparent and accountable governance principles and practices among stakeholders.
- Strengthen Biodiversity and Environment Division with coordination committee at the central level and multi-sectoral representation.
- Support and strengthen capacity of institutions to enforce regulatory measures at all levels, including local organizations and communities at local level.
- Support policy development to enhance private sector engagement in landscape conservation and development.
- Strengthen transboundary cooperation and collaboration with China and India.

3.6.2. Institutional arrangements for integrated river basin planning and management

- Create and institutionalize integrated river basin management (IRBM) mechanisms for Gandaki river basin and each sub-basin.
- Build capacity of these institutions and related stakeholders for IRBM in each basin/sub-basin.

3.6.3. Gender equality and social inclusion

- Strengthen engagement and roles of women, poor and marginalized communities in landscape conservation and development at all levels.
- Facilitate and support participation of women, marginalized and socially excluded people in leadership roles in resource governance.
- Initiate targeted activities to strengthen economic status of women and marginalized groups.
- Reduce gender-based and other discrimination related to natural resource management and promote equitable benefit sharing.
- Mainstream and implement GESI provisions on policies and guidelines.

3.6.4. Climate change

- Conduct awareness programs on the potential risks from disasters due to ecosystem degradation and climate change at national and local levels.
- Integrate basin-scale and smaller scale climate adaptation plans into relevant socio-ecological interventions and development plans (several of these are already listed as activities in the four major thematic areas).
- Develop protocol for long-term monitoring of climate change impacts on socio-ecological systems.

3.6.5. Multi-stakeholder capacity strengthening

- Train GoN staff on landscape-scale climate adaptation and conservation through higher education, exposure visits, and participation in meetings, seminars and workshops.
- Provide training opportunities, landscape-wide seminars and workshops, and study tours to local community groups engaged as conservation stewards (e.g., CFUGs, BZUCs, CAMCs, water management committees, community based organizations (CBOs), NGO partners) to increase knowledge, awareness, and analytical capacity, especially for adaptive management to cope with and respond to climate change and disasters.
- Provide technological support for capacity strengthening of stakeholders.

3.6.6. Infrastructure

- Develop and promote engineering designs for infrastructure that do not disrupt ecological processes and services, that continue to provide desired environmental flows, and that do not cause disasters (e.g. earth slips, landslides, floods).
- Ensure all large-scale and complex development projects are based on strategic environmental assessments (SEAs), with communication and collaboration among different stakeholders involved in related infrastructure (e.g. hydropower operators in a basin or sub-basin).
- Ensure investment for mitigation and management plans and programs as recommended in IEE and EIA reports.
- Develop climate-smart and disaster-resilient designs for planned infrastructure and retro-fit existing infrastructure where feasible.
- Review vulnerabilities of existing major infrastructure to disasters, including climate change induced disasters, and develop plans to increase resilience where possible.

3.6.7. Knowledge management and communication

- Carry out research to find ways for in situ or ex situ conservation, and promote through community participation.
- Study and identify ways to reduce pressure on biodiversity, natural populations and habitats through reconciliation with agro-ecosystems for sustainable ecosystem services.
- Undertake genetic mapping and bio-prospecting of endemic biodiversity including forest and agriculture species.
- Document best practices, approaches and strategies traditionally adopted for conservation, management and development of natural resources, biodiversity and agro-biodiversity.
- Conduct research and monitoring of key species of fauna and flora, environmental flows for management, and of relevant socio-economic issues.
- Study potential adverse impacts of climate change and infrastructure on ecological and human communities.
- Undertake studies on land use/land cover and functions of corridors.
- Document and protect traditional knowledge and practices on biodiversity resources.
- Support establishment of landscape level knowledge management center and improve information sharing and dissemination mechanisms.
- Support presentations and publications in scientific and technical forums.
- Continue education and awareness programs in schools and eco-clubs. Recruit alumni as future educators.

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- Engage eco-clubs and members as citizen scientists, and network them for landscape-scale perspectives through seminars, meetings, and exchange visits.
- Engage communities in ecosystem and landscape level conservation initiatives through hands-on practices, exposure visits, workshops, and interactive meetings.

3.6.8. Sustainable financing

- Support the valuation of ecosystem services including REDD+ and other non-carbon credit benefits.
- Promote private sector engagement in landscape conservation and development.
- Mainstream government investments in landscape conservation and development.
- Explore and develop innovative funding opportunities.

3.7. Expected outcomes

Outcome 1. Biodiversity in the CHAL conserved

This outcome results from the focus on protection and management of biodiversity hotspots and core areas; conservation and recovery of key species populations; and maintaining ecological connectivity, functions and services. Conserved biodiversity will include species populations and communities, and genetic variations, especially of plants and agro-biodiversity. Representative ecosystems of the CHAL will be conserved, along with ecological linkages that maintain ecosystem dynamics, functions, and their services. The upstream-downstream linkages associated with hydrological flows will be especially important, along with migration. Conservation efforts will be focused within and outside protected areas under the landscape/basin scale approach. The Strategy will also take into account climate change impacts, and incorporate adaptation plans that seek to conserve and manage old-growth and undisturbed forests, restore degraded forests on strategic slopes to stabilize them, create climate corridors, and proactively facilitate climate-related change.

Outcome 2. Social and cultural well-being and economic prosperity of local communities are enhanced, especially among women and disadvantaged groups

People have caused extensive conversion of natural ecosystems in the CHAL area, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. These agricultural and animal husbandry practices, along with the more recent socio-economic opportunities from tourism, remittances from foreign employment, and large infrastructure development have improved the well-being of people. However, emerging changes, such as outmigration of people from rural areas and feminization

of agriculture, is creating changes in the socio-economic fabric of society, and these changes must be incorporated into the CHAL Strategy to ensure continued improvement to enhance prosperity.

The Strategy also entails addressing drivers of over-exploitation that can degrade natural ecosystems and resources beyond thresholds of sustainability and recovery. Climate change can change these thresholds; thus, the impacts of climate change will also have to be factored and integrated into the strategies, especially since the region's economic growth has been highly dependent on natural resources, including niche forest products (both timber and non-timber) and water. This outcome will be achieved by empowering local communities to manage their natural resources sustainably, promoting sustained enterprises, and good governance practices. Improved natural resource-based, on-farm and off-farm livelihoods, including culture-based hospitality, are some of the proposed strategies. The private sector will be engaged in green enterprise development, value addition locally, networking, and marketing of products. In addition, communities will be encouraged to engage in regional trade along the green corridor in the CHAL region across the border with China.

Outcome 3. Good governance is practiced and contributes to strong inter-sectoral coordination with meaningful gender and social inclusion and strong multi-stakeholder capacities

Good governance will be achieved by: strengthening and developing capacity of stakeholders; implementing a river basin approach to integrated land, water and natural resources development and management; restructuring community-based and decentralized organizations for better alignment with the changed political and administrative structures; strong inter-sectoral coordination mechanisms; training and awareness programs; supporting policy; and empowering and meaningfully engaging women and marginalized groups.

Outcome 4. Risks and vulnerabilities to climate change, natural disasters, human induced activities, and infrastructure development are reduced

Climate change is expected to act in synergy with and accelerate other ecosystem degradation processes. While it is imperative to effectively implement development programs in the landscape, key challenges include balancing conservation with development for better land and natural resource management that can sustain biodiversity, people and their livelihoods, and development. Failure to do so can lead to increased ecosystem degradation, and intense and frequent disasters. Thus, strategies to mitigate risks and reduce vulnerabilities will include conservation and land restoration in strategic areas, incorporation and promotion of indigenous knowledge and sustainable natural resource practices, conservation of traditional genetic resources, strengthening customary institutions, incorporating climate change mitigation, climate resilience building and adaptation, developing a functional network of institutions related to conservation and development, 'green' engineering designs, and appropriate operation and maintenance of infrastructure, sound EIA and IEE practices, and disaster risk reduction.

Outcome 5. Long-term socio-ecological and environmental monitoring, knowledge management, and communication systems are established and functioning

Scientific information exists on natural resources, crop production, water resources, timber and non-timber products in Nepal. However, relatively little is known about the actual socio-ecological and long-term comparative environmental conditions, in particular from the mountain regions. This outcome will be achieved by establishing and strengthening long-term monitoring of climate change, socio-ecological and environmental processes at national and sub-national levels; and strengthening two-way knowledge management, information sharing and dissemination mechanisms.

Outcome 6. Innovative sustainable financing mechanisms including public-private partnerships are developed and institutionalized

Innovative financing mechanisms play a key role in bridging the gap in the development process, besides government's regular funding commitment. This includes a range of non-traditional mechanisms to raise additional funds for development. The innovative mechanisms in the CHAL includes revenues and taxes from several opportunities through PES, including REDD+, ecotourism, wildlife premiums, and payments for ecosystem services in the water catchments of sub-river basins. Innovative sustainable financing mechanisms, including public-private partnerships, will be developed and institutionalized.

Table 3.1: Vision, Goal and thematic areas

Vision: Biodiversity thrives and human communities prosper in co-existence through integrated, climate-smart conservation and development in the Chitwan-Annapurna Landscape in Nepal.

Strategic goal: The Chitwan-Annapurna Landscape is managed through an integrated, river basin planning approach which is built on the foundation of climate-smart conservation and sustainable development practices to promote persistence of biodiversity, and sustainable management of natural resources for continued provision of ecosystem goods and services that support equitable and inclusive socio-economic prosperity.

Thematic area 1: Ecosystem services and ecological processes

Strategy 1.1: Promotion of integrated water use and management through river basin and sub-basin scale plans that balance multiple uses of water, including hydropower generation for sustainable economic development and desired environmental flows and services

Strategy 1.2: Promotion of watershed conservation for healthy ecosystem services

Strategy 1.3: Promotion of forest conservation and restoration of degraded areas for sustaining ecosystem services including carbon sequestration

Thematic area 2: Forests and other land uses

Strategy 2.1: Securing forests and other terrestrial natural ecosystems (grasslands and rangelands) in ecologically sensitive areas for conservation and sustainable management

Strategy 2.2: Ensuring conservation and sustainable use of aquatic ecosystems to provide desired environmental flows

Strategy 2.3: Promotion of sustainable farming and pastoralism, including traditional and evolved pastoral and agricultural practices, for better land and water management

Strategy 2.4: Managing and planning built-up area development to minimize impacts on natural and agricultural areas, and aquatic systems

Thematic area 3: Species of special concern

Strategy 3.1: Strengthening mechanisms that link protected areas (PAs) and biodiversity rich forest areas outside PAs, enhancing wildlife health management, reduction in human-wildlife conflict, community stewardship, and the national anti-poaching/illegal trade control strategy for better coordination to address poaching and illegal trade

Strategy 3.2: Development of climate smart management plans for protected areas buffer zones, corridors, protection forests, and critical watersheds to guide conservation management

Strategy 3.3: Enhancing conservation and maintenance of habitat linkages and corridors for ecological connectivity necessary for threatened, endangered and migratory species

Strategy 3.4: Conservation of critical habitats for endemic species and habitat specialists

Strategy 3.5: Management of plant species of NTFP/MAPs values

Strategy 3.6: Conservation of indigenous and traditional crop varieties and livestock

Thematic area 4: Socio-economic prosperity

Strategy 4.1: Promotion of both innovative and traditional livelihood opportunities based on sustainable resource use, tourism, and green enterprises for economic prosperity, equity and social justice

Strategy 4.2: Reducing climate change and natural disaster risks

Strategy 4.3: Protection and restoration of important cultural and religious heritage

Cross cutting thematic areas: Policy and governance; institutional arrangement for integrated river basin planning management; gender equality and social inclusion; climate change; multi-stakeholder capacity strengthening; infrastructure; knowledge management and communication; sustainable financing.

Chapter

IV Financial Plan

The financial resources required to secure major funding will be sourced from the following:

Government support: The government will be the main source of funding. The government provides regular budgetary support to line agencies for development expenditure and administrative costs, including salaries. The development expenditure related to conservation and development will be mobilized in an integrated way for implementation of various programmatic activities proposed in the Action Plan.

Locally generated revenues: These revenues will be mainly generated from the forestry sector and tourism. Funds from forestry come from sale of forest products including sustainable extraction of timber through community managed forests, and NTFPs. Revenues are also generated by local government (DDCs and VDCs); by DFOs (DDCs receive 10% of this revenue); and from the sale of sand, gravel, stones, and boulders extracted from authorized sites. Tourist entry fees from protected areas will also contribute to conservation and development.

External assistance: An important role will be played by development partners and conservation donors who provide external assistance to implement the CHAL strategic plan. These will include grants and loans from multilateral and bilateral organizations; contributions from international and national NGOs, CBOs, private sector and individuals; and externally funded projects that operate in the districts.

Innovative financing approaches: Innovative revenue generating approaches based on natural capital will be developed to augment sustainable financing of conservation and development activities. These will include REDD+ and PES schemes, linked to watershed conservation and river basin services. Another promising innovative financing approach will be sharing benefits from generation of hydropower electricity.

Considerable investment is required to move towards achieving the CHAL Vision. The estimated budget to implement the CHAL Strategy and Action Plan 2016-2025 is NRs 35,902 million. The summary budget for the major themes and crosscutting themes is given below, in NRs and US dollars (USD) (Table 4.1).

Table 4.1: Estimated budget for major themes and cross cutting themes

Themes	Million NRs	Million USD[5]
Major themes		
Ecosystem services and ecological processes	13,494	134.94
Forests, grasslands and rangelands, aquatic systems, agriculture areas, and built-up areas	11,171	111.71
Species of special concern	7,346.5	73.47
Socio-economic prosperity	1,923	19.23
Cross-cutting themes		
Policy and governance	681	6.81
Institutional arrangement for integrated river basin planning and management	48	0.48
Gender equity and social inclusion	134	1.34
Climate change	118	1.18
Multi-stakeholder capacity strengthening	405	4.05
Infrastructure	36.5	0.36
Knowledge management and communication	477.5	4.78
Sustainable financing	67.5	0.67
Total	**35,902**	**359.02**

Lessons learned from Strategy and Action Plan development in the Terai Arc Landscape and current investments there indicate that it is likely that about one third of the estimated budget will be available. Therefore, additional fund-raising will be required to implement many of the activities to achieve all conservation targets included in this CHAL plan. An annual stock-taking of priority interventions should be made using the Action Plan as a guide, and funds should be raised for these activities. A logical framework is provided in Annex XI.

The Biodiversity and Environment Division of MoFSC will take a lead role in prioritizing and formulating projects and programs in collaboration with the relevant line agencies and target groups. External fundraising will be undertaken by identifying strategic donors, taking into account their respective mandates, areas of interest, and previous commitments and contributions to conservation in the CHAL.

5 Assuming an exchange rate of NRs 100 = USD 1

Chapter

V

Implementation Mechanism

5.1. Coordination and implementation arrangements

A coordination and implementation management arrangement (Figure 5.1) is proposed to ensure full and effective implementation and monitoring of the CHAL ten-year Strategy and Action Plan. The activities under the Action Plan will be implemented by government and partners at different levels. Both implementers and beneficiaries will have a clear understanding of the links between site-level activities and the landscape as a whole.

Activities under the CHAL Action Plan will be implemented through the existing institutional framework of the local, provincial, and central government. The proposed framework will ensure better landscape-wide linkages and coordination among inter-sectoral agencies to: a) prevent conflicts in land and other resource use and allocation; and b) ensure coordinated focus of funds and projects on a priority basis. These arrangements should be reviewed in light of the recently promulgated Constitution and provincial boundaries, as there will be major implications for CHAL coordination.

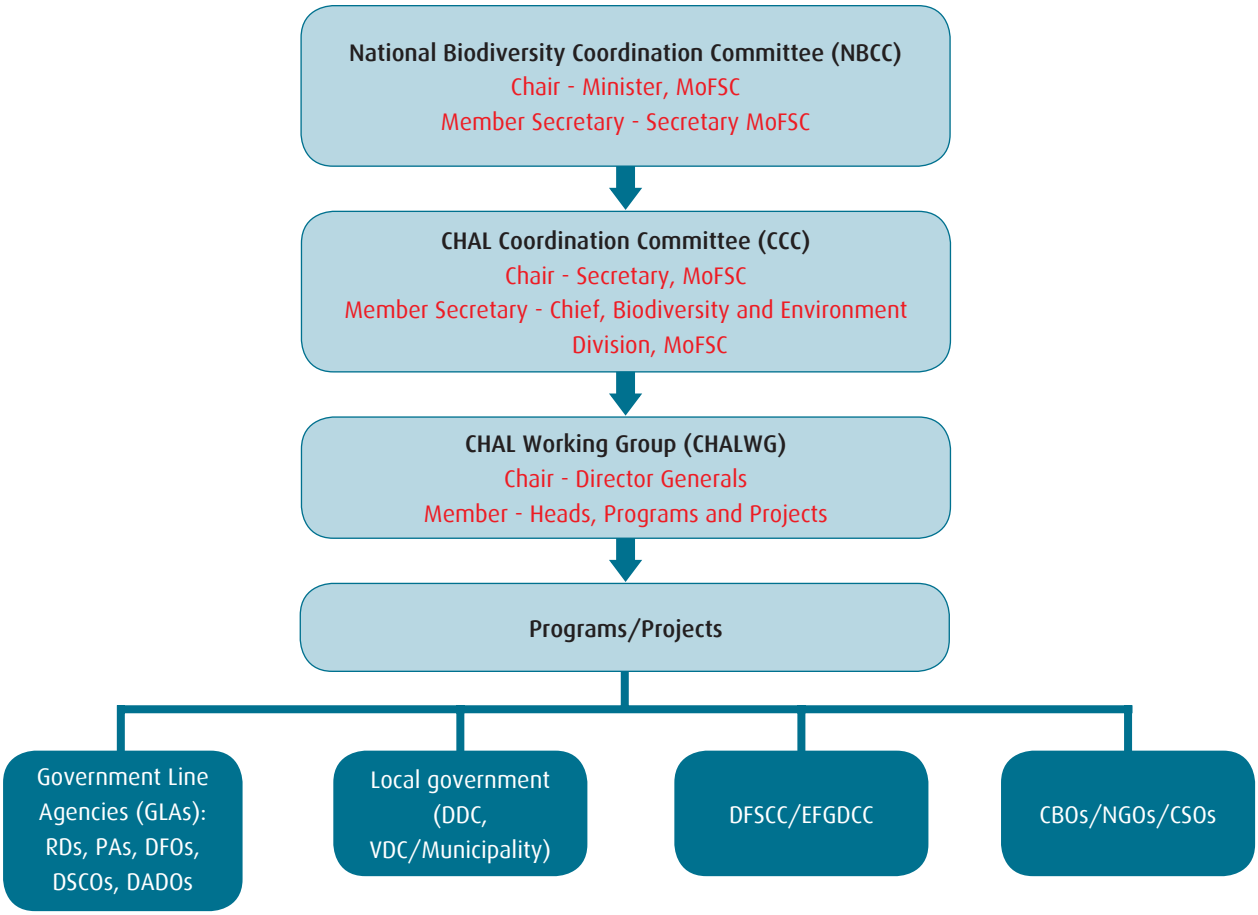

Figure 5.1: Coordination and implementation mechanism

Since conservation in the CHAL will involve multiple partners with different working modes and interests, and the Action Plan will be implemented in a changing political and institutional environment, a flexible framework is needed that permits adaptive management. The various institutions that will be involved in the CHAL management structure are described in the following sections. The actors and their major roles in the implementation plan are presented in Tables 5.1 and 5.2. However, the roles of different government institutions will be changed when the new federal structures come into effect.

5.1.1. National Biodiversity Coordination Committee

The National Biodiversity Coordination Committee (NBCC) is the main institutional entity responsible for coordination and monitoring of biodiversity related programs at the national level. The NBCC is a 27-member body chaired by the Minister of Forests and Soil Conservation, and with representation of government, academic sector, independent experts and NGOs (Table 5.3). This body will oversee and provide policy directives at the landscape level.

Table 5.1: Actors and their main roles in Action Plan implementation

Actors	Major roles
Central government	Steering program implementation, facilitation, coordination and monitoring of program implementation, creating enabling policy
Provincial government	Steering program and facilitating within the province, coordination and monitoring program implementation
Local government bodies	Coordination, partnership development, financial support, creating enabling policy, joint planning
Development partners	Financial assistance, technology development and transfer, capacity building, knowledge dissemination
Academic institutions	Research and development, monitoring, strengthening collaboration
Private sector	Entrepreneurship development, business linkages, partnership development, conservation finance
Community institutions, local NGOs and user groups	Management implementation, partnership and resource leverage, advocating local needs (direct beneficiaries)

Table 5.2: Roles of different government institutions

Level	Type of institution	Institutions	Major roles
Central	Ministries, departments	MoFSC, MoAD, Ministry of Livestock Development, Ministry of Federal Affairs and Local Development (MoFALD), Ministry of Irrigation, Ministry of Energy, Ministry of Industry, WECS, relevant departments	Ensuring enabling policy, leading the program, priority setting, budget allocation
Regional	Regional directorates	Regional Forest Directorate, Regional Agricultural Directorate, Regional Irrigation Directorate, etc.	Coordinating district level activities, monitoring and guidance
District	Line agencies	DFO, District Soil Conservation Office (DSCO), DADO, PA offices, Irrigation Division and sub-division offices, district Cottage and Small Industry Office, etc.	Planning, implementation, mobilization of partners from the communities, NGOs, private sectors and other agencies
VDC/village, municipality	Community	VDCs, municipalities, government service centers (health, agriculture, veterinary, etc.)	Identification and development of critical social and physical infrastructures at the local level, coordinate, consolidate local level needs

Table 5.3: 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, Tribhuwan 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.*

5.1.2. CHAL Coordination Committee

A multi-sectoral, high-level CHAL Coordination Committee (CCC) will function as the convergence point for landscape level coordination in the Ministry. This will be a standing committee with representatives from all major partners working in the landscape. It will be responsible for examining the linkages and contributions of individual projects or programs towards realizing the landscape vision.

In addition to the Hydropower Master Plan for the country, the Water and Energy Commission is preparing an Integrated River Basin Management Plan for each of the major river basins in Nepal including the Gandaki river basin. These plans will be prepared during the next three years. River Basin Management Plans will establish water allocation principles and allocate water for different users/ sectors by considering their needs. Environmental flow is an important water use in a river basin and sub-basins. Hence, the CCC should represent the environmental water use sector during the basin plan preparation, claiming a stake and establishing the environmental flow requirements based on an ecosystem approach for the Gandaki Basin plan and its sub-basin plans.

WECS, being the apex body for the water and energy sectors in Nepal, is mandated to manage the development of water resources in the country. In order to implement the river basin plans, it is likely that a river basin organization will be established for each of the nine major basins in Nepal. Since CHAL is in the Gandaki basin, the CCC must be an important stakeholder in the Gandaki river basin organization, and should monitor the implementation of the river basin management plan very closely.

The CCC will represent all stakeholders including WECS. To make it functional and manageable, the composition of the committee is proposed as shown in Table 5.4. The following roles have been identified:

- The Secretary, MoFSC, will chair this committee to make sure that its main role of coordination is achieved by mainstreaming with government programs and priorities.
- Chief, Biodiversity and Environment Division, MoFSC will serve as the committee's Member Secretary.

Other members of the committee will comprise representatives from relevant ministries, donors, implementing organizations, NGOs and the private sector.

The responsibilities of CCC will be to:

- Provide strategic direction to the programs implemented in the CHAL
- Identify priority areas and take decisions related to integrated landscape management issues, including the implementation of the river basin plan for the Gandaki River Basin
- Assess proposals for new policies, and facilitate their development
- Ensure stakeholder coordination
- Strategically involve new and prospective donors and partners interested in supporting landscape activities
- Communicate and market the landscape Vision
- Provide guidance to sectoral ministries and DDCs for integrated landscape planning and program implementation
- Approve programs and budget
- Review and monitor the work of landscape working groups including DFSCC

Table 5.4: Proposed composition of CHAL Coordination Committee

Representation	No of people	Position	Remarks
Secretary, MoFSC	1	Chairperson	
Chief, Planning Division, MoFSC	1	Member	
Government agencies	8	Members (Joint Secretary level)	National Planning Commission, MoAD, MoFALD, Water and Energy Commission (in lieu of Gandaki River Basin Organization), Division Heads and Regional Directors (RDs) of MoFSC
Department heads	4	Members	Department of Forests (DOF), Department of National Parks and Wildlife Conservation (DNPWC), DOA, Department of Soil Conservation and Watershed Management (DSCWM), Department of Irrigation, Department of Electricity Development
Donors	3	Members	Representatives
INGOs/national NGOs	3	Members	Representatives
Representatives from Networks/forums and private sector	2	Members	As nominated by MoFSC
Other stakeholders	1	Member	One institution from CHAL to be nominated by MoFSC
Chief, Biodiversity and Environment Division, MoFSC	1	Member Secretary	Biodiversity and Environment Division, MoFSC

5.1.3. CHAL Working Group

The CHAL working group (CHALWG) will function as the main coordinating body. Director Generals of the relevant Departments will act as co-chairs, and the heads of programs and projects in the implementing organizations will serve as members. The CHALWG will designate the member secretary as and when needed.

Responsibilities of CHALWG

- Coordinate programs/projects implemented in CHAL
- Facilitate implementation of programs/projects
- Provide relevant information to Landscape Coordination Committee in a timely manner so it can make informed decisions
- Facilitate coordination among CHAL partners from within government and outside
- Communicate regularly with all CHAL based programs/projects to share directives/decisions of Landscape Coordination Committee, and monitor to ensure that the directives are being followed
- Promote regular dissemination of information and engage in dialogue on GON policies relevant to CHAL and its programs/projects
- Carry out joint monitoring of programs/projects

5.1.4. Local level coordination

At district level, the DFSCC and Environment Friendly Governance District Coordination Committee (EFGDCC), as multi-stakeholder forums, will carry out collaborative landscape planning. At local level the Environment Friendly Local Governance Municipal Coordination Committees (EFLGMCCs) and Environment Friendly Local Governance Village Coordination Committees (EFLGVCCs) will coordinate the overall planning and implementation of the Action Plan. Formation of EFGDCCs, EFLGMCCs and EFLGVCCs will be based on the framework for Local Biodiversity Strategy and Action Plans.

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Chapter

VI Monitoring, Evaluation and Knowledge Management

6.1. Monitoring

Many activities under the CHAL Action Plan will be implemented across the landscape by local government agencies and a range of partners. It is therefore imperative that the impacts of the projects and activities at site level are monitored through a landscape-scale lens to ensure that the activities complement each other and produce a synergetic effect towards realizing the Vision of CHAL. Monitoring compliance for the environmental flow requirements as agreed in the river basin and sub-basin management plans is one important task.

Two types of monitoring mechanisms are identified for the monitoring of the projects and activities under the Strategic Plan. These are:

- Mechanism to monitor activities/outputs
- Mechanism to monitor outcomes and impacts

For each of these mechanisms, responsibilities and indicators are as follows:

Activity/output monitoring: The activities identified in annual plans will be monitored by the respective implementing agencies. These agencies include community based organizations, district government line agencies (DFOs, park offices, DSCOs, DADOs), international and national NGOs, and other service providers. Activity and output monitoring will be through field observation and assessment of the implementation process. The baselines against which the monitoring will be made are annual plans. One of the important aspects of activity/output monitoring is monitoring implementation processes. Client satisfaction will be another fundamental dimension. An indicative checklist of actions to be taken during monitoring is presented in Table 6.1. A standard monitoring format will be developed for monitoring activities. Each implementing agency, program or project will adjust the format to suit its individual requirements.

Outcome and impact monitoring: Outcome and impact monitoring is done at a higher level. The CHAL log frame

Table 6.1: Checklist of actions to be taken during the activity/output, outcome and impact monitoring

Rationale	Activity/output monitoring	Outcome and impact monitoring
Baseline to compare	Baseline survey and annual plan of operation (activities, financial benchmarks)	Outcome and impact indicators from CHAL log frame
When to do	During the implementation or immediately after implementation of the activities (annually, or more often)	After the implementation of activities
Measurement parameters	The process of implementation of the activities ■ Adherence to technical and social standards ■ Time, funds, material and other resources involved	Indicators in log frame ■ Adherence to technical and social standards (process)
Recommendations	■ Corrective measures for the following years ■ Corrective measures for the remaining period of the year ■ Results for action learning ■ Resource optimization	■ Reinvention or continuation of the ongoing process ■ Results for action ■ Learning ■ Resource optimization
Process	■ Field observation ■ Measurement of performance ■ Assessment of the process ■ Interviews with beneficiaries ■ Photography (dated)	■ Field observation ■ Measurement of outcomes and impacts ■ Interviews with key beneficiaries ■ Assessment and analysis
Responsibility	Agency for implementation ■ District line agencies ■ Regional Directorate Office (occasionally) ■ Service providers	■ Regional Directorate Office (generally) ■ Central level agencies (Monitoring and Evaluation Division of MoFSC and departments) ■ Joint effort across donors, implementers ■ Service providers ■ Biodiversity and Environment Division
Where the information will be communicated and utilized	■ Annual report ■ Annual planning process ■ Output level monitoring team ■ Line agencies across the landscape ■ Database	Annual report (projects/ departments) ■ Project planning and adaptive management ■ Project log frame ■ Fund raising ■ Global forums (network, commitment) ■ Management of information system

will be the basis for monitoring outcomes and impacts under the CHAL Action Plan. Field assessments will be made for indicators to the extent possible.

Monitoring logic: The entire CHAL program will be managed according to the principle of adaptive management. Therefore, action learning, best practices, and successes and failures will be documented. These lessons will be incorporated into the adaptive management process. The highest degree of transparency will be maintained through joint monitoring of the activities and outputs across the program. Work plans and implementation plans will constitute an integral part of program implementation. The results of the monitoring will be made available to all the development partners so that they can all learn from the implementation of the CHAL programs, adopt proven successful approaches, and avoid trying approaches that have already been found unsuccessful.

6.2. Evaluation

It is envisaged that broadly the implementation will be in two phases, each lasting 5 years. The learning from the first five-year phase and emerging issues will be incorporated in the implementation of the second five year phase. The schedule for CHAL implementation evaluation is provided in Table 6.2. The evaluation will be done in the presence of the representatives from civil society to make the interventions more transparent.

6.3. Knowledge management

A database and its management are an essential part of a complex monitoring plan. The CHAL Vision is projected over 50 years, and this CHAL Strategy and Action Plan are for 10 years. If a proper database is not maintained, the learning and experience of the entire implementation process will not be documented properly for eventual assessments and evaluation. In order to keep track of the development of the process over the long period it is necessary that a comprehensive database is established, maintained, and supported.

The Biodiversity and Environment Division of the Ministry will be responsible for information collection, storing and analyzing data, and ensuring that the database is updated and managed. However, at a higher level, a Forestry Sector Management Information System (MIS) Team comprising representatives from the key landscape partners will be formed to streamline and validate the database. The Forestry Sector MIS Team will be formed under the leadership of the Monitoring and Evaluation Division of the Ministry. This team will be a permanent standing body with strong links to the Biodiversity and Environment Division of MoFSC. The major responsibility of the team will be to develop and manage a comprehensive database for the landscape. The team will thus collect, collate and validate CHAL level data.

The Biodiversity and Environment Division will maintain both spatial and other data. Landscape level partners will share their spatial databases with the Biodiversity and Environment Division in order to build the capacity of the unit in the beginning. Similarly, the Biodiversity and Environment Division will also collect and collate spatial and other data from all partners. The Forestry Sector MIS team will validate and verify the integrity of the data.

Data from partners will be shared freely. The Biodiversity and Environment Division will maintain an intranet with access for registered users to share the information among the partners of CHAL. The major objective of the CHAL Intranet will be to provide and obtain feedback in a continuous manner to share and update information.

Table 6.2: Evaluation plan for the CHAL Strategy and Implementation Plan.

SN	What	When	Who
First Phase			
1	Mid-term evaluation	Year 3	Independent team headed by an external (international) facilitator
2	Final evaluation	Year 5	Independent team headed by an external (international) facilitator
Second Phase			
3	Mid-term evaluation	Year 7	Independent team headed by an external (international) facilitator
4	Final evaluation of both phases	Year 11	Independent team headed by an external (international) facilitator

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Action Plan

Actions in the Plan have been prioritized: P1 (high), P2 (medium), and P3 (low), as far as possible by harmonizing with the programs of the GoN, with some exceptions. P1 actions comprise core conservation and development related programs/plans/actions such as: (a) management of critical habitats and protection of species of special concern; (b) social well-being and poverty reduction; (c) community regulated management plans; (d) climate-smart infrastructure development immediately needing post-earthquake, and promotion of green energy; (e) basic and advanced survey, studies and research; and (f) innovative funding. P2 actions are the complimentary activities that are essential/mandatory to successfully accomplish P1 actions, such as: (a) capacity strengthening of stakeholders and awareness; (b) gender and social inclusion; (c) policy formulation; (d) functioning of corridors & connectivity; (e) basin-scale adaptation; and (f) ex-situ conservation. P3 actions are the supporting activities that bring enabling conditions by combining with regular programs of GoN & international/national NGOs, private sectors, etc. such as: (a) awareness raising; (b) pollution & waste management; (c) incentives and benefit sharing; (d) heritage and indigenous knowledge related protection; (e) technology support; and (f) knowledge management. P1 actions will be initiated with highest priority, followed by P2 and P3.

(Rate and Amount in NRs)

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
1	**Ecosystem services and ecological processes**				
1.1	**Promotion of integrated water use and management through river basin and sub-basin scale plans that balance multiple uses of water including hydropower generation for sustainable economic development and desired environmental flows and services**				
P1	Conduct studies to identify and prioritize environmental and ecosystem goods and services	Study	7	2000	14
P1	Conduct environmental flow studies and incorporate into basin and sub-basin scale water management plan	Study	14	3000	42
P2	Identify impacts of development interventions on environmental flows and consequences at basin scales and implement appropriate mitigations to maintain desired flows and ecological connectivity	Study	7	5000	35
P2	Assess the impacts of climate change in water resource use, and identify vulnerabilities and adaptation strategies for management and disaster risk reduction	Study	19	2000	38
P2	Promote communication and collaboration among users (e.g. hydropower operators) to ensure more efficient use of resources and reduce risk of disasters	No	20	1000	20
P1	Promote alternative or complementary renewable energy	No	19	10000	190
P1	Monitor regularly hydrological flows for necessary regulation and release	No	14	2000	28
	Sub-total (1.1)				**367**

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
1.2	**Promotion of watershed conservation for healthy ecosystem services**				
P3	Strengthen mechanisms to prevent agricultural, industrial, municipality, household effluent flow into aquatic systems	No	19	3000	57
P3	Provide economic incentives through PES for better watershed and sub-watershed management	No	95	2500	237.5
P3	Raise awareness of the ecological links between terrestrial and aquatic systems to promote better watershed management to sustain clean water supplies	No	19	2000	38
P2	Prepare and implement integrated soil and water management plans engaging communities in restoration, slope stabilization and controlling erosion	No	38	5000	190
P3	Promote and protect water use rights among local communities	No	20	1200	24
P2	Develop and implement equitable water use policy	Policy	1	4500	4.5
P1	Develop sub-basin plans in the context of the Gandaki Basin plan to cover critical watersheds, and revise and integrate LAPA/CAPAs relative to basin-scale vulnerability assessments	No	38	2000	76
	Sub-total (1.2)				**627**
1.3	**Promotion of forest conservation and restoration of degraded areas for sustaining ecosystem services including carbon sequestration**				
P1	Reforest or afforest abandoned and degraded lands	Ha	4000	2000	8000
P1	Reduce dependency on forest for fuelwood supply for domestic consumptions by promoting green energy (hydropower, solar, wind power)	No	190	5000	950
P2	Identify and prioritize corridors for REDD+ based forest conservation	Study	15	4000	60
P2	Conserve forest carbon through minimizing anthropogenic pressure on forest providing alternatives to forest products	No	95	20000	1900
P3	Enhance forest carbon through better management of existing forests and development of new forests through plantation in abandon land	No	190	2000	380
P1	Reduce forest carbon emission in CHAL through community participation and addressing the major drivers of deforestation and forest degradation	No	190	2000	380
P2	Develop a REDD+ emission reduction carbon credit project at the landscape level and provide benefits to the local communities through the REDD+ project	No	1	200000	200
P3	Raise awareness and engage communities to restore degraded forests and provide benefits through REDD+, as appropriate	No	190	2000	380
P3	Monitor climate change impacts focusing on forests and forest biodiversity	No	10	25000	250
	Sub-total (1.3)				**12500**
	Total (1)				**13494**

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
2	**Forests and other land uses**				
2.1	**Securing forests and other terrestrial natural ecosystems (grasslands and rangelands) in ecologically sensitive areas for conservation and sustainable management**				
P1	Identification and management of representative forest, grassland, and rangeland ecosystems currently not represented within the Protected Areas and include them in the landscape-scale conservation plan	No	50	2500	125
P1	Facilitating and supporting community, leasehold, collaborative, protected, religious, and private forests	No	5000	200	1000
P2	Identification and conservation of natural forests in ecologically sensitive areas	No	95	1500	142.5
P2	Management of natural forests, shrub lands, rangelands and grasslands to reduce vulnerability and ecological stresses from potential climate change impacts	Ha	40000	100	4000
P1	Support to implement Rastrapati Chure-Terai Madesh Conservation Program	No	1	2000	2
P2	Reforestation of vulnerable and abandoned areas including areas under shifting cultivation with climate adaptive tree species to reduce risk from disasters such as landslides, floods and increase biodiversity and availability of forest resources	Ha	950	500	475
P2	Integration into Nepal's Carbon sequestration strategy and REDD+ benefits to local communities	No	1	5000	5
P1	Capture ecological processes and services (e.g., pollination, slope stabilization)	No	100	1500	150
P1	Preventing forest fires and creating community-based firefighting units including firefighting trainings and exposure visits	No	190	2500	475
P2	Preventing forest degradation caused by invasive alien species, overgrazing, etc.	No	100	2500	250
P3	Engage communities for participation and stewardship of forests, rangelands and grasslands	No	475	700	332.5
	Sub-total (2.1)				**6957**
2.2	**Ensuring conservation and sustainable use of aquatic ecosystems to provide desired environmental flows**				
P1	Undertake an environmental flow assessment in the Gandaki basin and its sub-basins and ensure that an ecosystem approach to water allocation is followed in preparing the integrated river basin plan in the Gandaki basin; monitor and ensure that this plan is implemented as planned	No	1	20000	20
P2	Identify rights/duties of upper and lower riparian areas	No	1	10000	10
P2	Protect water sources and riparian areas	No	190	2500	475
P1	Identify critical watersheds and conserve watershed integrity with necessary restoration interventions, working with upstream and downstream users	No	95	1500	142.5
P2	Maintain river connectivity to sustain ecological processes and services from headwaters to the Terai	No	14	3500	49

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
P2	Conserve river courses including regulating extraction of river bed sand, gravel and boulders	No	21	1500	31.5
P1	Restore flood plain functions including flood control through natural processes; promote bioengineering as appropriate	No	14	1500	21
P1	Prepare and update management plans of Ramsar sites including Pokhara valley lake clusters and engage all stakeholders for management.	No	1	10000	10
P2	Promote water conservation practices/culture among communities including rainwater harvesting, water efficiency, and multiple use of water	No	200	1000	200
P1	Identify wetlands with potential as Wetlands of International Importance and designate them as Ramsar sites	No	3	6000	18
P2	Engage communities for participation and stewardship of rivers and wetlands	No	190	1000	190
P3	Incorporate cultural aspects of water uses in water related development initiatives	No	158	1500	237
P3	Control pollution from agricultural, industrial, municipality, and household sources and prevent eutrophication	No	200	2500	500
P2	Prevent and control invasive alien species, especially from lentic ecosystems	No	100	2000	200
	Sub-total (2.2)				2104
2.3	**Promotion of sustainable farming and pastoralism, including traditional and evolved pastoral and agricultural practices, for better land and water management**				
P2	Promote traditional sustainable agriculture and pastoralism including promotion of climate adaptive and traditional crops and livestock	No	190	1500	285
P1	Promote sustainable agricultural practices for sustainable land and soil management	No	190	2000	380
P2	Promote sustainable rangeland management, including designated grazing areas to relieve pressure on forests and grasslands.	No	190	2000	380
P2	Strengthen community-based water management systems and promote water conservation technologies and practices	No	190	1500	285
P2	Provide better weather forecasting for farmers	No	7	3000	21
P2	Strengthen government and community capacity and understanding of climate change-integrated forest, grassland, and water management	No	114	2000	228
	Sub-total (2.3)				1579
2.4	**Managing and planning built-up area development to minimize impacts on natural and agricultural areas, and aquatic systems**				
P1	Develop and implement basin and sub- basin scale integrated land-use plans following the Land Use Policy to zone areas for development and mainstream these plans into overall conservation and development plans of the districts	No	14	4000	56

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
P1	Mainstream climate change and natural disaster risks in all development planning and implementation	No	4	5000	20
P3	Implement good garbage, sewerage, and other urban waste management/recycling plans and mechanisms to prevent pollution	No	20	2000	40
P2	Promote green infrastructure including wildlife friendly structures (over-under passes) and earthquake-proof structural designs to minimize threats to ecosystems, ecosystem services, and socio-economic well-being of communities	No	95	4000	380
P1	Promote infrastructure reconstruction with environmentally responsible practices	No	7	5000	35
	Sub-total (2.4)				**531**
	Sub-total (2)				**11171**
3	**Species of special concern**				
3.1	**Strengthening mechanisms that link protected areas (PAs) and biodiversity rich forest areas outside PAs, enhancing wildlife health management, reduction in human-wildlife conflict, community stewardship, and the national anti-poaching/illegal trade control strategy for better coordination to address poaching and illegal trade.**				
P1	Prevent poaching of wildlife and illegal extraction of plants through stronger protection and smart patrolling	No	900	2500	2250
P1	Reduce human wildlife conflict	No	5	2500	12.5
P1	Establish wildlife rescue centers with health facilities	No	2	2500	5.0
P1	Prepare and implement national wildlife health management strategy and enhance wildlife disease surveillance	NO	50	2500	125
P3	Engage community and civil society in stewardship and protection across the landscape through livelihoods incentives, awareness programs, and self-regulatory mechanisms	No	760	1000	760
P1	Establish community conserved conservation areas to conserve critical forest ecosystems, flora and fauna	No	5	3800	19
P2	Strengthen capacity of GoN staff, community members and civil society on protection and monitoring techniques	No	260	1400	364
P1	Establish an effective coordination system among all concerned stakeholders, including transboundary coordination with China and India	Event	40	2500	100
P1	Coordinate with the police and CIB, Customs, WCCB cells to implement the National Strategy on Illegal Wildlife Trade and Poaching Control for Nepal (2012-22)	Event	120	1000	120
	Sub-total (3.1)				**3790.5**

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
3.2	**Development of climate smart management plans for Protected Areas buffer zones, corridors, protection forests, and critical watersheds to guide conservation management**				
P1	Update existing management plans (for PAs, BZs, corridors, critical watershed) to include climate change impacts, habitat restoration and prepare management plans for those areas that lack them, using the CHAL strategic plan as a guiding document	No	200	1000	200
P2	Strengthen capacity of concerned government agencies and civil society stewards to manage PAs, BZs, protection forests, corridors, critical watershed by providing necessary infrastructure, training, and human resources	No	200	2500	500
	Sub-total (3.2)				**700**
3.3	**Enhancing conservation and maintenance of habitat linkages and corridors for ecological connectivity necessary for threatened, endangered and migratory species**				
P1	Adopt ecosystem approach to water allocation in integrated river basin planning and water resources development and management, using the river basin and sub-basins as the units of management.	No	7	2000	14
P1	Inventory of the ecosystem goods and services from each of the four groups of ecosystems in the CHAL and prioritize them for conservation.	Study	4	2000	8
P2	Identify and protect the terrestrial and aquatic corridors that are critical for sustaining the priority ecosystem goods and services.	No	20	700	14
P1	Connect core areas that harbor viable breeding populations of focal species with habitat corridors to allow dispersal and migration through spatial planning	No	100	3000	300
P1	Manage corridors to prevent habitat loss, degradation and fragmentation from encroachment and invasive alien species. Restore critical corridor bottlenecks where necessary	No	50	3500	175
P2	Identify climate corridors for species to 'migrate' or shift into suitable areas in the event of climate change, and secure these areas. Integrate these climate corridors into the landscape spatial plan	Study	10	3000	30
P2	Maintain lateral habitat connectivity with habitat and core areas outside the CHAL for landscape species that range outside CHAL boundaries (e.g., snow leopard, Himalayan wolf)	No	10	3500	35
P3	Create awareness among communities, industry, and government of the importance and need for corridor conservation	Event	200	1000	200
P1	Coordinate actions within government institutions to mainstream conservation and connectivity into development plans	No	190	1000	190
	Sub-total (3.3)				**966**

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
3.4	**Conservation of critical habitats for endemic species and habitat specialists**				
P1	Identify critical climate-resilient habitats for endemic and habitat specialist species (aquatic and terrestrial) and secure them for conservation	Study	25	5000	125
P2	Monitor populations, including spatial shifts due to climate change	No	50	3500	175
P1	Promote research to understand species biology/ecology for better management through academic institutions	No	50	4500	225
	Sub-total (3.4)				**525**
3.5	**Management of plant species of NTFP/MAPs values**				
P1	Promote sustainable harvest of NTFPs/ MAPs through community-regulated sustainable harvesting practices reinforced by regulations and monitoring	No	190	1000	190
P1	Strengthen cross-border collaboration to prevent illegal trade	No	10	3000	30
P2	Facilitate ex-situ conservation of selected species as identified and approved by the government	No	190	1000	190
P1	Document traditional knowledge on NTFPs/MAPs	Study	10	2500	25
P2	Capacitate GoN and community institutions for NTFP/MAP promotion	Training	50	500	25
	Sub-total (3.5)				**460**
3.6	**Conservation of native fish species, indigenous and traditional crop varieties and livestock**				
P2	Identify and document native fish species, traditional crops and livestock races and practices	Study	10	2500	25
P3	Promote cultivation and raising of traditional crops and livestock rearing using organic approaches, and develop value-added niche markets for these crops and products	No	200	2500	500
P3	Zone agricultural areas to create a forest-farmland matrix with refuge habitats for pollinators and indigenous bio-control agents, and organic fertilizers to increase crop productivity and reduce dependency on pesticides and artificial fertilizers	No	190	2000	380
	Sub-total (3.6)				**905**
	Sub-total (3)				**7346.5**
4	**Socio-economic prosperity**				
4.1	**Promotion of both innovative and traditional livelihood opportunities based on sustainable resource use, tourism, and green enterprises for economic prosperity, equity, and social justice**				
P1	Promote and diversify Green enterprises (e.g., nature and adventure-based tourism, value addition to natural and forest-based products) for enhancing economic prosperity	No	95	3000	285
P2	Promote commercialization of agriculture and niche products through value chain approach	No	76	2500	190
P1	Develop storage and marketing infrastructure for agriculture products	No	19	2500	47.5

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
P3	Provide required access to resources to local communities and stakeholders, and opportunities for training, skill development, and new knowledge transfer	No	190	2000	380
P2	Develop PES mechanisms, and equitable benefit sharing opportunities from Clean Development Mechanism (CDM)/ REDD+	No	95	2000	190
P3	Promote engagement of private sectors in entrepreneurship development and scale up credit schemes for small and medium sized enterprise start-ups	No	95	1500	142.5
P2	Promote sustainable fisheries (in-situ and ex-situ)	No	100	1500	150
P2	Mainstream gender equality and social inclusion, and governance	No	19	2000	38
	Sub-total (4.1)				**1423**
4.2	**Reducing climate change and natural disaster risks**				
P2	Develop and implement holistic disaster risk reduction and disaster preparedness plans	No	19	3000	57
P2	Build awareness on climate change and expected or possible consequences, with options for adaptation and vulnerability reduction	No	95	1000	95
P3	Address health and disease issues, especially after disasters, extreme weather events and climate change, with contingencies and emergency response procedures	No	10	2000	20
P1	Develop early warning systems for disasters, including floods, GLOFs/LDOF/CLOF fires, landslides	No	50	1000	50
P2	Integrate LAPA/CAPAs to basin-scale vulnerability assessments	No	12	2000	24
P1	Monitor climate change impacts on forests and forest biodiversity	No	60	1000	60
P1	Support implementation of DRR plans and LAPA/CAPAs	No	114	1000	114
	Sub-total (4.2)				**420**
4.3	**Protection and restoration of important cultural and religious heritage**				
P3	Conserve, and restore where possible or necessary, cultural and religious heritages	No	20	2000	40
P2	Preserve the multi-ethnic cultural identities of people in the CHAL	No	20	2000	40
	Sub-total (4.3)				**80**
	Total (4)				**1923**
5	**Policy and Governance (Also linked with strategies 1.1 & 1.2)**				
P1	Manage water resources in an integrated manner at river basin and sub-basin scales. Adopt ecosystem approach to allocate water for environmental flow in river basin planning and development	NO	7	2000	14
P1	Implement land use policy effectively and efficiently	No	19	2500	47.5
P2	Formulate policies to address emerging issues related to climate change and disaster risk mitigation	No	2	3500	7

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
P3	Facilitate landscape-scale resource management, and land and resource governance, especially with respect to decentralization	No	10	2500	25
P1	Strengthen good, transparent and accountable governance practices among stakeholders	No	95	1000	95
P1	Strengthen Biodiversity and Environment Division with a coordination committee at the central level and multi-sectoral representation	No	2	2500	5
P2	Support and strengthen capacity of institutions including local organizations and communities to enforce regulatory measures at all levels	No	570	500	285
P3	Support for policy development to enhance private sector engagement in landscape conservation and development	No	1	2500	2.5
P2	Strengthen transboundary cooperation and collaboration with China and India	No	20	10000	200
	Sub-total (5)				**681**
6	**Institutional arrangement for integrated river basin planning and management**				
P2	Create and institutionalize IRBM and implementation mechanisms for Gandaki river basin and each sub-basins	No	12	2000	24
P2	Build capacity of this institution and related stakeholders for IRBM in each basin/sub-basin	No	12	2000	24
	Sub-total (6)				**48**
7	**Gender equality and social inclusion**				
P2	Strengthen engagement and roles of women, poor and marginal communities in landscape conservation and development at all levels	No	10	3500	35
P1	Facilitate/support participation of women, marginalized and socially excluded people in leadership roles in resource governance	No	57	500	28.5
P2	Initiate targeted activities to strengthen economic status of women and marginalized groups	No	19	1000	19
P1	Reduce gender-based and other discrimination related to natural resource management	No	19	2500	47.5
P1	Mainstream and implement GESI provisions on policies and guidelines	No	2	2000	4
	Sub-total (7)				**134**
8	**Climate change**				
P3	Conduct awareness programs of the potential risks from natural disasters due to ecosystem degradation and climate change at national and local levels	No	190	500	95
P2	Integrate basin-scale climate adaptation plan into relevant socio-ecological interventions and development plans. (Several of these are already listed as activities in the four major thematic areas).	No	6	3000	18
P1	Develop protocol for long-term monitoring of impact of climate change on socio-ecological systems	No	1	5000	5
	Sub-total (8)				**118**

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
9	**Multi-stakeholders' Capacity Strengthening**				
P1	Train GoN staff on landscape-scale, climate adaptation conservation through higher education, exposure visits, and participation in meetings, seminars and workshops	No	10	2500	25
P2	Provide training opportunities, landscape-wide seminars and workshops, and study tours to local community groups engaged as conservation stewards (e.g., CFUGs, BZUCs, CAMCs, water management committees, CBOs, NGO partners) to increase knowledge, awareness, and analytical capacity, especially for adaptive management to cope with and respond to climate change and disasters	No	190	1000	190
P3	Provide technological support for capacity strengthening of stakeholders	No	95	2000	190
	Sub-total (9)				**405**
10	**Infrastructure**				
P1	Develop and promote engineering designs for infrastructure that does not disrupt ecological processes and services, continues to provide desired environmental flows, and does not cause natural disasters (earth slips, landslides etc.)	No	5	2500	12.5
P1	Ensure all large-scale and complex development projects are based on SEAs	No	1	2500	2.5
P2	Ensure IEE and EIA are of good quality, and ensure investment for mitigation and management plans and programs as recommended in IEE and EIA reports	No	2	2000	4
P1	Develop climate-smart and disaster-proofed designs for planned infrastructure and retro-fit existing infrastructure where feasible	No	5	2500	12.5
P2	Review vulnerabilities of existing major infrastructure to disasters, including climate change induced disasters, and develop plans to increase resilience where possible	No	2	2500	5
	Sub-total (10)				**36.5**
11	**Knowledge management and communication**				
P1	Conduct research and monitoring of key species of fauna and flora, environmental flows for management, and of socio-economic issues	Study	30	2500	75
P2	Study potential adverse impacts of climate change and infrastructure on ecological and human communities	Study	2	2500	5
P2	Undertake studies on land use/land cover and functions of corridors	Study	2	2500	5
P1	Engage all indigenous and ethnic groups to document and protect traditional knowledge and practices on biodiversity resources	No	5	1000	5
P3	Support to establish landscape level knowledge management center and improve information sharing and dissemination mechanism	No	1	5000	5
P3	Support presentations and publications in scientific and technical forums	No	50	1000	50

SN	Thematic areas; Strategies and Strategic Actions	Unit	Quantity	Rate (thousand)	Amount (million)
P2	Continue education and awareness programs in schools and eco-clubs. Recruit alumni as future educators	No	190	1000	190
P2	Engage eco-clubs and members as citizen scientists, and network them for landscape-scale perspectives through seminars, meetings, exchange visits, and other	No	95	500	47.5
P3	Engage communities in ecosystem and landscape level conservation initiatives through hands on practices, exposure visits, workshops, and interactive meetings	No	95	1000	95
	Sub-total (11)				**477.5**
12	**Sustainable financing**				
P3	Support for valuation of ecosystem for REDD+ and PES and ensure benefits from PES	Study	10	1500	15
P2	Promote private sector engagement in landscape conservation and development	No	19	2500	47.5
P1	Mainstreaming of government investments on landscape conservation and development	No	1	2500	2.5
P1	Explore and develop innovative funding opportunities	No	1	2500	2.5
	Sub-total (12)				**67.5**
	Grand Total				**35,902**
	Monitoring, Evaluation and Communication (2% of the total budget)				**718.04**

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Annexes

Annex I: National Parks and Conservation Areas of CHAL

Protected areas	Area (km²)/ Alt. (m)	Year of Notification	IUCN Mgmt category	Notable Biodiversity	
				Forest type/vegetation	Fauna
National parks					
Chitwan (World Heritage Site 1984)	932 *150-815*	1973 1984	II X	Sal, sal-pine, riverine forest, grassland	Rhinoceros, elephant, tiger, gaur, leopard, wild dog, sloth bear, dolphin, gharial, king cobra, Bengal florican
Langtang	1,710 *792-7,245*	1976	II	Sal, *Schima-Castanopsis,* oak, blue pine, oak & hemlock, fir & *Rhododendron,* fir & birch, alpine meadows	Red panda, snow leopard, black bear, musk deer, tahr, goral, serow, rosefinch, ibisbill, scarlet finch, smoky warbler, rock lizard
Shivapuri-Nagarjun	159 *1,366-2,732*	CA 1984 NP in 2002	IV II	*Schima-Castanopsis,* pine, oak, *Rhododendron*	Common leopard, common langur, leopard, clouded leopard, yellow-throated marten, wild board, yellow-bellied bush warbler, grey-sided laughing thrush
Wildlife reserve					
Parsa	499 *150-815*	1984	IV	Mixed deciduous riverine, mixed deciduous hardwood, sal, sal-pine, pine, Acacia	Wild elephant, tiger, sambar deer, leopard, leopard cat, rhesus macaque, langur, giant hornbill, cobra, king cobra, krait, python

Protected areas	Area (km²)/ Alt. (m)	Year of Notification	IUCN Mgmt category	Notable Biodiversity	
				Forest type/vegetation	Fauna
Conservation areas					
Annapurna	7,629 *1,000-8,092*	1986 1992	VI	Hill sal forest, *Schima-Castanopsis,* alder, oak, mixed broad-leaved, *Rhododendron,* birch, blue pine, juniper	Snow leopard, kiang, Himalayan brown bear, Himalayan black bear, Langur, yellow-throated marten, jungle cat, Indian muntjak, goral, serow, tahr, bharal, partridge, pheasants
Manaslu	1,663 *1,360-8,163*	1998	VI	Oak, blue pine, larch, birch,	Snow leopard, musk deer, mountain black bear, blue sheep, Himalayan tahr, Assamese monkey, langur, rhesus monkey

Source: Modified after Chaudhary (1998) and MoFSC (2002)

Annex II: Cold water fishes from CHAL

Fish	Kali Gandaki	Pokhara lakes
INDIGENOUS		
Cyprinidae		
Barilius barila	+	
B. barna	+	+
B. bendelisis	+	+
B. bola	+	
B. tileo	+	
B. vagra	+	+
Chagunius chagunio	+	+
Crossocheilus latius	+	+
Esomus danricus	+	+
G. gotyla	+	
G. lamta	+	
L. dero	+	
Neolissocheilus hexagonolepis	+	+
P. sophore	+	+
P. ticto	+	+
P. titus		+
S. plagiostomus		+
S. richardsonii	+	
S. esocinus	+	
S. progastus	+	
Semiplotus semiplotus	+	
Tor putitora	+	
Tor tor	+	
Cobitidae		
Lepidocephalichthys guntea	+	
Nemacheilus beavani	+	
N. botia	+	
N. corica	+	
N. rupicola	+	
N. scaturigina	+	
N. shebbearei	+	
Schilbeidae		
Clupisoma garua	+	
Amblycepitidae		
Amblyceps managois	+	
Sisoridae		
Euchilogl anis hodgarti	+	
G. kasmirensis	+	
G. pectinopterus	+	
G. telchita	+	
G. trilineatus	+	

Annex III: Socio-economic features of CHAL

SN	District	2011 census *				Absentee Population *		Avg. annual growth	Pop Density	Poverty 2001 **		Poverty 2011 **		HD ***I	HPI ***	Per Capita (PPP $) ***	Food balance (MT) ****
		Total population	Male	Female	Sex ratio	Number	% of total			%	Rank	%	Rank				
1	Arghakhanchi	140637	60040	80597	74	30710	22	-0.67	103.69	44.1	49	28.8	47	0.482	27.27	909	24601
2	Baglung	262705	114605	148100	77	41770	16	-0.03	146.70	40.2	37	22.9	28	0.478	27.33	868	34948
3	Chitwan	566661	272289	294372	92	48682	9	2.00	252.77	11.9	5	8.9	5	0.551	24.80	1537	-55332
4	Dhading	336250	157928	178322	89	22534	7	-0.07	176.32	43.3	48	18.8	22	0.461	33.38	982	10077
5	Gorkha	269388	120541	148847	81	28014	10	-0.65	73.86	38.2	33	20.4	24	0.481	33.58	1039	22934
6	Gulmi	273986	117817	156169	75	57674	21	-0.49	242.57	42.5	43	25.6	34	0.464	27.42	752	14376
7	Kaski	490429	235576	254853	92	57238	12	2.89	234.92	11.1	4	4.0	1	0.576	16.50	1561	4898
8	Lamjung	169104	77505	91599	85	21293	13	-0.45	101.63	31.5	20	16.8	18	0.507	26.98	1186	42794
9	Makwanpur	355393	173163	182230	95	14264	4	0.81	107.35	43.0	47	27.9	43	0.497	28.44	757	-731
10	Manang	6527	3664	2863	128	262	4	-3.19	2.81	21.2	9	36.9	59	0.568	25.52	3166	-143
11	Mustang	13799	7317	6482	113	1479	11	-0.79	3.87	25.8	11	40.0	63	0.508	31.16	1922	-298
12	Myagdi	97302	42289	55013	77	12869	13	-0.46	49.66	34.8	25	28.6	44	0.490	28.54	1028	24951
13	Nawalparasi	367034	168123	198911	85	48050	13	1.45	155.46	36.3	28	17.0	19	0.493	27.99	1157	37637
14	Nuwakot	278461	134071	144390	93	14722	5	-0.35	233.43	37.4	31	20.3	23	0.466	35.66	1086	47765
15	Palpa	208435	91512	116923	78	32890	16	-0.37	135.78	42.9	45	21.6	27	0.500	25.23	985	9487
16	Parbat	147076	65357	81719	80	22148	15	-0.68	271.04	34.1	22	12.7	11	0.510	24.62	1013	21011
17	Rasuwa	43798	21775	22023	99	3118	7	-0.21	29.19	50.9	64	31.6	52	0.461	42.24	1520	-958
18	Syangja	288040	125872	162168	78	50167	17	-0.92	277.13	35.1	26	11.8	8	0.527	25.31	1215	65175
19	Tanahun	330581	147411	183170	80	47304	14	0.49	212.92	34.6	24	14.8	14	0.506	29.75	1072	29148
	Total	**4648346**	**2138121**	**2510225**	**85**	**555188**	**12**	**0.38**									

* CBS 2013b; ** CBS 2013a; *** GoN/NPC 2014; **** MoAD 2014

Annex IV: List of operating hydropower projects in CHAL

SN	Project	Capacity (MW)	River	VDC/District
1	Devighat	14.1	Trishuli	Nuwakot
2	Gandak	15	Narayani	Nawalparasi
3	Kulekhani[6]-I	60	Kulekhani	Makwanpur
4	Kulekhani-II	32	Kulekhani	Makwanpur
5	Marsyangdi	69	Marsyangdi	Tanahun
6	Seti	1.5	Seti	Kaski
7	Tatopani	2	Tatopani	Myagdi
8	Tinau	1.024	Tinau	Palpa
9	Trishuli	24	Trishuli	Nuwakot
10	Andhi Khola	9.4	Andhi Khola	Syangja
11	Modi Khola	14.8	Modi	Parbat
12	Kali Gandaki A	144	Kali Gandaki	Shreekrishna Gandaki, Syangja
13	Chilime	22	Chilime	Chilime, Rasuwa
14	Madhya Marsyangdi	70	Marsyangdi	Lamjung
15	Mailung Khola	5	Mailung	Rasuwa
16	Khudi Khola	4	Khudi	Ghanpokhara, Khudi, Simpani; Lamjung
17	Thoppal Khola	1.65	Thoppal	Dhading
18	Mardi Khola	4.8	Mardi	Kaski
19	Ridi Khola	2.4	Ridi	Palpa
20	Lower Modi -1	10	Modi	Parbat
21	Siuri Khola	5	Siuri	Lamjung
22	Ankhu Khola – 1	7	Ankhu	Dhading
23	Bijayapur-1	4.5	Bijayapur	Kaski
24	Radhi Small	4.4	Radhi	Lamjung
25	Tadi Khola (Thaprek)	5	Tadi	Nuwakot
Total projects in operation in CHAL 532.60 MW				

6 Water for the Kulekhani projects comes from the Bagmati basin, but is released into the Rapti basin

Annex V: List of issued hydropower generation licenses in CHAL

SN	Project	Capacity(MW)	River	VDC (District)
1	Upper Madi	25	Madi	Namarjung, Thumakodada, Sildujure (Kaski)
2	Lower Modi Khola	20	Modi	(Parbat)
3	Upper Trishuli 3A	60	Trishuli	(Rasuwa)
4	Dordi Khola	27	Dordi	(Lamjung)
5	Rahughat	32	Rahughat	Jhin (Myagdi)
6	Tadi Khola	5	Tadi	(Nuwakot)
7	Mristi Khola	42	Mristi	(Myagdi)
8	Sanjen	42.5	Sanjen	Chilime (Rasuwa)
9	Upper Mailung -A	6.42	Mailung	(Rasuwa)
10	Upper Marsyangdi A	50	Marsyangdi	Bhulbhule, Bahundada, Khudi (Lamjung)
11	Thapa Khola	11.2	Thapa	(Mustang)
12	Daraundi A	6	Daraundi	(Gorkha)
13	Midim Khola	3	Midim	Karapu (Lamjung)
14	Upper Sanjen	14.8	Sanjen	Chilime (Rasuwa)
15	Rasuwagadhi	111	Bhote Koshi	Thuman, Timure (Rasuwa)
16	Namarjun Madi	12	Madi	(Kaski)
17	Dordi-1	10.3	Dordi	(Lamjung)
18	Nyadi Khola	30	Nyadi	Bahundada, Bhulbhule (Lamjung)
19	Lower Tadi	4.993	Tadi	Balkumari, Samundratar, Sundaradevi
20	Daram Khola-A	2.5	Daram	(Baglung)
21	Middle Modi	15.1	Modi	(Parbat)
22	Sardi Khola	4	Sardi	(Kaski)
23	Middle Midim	3.1	Midim	(Lamjung)
24	Upper Trishuli 3B	37	Trishuli	(Nuwakot)
25	Chhandi Khola	1.7	Chhandi	(Lamjung)
26	Salankhu Khola	2.5	Salankhu	(Nuwakot)
27	Rudi A	6.8	Rudi	(Kaski)
28	Ghalemdi Khola	4	Ghalemdi	(Myagdi)
29	Madkyu Khola	10	Madkyu	(Kaski)
30	Super Dordi Kha Hydropower Project	49.6	Dordi	Dhodeni, Faleni (Lamjung)
31	Upper Myagdi	20	Myagdi	Marang, Mudi, Muna (Myagdi)
32	Rupse Khola	4	Rupse	Myagdi
33	Upper Dordi A HEP	25	Dordi	Dhodeni, Faleni (Lamjung)
34	Badigad HPP	6.6	Badigad	Burtiwang, Bhinggithe, Rajkut (Baglung)
35	Durbang Myagdi Khola	25	Myagdi	(Myagdi)
36	Upper Modi A	42	Modi	Lumle, Ghandruk (Kaski)
37	Ghar Khola	8.3	Ghar	Shikha (Myagdi)
38	Theule Khola HPP	1.5	Theule	Kusmi, Binamare, Sarkuwa (Baglung)
39	Tanchhahara SHP	2.4	Tanchhahara	(Mustang)
40	Langtang Khola Small Hydropower Project	10	Langtang	Syafru (Rasuwa)
41	Upper Tadi	11	Tadi	(Nuwakot)
Total capacity for 41 project = 805 MW				

Annex VI: Existing Policy and Legislations with direct implication for CHAL

Sector Specific Policies and Plans	Sector Related Policies/Plans	General Policies/Plans
■ Master Plan for Forestry Sector 1989 ■ Revised Forest Policy 2000 ■ Nepal Biodiversity Strategy 2002 ■ Leasehold Forest Policy 2002 ■ Herbs and Non Timber Forest Products Development Policy 2006 ■ Sacred Himalayan Landscape-Nepal Strategic Plan 2006-2016 ■ National Bio-safety Framework 2007 ■ Churia Area Program Strategy 2008 ■ Forestry Sector Gender and Social Inclusion Strategy 2008 ■ Forest Fire Management Strategy 2010 ■ Rangeland Policy 2012 ■ Land Use Policy 2012 ■ National Wetlands Policy 2012 ■ Forest Encroachment Control Strategy 2012 ■ Forestry Sector Protection Plan 2013 ■ Nepal National Biodiversity Strategy and Action Plan 2014 ■ Forest Policy 2015	■ Agriculture Perspective Plan 1995 ■ Water Resources Strategy 2002 ■ National Agriculture Policy 2004 ■ National Water Plan-Nepal 2005 ■ National Agrobiodiversity Policy 2007 ■ Tourism Policy 2009 ■ Climate Change Policy 2011 ■ National Land-use Policy 2012 ■ Irrigation Policy 2013	■ Sustainable Development Agenda for Nepal 2003 ■ The Periodic National Plans (11th, 12th & 13th) ■ Environment Friendly Local Governance Framework 2013
Regulatory Frameworks		
Sector Specific Acts	**Sector Related Acts**	**General Acts**
■ National Park and Wildlife Conservation Act 1973 ■ Soil and Watershed Conservation Act 1982 ■ Forest Act 1993	■ Aquatic Animals Protection Act 1961 ■ Pasture Land Nationalization Act 1974 ■ Tourism Act 1978 ■ Seed Act 1988 ■ Electricity Act 1992 ■ Water Resources Act 1992 ■ Environment Protection Act 1996 ■ Nepal Tourism Board Act 1997 ■ Livestock Health and Livestock Services Act 1998 ■ Local Self Governance Act 1999 ■ Plant Protection Act 2007	■ Land (Survey and Measurement) Act 1963 ■ New Civil Code 1964 ■ Lands Act 1964 ■ Land Administration Act 1967 ■ Public Roads Act 1974 ■ Nepal Treaties Act 1991 ■ Land Acquisition Act 1997 ■ Proposed Civil Code

Annex VII: Existing Policy and Legislations having direct implication for CHAL

Policy & Legislation	Relevant provisions
Constitution of Nepal 2015	■ Right of every person to live in a clean environment affirmed as a fundamental right ■ Protection of forests, vegetation and biodiversity, their sustainable use, and equitable distribution of benefits ■ Identification and protection of traditional knowledge, skills, and practices
Sector-specific Policies and Plans	
Master Plan for Forestry Sector 1989	■ Contributing to the growth of local and national economies by managing the forest resources and forest based industries ■ Creating opportunities for income generation and employment; meeting people's basic needs for fuelwood, timber, fodder, and other forest products on a sustained basis ■ Promoting people's participation in forestry development, development of legal framework and strengthening the organizational structure
Revised Forest Policy 2000	■ Prioritization of biodiversity conservation while ensuring sustainable livelihoods and equitable benefit sharing ■ Management of biodiversity with landscape level planning approach
Nepal Biodiversity Strategy 2002	■ Adoption of landscape planning approach to protect and manage biodiversity ■ Aiming to conserve forests, soil, water and biological diversity, while at the same time meeting basic needs of people who are dependent on these resources
Leasehold Forest Policy 2002	■ Handing over forests to the community living below poverty line
Herbs and Non Timber Forest Products Development Policy 2006	■ Contribution to economy through protection and promotion of NTFPs
Sacred Himalayan Landscape Nepal Strategic Plan 2006-2016	■ Long term sustainable management of biodiversity and water resources, promotion of traditional knowledge and cultural values, and sustainable livelihoods in the transboundary landscape of the Eastern Himalayan Region of Nepal
National Bio-safety Framework 2007	■ Protection of biodiversity, human health, and the environment from adverse effects of research and development activities of modern biotechnology
Churia Area Program Strategy 2008	■ Creation of an enabling environment for all stakeholders to contribute to the conservation and livelihood of the resource dependent people in an equitable manner
Forestry Sector Gender and Social Inclusion Strategy 2008	■ Enhancing gender and equity, good governance and gender sensitive institutional development; gender budgeting, planning and monitoring; and equitable access to benefit sharing and decision making process
Forest Fire Management Strategy 2010	■ Consideration of four pillars for forest fire management as: (i) policy, legal and institutional development, and improvement; (ii) education, awareness raising, capacity strengthening, and technology development; (iii) participatory fire management and research; and (iv) coordination and collaboration, networking and infrastructure development, and international cooperation.
Rangeland Policy 2012	■ Maintaining ecological balance by conserving, promoting, and sustainable use of rangeland biodiversity ■ Conducting scientific study to generate data on rangeland biodiversity and genetic differences of rangelands

Policy & Legislation	Relevant provisions
National Wetlands Policy 2012	■ Conservation of wetland biodiversity by rehabilitation and effective management of wetland areas ■ Contribution to the wellbeing of wetland dependent communities by sustainable and wise use of wetland-based resources ■ Identification and utilization of traditional knowledge and skills of wetland dependent communities and equitable distribution of the benefits
Forest Encroachment Control Strategy 2012	■ Aiming to achieve the national policy of maintaining 40% of the total area under forests
Forestry Sector Protection Plan 2013	■ Control of different types of forest offences to achieve the long term vision of forestry sector
Nepal-National Biodiversity Strategy and Action Plan: 2014-2020	■ Preparation of a 35-year vision of conservation of biodiversity for sound and resilient ecosystems and national prosperity
Forestry Sector Strategy 2016-2025	■ Provide strategic guidelines to the forestry sector
Sector Related Policies/Plans	
Agriculture Perspective Plan 1995	■ Envisioning to increase agricultural productivity through the delivery of agriculture inputs and services
Water Resources Strategy 2002	■ Protection and development of water resources through the approach of integrated water resources management
National Agriculture Policy 2004	■ Improvement of degraded forests and natural water bodies for biodiversity conservation, as well as utilization and development of agroforestry system
National Water Plan-Nepal 2005	■ Contribution in a balanced way to the overall national goals of economic development, poverty alleviation, food security, public health and safety, decent standard of living for the people through water resources development and protection.
National Agrobiodiversity Policy 2007	■ Emphasis on Sustainable development and maintenance of ecological balance by protecting agrobiodiversity promoting to benefit from protection and utilization of genetic resources for food security and poverty reduction
Tourism Policy 2009	■ Promotion of Nepal in global scenario as an attractive, secured destination by conserving and promoting natural, cultural, biological resources
Climate Change Policy 2011	■ Improvement of livelihoods by mitigating and adapting to the adverse impacts of climate change
National Land-use Policy 2012	■ Identification and protection of environmental sensitive areas; conservation and promotion of biodiversity, sustainable forest and watershed management
Irrigation Policy 2013	■ Promoting conjunctive use of ground and surface water based irrigation systems along with new/non-conventional irrigation systems for food security and economic prosperity
General Policies/Plans	
Sustainable Development Agenda for Nepal 2003	■ Sustainable use of natural resources, identification of high biological diversity needing protection ■ Environmental conservation to be an integral component of poverty alleviation and sustainable economic growth ■ Emphasis on the need for more effective management of forests, ecosystem and biodiversity for sustainable development

Policy & Legislation	Relevant provisions
The Periodic National Plans of Nepal (11th, 12th and 13th)	■ The 11th Plan (2008-2010) emphasized on access to forest resources of the poor, downtrodden and socially excluded groups; and laid the objective of the forestry sector as the maintenance of balanced environment through sustainable management of forest, plants, watersheds, biodiversity and protected areas as well as enhancing forest supply and promotion of forest based enterprises for employment generation ■ The Twelfth Plan Approach Paper (2010-2013) had the objectives of promoting forest ecosystem services through scientific and participatory management and creating employment and income generating opportunities through forest based enterprise development ■ The Thirteenth Plan Approach Paper (2013/14-2015/16) supports the economic development through conservation, sustainable management, and appropriate use of forests, flora and fauna as well as biodiversity
Environment Friendly Local Governance Framework 2013	■ Mainstreaming environment, climate change, disaster management in the local planning process; encouraging coordination and collaboration in environment and development
Regulatory Frameworks – Sector-specific Acts	
National Park and Wildlife Conservation Act 1973	■ The legal foundation for conservation and management of natural areas and wild species and empower the government to created different types of protected areas
Forest Act 1993	■ Provision for management of community forests, leasehold forests, government managed forests, protected forests, religious forests under the category of national forest and private forests in the country
Soil and Watershed Conservation Act 1982	■ Provision of legislative measures concerning soil and water conservation to properly manage the catchment of Nepal
Regulatory Frameworks – Sector Related Acts	
Aquatic Animals Protection Act 1961	■ Recognition of the value of wetlands and aquatic animals ■ Prohibition on the use of unsafe pesticides for catching aquatic life.
Pasture Land Nationalization Act 1974	■ Bestowing of rights over all pastureland in the country on the government and provision of compensation for such transfer of rights
Tourism Act 1978	■ The legal foundation for promoting tourism activities in the country; provision of environmental code of conduct for mountaineering activities
Seed Act 1988	■ Promotion and regulation of production and distribution of quality seed in order to increase the yields of agricultural crops
Electricity Act1992	■ Prohibition of blocking, diverting, or placing hazardous or explosive materials in rivers, streams or any water source
Water Resources Act 1992	■ Prioritization of different uses of water ■ Development of mechanism for issuing license for different uses and compensation mechanism
Environment Protection Act 1996	■ Provision of requirement for regulations such as Initial Environmental Examination, Environmental Impact Assessment while undertaking development initiatives
Nepal Tourism Board Act 1997	■ Development of tourism business while conserving and promoting natural and cultural heritage and environment of the country
Livestock Health and Livestock Services Act 1998	■ Provision requiring government to establish temporary or permanent quarantine check posts in any area of Nepal

Policy & Legislation	Relevant provisions
Local Self Governance Act 1999	■ Empowerment of VDCs to prepare and implement programs related to forests, vegetation, biodiversity, soil conservation, and environmental conservation in the village development area
Plant Protection Act 2007	■ 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
General Acts	
Land (Survey and Measurement) Act 1963	■ Stipulation that land can be registered on the basis of an unofficial deed if it has been in the uninterrupted possession of an individual for 15 years
New Civil Code 1964	■ Prohibition of cultivation on any land which has been used since time immemorial for grazing or watering cattle, or for roads, streets, graveyards or other public uses
Land Act 1964	■ Aiming to divert "inactive" capital and labor from land to other economic sectors, bring about an equitable distribution of cultivable land, improving the standard of living of "actual tillers" who depend on land for their livelihood, and maximization of agricultural production
Land Administration Act 1967	■ Prohibition of cultivation on any land which has been used since time immemorial as a road, highway, grazing land, waterhole, public resting hut, cemetery or graveyard, and any other land area or "servitude land" which has been used for public purposes.
Public Roads Act 1974	■ Empowering the government to acquire any land for the construction, development and improvement of public roads, in accordance with prevailing law related to land acquisition
Land Acquisition Act 1997	■ Authorizing the government to acquire any land, and as much land as it determines to be necessary for public purposes, and required to pay compensation as decided by a committee.
Nepal Treaties Act 1991	■ Provision that the treaties are to prevail over national legislation to the extent of the inconsistency if conflicting with the law in force ■ Requirement that the law be enacted for the execution of the treaties

Annex VIII: List of Regulations related to forestry sector

SN	Name of Regulation	Remarks
1	Forest Regulations (1995)	Framed as provisioned by Section (72) of Forest Act (1993)
2	National Parks and Wildlife Conservation Regulation (1974)	Framed as provisioned by Section (33) of National Parks and Wildlife Conservation Act (1973)
3	Himalayan National Parks Regulations (1980)	Framed as provisioned by Section (33) of National Parks and Wildlife Conservation Act (1973)
4	Buffer Zone Management Regulations (1996)	Framed as provisioned by Section (33) of National Parks and Wildlife Conservation Act (1973)
5	Conservation Area Management Regulation (1997)	Framed as provisioned by Section (33) of National Parks and Wildlife Conservation Act (1973)
6	Kanchenjunga Conservation Area Management Regulation (2008)	Framed as provisioned by Section (33) of National Parks and Wildlife Conservation Act (1973)
7	Environmental Protection Regulation (1999)	Framed as provisioned by Section (24) of Environment Protection Act (1996)
8	Local Self Governance Regulation (2000)	Framed as provisioned by Section (265) of LSG Act (1999)
9	Water Resources Regulation (1993)	Framed as provisioned by Section (24) of Water Resources Act (1992)
10	Drinking Water Regulations (1998)	Framed as provisioned by Section (24) of Water Resources Act (1992)
11	Irrigation Regulations (2003)	Framed as provisioned by Section (24) of Water Resources Act (1992)
12	Lands Regulation (1964)	Framed as provisioned by Section (61) of Lands Act (1964)
13	The Land Acquisition Regulation (1969)	Framed as provisioned by Section (42) of Land Acquisition Act (1977)
14	Land Survey and Measurement Regulation (2002)	Framed as provisioned by Section (14) of Land Survey and Measurement Act (1963)
15	Electricity Regulation (1993)	Framed as provisioned by Section (40) of Electricity Act (1992)

Annex IX: List of Directives/Guidelines related to forestry sector

Directives/ Guidelines	Approved/Published by	Focus
Community Forest Directives 1996	Department of Forests	Setting working procedures of the community forestry process
Leasehold Forest and Pasture Development Project Program Implementation Guidelines 1998	Department of Forests	Processes for the formation of LFUGs and formulation of the operational plan and its implementation.
Buffer Zone Management Guidelines 1999	Department of National Parks and Wildlife Conservation	Setting working procedures for the sustainable utilization and conservation of the natural resources and community development in the buffer zone.
Collaborative Forest Management Directive 2003	Ministry of Forests and Soil Conservation	Developed for establishing collaborative forest, formulation of operational plan and organizational structure of the collaborative forest.
Standard Norms for Development Activities in the Forestry Sector 2000	Ministry of Forests and Soil Conservation	Revised norms for implementing the development and conservation activities.
IEE Directives for Forestry Sector, 2003	Ministry of Forests and Soil Conservation	Guidelines for the preparation of terms of reference and initial environmental examination for forestry sector projects
Guidelines for Review of IEE and EIA of Forestry Sector 2004	Ministry of Forests and Soil Conservation	Guidelines to assist in the review process of IEE, EIA and associated documents of forestry projects or others projects likely to affect forest and biodiversity environments in order to provide information for decision making
Non-Government Service Provider Guidelines 2004	Ministry of Forests and Soil Conservation	Involvement of NGOs in provision of services in forestry sector development, sustainable forest management
Forest Sector Foreign Aid Policy Guidelines 2004	Ministry of Forests and Soil Conservation	Sector wide approach in foreign sector development, donor coordination; sustainable forest development and poverty reduction
Community Forestry Resource Inventory Guidelines 2005	Department of Forests	Setting different procedures and processes to carry out resource inventory for forest products in community forests
Biosafety Guidelines 2005	Department of Plant Resources	Establishment of procedures in the protection of natural environment, human health and biodiversity from the adverse impact of the use of modern biotechnology, regulate trans-boundary movement of genetically modified organisms
Operational Directives for allocation/utilization of National Forest for non-forestry purposes 2006	Ministry of Forest and Soil Conservation	Establishment of operational procedures for allocation/ utilization of National Forests to national development priority programs with prior approval of GoN
District Forest Products Supply Committee Directives 2006	Ministry of Forests and Soil Conservation	Establishment of operational procedures for collection and sales/distribution of the forest products by the committee.
Operational Directives of Fund Mobilization for Timber/ Fuelwood Collection and Depot Management 2006	Ministry of Forests and Soil Conservation	Operational procedures for mobilizing fund for Timber/ Fuelwood Collection and Depot Management in the Government Managed Forests of Terai and Inner Terai Districts.

Directives/ Guidelines	Approved/Published by	Focus
Forest Products Auctioning and Selling Operational Directives 2007	Ministry of Forests and Soil Conservation	Establishment of procedures to be followed for auctioning/selling forest products of the national forests
Forest Products Collection and Distribution Directives 2007	Ministry of Forests and Soil Conservation	Establishment of procedures for collection and sales/ distribution of the forest products under government managed forests
Resin Collection Operational Directives 2007	Ministry of Forests and Soil Conservation	Setting different procedures and processes to carry out resin collection in community and Government managed forests.
Operational Guidelines for Community Forestry Development Program 2002	Department of Forests	Processes of the formation of CFUGs, formulation of constitution and the operational plan and their revision. Revision of Operational Guidelines 1995 (2051) version
Operational Directives for Physical Infrastructure Development and Implementation in the Protected Areas 2008	Ministry of Forests and Soil Conservation	Establishment of operational procedures for handing over protected area and implementation of programs in the protected areas with prior approval of GoN
Wildlife Damage Relief Directives 2009	Ministry of Forests and Soil Conservation	Establishment of procedures for compensatory measures in the wildlife damage relief activities.
Operational Directives for Rastrapati Churia Conservation Program 2011	Ministry of Forests and Soil Conservation	Developed for protection of Churia forest area, formulation of operational plan and operational procedures, and coordination mechanism at central, regional and district level.
District Forest Sector Coordination Committee Establishment and Implementation Directives 2011	Ministry of Forests and Soil Conservation	Guidelines for procedures and processes for preparation of the plan, policy recommendation, facilitation for forest products distribution, monitoring and coordination, and fund mobilization.

Annex X: Major International Conventions, Treaties, and Agreements signed by Nepal

Name of Convention	Date signed	Remarks (Objectives/Obligations)
Convention on Wetlands of International Importance especially as Waterfowl Habitat (known as Ramsar Convention)	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
Convention on International Trade in Endangered Species of Wild Fauna and Flora	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
Convention for the Protection of World's Cultural and Natural Heritage	20 Sep. 1978	■ Identification, protection, conservation, and transmission of its cultural and natural heritage for future generations. ■ Taking appropriate legal, scientific, technical or financial measure to conserve cultural and natural heritage
United Nations Framework Convention on Climate Change	31 Jul. 1994	■ Adoption of precautionary measures to prevent or minimize the release of greenhouse gases and mitigate effects of climate change
Convention on Biological Diversity	21 Feb 1994	■ Ensure conservation and sustainable use and equitable sharing of benefits of the biological diversity ■ Prepare and implement national strategies, plans and programs including the National Biodiversity Strategy and Action Plan for the conservation and sustainable use of biodiversity ■ Conservation both in situ and ex situ conditions and promotion of biotechnology and genetic research
Vienna Convention for the Protection of Ozone Layer	04 Oct. 1994	■ Adoption of appropriate measures to protect human health and the environment resulting from change in ozone layer. ■ Adoption of measures to reduce ozone depleting substances
United Nations Convention to Combat Desertification	13 Jan. 1997	■ Adoption of measures to combat desertification ■ Addressing the physical, biological, and socio economic aspects of the processes of desertification and drought
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	13 Jan. 1997	■ Adoption of measures for safe transport, disposal and management of hazardous waste for environment protection ■ Controlling illegal traffic in hazardous wastes
Plant Protection Agreement for the South East Asia and Pacific Region	12 Aug. 1965	■ Prevent introduction into and spread of destructive plant diseases and pests ■ Regulate trade in plants and plant products
Agreement on the Network of Aquaculture Centers in Asia and the Pacific	04 Jan. 1990	■ Promotion of aquaculture development for increasing production, improving rural income and employment ■ Strengthening institutional capacity ■ Promotion of exchange of information
International Tropical Timber Agreement	03 Jul. 1990	■ Ensure conservation and sustainable use of timber ■ Implement activities for forest management and any decisions on timber trade

Name of Convention	Date signed	Remarks (Objectives/Obligations)
The World Trade Organization	23 Apr. 2004	■ Protection of intellectual property on plant varieties through development of a patent regime (Agreement on Trade-Related Aspects of Intellectual Property Rights) ■ Make legal regime compatible with the World Trade Organization (WTO) ■ Comply with all WTO trade rules latest by the end of 2006
Kyoto Protocol to United Nations Framework Convention on Climate Change	14 Dec 2005	■ Regulate the reduction of GHG in Annex I countries with Kyoto mechanism to support Annex II countries
Global Tiger Forum	1994	■ Highlight the rationale of tiger preservation and provide leadership and common approach throughout the world in order to safeguard the survival of the tiger, its prey and its habitat in tiger range countries

Sources: Bhuju et al. (2007); MoSTE (2008).

Annex XI: Logical Framework for Action Plan

Narrative Summary	Indicators	Reporting period	Means of Verification
Strategic Goal			
The Chitwan-Annapurna Landscape is managed through an integrated, river basin planning approach which is built on the foundation of climate-smart conservation and sustainable development practices to promote persistence of biodiversity, and sustainable management of natural resources for continued provision of ecosystem goods and services that support equitable and inclusive socio-economic prosperity.	River basin management committees are formed and functional in each sub-basin	Mid-term and final evaluation	Progress Reports, Meeting minutes
	Viable population of key species (Snow leopard, Common leopard, Tibetan wolf, Black bear, Red panda, Musk deer, Pangolin) maintained and enhanced; and in situ conservation of Larch, Chanp, orchids, and other important floral species promoted.	Mid-term and final evaluation	Field survey, reports, GIS Maps
	Habitats maintained and restored for wide ranging, habitat specialists, and threatened and endemic species	Mid-term and final evaluation	Vegetation mapping analysis, biodiversity survey, Reports, GIS Maps
	Area under critical watersheds managed and protected	Mid-term and final evaluation	Field Survey reports, GIS Map
	Socio-economic well-being of local communities improved	Mid-term and final evaluation	HDI, Poverty and CBS Reports, Baseline Study Reports

Outcome 1. Biodiversity in the CHAL is conserved.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
1. Key species of special concern conserved, maintained and recovered	Viable population of key species (Snow leopard, Common leopard, Tibetan wolf, Black bear, Red panda, Musk deer, Pangolin) In situ conservation of Larch, Chanp, orchids, and other important floral species	Mid-term and final evaluation	▪ Study reports ▪ Publications ▪ Independent periodic review and assessment report (baseline & end line survey)
2. Natural land cover and anthropogenic land-uses sustainably managed	Effective land use plan in place Management plan of each ecosystem in place Well planned and managed built-up areas	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey) ▪ Land Use Land Cover change analysis
3. Ecosystem services and ecological processes maintained through an integrated basin-scale approach	Management Plans in place Number of sub-basins adopting integrated water resource management	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)
OUTPUTS			
1.1 Poaching and illegal trade of wildlife controlled	Mechanism for controlled poaching and illegal trade in place Number of incidences of poaching and illegal trade reduced at least by 50%	Annual	▪ DNPWC, DOF progress reports, CHAL Database, Conservation partner reports
1.2. Climate change-integrated management plans for Protected Areas including, buffer zones, corridors, protection forests, and critical watersheds developed	Number of management plans updated/prepared	Mid-term and final evaluation	▪ DNPWC, DSCWM, DOF progress reports, CHAL Database, Conservation partner reports
1.3 Habitat linkages and corridors for ecological connectivity necessary for threatened, endangered, and migratory species conserved and maintained	Protected areas connected with functional corridors Degraded ecosystems restored	Mid-term and final evaluation	▪ DNPWC, DSCWM, DOF progress reports, CHAL Database, Conservation partner reports; ▪ Study reports
1.4 Critical habitats for endemic species and habitat specialists conserved	Critical habitats identified Critical habitats under effective management	Mid-term and final evaluation	▪ DNPWC, DSCWM, DOF progress reports, CHAL Database, Conservation partners reports ▪ Study reports

Narrative Summary	Indicators	Reporting period	Means of Verification
1.5 High value NTFP/MAP species managed	High value NTFPs/MAPs identified Critical important plant areas (IPAs) identified and managed	Mid-term and final evaluation	▪ DOF, Department of Plant Resources (DPR) progress reports, CHAL Database, Conservation partners reports ▪ Study reports
1.6 Indigenous and traditional crop varieties and livestock conserved	Number of breed and land races identified Conservation plans of selected species in place	Mid-term and final evaluation	▪ MoAD, DOF, DPR, DADO, DLSO, DFO progress reports, CHAL Database, Conservation partners report ▪ Study reports
2.1 Natural ecosystems in ecologically sensitive areas sustainably managed	Ecologically sensitive areas identified Management plans in place Number of sensitive areas managed	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)
2.2 Conservation and sustainable use of aquatic ecosystems ensured	Minimum flow of water level maintained in rivers of Gandaki basin Healthy aquatic habitats (natural and man-made)	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)
2.3 Sustainable farming and pastoralism promoted	Area of land under sustainable farming Number of rangelands under effective management	Mid-term and final evaluation	▪ MOAD, DADO, DLSO progress reports ▪ Independent periodic review and assessment report (baseline & end line survey)
2.4 Built-up areas developed following environmental codes	Planned built up areas Reduced pollution	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)
3.1 Integrated water resource management adopted	River basin scale management plan in place Installation (capacity/ number) of alternative energy Number of hydro-meteorological stations installed	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)

Narrative Summary	Indicators	Reporting period	Means of Verification
3.2 Critical watersheds protected	Number of critical watersheds identified and protected Integrated soil water management plans in place Upstream-downstream linkages strengthened	Mid-term and final evaluation	▪ Annual progress report of DSCWM and conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey)
3.3 Reduced degradation and loss of forest	Increase in forest area through restoration of degraded lands Reduction in forest encroachment	Mid-term and final evaluation	▪ Annual progress report of government & conservation partners ▪ Independent periodic review and assessment report (baseline & end line survey) ▪ Land Use Land Cover Change analysis reports

Outcome 2. Social and cultural well-being and economic prosperity of local communities are enhanced especially of women and disadvantaged groups.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
Social, economic, and cultural well-being of local people enhanced	▪ Increased per capita income ▪ Increased Gini coefficient ▪ Cultural heritages protected	Mid-term and final evaluation	▪ Study reports ▪ HDI reports, CBS Reports
OUTPUTS			
Innovative and traditional livelihood opportunities promoted	Number of functional local enterprises Number of local employment generated Number of cooperatives and business centers established Number of functional public-private partnerships	Annual	▪ DDC reports ▪ Progress reports, CHAL Database, Conservation partners report
Leadership of women and disadvantaged groups promoted	Number/% of NRM leaders from women and disadvantaged communities in various institutional frameworks	Mid-term and final evaluation	▪ Ministry of Women, Children, and Social Welfare reports ▪ CHAL Database, Conservation partners report
Important cultural heritage restored and protected	Number of heritages restored and protected	Mid-term and final evaluation	▪ DDC reports, Ministry of Culture, Tourism and Civil Aviation reports

Outcome 3. Good governance is practiced and contributes to strong inter-sectoral coordination with meaningful gender and social inclusion and strong multi-stakeholder capacities.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
Governance and policy made effective	Relevant laws and policies in place Governance practices among stakeholders strengthened Number of issues identified and addressed	Mid-term and final evaluation	▪ MoFSC reports, CHAL Database, Conservation partners report
Institutional mechanism, partnership, local capacity for landscape level conservation and development strengthened	Institutional mechanism for adoption of IRBM approach in place Capacity of multi-stakeholders enhanced	Mid-term and final evaluation	▪ MoFSC progress reports, CHAL Database, conservation partner reports
Gender equity and social inclusion enhanced	Increased engagement of women and disadvantaged groups in decision making and benefit sharing Decreased incidences of gender based violence	Mid-term and final evaluation	▪ Ministry of Women, Children and Social Welfare reports ▪ DDC reports
OUTPUTS			
Governance among all stakeholders strengthened	Governance assessment, public hearing, use of right to information an civil society auditing conducted	Mid-term and final evaluation	▪ MoFSC reports, CHAL Database, Conservation and development partners report
Institutional framework for adoption of IRBM approach in landscape conservation and development followed	IRBM institutions in place	Mid-term and final evaluation	▪ DSCWM progress reports, CHAL Database, Conservation partners report
Inter-sectoral coordination and cooperation mechanism strengthened	Inter-sectoral coordination and cooperation mechanism	Mid-term and final evaluation	▪ MoFSC progress reports, CHAL Database, Conservation partners report
Participation of women and disadvantaged groups in decision making process in resource governance enhanced	Increase in representation of women, poor and disadvantaged groups in executive position of resource management committees	Mid-term and final evaluation	▪ MoFSC progress reports, CHAL Database, Conservation partners report

Outcome 4. Risks and vulnerabilities to climate change, natural disasters, human induced activities, and infrastructure development are reduced.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
Risks and vulnerabilities of ecosystems, people and infrastructure due to climate change and other natural disasters reduced	Reduction in number of recorded incidences of environmental risks and hazards Climate adaptation plans at basin and sub basin scale prepared and implemented Community based adaptation plan under implementation Environmental standards followed in developing infrastructure Spread of invasive and alien species reduced	Mid-term and final evaluation	▪ DDC Reports ▪ Department of Hydrology and Meteorology (DHM), Ministry of Urban Development, Ministry of Physical Planning, MoFSC reports ▪ CHAL Database, Conservation partners report
OUTPUTS			
Institutional and local capacity building to address impacts of climate change enhanced	Trained human resources Capacity-enhanced institutions	Mid-term and final evaluation	▪ DDC reports ▪ Ministry of Population and Environment reports, CHAL Database, conservation partner reports
Basin, sub-basin scale climate change adaptation plans implemented	Climate change adaptation plans in place		▪ Ministry of Environment DSCWM, DOF, MoFALD progress reports, CHAL Database, Conservation partner reports
Reliable forecasting and early warning system developed	Warning system in operation	Mid-term and final evaluation	▪ DHM progress reports, CHAL Database, Conservation partner reports
Compliance of environmental safeguards in infrastructure development	Environment auditing of infrastructure	Mid-term and final evaluation	▪ MoFALD, Ministry of Physical Planning, Ministry of Urban Development progress reports CHAL Database, Conservation partner reports
Environmental pollution, risks, and hazards identified and mitigated	Reduction in number of environmental risks and hazards	Mid-term and final evaluation	▪ Ministry of Population and Environment and DDC reports ▪ CHAL Database, Conservation partner reports
Invasive alien species identified and controlled	Area invaded by invasive alien species restored	Mid-term and final evaluation	▪ MoFSC progress reports, CHAL Database, Conservation partner reports

Outcome 5. Long-term socio-ecological and environmental monitoring, knowledge management, and communication systems are established and functioning.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
Long-term socio- ecological and environmental monitoring integrated into Knowledge Management Center	Effective monitoring system Functional knowledge management Center	Mid-term and final evaluation	▪ MoFSC reports, CHAL Database, Conservation partner reports
OUTPUTS			
Long term monitoring of socio-ecological and environmental process established and implementation supported	Effective monitoring systems at sub-basin level Application of MIS	Mid-term and final evaluation	▪ Ministry of Home, MoFSC reports, Ministry of Home CHAL Database, Conservation partner reports
Inter-disciplinary knowledge management and communication system established and implemented	Functional Knowledge Management System Establishment of knowledge Management Center	Mid-term and final evaluation	▪ MoFSC reports, CHAL Database, Conservation partner reports

Outcome 6. Innovative sustainable financing mechanisms including public-private partnerships are developed and institutionalized.

Narrative Summary	Indicators	Reporting period	Means of Verification
PURPOSE			
Innovative sustainable financing mechanism based on ecosystem services, natural capital and public private partnership developed and institutionalized	Conservation investment from government and private sector Revenue generated from PES, CDM. REDD+ Equitable benefit sharing mechanism in place	Mid-term and final evaluation	▪ Ministry of Finance, MoFSC, National Planning Commission reports, Federation of Nepalese Chambers of Commerce and Industries reports ▪ DDC reports ▪ CHAL Database, Conservation partner reports
OUTPUTS			
PES mechanism established and operationalized	Number of PES schemes operationalized Revenue generated from infrastructure (Hydropower) for conservation investment	Mid-term and final evaluation	▪ MoFSC, Ministry of Finance, Ministry of Energy, Ministry of Water Resources progress reports, CHAL Database, Conservation and development partners reports
Equitable benefit sharing mechanism established	Performance-based financing guidelines in place Number of households benefited	Mid-term and final evaluation	▪ MoFSC, Ministry of Finance, Ministry of Energy, Ministry of Water Resources progress reports, CHAL Database, Conservation and development partners reports
Environmental pollution, risks, and hazards identified and mitigated	Reduction in number of environmental risks and hazards	Mid-term and final evaluation	▪ MoFSC, Ministry of Energy, Ministry of Water Resources, DHM progress reports, CHAL Database, Conservation and development

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