



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: LDCF

PART I: PROJECT IDENTIFICATION

| | | | |
|---|--|------------------------------|---------------|
| Project Title: | Catalysing ecosystem restoration for resilient natural capital and rural livelihoods in degraded forests and rangelands of Nepal. | | |
| Country(ies): | Nepal | GEF Project ID: ¹ | 5203 |
| GEF Agency(ies): | UNEP | GEF Agency Project ID: | 00992 |
| Other Executing Partner(s): | Ministry of Environment of Nepal in partnership with Ministry of Forests and Soil Conservation and Ministry of Agriculture and Cooperatives. | Submission Date: | 9 Nov 2012 |
| | | Resubmission # 1 Date: | 20 Feb 2013 |
| | | Resubmission #2 Date: | 15 March 2013 |
| GEF Focal Area (s): | Climate Change Adaptation | Project Duration(Months) | 48 |
| Name of parent program (if applicable): ➤ For SFM/REDD+ <input type="checkbox"/> | | Agency Fee: | \$498,415 |

A. FOCAL AREA STRATEGY FRAMEWORK:

| Focal Area Objectives | Expected FA Outcomes | Expected FA Outputs | Trust Fund | Indicative Financing from relevant TF (GEF/LDCF/SCCF) (\$) | Indicative Cofinancing (\$) |
|---------------------------------|----------------------|---------------------|------------|--|-----------------------------|
| CCA-1(select) | 1.1 | 1.1.1 | LDCF | 380,000 | 435,000 |
| CCA-1(select) | 1.2 | 1.2.1 | LDCF | 970,000 | 3,000,000 |
| CCA-1(select) | 1.3 | 1.3.1 | LDCF | 370,000 | 785,000 |
| CCA-2(select) | 2.1 | 2.1.1 | LDCF | 470,000 | 785,000 |
| CCA-2(select) | 2.2 | 2.2.1 | LDCF | 355,000 | 700,000 |
| CCA-2(select) | 2.3 | 2.3.1 | LDCF | 470,000 | 600,000 |
| CCA-3(select) | 3.1 | 3.1.1 | LDCF | 1,466,500 | 3,830,000 |
| CCA-3(select) | 3.2 | 3.2.1 | LDCF | 408,000 | 778,000 |
| (select)(select) | | | | | |
| Sub-Total | | | | 4,889,500 | 10,913,000 |
| Monitoring and evaluation | | | | 112,500 | 120,000 |
| Project management ² | | | | 244,475 | 440,000 |
| Total project costs | | | | 5,246,475 | 11,473,000 |

¹Project ID number will be assigned by GEFSEC.

²GEF will finance management cost that is solely linked to GEF financing of the project.

B. PROJECT FRAMEWORK

| Project Objective: To increase the resilience of Nepalese communities to climate change through restoration of degraded forests and rangelands. | | | | | | |
|--|-----------------------------|--|--|-------------------|--|------------------------------------|
| Project Component | Grant Type (TA/IN V) | Expected Outcomes | Expected Outputs³ | Trust Fund | Indicative Financing from relevant TF (GEF/LDCF/S CCF) (\$) | Indicative Cofinancing (\$) |
| 1. Local and national institutional capacity development. | TA | Strengthened technical capacity of local and national institutions to plan and implement measures to reduce the vulnerability and increase the resilience of mid-hill and high mountain communities by restoring the rangelands and forests they rely on for their livelihoods | <p>A multi-disciplinary national committee established that i) facilitates cross-cutting national dialogue on adaptation through ecosystem restoration, ii) develops large-scale ecosystem restoration as means of adaptation programmes, and iii) mobilises funds for the implementation of the programmes.</p> <p>Local authorities, committees and user groups, with an emphasis on women and youth, trained on adapting communities to climate change by using specific techniques for restoring local degraded forests and rangelands in the most vulnerable ecosystems.</p> <p>Policy briefs and technical guidelines developed and distributed for policy- and decision-makers on increasing resilience of local communities to climate change by using appropriate forest and rangelands restoration techniques based on emerging research findings as well as local indigenous knowledge.</p> | LDCF | 650,000 | 2,300,000 |

³ Additional details on potential LDCF project interventions within specific outputs are presented in Annex 1.

| | | | | | | |
|---------------------------------------|----|---|---|------|---------|---------|
| | | | <p>PhD and MSc theses produced with a focus on the specific climate change risks (increasing temperatures and reduced water availability) and providing technical guidance to reduce these risks by developing suitable ecosystem management plans for the targeted areas. This could include research on appropriate multi-purpose, indigenous plant species for forest and rangeland restoration under this changed climate.</p> <p>Community awareness increased in terms of how to adapt to climate change through restoration of ecosystems, including lessons-learned in Component 3.</p> | | | |
| 2. Policy and strategy strengthening. | TA | Policies and strategies that promote the restoration of degraded forests and rangelands thereby increasing the resilience of local communities to climate change. | <p>Revisions on existing ecosystem management and development policies and strategies produced to identify entry points for promoting adaptation via restoration of degraded ecosystems.</p> <p>A national up-scaling adaptation strategy through ecosystem restoration developed and institutionalized.</p> <p>Current forestry, agricultural and water sector budgets, policies and strategies revised to promote adaptation through ecosystem restoration up scaling.</p> | LDCF | 525,000 | 745,000 |

| | | | | | | |
|---|-----|--|--|------|-----------|------------|
| 3. Demonstration measures that reduce vulnerability and restore natural capital. | Inv | Increased resilience of local mid-hill and high mountain communities in Achham, Salyan and Dolakha districts to increased temperatures, reduced water availability and intense rainfall events through restoration of degraded forests and rangelands. | Multi-purpose forests and rangelands established in landscapes that were initially highly degraded to increase water infiltration and fodder production in the face of drought conditions and intense rainfall events. Conservation of topsoils achieved in agricultural and natural landscapes despite greater intensity of rainfall events. Alternative livelihoods (e.g. non-timber forest products) developed and promoted based on the benefits of functional forests and rangelands that are resistant to drought and extreme rainfall events. | LDCF | 3,714,500 | 7,868,000 |
| Sub-Total | | | | | 4,889,500 | 10,913,000 |
| Monitoring and evaluation | | | | | 112,500 | 120,000 |
| Project management ⁴ | | | | LDCF | 244,475 | 440,000 |
| Total project costs | | | | | 5,246,475 | 11,473,000 |

C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

| Sources of Cofinancing for baseline project | Name of Co-financier | Type of Co-financing | Amount (\$) |
|---|--|----------------------|-------------|
| National Government | Ministry of Agriculture and Cooperatives. | Grant | 4,762,000 |
| National Government | Ministry of Forests and Soil Conservation. | Grant | 4,151,000 |
| National Government | Ministry of Agriculture and Cooperatives – Project management; Monitoring and evaluation. | In kind | 280,000 |
| National Government | Ministry of Forests and Soil Conservation – Project management; Monitoring and evaluation. | In kind | 280,000 |
| UNEP | UNEP-BMU programme: Ecosystem Based Adaptation in Mountain Ecosystems. | Grant | 2,000,000 |
| Total Cofinancing | | | 11,473,000 |

D. GEF/LDCF/SCCF RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

| GEF Agency | Type of Trust Fund | Focal area | Country name/Global | Project amount (a) | Agency Fee (b) ² | Total c=a+b |
|------------|--------------------|------------|---------------------|--------------------|-----------------------------|-------------|
|------------|--------------------|------------|---------------------|--------------------|-----------------------------|-------------|

⁴Same as footnote #2

| | | | | | | |
|------------------------------|----------|----------|--|---|---|---|
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| (select) | (select) | (select) | | | | 0 |
| Total Grant Resources | | | | 0 | 0 | 0 |

¹ In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table

² Please indicate fees related to this project.

PART II: PROJECT JUSTIFICATION

A. DESCRIPTION OF THE CONSISTENCY OF THE PROJECT WITH:

A.1.1 The LDCF/SCCF strategies:

The Government of Nepal (GoN) seeks LDCF funding for a Full-Sized Project (hereafter referred to as ‘the LDCF project’) to implement priority activities as outlined in the National Adaptation Programme of Action (NAPA, submitted to UNFCCC in September 2010). The LDCF project addresses NAPA priorities 5 (‘Forest and ecosystem management for supporting climate led adaptation innovations’) and 7 (‘Ecosystem management for climate adaptation’). The LDCF project is consistent with the ‘Revised Programming Strategy on Adaptation to Climate Change for the LDCF and SCCF’ and follows the Results-Based Management Framework (RBM). Table A indicates the Focal Areas under the RBM that are being funded and Annex 1 indicates how the activities in the LDCF project relate to those Focal Areas. The LDCF project is predominantly within Climate Change Adaptation (CCA) Focal Area 1: Reducing Vulnerability and CCA Focal Area 3: Adaptation Technology Transfer, with some activities falling within CCA Focal Area 2: Increasing Adaptive Capacity. The vulnerability of local Nepalese communities to climate change will be reduced as a result of the LDCF project because the capacity of local and national institutions to undertake ecosystem restoration as means for adaptation and resilience building on a large scale will be strengthened, and degraded ecosystems will be restored. Importantly, new and innovative techniques for restoring degraded ecosystems in the Nepal in the face of climate change will be piloted. The findings of this piloting will be used to develop local and national approaches to up-scaling adaptation through ecosystem restoration.

A.1.2. For projects funded from LDCF/SCCF: the LDCF/SCCF eligibility criteria and priorities:

Participatory approach: the Ministry of Environment organised a stakeholder consultation workshop on 27 March 2011 where this LDCF Project Identification Form (PIF) was presented for stakeholder comments. These comments were incorporated into the document. During the PPG phase, activities and demonstration sites will be selected through extensive further stakeholder consultations at both local and national levels.

NAPA priorities: the LDCF project will contribute to addressing NAPA priorities 5 and 7 (see Section A.1.1).

‘Learning-by-doing’ approach: the LDCF project will be piloting new innovative techniques for adapting local communities to climate change by restoring degraded ecosystems. The lessons learned from these demonstrations will be used to guide local communities as well as to showcase successes at a national scale and thereby catalyze large-scale ecosystem restoration interventions across Nepal as means for adaptation.

Multi-disciplinary approach: adaptation through ecosystem restoration cuts across a wide range of sectors, including water, agriculture, energy and conservation. Technical experts in all these sectors will be sought to develop appropriate adaptation through ecosystem restoration interventions at specific sites. There will also be collaboration with a wide range of stakeholder groups, namely: central and local governments, academia, NGOs, community-based organisations (CBOs), the private sector and civil society.

Complementary approach: the LDCF project will work in conjunction with relevant ongoing and proposed adaptation projects in Nepal (see Section B.6). These include the following: i) National Development and Reform Commission (NDRC) International Ecosystem Management Partnership (IEMP) SCCF Project implemented by UNEP; ii) German Federal Environment Ministry (BMU) Ecosystem-based Adaptation (EBA) programme implemented by UNEP, UNDP and IUCN; iii) Hariyo Ban Nepalko Dhan (Harriyo Ban) USAID Programme; iv) UNDP LDCF Regional Glacier Lake Outburst Floods (GLOF) Risk Reduction Project⁵; v) Pilot Programme for Climate Resilience; vi) proposed UK Department for International Development (DFID) supported Nepal Climate Change Support Programme; and vii) the Asian Development Bank Community-Based Adaptation Planning Programme.

Gender equality: the LDCF project will pursue a gender-sensitive approach whereby women representation at training workshops, demonstration activities and management committees will be strongly promoted (see Section B.3). The implementation of gender policies such as the Gender and Social Inclusion Strategy developed by the Ministry of Forests and Soil Conservation (MoFSC) will be emphasized.

A.2. NATIONAL STRATEGIES AND PLANS OR REPORTS AND ASSESSMENTS UNDER RELEVANT CONVENTIONS, IF APPLICABLE, I.E. NAPAS, NAPS, NBSAPS, NATIONAL COMMUNICATIONS, TNAS, NIPS, PRSPs, NPFE, ETC.:

The LDCF project is consistent with national government priorities/plans set out in key documents including *inter alia*: i) the NAPA and Local Adaptation Plan of Actions (LAPAs); ii) National Five-Year and Three-Year Plans which include the Tenth Plan/Poverty Reduction Strategy Paper (PRSP 2003), Nepal (2002-2007)⁶; iii) the Nepal Environmental Policy and Action Plan (NEPAP 1993); iv) Nepal's Initial National Communication to the UNFCCC (2004); v) the Third and Fourth National Reports to the United Nations Convention to Combat Desertification (UNCCD); v) the Fourth National Report to the Convention on Biological Diversity (2009); and vi) the Nepal Biodiversity Strategy (2002) and its Implementation Plan (2006). These documents all identify sound environmental management as critical for the sustainable development of Nepal.

The LDCF project is consistent with NAPA priority profiles 5 and 7. Under profile 5 – Forest and Ecosystem Management for Supporting Climate-led Adaptation Innovations – the project is concerned with managing the forest and the ecosystems in order to promote innovations for climate-led adaptations. For profile 7 – Ecosystem Management for Climate Adaptation – the goal is to conserve the ecosystem and promote the ecosystem-based livelihoods of the people living in the Western Nepal. The Government of Nepal's (GoN) series of National Five-Year Plans and Three-Year Plans are aimed at reducing poverty by providing a policy framework that encourages investment in primary sectors that form the foundation of rural development. The recently adopted Three Year Plan (TYP) Approach Paper (2010-2012) aims to *inter alia*: i) strengthen the institutional capacity related to environmental policies and regulation; ii) internalise environmental management into development; iii) prioritise planning for effective implementation of national and international environmental commitments; and iv) conduct research on climate change. The Nepal Environmental Policy and Action Plan (NEPAP 1993) is organised around five policy objectives. The LDCF project is consistent with priority 1: Sustainable Management of Natural Resources – Forest and Rangeland Management and Water Resource Management. Nepal's Initial National Communication to the UNFCCC Chapter 5 details the Vulnerability and Adaptation to Climate Change in Nepal. Section 5.3.5 Policy Framework and Adaptation Strategies h) Agro-forestry and forage development. To address Target 7.1 of the CBD's Biodiversity Target – “maintain and enhance resilience of the components of biodiversity to adapt to climate change” – Nepal's 4th national report⁷ suggests (i) initiating the NAPA process; (ii) initiating climate change research and monitoring; (iii) extending the study of climate change impacts on the livelihoods of communities; and (iv) finalising, endorsing and implementing REDD policy. One of the cross-sectoral strategies in

⁵ This project is still in the process of being developed at the time of writing. Linkages with the project will therefore be reassessed during the inception phase.

⁶ The Government of Nepal's (GoN) series of National Five-Year Plans and Three-Year Plans are aimed at reducing poverty by providing a policy framework that encourages investment in primary sectors that form the foundation of rural development. The recently adopted Three Year Plan (TYP) Approach Paper (2010-2012) aims to *inter alia*: i) strengthen the institutional capacity related to environmental policies and regulation; ii) internalise environmental management into development; iii) prioritise planning for effective implementation of national and international environmental commitments; and iv) conduct research on climate change.

⁷ The report is available at: www.cbd.int/doc/world/np/np-nr-04-en.pdf

Nepal's biodiversity strategy⁸ is the consideration of "*in-situ conservation*". This includes conserving natural habitats and the restoration of degraded ecosystems.

The GoN is strongly committed to managing Nepal's natural resources and environment effectively. Examples of this commitment include: i) mandatory EIAs; ii) the NEPAP which integrates environmental considerations into development; iii) the Rural Water Supply Sanitation Fund Development Board (1996) to promote sustainable and cost-effective demand-driven rural water supply and sanitation services; iv) the Local Self-Governance Act (1999) which promotes environmental considerations by local authorities; and v) the Water Resources Strategy (2002) and the National Water Plan (2005).

The LDCF project is also in line with the government priorities for attaining the Millennium Development Goals (MDGs). Specifically, the LDCF project will contribute towards achieving: i) MDG 1: 'eradicating extreme poverty and hunger'; ii) MDG 3: 'promoting gender equality and empowering women'; and iii) MDG 7: 'ensuring environmental sustainability'.

B. PROJECT OVERVIEW:

B.1. DESCRIBE THE BASELINE PROJECT AND THE PROBLEM THAT IT SEEKS TO ADDRESS:

B.1.1. Baseline projects:

The LDCF project will build on three baseline projects. In-depth consultations were held with stakeholders from all three baseline projects during the preparation phase of this PIF, to ensure that the LDCF project will be strongly aligned with and integrate fully into the baseline projects. The first baseline project, implemented by the MoFSC and funded by IFAD (US\$ 10.5 million loan and US\$ 1.2 million grant financing), improves the livelihoods of poor rural communities in Nepal by providing security of land tenure and restoring degraded forest ecosystems. The restoration of the degraded forests through the LDCF project will result in greater water flows in rivers, improved water quality, and greater agricultural productivity from crops and livestock. This is vital as poor rural communities are reliant on crops and livestock for their livelihoods. The second baseline project, implemented by the Ministry of Agriculture and Cooperatives (MoAC), improves livestock productivity through the restoration of degraded rangelands. Like the first baseline project it has a strong focus on improving the welfare of rural communities through innovative interventions to restore ecosystems. The third baseline project, implemented by the Department of Plant Resources in the MFSC through government funding, is a research programme focusing on the effects of climate change on indigenous plant communities in Nepal.

B.1.2. The problem the baseline projects seek to address:

The problem that these baseline projects seek to address is that the widespread and pernicious degradation of natural ecosystems in Nepal is significantly jeopardizing the livelihoods of rural communities, and ultimately the Nepalese economy as a whole. This is because the degradation of forests and rangelands in Nepal has negative impacts on a wide range of sectors, including water, agriculture, energy, transport, tourism and conservation. The chain of causal events is as follows:

- The cover of trees and grasses is reduced through degradation. Rates of fuel wood collection and levels of livestock stocking cannot be maintained as the plant cover is reduced, and as a result these practices become increasingly unsustainable through time, further exacerbating the degradation. A negative cycle of degradation is established.
- Soils are exposed to damage from raindrop impact. The soils in the mid-hills of Nepal are particularly vulnerable to this damage as a result of chemical and physical properties that predisposes them to clay dispersion and crusting.
- Soil erosion increases and water quality of surrounding streams and rivers decreases with the increased sediment load.

⁸ This report is available at: <http://www.cbd.int/doc/world/np/np-nbsap-01-en.pdf>

- There is less infiltration of rainwater into soil profiles, and consequently the ‘sponge effect’ of water catchments is reduced. This results in increased surface run-off and thus increased flow in rivers during wet seasons, but a concomitant reduced flow in rivers during dry periods.
- Water supply from rivers for domestic, agricultural and industrial use is consequently more variable and is reduced during dry periods.
- Hydro-electric power production is reduced because firstly the capacity and longevity of dams is reduced as a result of siltation and secondly the blades of the hydro-power turbines are damaged by the increased silt load in the water.
- The availability of fuel wood as a source of energy for heating and cooking is considerably reduced as a result of deforestation and degradation.
- Agricultural productivity is reduced firstly because less water infiltrates into soils and growth of both crops and pastures is reduced and secondly because irrigation projects are compromised by reduced water flow in dry periods. Food security is further compromised because supplies of indigenous fruit from natural ecosystems are reduced in degraded environments.
- The transport sector is compromised because greater runoff of rainwater from exposed soil surfaces increases flooding and thus damage of road and rail infrastructures.
- Tourism is adversely affected through *inter alia* reduced aesthetics of degraded natural environments, reduced wildlife viewing opportunities and reduced quality of road and rail networks.
- And lastly, conservation is compromised because biodiversity is inevitably considerably reduced in degraded ecosystems.

The negative impacts of degradation described above are particularly problematic for Nepal for the following reasons:

- Unemployment and poverty are ubiquitous across Nepal.
- Surface waters and agriculture form the basis of the Nepalese economy in rural areas⁹. 83% of the Nepalese population occurs in rural areas and 74% of the population is directly dependent on agricultural activities including cropping and livestock production.
- Industry in Nepal mainly involves the processing of agricultural products such as jute, sugarcane, tobacco, and grain. The main exports are carpets, clothing, jute goods, textile, pulses, juice and pashima totalling US\$ 907 million per year¹⁰.
- 91% of electricity in Nepal is generated through hydropower¹¹.
- 85% of the Nepalese population rely on fuel wood for energy¹².
- Biodiversity is an important feature of the Nepalese economy as it provides natural resources that are the foundation for many industries that rural communities rely on for their livelihoods. These industries include non-timber forest products (NTFPs)¹³, livestock production, crop agriculture and nature-based tourism¹⁴. Indeed, an important competitive advantage of Nepal on the global tourism stage is that it is extremely rich in biodiversity¹⁵ and contains 118 distinct ecosystems¹⁶.

⁹ The main agricultural products (mostly from the Terai region bordering India) include tea, rice, corn, wheat, sugarcane, root crops, milk, and water buffalo meat.

¹⁰ CIA World FactBook. <https://www.cia.gov/library/publications/the-world-factbook/geos/np.html>

¹¹ Horstmann, B. 2004. Glacial Lake Outburst Floods in Nepal and Switzerland: New threats due to climate change. (www.climate-responsibility.org and www.germanwatch.org).

¹² Regmi, B.R. & Adhikari, A. (LIBIRD). 2007. Climate change and human development : risk and vulnerability in a warming world, country case study- Nepal.

¹³ Examples include fiber, fruit, honey, medicines, spices and fodder. Nepal is in particular renowned for its large number of fodder trees.

¹⁴ Tourism amounted to 15% of exports in 2000. Regmi, B.R. & Adhikari, A. 2007. Human Development Report 2007/2008 – Fighting Climate Change: Human Solidarity in a divided world – country case study – Nepal, Human Development Report Office, Occasional paper No 57, cited in NAPA 2010.

¹⁵ Biodiversity is defined as the richness and variety of living beings from all sources including, *inter alia*, terrestrial, marine and freshwater ecosystems, and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.

¹⁶ Nepal Biodiversity Strategy. 2002.

B.1.3. Background information on economic sectors negatively affected by ecosystem degradation:

Subsistence **agriculture** is the foundation of the economy, with approximately 74% of the population employed in this sector. Currently, farming contributes 32% to the GDP which is an 11% decrease from the 1990s. Despite continued attempts to increase production and productivity in the past, the per-capita food availability has decreased in recent years because of an increased population and relatively stagnant performance of the agriculture sector. The per-capita holding size of agricultural land is less than 0.8 ha and approximately 42 districts (out of 75) in the country encounter a food deficit each year¹⁷. It is estimated that of utilised agricultural land around 10% of rain-fed agricultural land is degraded and 37% of rangeland is in a degraded condition¹⁸. The main agricultural products include tea, rice, corn, wheat, sugarcane, jute, root crops, milk, and buffalo meat. More than 60% of the agricultural production of the country takes place in the Terai region which only occupies 30% of the total land area. Industry mainly involves the processing of agricultural products such as jute, sugarcane, tobacco, and grain.

Nepal's steep topography results in a dense network of more than 6,000 rivers. All river systems drain from north to south towards the Ganges. The major **river systems**, which originate in the Himalayas, are the Koshi, Narayani (Gandaki), Karnali and Mahakali systems. The Koshi River Basin is the largest river basin in Nepal. It covers a total catchment area of 60,400 km² of which 46% lies in Nepal and the remainder in Tibet and China. The total annual run-off for all rivers in Nepal is estimated at approximately 225 billion cubic metres (BCM). Of this an estimated 15 BCM per annum is utilized for socio-economic purposes and 72% of the country's population has access to basic water supply at present. Hydro-geological mapping indicates that the Terai region is one of the most productive aquifers in the subcontinent. Rechargeable **groundwater** in the Terai region is estimated to be between 5.8 BCM and 11.5 BCM annually. At present, it is estimated that about 756 million cubic metres (MCM) of groundwater resources are being used for irrigation purposes and 297 MCM for domestic uses annually. There is consequently potential to increase the use of groundwater use in the Terai region¹⁹.

There are no known fossil fuel deposits in Nepal. As such the **energy sector** relies on traditional energy sources, and imported fuel and electricity from outside the country (predominantly India). Limited access to electricity in rural areas has forced people to mainly rely on fuel wood for energy, placing considerable pressure on forests²⁰. Less than a third of the population has access to electricity, which comes mainly from hydro-power. The rest of the population relies on fuel wood and energy derived from biomass²¹. Approximately 91% of the country's electricity is generated through hydro-power, which makes the energy sector particularly vulnerable to the impacts of climate change, notably GLOFs and the variability in river runoff, caused by the melting of glaciers²² (see Section B.2.1.). Nepal's potential for hydro-power, however, remains largely untapped. It is estimated that 21,000 MW could feasibly be generated through hydro-power. The total installed hydro-power capacity is around 586 MW, constituting approximately 3% of the potential. Apart from the national grid, there are also a number of initiatives (private and public) to install micro-hydro-power plants in remote areas of the country (currently about 35 of these plants are in place)²³.

The **health** sector of the country is afflicted by a wide range of diseases. Vector borne diseases like malaria, visceral leishmaniasis, lymphatic filariasis, Japanese encephalitis and recent emergence of dengue infection are major public health problems together with TB and HIV/AIDS. Incidence of diarrheal diseases and acute respiratory tract infection are high. Increasing incidence of diabetes, hypertension and cancer have been observed. Malnutrition among children, adolescents and women has been and remains a serious public health problem. About 50 % of under-five children are stunted due to malnutrition. Food availability and security remains a widespread problem, particularly in hill and mountain regions²⁴.

¹⁷Ministry of Agriculture and Cooperatives. 2010. National Agriculture Sector Development Priority (NASDP) for the Medium-Term (2010/11 - 2014/15). Government of Nepal.

¹⁸National capacity self-assessment for global environment management, Nepal Thematic assessment report: land degradation. 2008. Government of Nepal.

¹⁹WECS (Water and Energy Commission Secretariat). 2005. Nepal National Water Plan (NWP). Acharya, M.D. and S.P. Joshi, eds. Kathmandu, Nepal.

²⁰United Nations Development Assistance Framework for Nepal 2008-2010.

²¹Government of Nepal (GoN), NAPA, 2010.

²²BrittiaHorstmann. 2004. Glacial Lake Outburst Floods in Nepal and Switzerland: New threats due to climate change. Germanwatch (www.climate-responsibility.org and www.germanwatch.org).

²³National Energy Situation survey Report, Nepal- Focus on Renewable Energy and Poverty Reduction.

²⁴WHO. 2010. Country Cooperation Strategy. Available from http://www.who.int/countryfocus/cooperation_strategy/ccsbrief_npl_en.pdf.

Nepal is a landlocked country, and thus relies on roads and aviation as the major means of **transportation**. The railway network is extremely limited in extent, as is the urban transport network. The road network in Nepal is generally very limited which has a negative impact on the transport sector²⁵. In 2007, the network consisted of 17,282 km of roads. More than 60 percent of the network is concentrated in the lowland (Terai) areas of the country. The Eastern region is comparatively well served with road networks, whilst the mid-west and far-west have a sparse road network²⁶. In total 43 % of the population has access to all-weather roads. This influences socio-economic development and private sector investment opportunities in remote areas. Areas with a sparse road network have limited access to markets. Transport costs are also higher and there is thus less incentive for the private sector to operate in these regions.

Nepal contains 118 ecosystems, 75 vegetation types and 35 forest types that provide habitat for an immense amount of **biodiversity**, including: 9.5% of bird, 4.5.% of mammal, 1.9% of reptiles, 1.0% of fish, and over 2.0% of the flowering plant species of the world²⁷. Ecosystems in the east of Nepal receive more precipitation and are more species-rich whereas those to the west are drier with fewer species. There are three broad ecological regions in Nepal, namely²⁸: i) the Himalayas in the north (home to 7% of the country's population); ii) hills and valleys in the middle (home to 46% of the country's population); and iii) Terai, an extension of the Indo-Gangetic plain, in the south (home to 47% of the country's population). Forests constitute Nepal's largest natural resource in terms of coverage, and occupy approximately 40% of the total area of the country²⁹. However, deforestation (mainly through fuel wood harvest) is a major problem in all regions of the country and has led to erosion and degradation of ecosystems³⁰. The annual deforestation rate is estimated to be on average 1.7% with rates of 2.3% in the hills and 1.3% in the Terai³¹. The vast majority of deforestation and degradation is occurring outside of community forest management areas and protected areas. This highlights the advantages of community forest user groups.

The **protected area** system in Nepal covers 23% of the country's total land area³². The protected area network is one of the most important attractions for tourists visiting the country, highlighting the importance of ecotourism³³. There are also a number of landscape scale conservation initiatives underway, for example: the Terai Arc Landscape Management Program and the Western Terai Landscape Conservation Project³⁴.

Tourism contributes significantly to the economy of the country, amounting to 15% of exports in 2000³⁵. Tourism trends indicate that trekking and mountaineering tourism is a major draw card for Nepal. The most popular destinations within Nepal are Kathmandu, Patan and Bhaktapur. Adventure tourists are particularly drawn to Kathmandu, Chitwan, Pokhara, Annapurna and Everest³⁶.

B.1.4. Description of baseline projects:

The MoFSC and MoAC are tackling the above-described problem via three main programmes (hereafter referred to as the baseline projects). The first baseline project is the **Leasehold Forestry and Livestock Programme (LFLP)**, implemented jointly by the Department of Forests (DoF) in the MoFSC and the Department of Livestock Services (DLS) in the MoAC. The LFLP is a community-based forest management and livestock development programme targeting poor families in 22 mid-hill districts of Nepal. The overall goal of the programme is a sustained reduction

²⁵United Nations Development Assistance Framework for Nepal 2008-2010.

²⁶Poverty Reduction Strategy Paper, 2003. IMF Country Report No. 03/305.

²⁷Nepal Biodiversity Strategy. 2002.

²⁸Nepal's INC to the UNFCCC, 2004.

²⁹Nepal's INC to the UNFCCC, 2004.

³⁰Government of Nepal (GoN), NAPA, 2010.

³¹FSISP, 1999, Forest Resources of Nepal, (1987-1998), FINIDA/HMG, Ministry of Forest, Nepal

³² This includes nine national parks, three wildlife reserves, one hunting reserves, three conservation areas and eleven buffer zones (National capacity self-assessment for global environment management, Nepal Thematic assessment report: biodiversity. 2008. Government of Nepal.). Three more Conservation Areas have recently been declared to promote biodiversity conservation.

³³ National capacity self-assessment for global environment management, Nepal Thematic assessment report: biodiversity. 2008. Government of Nepal.

³⁴ These programmes are initiatives of the Ministry of Forests and Soil Conservation.

³⁵Regmi, B.R. &Adhikari, A. 2007. Human Development Report 2007/2008 – Fighting Climate Change: Human Solidarity in a divided world – country case study – Nepal, Human Development Report Office, Occasional paper No 57, cited in NAPA 2010.

³⁶Tourism marketing strategy for Nepal, 2005 – 2020.

in the poverty of 44,300 poor households through increased forest and livestock production with leasehold forestry plots allocated to them. The programme has four major component namely: i) leasehold forestry and group formation; ii) livestock development; iii) rural finance; and iv) project management and coordination. The Food and Agriculture Organization (FAO) of the United Nations has been providing Technical Assistance (TA) to the LFLP since 2009. The main objective of the TA is to support the DoF and DLS in improving the effectiveness of the LFLP and building up appropriate institutional and technical capacities to support institutionalization of leasehold forestry in the country. The TA group has piloted the leasehold forestry and livestock development approach in an additional five districts of western development region, namely Palpa, Nawalparasi, Syangja, Gulmi and Arghakhanchi.

The LFLP has identified several major constraints hindering success at present, including: i) lack of technical capacity at the district level to implement the programme; ii) the complexity of managing a wide range of agro-ecological conditions; iii) lack of consistency in the implementation protocols across projects and districts; iii) lack of appropriate indicators to quantify the poverty of rural households and communities; and iv) difficulties in quantifying the contribution of forests and trees to poverty reduction. To address these constraints, four major approaches have been taken: i) increased technical support to the local leasehold forestry institutions; ii) development of the livestock sector with a focus on goat breeding; iii) provision of financial support to leasehold forestry groups as well as cooperatives; and iv) establishment of a project management and coordination facility. These approaches are described in detail in Annex 4. Importantly, an underlying principle of the LFLP is to link ecosystem restoration interventions with changes to agricultural practices, access to finance and land tenure. The LDCF project will therefore integrate into current LFLP activities, providing the necessary funding to restore forests and increase the climate change resilience of vulnerable communities. The rationale behind the principle of linking ecosystem restoration to agricultural practices is discussed below.

The links between ecosystem restoration and livestock productivity: The LFLP has a primary focus on restoring degraded forest systems, and a secondary focus on improving livestock productivity. The two foci fit together because the two sectors ‘forest conservation’ and ‘agriculture’ are inextricably linked across Nepal. Forested landscapes and grassland landscapes are used for livestock production across Nepal. In the case of forested landscapes, degraded forests are the main grazing/browsing area for livestock. Any programme in Nepal that aims to improve community livelihoods by changing natural resource use also needs to consider (and in all likelihood alter) agricultural practices. In the case of the LFLP, livestock need to be removed from the sites where highly degraded forests are being restored. If the livestock are not removed, they damage the newly planted seedlings and prevent effective restoration of the forest. Communities are willing to remove their livestock from these sites because they see tangible benefits emerging from the restored sites such as medicines, honey, fodder for livestock (including grass and leaf browse), fruits, fibre and timber. These benefits more than compensate them for the removal of livestock from the sites. The community members also realize that there will be other benefits from the restoration such as improved water flows and less soil erosion into their river systems. The LFLP works with the assumption that improved livestock productivity is fundamental to improving rural communities’ livelihoods. (At present the livestock productivity is low relative to what could be achieved through appropriate livestock management practices). It is also fundamental to the success of the ecosystem restoration activities, because communities that improve their economic status as a result of restoration of forests are more likely to conserve their natural resources in times of stress (e.g. drought), rather than degrade their natural resources (as has occurred in the past). The LFLP consequently also focuses on improving livestock management practices, so that the poor communities can improve their economic status through enhanced livestock productivity. Importantly, the improved productivity is not only from activities such as using appropriate vaccines, introducing goats and providing supplemental nutrients from licks, but also by utilizing the restored forest landscapes. For example, the programme shows the community how to harvest fodder plants such as grass and leaves of certain tree species in a sustainable manner from the restored forests for their livestock. The improvement in the health and vigour of their livestock is then associated with the restored forests, and communities are motivated to conserve the forests as they experience direct benefit from them. The bottom line is that forest restoration and improved livestock production need to go hand in hand in Nepal if forest restoration activities are to succeed. The LDCF project will therefore link strongly with the LFLP to ensure that synergies are established and ecosystem restoration interventions are synergized with the agriculture-related activities of the baseline project

Micro-finance and land tenure: Improving the economic status of communities and promoting the conservation of restored forest landscapes requires more than improving the agricultural productivity of communities. In many cases there is insufficient access to finance to develop agricultural activities. Consequently, the LFLP has also established a micro-finance programme to enable small scale farmers to take out loans to buy seed, fertilizer, livestock, equipment, vaccines, fencing and other goods and services to develop their farming operations. An additional barrier to conserving restored forests is lack of land security. Most of the degraded forest land is owned by the government, and there was consequently little incentive for the communities to invest in the restoration of the forest if the government could at any stage remove the trees. The LFLP has consequently set up new systems whereby the communities have long-term, renewable leases on the sites of forest restoration. With this system in place, the communities can plant trees on the sites with the knowledge that the trees will not be harvested by the government, and will rather be used by the community for several generations.

The second baseline project is the **Livestock Service Development and Extension Programme (LSDEP)** – a component of the Livestock Services Extension Programme – implemented by the DLS in the MoAC. The LSDEP focuses on rangelands and has the main objective of reducing the incidence of poverty in rural communities. LSDEP operates in all 75 districts through the DLS district offices and has a wide range of interventions that result in increased livestock productivity seeking to increase levels of food security, nutrition, incomes and employment for rural communities. This will be achieved by increasing livestock productivity through the appropriate environmental management of rangelands. Activities include: i) establishment of a grass seed centre and subsequent distribution to district resource centres; ii) management of a livestock feed quality control system; iii) management of community resources to increase supply of pasture and fodder; iv) increasing productivity of community pasture land; v) involvement of the private sector in the production and marketing of grass seeds; and vi) assisting the establishment of livestock markets. Increasing livestock production and productivity lowers malnutrition, whilst improving the economic and social condition of the poor and socially disadvantaged members of the community. Livestock production can be increased by improving rangeland condition and through the amelioration of currently degraded rangelands. The provision and distribution of grass seeds improves rangeland condition by restoring degraded areas and increasing palatable grass cover. Supplying high quality livestock feed and the establishment of livestock markets prevents land degradation from overgrazing during times of drought, whilst maintaining livestock health and value.

The LDCF project will specifically build upon the interventions of LSDEP that focus on restoration of degraded rangelands and management of the rangelands. Such interventions include: re-seeding of degraded land with productive grasses; construction of stone bunds and contour ditches to reduce erosion; mulching of open soils in degraded land; planting of rangeland fodder plants; and management of livestock stocking levels. The LDCF project will modify these interventions in the context of climate change threats (See section B.2.2. below for further details) to ensure integration with and climate-proofing of the baseline project.

The third baseline project is the **Climate Change Research Programme (CCRP)** which started in 2011 and is implemented by the Department of Plant Resources (DPR) (see Annex 6 for further details on this department) in the MoFSC. At present the programme has a modest budget of \$7000 per year and is focusing on how climate change is affecting several important plant species (including *Rhododendron* and *Myrica* spp.). Importantly, DPR recognizes that an understanding of climate change effects on indigenous plant communities is critical for developing adaptation strategies based on ecosystem management. (If climate change, for example, has a negative impact on a particular indigenous species in a particular area, restoration of degraded ecosystems in that area is unlikely to be successful if there is a focus on re-establishing that particular species.) It also recognizes that horticultural and restoration research is necessary to identify appropriate species and restoration protocols for restoring degraded ecosystems in the face of climate change. DPR would consequently like to expand their research activities in climate change beyond the examination of climate change effects on particular plant species. Focal areas for research will include: species regeneration and adaptation in alpine meadows and forests; dendrology of selected tree species; ethno-ecological knowledge on climate change adaptation and restoration; species richness and endemic species distribution along land use and altitudinal gradients; and shifts in vegetation due to climate change. The LDCF project will work with the CCRP to undertake research that will complement the LDCF

interventions. The details of each research initiative will be site specific and will be determined during the PPG phase. In broad terms, the ecosystem restoration techniques used at each forest and rangeland project site will be studied using a scientific approach to determine the socio-economic costs and benefits as well as the biological suitability of different species for restoration purposes. This information will be used for developing restoration protocols in relation to different environmental factors such as soil type, soil depth, topographic position in the landscape, aspect, slope angle, and vegetation type. The scientific studies within the LDCF project will be conducted by local PhD and MSc students which, in the process, will build Nepalese ecological and restoration expertise. The students will be encouraged to publish their work in peer-reviewed publications, because these will form a credible basis for upscaling the work at a national level, and for leveraging additional funding after the LDCF project is complete.

Synergies between baseline projects. The LDCF project sites will be selected during the PPG phase as described in Section B.2.3. The selection process will be co-ordinated with the departments responsible for the three baseline projects (LFLP, LSDEP, CCRP), namely DoF, DLS and DPR. This co-ordination will ensure that LDCF project sites are positioned within LFLP and/or LSDEP areas, and that LDCF project interventions build upon and strongly complement the LFLP and/or LSDEP interventions. This will ensure climate-proofing of the baseline projects takes place, and maximum synergies with the LDCF project are established. CCRP research will be conducted within the LDCF project sites and DPR will work directly with the DoF-LFLP and DLS-LSDEP project managers and teams responsible for implementing the LDCF interventions. The interaction between the CCRP and LFLP and LSDEP will focus on the collection of scientific data from LDCF interventions. Synergies between the three departments will consequently be developed as a result of their joint focus on building climate resilience, and the co-ordination necessary to ensure rigorous data collection at the LDCF sites.

B. 2. INCREMENTAL /ADDITIONAL COST REASONING: DESCRIBE THE INCREMENTAL (GEF TRUST FUND) OR ADDITIONAL (LDCF/SCCF) ACTIVITIES REQUESTED FOR GEF/LDCF/SCCF FINANCING AND THE ASSOCIATED GLOBAL ENVIRONMENTAL BENEFITS (GEF TRUST FUND) OR ASSOCIATED ADAPTATION BENEFITS (LDCF/SCCF) TO BE DELIVERED BY THE PROJECT:

Climate change is already affecting rural mid-hill and high mountain communities in Achham, Salyan and Dolakha districts in Nepal. Local communities in these areas are particularly vulnerable to the effects of climate change because they are reliant on their natural environments for their livelihoods. These communities are poor, have limited services, and limited alternative livelihood options making them particularly vulnerable to the effects of drought. This is because they have limited financial or other resources available to cope with drought inflicted losses. Ecosystem based approaches to adaptation make local communities more resilient to the impact of climate change effects. This is achieved by strengthening ecosystem service provision. In Achham, Salyan and Dolakha districts livestock is important to the livelihoods of local communities. These communities are therefore reliant on: i) rangelands for grazing; ii) forests for browsing; and iii) natural water sources for watering their livestock. Productive vegetation and therefore fertile soils and water are therefore fundamental in this system. The effects of climate change in the mid and high hills are increased temperatures and reduced water availability leading to shifts in the areas suitable for some plant species, increased livestock pests and lower fodder availability (see Table 1).

The component of the Leasehold Forestry and Livestock Programme (LFLP) and Livestock Service Development and Extension Programme (LSDEP) that is most heavily impacted by climate change is livestock development. As a result of warming in the mid hill and high mountain regions there have been and will continue to be changes in the suitability of particular altitudinal belts to particular plant and pest species i.e. there will be shifts in the distribution of productive rangeland and livestock pests (Table 1). One of the objectives of the LSDEP is to reseed degraded rangelands with productive grasses. In some regions grasses that previously grew there might no longer be suitable. Another climate change consideration for livestock development is the increase of parasites as a result of increased temperatures. Reduced availability of water will also impact livestock production both directly – as livestock needs water – and indirectly through reducing rangeland productivity. The LFLP focuses on the management of forests. The influence of climate change in the mid hill in terms of increased temperatures and

reduced water availability necessitates that forest restoration focuses on the planting of climate resilient tree species i.e. species that can cope under water and heat stress and are sufficient at binding soil, promoting water infiltration and reducing erosion.

Without the LCDF project there will be limited use of ecosystem based approaches to adaptation by the baseline projects, namely LFLP and LSDEP. There is a risk that project activities will fail in the face of climate change if ecosystem services and the impact of climate change on ecosystems are not comprehensively considered. The application of climate change adaptation approaches is often not intrinsic in development projects. Component 3 of the LCDF project will ensure that project activities of the baseline projects are climate proofed using ecosystem based approaches to adaptation. In so doing, the resilience of rural communities to the effects of climate change will be increased (see Table 1). The complementary approaches of the LCDF project will include: i) the use of climate resilient multi-use tree species in forest restoration activities; ii) ensuring that rangeland restoration activities are conducted in areas that will be climatically suitable for rangelands in the next few decades; and iii) restoring grasslands with indigenous grass species that are resilient, productive and climatically suitable to restoration locations. The other two components of the LDCF project will also support the baseline projects. Component 2 of the LDCF project aims to strengthen policies and strategies to promote the restoration of forests and rangelands. This will provide a supportive environment for the up-scaling of the LFLP and LSDEP baseline project activities. Component 1 will similarly support baseline activities by improving capacity to plan and implement restoration activities (Table 1).

Activities additional to those already implemented by the baseline projects – are required to ensure that the baseline projects described above are not severely compromised by climate change impacts. The LDCF project management team will work closely with the management teams of the baseline projects to ensure that synergies are created and lessons learned are disseminated between the projects. This close working relationship has been initiated in the preparation of this PIF, which involved significant input from the baseline project managers. Once the LDCF project is implemented, frequent meetings between LDCF and baseline project managers will take place to ensure that the LDCF project builds upon the baseline project foundations in an effective manner. The paragraphs below provide further detail on: i) the current and expected climate change impacts facing Nepal; ii) adaptation solutions and benefits; and iii) proposed activities of the LDCF project.

Table 1. Business-as-usual activities versus the adaptation alternative for the LDCF project in Nepal.

| Baseline projects • Goals and activities | Climate change hazards affecting the baseline projects | Impacts to the baseline projects and targeted populations as a result of climate change | Targeted ecosystem services of the LDCF project | Alternative scenario including complementary activities of the LDCF project | Expected LDCF project benefits |
|---|---|--|---|--|---|
| Project targeted vulnerable sites and communities: Local rural communities – living in village development committees (VDCs) in the mid-hills in Achham ³⁷ and Salyan ³⁸ districts and in the high mountains in Dolakha ³⁹ district ⁴⁰ – that experience the adverse effects of drought | | | | | |
| Leasehold Forestry and Livestock Programme (LFLP) • Increased forest productivity through leasehold forestry, rural finance and project management. • Increased livestock production through improved quality of livestock animals and feed. | Increased temperatures in the mid-hills and high mountains leading to a shift in the distribution of agro-ecological zones. Decreased rainfall in the mid-hills in the dry months. | Climate variability and change is expected to: Reduce forest productivity as a result of: • Increased temperature and water stress. • Increased harvesting pressure when community livelihoods are compromised. Reduce livestock production as a result of: • Increased incidence of livestock parasites in the high hills. • Declines in fodder productivity in the high hills. • Reduction in water available⁴¹ for livestock and forest production. Compromise the livelihoods of local communities⁴² because of their: • Reliance on forests and livestock for food, energy and income. | • Fodder production in forests. • Infiltration of water into topsoils⁴³. • Production of non-timber forest products (NTFPs) in forests. | LDCF resources will be used to build resilience of this baseline project through: • Tailoring the restoration of climate resilient and multi-use⁴⁴ forests⁴⁵ to increase water availability, increase fodder available to livestock, provide alternative livelihoods for local communities and enable local communities to adapt to the effects of climate change ⁴⁶ , thereby increasing the resilience of local communities. • Building technical capacity to plan and implement forest restoration ⁴⁷ . • Strengthening policies and strategies that promote forest restoration. • Increasing adaptation awareness⁴⁸. | • Increased forest canopy cover leading to enhanced water infiltration⁴⁹ . This will result in increased water availability to livestock and the conservation of topsoils. • Increased fodder available to livestock. • Increased availability of NTFPs. The availability of additional NTFPs provides alternative livelihood options for local communities that are reliant on livestock. |

³⁷ There are 73 VDCs in Achham district. Some of these VDCs will be selected for LDCF project implementation. Achham has a very high vulnerability to drought and high vulnerability to landslides. The LFLP and LSDEP operate in this district.

³⁸ There are 44 VDCs in Salyan district. Salyan has a high vulnerability to drought and landslides. All three baseline projects – LFLP, LSDEP and CCRP operate in Salyan.

³⁹ There are 52 VDCs in Dolakha district. Dolakha has high vulnerability to drought and very high vulnerability to glacial lake outburst floods. The LFLP and LSDEP operate in this district.

⁴⁰ These districts were selected based on: i) vulnerability to drought and landslides/glacial lake outburst floods; ii) the presence of the baseline projects; and iii) the benefit local communities in these districts will gain from the LDCF project. These communities are poor, have limited services, are reliant on small-scale agriculture and lack alternative livelihoods.

⁴¹ Including reduced soil moisture, reduced ground water, reduced stream flow and reduced water levels in ponds, reservoirs and lakes.

⁴² In the mid-hills in Achham and Salyan districts and in the high mountains in Dolakha district.

⁴³ The infiltration of water into soils also reduces soil erosion resulting in more topsoil available for agriculture and less siltation in rivers.

⁴⁴ Multi-use forests include tree species that provide multiple provisioning (food, medicines, fiber, non-timber forest products), supporting (soil formation and retention) and regulating (water flow regulation, flood control) ecosystem services.

⁴⁵ Forest ecosystems play an essential role in climate change adaptation by: i) buffering communities from extreme weather events; ii) reducing erosion and trapping sediment; iii) increasing the land available for diversified local livelihoods; iv) providing economic services such as food and fibre; and v) providing habitats for local animals/plants which offer safety nets for communities during times of hardship.

⁴⁶ Through the conservation of topsoils, increasing fodder available, increased water available for domestic and agricultural use, developing alternative livelihoods based on the benefits of functional rangelands and forests (e.g. non-timber forest products).

⁴⁷ This capacity will be developed in government departments, academic institutions, NGOs and local user groups.

⁴⁸ Increasing awareness of the adaptation benefits of restoring natural capital among the public, policy makers and decision makers.

⁴⁹ The infiltration of water into soils also reduces soil erosion resulting in more topsoil available for agriculture and less siltation in rivers. Intense rainfall events during the monsoon season exacerbate soil erosion and causes landslides. Forests play a role in binding soil and reducing the risk of landslides.

| Baseline projects • Goals and activities | Climate change hazards affecting the baseline projects | Impacts to the baseline projects and targeted populations as a result of climate change | Targeted ecosystem services of the LDCF project | Alternative scenario including complementary activities of the LDCF project | Expected LDCF project benefits |
|---|---|--|---|---|---|
| Livestock Service Development and Extension Programme (LSDEP) • Increased rangeland productivity through reseeding degraded rangeland with productive grass, erosion control and planting rangeland fodder plants. • Increased livestock production through improved quality of livestock animals and feed as well as improved rangelands. | Increased temperatures in the mid-hills and high mountains leading to a shift in the distribution of agro-ecological zones. Decreased rainfall in the mid-hills in the dry months. | Climate variability and change is expected to: Reduce rangeland productivity as a result of: • Increased emperature and water stress. • Increased grazing pressure when community livelihoods are compromised. Reduce livestock production as a result of: • Increased incidence of livestock parasites in the high hills. • Declines in fodder productivity in the high hills. • Reduction in water available⁵⁰ for livestock and rangeland production. Compromise livelihoods of local communities⁵¹ because of their: • Reliance on livestock. | • Fodder production in rangelands. • Infiltration of water into topsoils ⁵² . | LDCF resources will be used to build resilience of this baseline project through: • The tailoring of rangeland restoration using indigenous, climate-resilient species to provide fodder for livestock in areas where fodder production has declined because of the effects of climate change, thereby increasing the resilience of local communities. • Building technical capacity to plan and implement rangeland restoration ⁵³ . • Strengthening policies and strategies that promote rangeland restoration. • Increasing adaptation awareness⁵⁴. | • Increased grass cover leading to enhanced water infiltration and reduced soil erosion. This will result in increased water available to livestock and more productive rangelands. • Increased fodder available to livestock, particularly in areas that have experienced reductions in fodder because of climate change. |
| Climate Change Research Programme (CCRP) • Bio-prospecting for plants with medicinal and chemical properties. | Increased temperatures in the mid-hills and high mountains leading to a shift in the distribution of agro-ecological zones. Decreased rainfall in the mid-hills in the dry months. | Climate variability and change is expected to: Reduce geographic distribution ranges of beneficial plants because of geographical shifts in climate conditions suitable for the success of these species. | • Plants with chemical and medicinal properties that have economic potential. | LDCF resources will be used to build resilience of this baseline project through: • Planting and improving habitat available for beneficial plants through restoration activities. • Research⁵⁵ on the benefits of EBA⁵⁶ for restoration to inform future restoration initiatives. | • Improved habitat available for useful indigenous plants. • An evidence-base on: i) best practice approaches for; and ii) the benefits of forest and rangeland restoration using climate resilient species that have multiple uses. |

⁵⁰ Including reduced soil moisture, reduced ground water, reduced stream flow and reduced water levels in ponds, reservoirs and lakes.

⁵¹ In the mid-hills in Achham and Salyan districts and in the high mountains in Dolakha district.

⁵² The infiltration of water into soils also reduces soil erosion resulting in more topsoil available for agriculture and less siltation in rivers. Soil accretion is also affected by landslides and soil erosion resulting from intense rainfall events during the monsoon season.

⁵³ This capacity will be developed in government departments, academic institutions, NGOs and local user groups.

⁵⁴ Increasing awareness of the adaptation benefits of restoring natural capital among the public, policy makers and decision makers.

⁵⁵ In component 1 4 PhD and 10 MSc theses will be produced with a focus on the specific climate change risks (increasing temperatures and reduced water availability) and providing technical guidance to reduce these risks by developing suitable ecosystem management plans for the targeted areas. This could include research on appropriate multi-purpose, indigenous plant species for forest and rangeland restoration under this changed climate.

⁵⁶ Ecosystem based approached to adaptation

B.2.1. Current and expected climate change impacts:

Climate variability and change has already impacted in Nepal. Mean annual temperature shows an increasing trend⁵⁷ and the seasonality of rainfall is changing. Trends in rainfall are difficult to assess due to large spatial variation of rainfall over Nepal and large seasonal variations. The overall trend evident is an increasing annual precipitation in the eastern, central, western and far western regions but a decreasing trend in the mid-western region. Projections of future changes include those listed below⁵⁸.

- An increase in mean annual temperature across the country by an average of 1.2° C by 2030, 1.7° C by 2050 and 3° C by 2100.
- A 15 – 20% increase in summer precipitation throughout the country.
- An increase in monsoon rainfall in eastern and central Nepal.
- A general increase in monsoon and post-monsoon rainfall as well as rainfall intensity throughout the country.
- A general decrease in winter precipitation throughout the country.

The impacts of the above changes can be summarized as follows^{59, 60}:

- **Reduced rates of infiltration into soils** as a result of increases in rainfall intensity. This will increase rates of soil erosion and reduce river flow in dry periods. See the associated negative effects of soil erosion on water, agriculture, energy, transport, tourism and conservation sectors in Section B.1.
- **An increased frequency of extreme events**, particularly GLOFs, droughts, floods, avalanches, landslides and wildfires. GLOFs have increased since the 1930s and there is a perceived increase in the number and frequency of droughts, floods, landslides and avalanches⁶¹. Floods and landslides are among the most recurrent climate-induced hazards in Nepal, claiming an average of 200 lives annually since 1998⁶². More than 4,000 people are reported to have died in the last decade due to climate-induced disasters, which have resulted in damages estimated at over US\$ 5 billion⁶³. The 1993 flood, for example, affected more than 500,000 people and killed over 1,000. Similarly, the 2002 landslide affected some 260,000 people, and caused over 470 deaths⁶⁴. Droughts have been reported, for example in the Nawalparasi District (2004-2006), Terai region (October 2008 to April 2009) and in the Doti District (2000, 2003-2006 and 2009). The incidence of wildfires has also increased, ostensibly as a result of increased temperatures. This has resulted in the destruction of large tracts of natural forest and has exacerbated the problems of ecosystem degradation described in Section B.1.
- **Greater variability in river flow** associated with i) increased intensity of rainfall; ii) increased rate of melting of snow and ice in mountain regions in summer; iii) reduced winter precipitation; iv) a greater frequency of droughts and floods; and v) greater evaporation from soils due to increased temperatures.

The consequences of these impacts are presently significant and likely to become increasingly significant for a wide range of sectors. Management of the **water sector** becomes increasingly difficult as the quality of water in rivers is reduced by erosion, as dams lose capacity due to siltation, as water supply from rivers is decreased during droughts and low base flows in the dry season, and as flooding increases as a result of enhanced snow/ice melt. Productivity of the **agricultural sector** decreases as a result of topsoil losses via erosion, reduced soil water content as a result of increased evaporation from soils, and crop losses from droughts, floods and landslides. The **energy sector** is compromised because hydro-power is reduced through siltation of dams and damage to turbines, increasingly low base flows in rivers during dry periods, and damage to infrastructure during floods and GLOFs⁶⁵. The **transport sector** is damaged predominantly due to physical damage from landslides and flooding. Income from the **tourism sector** will be reduced due to *inter alia* reduced water availability for consumption, local

⁵⁷Practical Action. 2009. Temporal and spatial variability of climate change over Nepal (1976-2005).

⁵⁸Government of Nepal (GoN), NAPA, 2010. Data as compared to pre-2000 baseline, based on General Circulation Models with the SRES B2 scenario.

⁵⁹UNDP 2002. Strengthening disaster preparedness capacities in Kathmandu Valley.

⁶⁰Government of Nepal (GoN), NAPA, 2010.

⁶¹Government of Nepal (GoN), NAPA, 2010. The increase in hazard events is largely based on people's perceptions and location-specific evidence, as there are no specific trends across Nepal due to the extreme variability in precipitation across the country.

⁶²UNDP 2002. Strengthening disaster preparedness capacities in Kathmandu Valley.

⁶³Ministry of Home Affairs, Disaster Preparedness Network, Documentation Centre, 2010, cited in NAPA

⁶⁴<http://saarc-sdmc.nic.in/nepal.asp>

⁶⁵In 1985, for example, Dig Tsho Lake breached a dam destroying hydro-electric infrastructure (GoN NAPA, 2010). See also: Horstmann, B. 2004. Glacial Lake Outburst Floods in Nepal and Switzerland: New threats due to climate change. (www.climate-responsibility.org and www.germanwatch.org).

extinction of wildlife and extreme events damaging infrastructure and the reputation of the country as a safe destination. The **health sector** will be impacted markedly as a result of injuries, diseases and malnutrition associated with extreme events such as droughts, floods and landslides. Lastly, the **conservation sector** is compromised by climate change impacts because of localized extinctions of plants and animals that are unable to adapt to the changed environmental conditions⁶⁶.

The effects of climate change that have already been observed in the mid-hill and high mountain regions in Nepal include the following: i) a shift in distribution of agro-ecological zones to higher altitudes in response to an increase in temperature in the mid-hill and high mountain regions; ii) increased growing periods of some crop species; iii) declined fodder productivity in the high hill region; and iv) significantly decreased water availability in the mid-hill limiting agricultural expansion⁶⁷. These drought-related impacts – increased temperatures and reduced water availability – will form the focus of the LDCF project.

The problems facing Nepal that the LDCF project seeks to address: Given the expected and existing impacts described above, it is evident that rural Nepalese communities as well as most economic sectors are highly vulnerable to current climate variability and change. This vulnerability is exacerbated by factors such as: i) widespread poverty; ii) a high dependence on rain-fed agriculture; iii) wide-spread ecosystem degradation; iv) conflict over land use rights⁶⁸; v) limited integration of climate change risks into policies; and vi) limited technical capacity of local and national institutions to address the impacts.

The preferred solution to these problems is to build the resilience of Nepalese communities and economic sectors by restoring and managing degraded ecosystems in such a way that a natural infrastructure is created which provides a strong buffer to the negative impacts of climate change.

B.2.2. Adaptation interventions and benefits within the LDCF project: using natural infrastructure to increase resilience of communities to climate change:

There are numerous interventions available to Nepalese communities to increase their resilience to the above-described climate change impacts. These include for example construction of climate change-proof infrastructure, establishing early warning systems, intensifying agricultural production and managing ecosystems to minimize climate change impacts. The LDCF project focuses on the latter intervention pertaining to management of ecosystems. The rationale behind managing ecosystems to increase the resilience of communities to climate change impacts is described below.

Degraded ecosystems exacerbate the impacts of climate change on Nepalese society because of the chain of events that result from exposure of soils to the damage from raindrop impact (see Section B.1.). By restoring ecosystems and reducing the exposure of soils to raindrops, the vulnerability of communities to climate change impacts is reduced. Soil erosion that normally occurs after high intensity rainfall events is reduced. Water quality improves. Water supply in dry periods/droughts increases, providing additional opportunities for irrigation of crops and micro-hydro-power plants⁶⁹. Dams have longer longevity. Hydro-power production is less frequently disturbed by

⁶⁶WWF Nepal has for example studied the likely impacts of climate change on snow leopard populations. The research shows a major contraction in the range of the snow leopard. This is likely to have implications for tourism and community livelihoods based on tourism because the snow leopard is a species of iconic status for wildlife enthusiasts, and consequently a major attraction for many eco-tourists.

⁶⁷ Government of Nepal 2010 National Adaptation Programme of Action (NAPA) to climate change. Ministry of Environment.

⁶⁸ Sedentary communities are in some regions moving into areas which migratory communities traditionally used for winter grazing.

⁶⁹ This effect of restoring forests and improving water supply has been documented in Nepal in the following paper: Singh, B.K., Adhikari, B.R. and Singh, H. (2009). Seeing the Community and Leasehold Forestry from the Perspectives of Environmental Services and its Contribution in Food Security in Nepal: A Case of Sathighar, Kavre. Paper for the International Community Forestry Workshop, 15 - 18 September 2009, Pokhara, Nepal. This study investigated the benefits of community - based forestry in terms of supply of clean water for drinking purposes, irrigation, electricity generation and its contribution in food security of local communities. It included ten leasehold forests and one community forest near to Sathighar VDC in the Kavre District. Results showed that the conservation of forest through community and leasehold forestry has increased the downstream water quantity and improved the water quality relative to 15 years ago. Downstream villages (224 households) now have sufficient drinking water for the whole year and have made a series of cemented small dams to collect water for irrigation of vegetables at a commercial scale. This has augmented their income and contributed to food security. The study showed that community-based forests should bundle themselves to claim payment for the ecosystem services in watershed areas, particularly those of hydro-electric dams as well as towns and municipalities with high water demands.

low-flow events or damage to turbines. Floods are less severe due to greater infiltration of rainfall. Crop productivity increases due to increased water supply and less evaporation. Livestock production increases due to greater fodder production. Fuel wood supplies increase through time. The supply of other NTFPs such as fruit, honey and fiber increases. Wildlife and other biodiversity return to the system. The aesthetics of the landscape improve, and the potential for tourism operations increases⁷⁰. All of these ecosystem services – fodder production, fuel wood and NTFPs – are vital for the livelihoods of local rural communities that are heavily reliant on their immediate environment.

Restoration of degraded ecosystems is in effect creating a ‘natural infrastructure’ to buffer society against the negative impacts of climate change. However, there is a danger that the natural infrastructure itself is vulnerable to climate change impacts such as drought and increased temperatures. For this reason, a ‘learning by doing’ approach is required to determine best practice for constructing the appropriate natural infrastructure in different forest and rangeland ecosystems. Each ecosystem is likely to require a different restoration recipe for restoring the natural infrastructure. The recipe ultimately used will depend on factors such as the anticipated climate change impacts in the region, species composition of the plant community, the soil type, the local micro-climate and the pressures on the ecosystem from livestock, fire, indigenous herbivores and local communities. Importantly, the recipe will need to be refined through trials and demonstrations on the ground.

To improve the climate resilience and reduce the vulnerability of communities in Nepal restoration should be conducted with species that are climate resilient and have multiple benefits. Climate resilient species are necessary because climate variability is likely to increase in the ensuing decades and beneficial species are needed because the demands of local communities for alternative sources of income and food are likely to increase in the face of climate change impacts.

Following this approach, the types of indigenous plant species listed below should be preferentially used in the restoration process.

- Drought-resilient species that enhance the resilience of the ecosystem to droughts and reduced soil water availability.
- Species with particularly dense root systems that are consequently very effective binders of soils. The presence of such species will increase the resilience of soil to erosive forces from an increased intensity of rainfall under a changed climate, and will also reduce the likelihood of climate change-induced extreme events such as landslides.
- Species that produce goods such as timber, fruits, fiber and nutrient-rich leaf litter for compost production, medicines, spices and fodder. By increasing the density of these types of species a multi-purpose forest ecosystem can be created. Such forests can also potentially become very rich in biodiversity. Such a precedent has already been set in South America and Sri Lanka where ‘multi-benefit’ and ‘biodiversity-rich’ forests have been promoted by indigenous peoples for centuries⁷¹.

Conventional ecosystem restoration approaches such as terracing and contouring of rangelands or pastures will also be appropriate in many landscapes. However, given the expected impacts of climate change, the measures will

⁷⁰ The restoration of degraded ecosystems can not only benefit local communities, but if positioned in appropriate areas in Nepal, could also potentially benefit tiger and snow leopard populations. The tourism attraction of tigers and snow leopards is considerable, and appropriate marketing would need to be undertaken to maximize the benefits for local communities. In the case of tigers, the restoration could be positioned in wildlife corridors between tiger reserves - areas that are likely to be critical for tiger migration in response to climate change and/or human pressures. In particular, ‘bottlenecks’ created by degradation of forests which restrict tiger movement could be targeted. WWF has done extensive GIS studies to identify these bottlenecks, and have started restoring large areas of degraded forest to alleviate the bottlenecks. The LDCF project will aim to build on this initiative, and thereby increase the benefits of the restoration in terms of biodiversity, tourism and income to local communities. In terms of snow leopards, WWF has mapped how climate change is likely to impact on the distribution of snow leopards over time. One strategy to conserve snow leopards is to ensure that the areas where they will be able to survive have sufficient densities of prey. By restoring landscapes in these areas and putting in place appropriate range management systems, the prey base could increase and snow leopard numbers could increase. The important point is that snow leopards could result in major tourism opportunities if marketed appropriately – like gorillas in Rwanda – and Nepal could capitalise on this, while managing their snow leopard populations in an appropriate manner. Focusing on restoration of the snow leopard habitat will need to go hand in hand with appropriate management of not only livestock, but also indigenous species such as mountain goats that are the prey base of the snow leopard.

⁷¹ See Hochegger, K. 1998. Farming like the forest: Traditional home garden systems in Sri Lanka. Tropical Agroecology 191, Margraf Verlag, Weikersheim, Germany, 203pp as well as Halladay, P. and D.A. Gilmour (Eds.) (1995). *Conserving biodiversity outside protected areas: The role of traditional agroecosystems*. IUCN/Gland, Switzerland, and Cambridge, UK. pp.viii + 229pp.)

need to be tailored appropriately. For example, terraces may need to be higher, or gaps between contour ridges reduced compared to conventional approaches. The Nepalese people have a rich history in land management of rangelands, and the restoration techniques developed over millennia will need to be assessed and adapted to manage climate change impacts. This adaptation will render communities more resilient to climate change impacts such as droughts and intense rainfall events.

The restored system should also be botanically diverse with respect to local indigenous species. Increasing the diversity of the ecosystem is one potential way for increasing the resilience of the natural infrastructure to climate change, and thereby maximizing the adaptation benefits for local communities. This is because diversity tends to be associated with greater stability in the face of disturbance⁷².

Lastly, it should be noted that climate change can also potentially bring positive impacts that need to be maximized. For example, an increase in rain can potentially increase agricultural productivity if managed appropriately. Although an increase in rain will often be associated within an increase in rainfall intensity and associated problems of soil erosion, if the rainwater is contained or infiltrates into soils, it can potentially be used for increasing crop production. It may also be feasible, with appropriate water management, to introduce new water-demanding crops, such as rice, into areas that were too dry, prior to climate change. Even flooding events, which usually have a diverse array of negative impacts, can potentially be used to increase the productivity of rice production. The natural infrastructure developed through restoration of ecosystems will reduce the severity of flooding and thereby increase the potential of harnessing water for agricultural use and reduce the risk of flooding damaging numerous sectors, in particular agriculture, energy, transport and health.

B.2.3. Geographic location of the LDCF project's adaptation interventions:

Demonstrations of adaptation interventions that increase the resilience of local communities to climate change impacts will be undertaken in the mid-hills and high hills regions of Nepal in degraded forests and rangelands. These regions were chosen because:

- Communities living in the high hills are particularly vulnerable to climate change impacts, primarily because of the remote nature of their homesteads, the lack of basic services, severe droughts in recent decades and limited technical capacity of local authorities.
- The mid-hills ecosystems are becoming increasingly degraded as a result of deforestation and overstocking of livestock. Mid-hills communities are consequently increasingly vulnerable to climate change impacts (see Section B.1.).
- The high hills comprise around one third of the forest cover of Nepal⁷³. NTFP collection (largely medicinal and aromatic herbs) is common in this area and is causing forest degradation. Agricultural expansion is also causing land degradation. The area is not suitable for agriculture because it leads to severe soil erosion on the steep slopes. This erosion decreases productivity of arable land and increase siltation of rivers and dams. High hill communities are consequently becoming increasingly vulnerable to climate change impacts.
- The mid-hills are the main water catchments for the fertile, highly productive croplands of the Terai lowland region. Interventions that build natural infrastructure in the mid-hills will consequently benefit not only local communities in these areas, but also other farming communities in the lowlands. There are consequently knock-on benefits and greater cost efficacy associated with adaptation interventions in this region.
- The mid-hills and high hills are home to 90 of the 118 described ecosystems in Nepal⁷⁴. In order to catalyse the adaptation of a wide range of Nepalese communities to climate change impacts using natural infrastructure, techniques for restoring the infrastructure will need to be developed across a wide range of ecosystems in Nepal. The mid-hills and high hills provide the opportunity to develop a project within a relatively small area thereby ensuring that the adaptation efforts are not spread too thinly, yet still allowing for the demonstrations to be implemented in a large number of different ecosystems. This too will improve the cost effectiveness of the LDCF project.

⁷²McCann, K.S. 2000. The diversity- stability debate. *Nature*, 405: 228-233.

⁷³Nepal Biodiversity Strategy. 2002.

⁷⁴Nepal Biodiversity Strategy. 2002.

The western and mid-western regions of Nepal have been identified as a further likely geographic focus for the LDCF project. This is because approximately 70 % of Nepal's rangelands occur in this region⁷⁵. In addition large tracks of degraded forest occur in the adjoining areas of Nawalparasi, Palpa and Tanahun in the western region of Nepal. Shifting cultivation is being practiced on a large scale (approximately 10,000 ha) within degraded forests. Piloting of the LFLP in one cluster of Jhirubas in Palpa has demonstrated encouraging results in managing shifting cultivation. Management of the remaining shifting cultivation areas of above the mentioned districts forms a corridor connecting Chitwan National Park with Annapurna Conservation Area and contributes to biodiversity conservation. The people living here are very poor and mostly from the Magar ethnic community.

The selection of project specific sites (village development committees (VDCs)) for the demonstration interventions will be undertaken during the PPG phase by consulting a wide range of stakeholders at local and national levels. Criteria for site selection will include *inter alia*: i) vulnerability of local communities to climate change impacts; ii) potential of restored ecosystems to address specific climate change challenge that communities are facing/expected to face; and iii) potential to complement and upscale other related projects. Importantly, in-depth Vulnerability and Impact Assessments (VIAs) will be undertaken during the inception phase of the LDCF project to pinpoint the most vulnerable communities and ecosystems to climate change impacts within the LDCF project sites. A preliminary selection process has suggested that VDCs in Achham, Salyan and Dolakha districts should be a priority for the LDCF project. Achham and Salyan districts are in the mid-hill ecoregion and Dolakha district is in the high mountain ecoregion in Nepal. Local rural communities living in village development committees (n=73) in Achham are very vulnerable to drought and vulnerable to landslides. Additionally, the LFLP and LSDEP operate in this district. There are 44 VDCs in Salyan district. Salyan is very vulnerable to drought and landslides and all 3 baseline projects operate in this district. Dolakha (52 VDCs) is vulnerable to drought and very vulnerable to glacial lake outburst floods. Both LFLP and LSDEP operate in Dolakha district. In all of these districts the communities are poor, have limited services, they are reliant on small-scale agriculture and lack alternative livelihoods. Therefore, these communities would benefit greatly from the activities from the LDCF project (See Table 1).

B.2.4. Barriers to up scaling adaptation of rural communities to climate change via restoration of natural infrastructure:

Barriers to up scaling adaptation through appropriate restoration of degraded ecosystems on a large scale across Nepal are myriad, and include:

- The limited technical capacity of local and national stakeholders to plan and implement the adaptation interventions. This is partly because adaptation based on natural infrastructure is a complex subject and requires cross-sectoral planning that includes, for example, the water, agriculture and environmental sectors. Historically such sectors have tended to operate in isolation in Nepal.
- A very limited understanding of the appropriate restoration approaches for maximizing adaptation benefits in different Nepalese ecosystems. This is partly because there have been to date no restoration trials undertaken that focus mainly on adapting local communities to climate change. Restoration/adaptation best practices for a wide range of Nepalese ecosystems are consequently lacking.
- Little public awareness on the benefits of restoring natural infrastructure to reduce the vulnerability of local communities and a wide range of sectors (see Section B.1.).
- The policy, strategy and legislative environment does not specifically provide incentives for adapting communities to climate change through ecosystem restoration.
- The NAPA recognises adaptation through ecosystem restoration at a macro-level but the framework development process for LAPAs, recently started by the GoN with UK DFID support, does not provide details on appropriate adaptation through ecosystem restoration activities to integrate into local level planning.

⁷⁵ A large percentage of endangered wildlife species occur predominantly in the rangelands of Nepal⁷⁵. An additional advantage of restoring degraded ecosystems in this region will consequently be conservation of these species and concomitant growth of nature-based tourism operations that rely on such species to attract tourists to the region. The restoration interventions should preferably be located in a landscape that allows for movement of wildlife in response to climate change. This will conserve biodiversity in the face of climate change and thereby increase the tourism potential of the landscape for local communities.

- Insufficient evidence and demonstration of adaptation through ecosystem restoration benefits on-the-ground to influence policy- and decision-making.

B.2.5. Project components:

The LDCF project has been designed to address the above-described barriers and will be undertaken under three main components described in detail below. Importantly, there will be a ‘learning by doing’ ethos throughout the LDCF project, and there will be active promotion of the concept of ‘dynamic, learning organisations’ that have an adaptive management approach, changing policies rapidly as new scientific information becomes available. The rationale for this approach is: i) policies that incorporate climate change risks will be based on highly uncertain, imperfect knowledge; ii) knowledge on climate change is increasing in an exponential manner in the international arena; and iii) developing countries need to invest in research to place the knowledge in a local context and maximize adaptation benefits.

Component 1: Local and national institutional capacity development.

In this component, that comprises a single outcome described below, local and national institutional capacity will be strengthened to initiate adaptation through rangeland and forest ecosystem restoration interventions in the mid-hill and high mountain in Nepal. The LFLP will benefit from the LDCF project through the development of technical capacity to plan and implement forest restoration. Likewise, the LSDEP will benefit from rangeland restoration capacity development. Increased technical capacity in these areas will catalyse forest and rangeland restoration leading to increased provision of vital livelihood services including fodder for livestock, firewood and NTFPs (See Table 1). This will ultimately build resilience of rural communities to climate change. Focal areas will include:

- developing appropriate coordination mechanisms between a diverse range of sectors (e.g. water, agriculture, energy, transport, tourism and conservation) for upscaling rangeland and forest ecosystem restoration as means of adaptation across Nepal;
- determining the most appropriate adaptation measures through ecosystem restoration for rangeland and forest ecosystems in Nepal;
- increasing public awareness of rangeland and forest ecosystem restoration benefits;
- creating feedback mechanisms to share lessons learned with other institutions and to guide the adaptive management of rangeland and forest ecosystem restoration activities in Nepal⁷⁶;
- training local communities in the technical details of restoring degraded rangeland and forest ecosystems to maximize adaptation benefits;
- producing policy briefs and best practice guidelines for informing policy- and decision-making at both local and national scales based on emerging research findings as well as local indigenous knowledge.

Outcome 1: Strengthened technical capacity of local and national institutions to reduce the vulnerability and increase the resilience of mid-hill and high mountain communities by restoring the rangelands and forests they rely on for their livelihoods.

Without LDCF intervention (baseline): Reducing the vulnerability of communities to the impacts of climate change by restoring degraded rangeland and forest ecosystems on a large scale requires detailed cross-sectoral dialogue between experts in sectors such as water, agriculture, energy, tourism and conservation. Nepal does not presently have a mechanism for promoting this dialogue, and consequently without the LDCF intervention, adaptation interventions involving ecosystem management will remain largely *ad hoc*, without the numerous synergies and benefits that could be created (see Section B.2.2.) by involving a wide range of sectors. In addition, Nepal does not presently have the technical capacity in its line ministries for developing the full potential suite of adaptation benefits that can arise from restoring degraded rangeland and forest ecosystems. With the appropriate ecological and environmental expertise, for example, restored ecosystems can become ‘natural infrastructure’ that improves

⁷⁶ This will include the use of existing mechanisms such as the Asia Pacific Adaptation Network and Web-based Portal.

water quality and supply, provides a range of goods (e.g. fruits, fiber, fodder) and buffers communities against extreme events such as droughts and floods.

Without the LDCF intervention the technical capacity will remain insufficient for planning and implementing rangeland and forest ecosystem restoration as a means of adaptation on a large-scale in such a way that adaptation benefits are maximized. The technical capacity for accessing international funds is also limited and constitutes a further bottleneck for upscaling adaptation through ecosystem restoration in the future. Awareness of the adaptation benefits to communities through appropriate tailor-made restoration of degraded ecosystems is also very limited both in the general public and amongst policy-makers and decision-makers. Without a public awareness of the benefits and the need for these adaptation interventions, policymakers and decision-makers in government are unlikely to make such interventions a high priority. Budget allocations and staff commitment to ecosystem restoration will consequently remain small. Lastly, the scientific knowledge of how best to restore degraded forests and rangelands to maximize adaptation benefits for communities is limited. The MoFSC has established a climate change research programme that is investigating the effects of climate change impacts on a range of different plant species. This is only the first step in determining which mixes of plant species should be used in restoration initiatives in different ecosystems. International NGOs have also made some progress in restoring degraded ecosystems (e.g. WWF's Terai Arc Landscape Programme described in Annex 3). However, the large-scale restoration work has tended to focus on conservation of biodiversity rather than maximizing adaptation benefits for communities. Restoration of degraded ecosystems on a large-scale to increase the resilience of communities to climate change is a 'soft', relatively low cost, and a 'no regrets' option for Nepal. Without the LDCF intervention, this opportunity will remain theoretical.

With LDCF intervention (adaptation alternative): Additional funding of US\$ 450,000 is required to promote cross-sectoral dialogue, develop technical capacity and increase public awareness on ecosystem restoration as means of adaptation. The interventions in this outcome will form a platform for catalyzing large-scale adaptation through ecosystem restoration initiatives across Nepal across a wide range of ecosystems. Importantly, the LDCF intervention will not result in large-scale interventions during the course of the LDCF project. It will rather prepare Nepal with the appropriate institutional frameworks and technical capacity for embarking on large-scale implementation of adaptation through ecosystem restoration. A comprehensive list of potential activities in this regard is detailed in Annex 1. During the PPG phase, activities will be finalized through consultation with stakeholders. The first step in this outcome will be an institutional mapping exercise to determine through consultation with stakeholders the most appropriate institutional framework for cross-sectoral and cross-ministerial dialogue on adaptation through ecosystem restoration. This step will culminate in the establishment of the selected framework/mechanism for taking strategic national decisions on adaptation through ecosystem restoration.

The second step is building the technical capacity of a wide range of stakeholders to plan and ultimately implement large-scale adaptation through ecosystem restoration programmes. The stakeholders will include *inter alia*: line ministries and departments, the National Planning Commission, academic institutions, NGOs, CBOs, local authorities, district development committees, village development committees, conservation area management committees, community forestry committees, leasehold forestry user groups and other local user-groups. Building technical capacity will include for example i) assessing the socio-economic costs and benefits of restoring different types of ecosystems, ii) identifying trade-offs and synergies between sectors when undertaking restoration, iii) documenting appropriate restoration techniques for maximizing adaptation benefits, iv) developing Nepalese skills for writing business plans and proposals for accessing a range of carbon markets and adaptation through ecosystem restoration international funding; and v) training local communities in the appropriate restoration techniques for developing multi-purpose ecosystems. Benefits to be assessed include for example linking adaptation through ecosystem restoration to micro-hydro power generation and the potential for ecosystem restoration to generate additional water for irrigation purposes (see Section B.2.2.).

The third step will be promoting awareness of the adaptation benefits of restoring natural capital among the general public as well as policymakers and decision-makers. The awareness campaign will stretch from school children in rural areas to parliamentarians and will use a wide range of media including radio, TV, newspapers, magazines and the internet and policy briefs. Importantly, local networks and school clubs that have been created by international

NGOs and by the GoN will be used to disseminate information. These networks include forestry networks, adaptation networks, water networks and Green Action clubs in schools. Activities under this output will include school/university field trips to sites where adaptation through ecosystem restoration has been successfully demonstrated. The last step in this outcome will be promoting scientific research within Nepalese institutions to determine appropriate restoration techniques for maximizing the adaptation benefits for communities in different ecosystems. This will entail intensive literature reviews as well as primary research by PhD and MSc students. Four PhD and ten MSc students will be supported by the LDCF project during the project period only for research activities in areas identified as appropriate by the LDCF project. In addition, adaptation through ecosystem restoration modules will be introduced into university courses and school curricula to encourage young scientists to pursue this innovative field. The research undertaken in this component along with local indigenous knowledge will inform the development of adaptation through ecosystem restoration policies and strategies in component 2 and the development of appropriate adaptation through ecosystem restoration interventions and restoration protocols in component 3.

Component 2: Policy and strategy strengthening.

In this component, that comprises a single outcome described below, a policy and strategy environment will be created to promote upscaling of adaptation through rangeland and forest ecosystem restoration across Nepal. The capacity and knowledge base developed in Components 1 and 3 will be critical for guiding the development of such an enabling environment. This component will benefit both the LFLP and LSDEP in strengthening policies and strategies that promote rangeland and forest restoration (See Table 1). Focal areas will include:

- reviewing policies and strategies to identify key entry points for facilitating adaptation through ecosystem restoration;
- developing a national strategy for adaptation through ecosystem restoration upscaling which focuses on improving the resilience of local communities to climate change through tailor-made restoration of degraded ecosystems;

Outcome 2: Policies and strategies that promote the restoration of degraded forests and rangelands thereby increasing the resilience of local communities to climate change.

Without LDCF intervention (baseline): The concept of restoring degraded ecosystems to create a natural infrastructure that buffers communities against climate change is relatively new to Nepal, and indeed to the international community. As a result, policymakers and decision-makers in Nepal are largely unaware of the considerable benefits of investing in natural infrastructure and are not actively promoting ecosystem restoration as means of adaptation at present. Despite the potential benefits involved (see above Section B.2.2.), policies and strategies within Nepal do not provide an environment conducive to maximizing these benefits on a large scale. Without the LDCF intervention the national approach to adaptation through ecosystem restoration will remain *ad hoc*, with various ecosystem restoration-related activities taking place in isolation in different sectors. Without the LDCF intervention, i) the benefits of adaptation via an ecosystem restoration approach will occur in random pockets of Nepal, ii) budget allocations will not be made to adaptation through ecosystem restoration, and iii) large-scale ecosystem restoration initiatives for adaptation will not be promoted across Nepal in a systematic manner using the extension services and infrastructure available to a wide range of line ministries. Furthermore, restoration initiatives that are undertaken by government, the private sector or NGOs will invariably focus on biodiversity within the ecosystem, rather than using the ecosystem to maximize adaptation benefits for local communities. For example, ecosystems could be developed that are drought-resilient, not prone to erosion, provide numerous goods to communities and are highly stable in the face of climate variability. In summary, without the LDCF intervention, adapting Nepalese communities to climate change using ecosystem restoration for adaptation will not be a strategic priority on the development agenda of Nepal.

With LDCF intervention (adaptation alternative): Additional funding of US\$ 325,000 is required to develop a policy and strategy within Nepal that actively promotes building the resilience of local communities to the impacts

of climate change via ecosystem restoration. The first step will be reviewing existing policies and strategies⁷⁷ that are particularly relevant to ecosystem restoration as means for adaptation. The review will have a strong cross-sectoral focus and would include for example the Water Resources Policy⁷⁸, Hydro-power development policy (2001), Rural Energy Policy (2006), National Water Plan (2005) and National Water Resources Strategy (2002). Appropriate entry points for ecosystem restoration for adaptation will be identified through the review. The second step will be developing proposed revisions and thereby using the identified entry points. This will be done in a highly consultative manner across a wide range of sectors (e.g. water, agriculture, energy, tourism, biodiversity conservation).

The third step, to be undertaken in conjunction with the second step, will be the development of a national strategy on ecosystem restoration for adaptation. This strategy will detail *inter alia*: i) the adaptation benefits associated with ecosystem restoration for adaptation ; ii) the need for a well-coordinated approach for upscaling; iii) the cost-effectiveness of adaptation through ecosystem restoration relative to other adaptation interventions; iv) how adaptation through ecosystem restoration will be mainstreamed into development planning; v) the role local authorities will play in implementing large-scale adaptation through ecosystem restoration; vi) the mechanisms for financing ecosystem restoration as means for adaptation across Nepal; vii) the research to be undertaken to support adaptation through ecosystem restoration initiatives across Nepal; and viii) the mechanisms for ensuring ecosystem restoration principles are a major focus of all adaptation efforts. Importantly, the strategy will be strongly informed by research results emanating from Outcome 3, and will be developed in conjunction with capacity building activities in Outcome 1. This will result in tools and methodologies for effective long-term decision making on adaptation approaches, particularly through ecosystem restoration, for Nepal.

A fourth step will be developing a financing plan for large-scale adaptation through ecosystem restoration. This will include work by the National Planning Commission to propose appropriate policies and strategies along with a national budget for adaptation through ecosystem restoration. It will also promote the development of proposals for accessing international funds via carbon markets and adaptation funds. Under this outcome, policy- and decision-makers will be provided with the tools and knowledge to integrate adaptation through ecosystem restoration into policies, strategies and budget allocations. The end result will be an enabling policy environment that strongly promotes the adaptation of Nepalese communities to climate change through large-scale restoration of natural infrastructures in currently degraded ecosystems.

Component 3: Demonstration measures that reduce vulnerability and restore natural capital.

In this component, that comprises a single outcome described below, techniques will be developed for maximizing the adaptation benefits (see section above and Table 1) for local communities via the restoration of degraded rangeland and forest ecosystems in the mid-hill and high mountain in Nepal. Importantly, this component will undertake a ‘learning-by-doing’ approach that will provide information for further adaptation through ecosystem restoration endeavours in Nepal. Focal areas will include:

- restoration of degraded rangeland and forest ecosystems such that multi-purpose ecosystems – providing fodder, improved water supplies, NTFPs and plants with economic potential⁷⁹ – are established;
- developing techniques to increase the rate of infiltration of rainwater into top soils such that erosion is reduced and base flows in rivers during dry periods is increased;
- developing and piloting alternative livelihoods based on the multi-purpose ecosystems.

Outcome 3: Increased resilience of local mid-hill and high mountain communities in Achham, Salyan and Dolakha districts to increased temperatures, reduced water availability and intense rainfall events through restoration of degraded forests and rangelands.

⁷⁷As sedentary communities in Nepal relocate their residences and move further up mountains – possibly in response to climate change effects – they encounter migratory communities using the natural resources. This results in disputes over land rights, and potentially overstocking of rangelands. An in-depth analysis of this socio-economic and legal problem is required.

⁷⁸WWF has started revising the Water Resources Policy and certain Local Development Plans to incorporate ecosystem restoration principles. The LDCF project will build on this platform and expand the work being undertaken.

⁷⁹For example, plants with medicinal uses.

Without LDCF intervention (baseline): The restoration of degraded rangeland and forest ecosystems in Nepal is currently undertaken in an *ad hoc* manner by a range of stakeholders, including government, conservation NGOs and CBOs. The focus of these restoration efforts is usually conservation of biodiversity in the face of threats such as deforestation, overgrazing and/or climate change. Importantly, the restoration is not tailored to maximize adaptation benefits for local communities. (See Section B.2.2. above for a full description of such benefits.) Furthermore, the appropriate methodologies for maximizing these benefits through restoring different forest and rangeland ecosystems have either not been systematically documented or are not known. This is because restoration trials focusing on adaptation of communities have not been undertaken to date and where restoration trials have been conducted, they are limited to a small percentage of the full range of Nepalese ecosystems. The appropriate plant species to use for developing multi-purpose ecosystems have consequently not been systematically documented or researched. Furthermore, the opportunities for developing alternative livelihoods using ecosystem restoration principles as means for adaptation have not been specifically studied. Several restoration programmes in Nepal (see Annex 3 for a full list), including the two baseline projects, do focus on improving rural livelihoods. However, the impacts of climate change on rural livelihoods have not been specifically taken into account. Without the LDCF intervention, restoration initiatives in Nepal will continue to be implemented without i) focusing specifically on the adaptation needs of rural communities, and ii) taking full advantage of the adaptation benefits that restored natural infrastructure, if appropriately designed, can provide.

With LDCF intervention (adaptation alternative): Additional funding of US\$ 3,214,500 is required to undertake adaptation through ecosystem restoration demonstrations in a wide range of degraded forests and rangelands that focus primarily on increasing the resilience of Nepalese communities to climate change. This large amount of funding is required because Nepal has an exceptional diversity of highly degraded ecosystems, and in-depth ‘on-the-ground’ analysis is required to develop appropriate adaptation through ecosystem restoration approaches for each particular ecosystem. The LDCF intervention will not cover all Nepalese ecosystems but it will make a significant start to the process, and will focus on regions particularly vulnerable to climate change impacts. The end result of this outcome will be evidence-based, tailor-made restoration protocols for different forest and rangeland ecosystems that maximize adaptation benefits for communities. The sites and types of demonstrations will be determined through extensive stakeholder consultation during the PPG phase. This will be followed up in the inception phase of the LDCF project with Vulnerability and Impact Assessments (VIAs) of the ecosystems involved, pinpointing the exact geographic locations of the on-the-ground activities.

Annex 1 lists a range of possible demonstration activities. These include identifying and trialling *inter alia* i) drought-resilient species; ii) species with dense root systems; iii) species that produce goods such as fruit, fibre, timber, fodder; iv) species that facilitate rather than hinder growth of other species in the immediate environment; and v) species that are tolerant of water logging. Within the four year period of the project there will be considerable adaptation benefits obtained if fast growing tree species are planted at the outset of the project. Examples of the benefits include a development of a canopy cover which protects soils, fixation of nitrogen into soils which will boost agricultural productivity and the production of fodder and fruits. The following fast growing trees indigenous to Nepal could be used in this context: Indian Rosewood (*Dalbergia sissoo*); Siris (*Albizia lebbek*); Utis (*Alnus nepalensis*); and Bakaino (*Melia azedarach*).

Importantly, various land management techniques will also need to be trialled with a focus on enhancing the adaptive capacity of communities in the face of climate change impacts. These include techniques such as terracing, contouring, stone-ridging, fire management, agro-forestry, pasture management, and pasture improvement. Determining appropriate stocking rates of livestock in different ecosystems in the face of negative climate change impacts on grass productivity, and how to manage the stocking levels will be an important focus for rangeland sites. Furthermore, socio-economic assessments will be required to develop appropriate rangeland management protocols that take the needs of sedentary as well as migratory populations into account. The up-to-date scientific literature on climate change adaptation will be consulted to advise on best practices and how the baseline projects can be adjusted to make it more climate change resilient.

Local communities will be trained on the technical details of establishing and monitoring the demonstrations. Committees of local stakeholders will be established to oversee the work and to encourage continued implementation of adaptation through ecosystem restoration beyond the lifespan of the LDCF project. Monitoring and evaluation will be strongly focused on quantifying the cost-effectiveness of the different methodologies and collecting ecological data that will be used for developing scientifically-rigorous restoration protocols. Alternative livelihoods based on the restored natural infrastructure will also be developed at selected sites. For example, niche tourism packages that focus on i) viewing of wildlife that have returned to the restored ecosystems, ii) hiking through restored ecosystems and iii) botanical information pertaining to the restored plant communities may be appropriate at some sites. Other potential alternative livelihood options include firstly the sale of goods from restored ecosystems, and secondly the development of irrigated agricultural projects using water supplied from restored watersheds. By promoting a diversity of livelihoods and income earning opportunities communities will be more resilient in the face of climate change. Importantly these livelihoods will be technically viable and socially acceptable. The demonstrations will be conducted on a relatively small scale at each site i.e. tens or hundreds of hectares. However, in the order of hundreds of community members at each of these sites will benefit from the demonstrations and their resilience to climate change impacts will be increased during the course of the LDCF project. (It is anticipated that there will be between 5 and 10 demonstration sites. This decision will be taken by stakeholders during the PPG phase.) Importantly, the demonstrations will be undertaken in a ‘learning-by-doing’ approach, and the information generated from this outcome will be critical for: i) building the technical capacity of stakeholders under Outcome 1; ii) informing the budget, policy and strategy revisions under Outcome 2; and iii) developing restoration protocols across a wide range of ecosystems in Nepal that focus on maximising the adaptation benefits from natural infrastructure.

B.3. DESCRIBE THE SOCIOECONOMIC BENEFITS TO BE DELIVERED BY THE PROJECT AT THE NATIONAL AND LOCAL LEVELS, INCLUDING CONSIDERATION OF GENDER DIMENSIONS, AND HOW THESE WILL SUPPORT THE ACHIEVEMENT OF GLOBAL ENVIRONMENT BENEFITS (GEF TRUST FUND) OR ADAPTATION BENEFITS (LDCF/SCCF). AS A BACKGROUND INFORMATION, READ MAINSTREAMING GENDER AT THE GEF:

The socio-economic benefits to be delivered by the LDCF project at the national level include building technical capacity of a wide range of policymakers and decision-makers in government on adaptation through ecosystem restoration principles, particularly through activities undertaken in Outcomes 1 and 2. Ecosystem restoration for adaption is an emerging field that is likely to grow exponentially over the ensuing decades because of the wide-scale damage likely to be inflicted by climate change and the consequent need to develop resilience in rural communities. The technical skills imparted by the LDCF project are consequently likely to be extremely beneficial for the individuals involved in terms of furthering their careers. The skills will include a strong ecosystem restoration focus for adaptation interventions, but there will also be more generic skills that could be transferred into other fields. For example, skills in quantitative assessment of costs and benefits of different on-the-ground interventions as well as facilitating cross-sectoral dialogue will be developed. Importantly, women will be preferentially selected for the skills development activities, thereby contributing to a national Nepalese priority of empowering women.

At a local scale the socio-economic benefits delivered by the LDCF project will occur mainly within Outcome 1 and 3 and will include building the capacity of local authorities and user groups to develop adaptation through ecosystem restoration plans and to implement the plans using evidence-based protocols. This will include developing technical as well as managerial capacity for hundreds of individuals in local communities. Women will also be preferentially selected for skills development in this regard. This will enable women to be represented in greater numbers on committees such as district development committees, village development committees, and local user groups. To this end, gender disaggregated indicators will be included in the programme’s monitoring and evaluation framework. In addition to capacity building benefits, the LDCF project will result in tangible physical benefits such as improved water quality and supplies, reduced soil erosion, improved crop production, a greater supply of goods (e.g. fruit, fiber, medicines) from restored ecosystems and a range of alternative livelihoods based on entrepreneurial enterprises.

The above socio-economic benefits will contribute towards building the resilience of local communities in Nepal to the impacts of climate change. Natural infrastructures will be developed by communities that provide buffering against extreme events such as droughts, floods and landslides. Additional adaptation benefits of investing in such natural infrastructures are described in detail in Section B.2.2 above. In summary, these are the sustained provision of water and goods from natural ecosystems despite the negative impacts of climate change. In addition, potential opportunities arising as a result of climate change such as increased rainfall in some areas will be capitalized upon. Importantly, the restoration of the natural infrastructure needs to be tailored to maximize all adaptation benefits. If restoration is undertaken without this focus, climate change impacts are likely to jeopardize the realization of the benefits.

Global environmental benefits will include: i) a reduction in deforestation and forest degradation; ii) protection of biodiversity within a number of ecosystems, including endangered species of global importance; iii) maintenance and improvement of ecosystem services; and iv) protection of ecosystem processes that will improve the likelihood of persistence of biodiversity despite climate change e.g. corridors for wildlife movement and refugia where speciation may occur.

B.4 INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS THAT MIGHT PREVENT THE PROJECT OBJECTIVES FROM BEING ACHIEVED, AND IF POSSIBLE, PROPOSE MEASURES THAT ADDRESS THESE RISKS TO BE FURTHER DEVELOPED DURING THE PROJECT DESIGN:

| Identified Risks | Risk rating | Mitigation Measures |
|--|--------------------|--|
| Current climate and seasonal variability and/or hazard events result in poor restoration results. | Medium | <ul style="list-style-type: none"> • Ensure that current climatic variability is taken into account in restoration process. • Focus on resilient species, and techniques to assist plant growth particularly in the seedling/sapling phases. |
| Disagreement amongst stakeholders with regards to pilot project site selection | Low | <ul style="list-style-type: none"> • Pilot sites will be selected using a strict list of criteria in order to ensure the selection is transparent, based on logical criteria and equitable. |
| Communities may not adopt ecosystem restoration for adaptation activities during or after the LDCF project. | Medium | <ul style="list-style-type: none"> • The pilot programmes will be institutionalised within the MoFSC and MOAC under to ensure sustainable delivery into the future. • Alternative livelihood projects, that have been deemed financially, technically and socially viable/feasible, will be implemented through the LDCF project to reduce reliance on intensive land uses such as agriculture and grazing. • Capacity building and training of the communities to understand the benefits of the ecosystem restoration for adaptation activities they are undertaking will be implemented. |
| Loss of government support may result in lack of prioritisation of LDCF project activities. | Low | <ul style="list-style-type: none"> • Ensure that government maintains its commitment and considers the LDCF project as a support to its forestry and agriculture programmes by undertaking regular stakeholder consultation. |
| Capacity constraints of local institutions may limit the ability to undertake the research and demonstration activities. | Medium | <ul style="list-style-type: none"> • Identify and develop human resources capacity as required. • Initiate collaboration and exchange between local institutions and international research institutes. • A Chief technical Advisor (CTA) and/or a Nepalese expert will work closely with the LDCF Project Manager to ensure timely delivery of project outputs. |
| Lack of commitment/buy-in from local communities may result in failure of demonstration projects. | Medium | <ul style="list-style-type: none"> • A stakeholder engagement plan will be drawn up during the PPG phase. • Community stakeholders will be engaged with from the PPG phase to ensure their buy-in into the LDCF project. • Actively engage local communities during implementation |

| | | |
|--|--|---|
| | | of interventions. • Raise awareness through campaigns via radio and television programmes. • Foster a bottom-up grassroots approach throughout the project development and implementation phases. |
|--|--|---|

B.5. IDENTIFY KEY STAKEHOLDERS INVOLVED IN THE PROJECT INCLUDING THE PRIVATE SECTOR, CIVIL SOCIETY ORGANIZATIONS, LOCAL AND INDIGENOUS COMMUNITIES, AND THEIR RESPECTIVE ROLES, AS APPLICABLE:

Key stakeholders in the LDCF project include local communities, regional and district administrations, government agencies and parliamentarians as appropriate. The LDCF project will also actively engage with NGOs and CBOs as partners for on-the-ground implementation at the local and national level. A thorough analysis of stakeholders will build on the list below, and be completed during the PPG phase.

| Stakeholder type | Stakeholder list | Potential contributions and roles in the LDCF project |
|------------------------------------|--|--|
| Government ministries | <ul style="list-style-type: none"> • Ministry of Environment; • Ministry of Forests and Soil Conservation (LFLP); • Ministry of Agriculture and Cooperatives; • National Planning Commission; | Delivery of technical project components in collaboration with the Project Management Unit (PMU)/UNEP technical advisors and consultants (where appropriate); provision of technical advice; undertaking of scientific studies in collaboration with the PMU/UNEP technical advisors and consultants (where appropriate); coordination with government authorities at a national level; mobilisation of human and financial resources. |
| Regional and local administrations | <ul style="list-style-type: none"> • Parliamentarian Natural Resources Committee; • Regional Directorates • Local government (District Administrations) e.g. District Development Committees; • Village Administrations e.g. Village Development Committees; • District line agencies (Local Authorities); • Universities and schools. | Beneficiaries of capacity building and training; coordination at a regional and local level; and facilitation of permits and authorisations. |
| Community level stakeholders | <ul style="list-style-type: none"> • Village leaders; • Natural resource user groups e.g. Conservation Area Management Committees; community forest user group, leasehold forest user group • Women's groups; • CBOs. | Beneficiaries of capacity building and training; community mobilisation; delivery of programme components in collaboration with NGOs (where appropriate); and monitoring. |
| NGOs | <ul style="list-style-type: none"> • WWF; • IUCN; • National Trust for Nature Conservation (NTNC); • The Mountain Institute; • Local NGOs. | Beneficiaries of capacity building and training; delivery of training; community mobilisation; and monitoring. |

B.6. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The LDCF project will be undertaken in coordination with ongoing initiatives and projects to maximise synergies and to avoid duplication of activities. Collaboration of Project Managers will be essential in this regard. Project Manager Working Groups will be set up and meetings facilitated between Project Managers and researchers on a regular basis (to be defined in the PPG phase) to establish linkages and coordinate efforts. The LDCF project could potentially fund such meetings. Collaboration arrangements will be finalised during the PPG phase with the following projects:

- **UNEP National Development and Reform Commission (NDRC) International Ecosystem Management Partnership (IEMP) SCCF Project.** The objective of the project, entitled “Enhancing capacity, knowledge and technology support to build climate resilience of vulnerable developing countries”, is to build climate resilience in vulnerable developing countries by increasing institutional capacity, mobilizing knowledge and transferring appropriate best-practice adaptation technologies. The project has three pilot countries (Mauritania, Nepal and the Seychelles) in three selected regions (i.e. West Africa, South Asia and the Small Island Developing States (SIDS)). The proposed project has three main components: i) strengthening capacity building at local, national and regional level in Mauritania, Nepal and the Seychelles to plan and implement climate change adaptation technologies; ii) improving the availability of information and increase public awareness on best-practices for implementing and financing adaptation technologies with an ecosystem management approach in the pilot countries, and support knowledge sharing at an inter-regional level; and iii) supporting technology transfer and know-how on best-practice adaptation measures through the integration and demonstration of concrete on-the-ground activities to build the climate resilience of vulnerable communities in Mauritania, Nepal and the Seychelles. In Nepal the SCCF project is implementing ecosystem and community based approaches to watershed restoration focussed on the restoration of forests in mountain ecosystems using multi-use tree species.
- **The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) - Ecosystem Based Adaptation in Mountain Ecosystems** project is implemented by UNEP, UNDP and IUCN. The objective of the proposed project is to strengthen the capacities of Nepal, Peru and Uganda to strengthen ecosystem resilience for promoting EBA options and to reduce the vulnerability of communities, with particular emphasis on mountain ecosystems. Specifically the project will support: (i) the development of methodologies and tools for mountain ecosystems; (ii) the application of the above tools and methodologies at the national level; (iii) the implementation of EBA pilots at the ecosystem level; and (iv) the formulation of national policies and building an economic case for EBA at the national level. The project will create new opportunities for experimental learning between regions and among countries within the same region. Through parallel and cooperative development and application of methodologies and tools and the implementation of pilot projects, the project will shorten the learning curve of local and national institutions and fast track the transfer of knowledge and experience building ecosystem resilience. In order to create synergies with the BMU EBA project, the LDCF project will target different and/or adjacent geographic areas. This will facilitate more wide-spread capacity building of local level institutions in different regions of Nepal. The Project Manager Working Groups will ensure that there is no duplication of efforts in terms of *inter alia*: i) public awareness campaigns; ii) policy brief and technical guideline development; ii) review of management and development policies; and iii) national budget revisions. The two projects could potentially use the same multi-disciplinary technical committees and share information arising from the Vulnerability and Impact Assessments.
- **Hariyo Ban NepalkoDhan (Harriyo Ban) USAID Programme** supporting natural resource management and climate change adaptation to reduce threats to biodiversity and vulnerability to climate change. This project will focus the majority of its efforts on a North-South Landscape connecting the Annapurna Conservation Area to the Chitwan National Park in the central region of Nepal. A second project site will be an East-West Landscape stretching across the western Terai. There is therefore potential to link this project to the LDCF project initiatives in the mid-hills and high hills of the western and mid-western regions of Nepal.
- **UNDP LDCF Regional GLOF Risk Reduction Project**, focussing on community adaptation through improved Disaster Risk Management, aims to address the risks posed by GLOFs in the Hindu Kush-Himalaya region comprising Bhutan, India, Nepal and Pakistan through strengthening non-structural and community-based approaches, as well as enhancing understanding of socio-economic risks associated with GLOFs. Through alignment with the key disaster management projects and programmes currently under design and/or implementation in Nepal, this project will improve the adaptive value of ongoing government, bilateral and

multilateral investments in priority vulnerable communities which are most affected by climate-related extreme events.

- **Strategic Programme for Climate Resilience (SPCR)**, which was prepared under the World Bank-supported Pilot Programme for Climate Resilience (PPCR). Component 2 of the SPCR (“Building Resilience to Climate-Related Hazards”) focuses on investments to integrate climate resilience into development planning, among other issues. Close collaboration with the relevant project managers’ will be established when developing the LDCF project.
- A **DFID-funded** (in process) Nepal Climate Change Support Programme reducing vulnerability of poor communities through adaptation measures to improve resilience in the face of climate change.
- **Asian Development Bank Community-Based Adaptation Planning Programme** undertaking vulnerability assessments and risk mapping exercises that will potentially assist in site selection for the LDCF project.

A list of potential partner projects is provided in Annex 3. These projects will be fully investigated once demonstration sites have been selected. Lesson learned over the course of the LDCF project will be shared through the Regional Climate Change Adaptation Knowledge Platform for Asia (the Adaptation Platform).

C. DESCRIBE THE GEF AGENCY’S COMPARATIVE ADVANTAGE TO IMPLEMENT THIS PROJECT:

UNEP has considerable experience in implementing projects and providing scientific guidance in the field of climate change. To date UNEP has facilitated the completion of 15 NAPAs and has assisted 38 countries in developing National Communications including studies on vulnerability assessments and adaptation measures. UNEP is also assisting LDCs and other developing countries towards implementation of the adaptation priorities identified by the NAPAs, National Communications and Technology Needs Assessments. It has also implemented or is in the process of implementing approximately 80 adaptation projects at global, regional and national levels. Through the implementation of those projects UNEP works to develop innovative solutions for national governments and local communities to adapt in an environmentally sound way to future climate change, through the provisions of methods and tools to support decision making, addressing barriers to implementation, and testing and demonstrating those solutions, as well as building climate resilience through restoration of key ecosystems (river basins, mountains, coasts and dry lands) vulnerable to climate change. UNEP’s work on climate change adaptation focuses on three main areas: i) Science and Assessments; ii) Knowledge and Policy Support; and iii) Building the Resilience of Ecosystems for Adaptation. UNEP has recently focused its adaptation work on Ecosystem-based Adaptation (EBA), as mandated by its Governing Council. This new initiative is known as the EBA⁸⁰ Flagship Programme of UNEP.

Although the UNFCCC Ad hoc Working Group on Long Term Cooperation Action has yet to finalise a definition for EBA, the negotiating text of the 8th session (FCCC/AWGLCA/2009/L.7/Add.1) does ‘invite parties to build resilience of socio-economic and ecological systems, including through economic diversification and sustainable management of natural resources’, indicating that ecosystem management is considered important for global adaptation efforts⁸¹. UNEP is a key institution contributing towards a definition of EBA for the UNFCCC negotiations. Ecosystem restoration is a core facet of the EBA approach, and the LDCF project is consistent with UNEP’s comparative advantage. This is highlighted in the GEF Council paper C.31/5, which delineates UNEP’s comparative advantage in providing the GEF with a range of relevant experiences, a proof of concept, the testing of ideas, and the best available science and knowledge upon which it can base its investments. The LDCF project also concurs with the GEF Council paper C.28/18 that delineates UNEP’s comparative advantage areas including: “developing and using climate information to effect changes in relevant sectoral policies based on climate science”.

⁸⁰ Participants at COP 16 as well as the IUCN have noted that UNEP is an appropriate agency for implementing in developing countries and further developing the EBA concept. At the 2010 United Nations Climate Change Conference (COP 16) the EBA approach adopted by UNEP was noted as vital in playing a role in integrating EBA into the adaptation and development strategies of developing countries. It was also noted at this COP that investing in EBA was one of the most effective ways to address the multiple challenges of vulnerability and poverty. (As reported in the article ‘Inspiring action towards a low carbon, climate resilient future’. Available from http://www.cc2010.mx/en/press-center/press-resources/news_2010112340160.htm)

⁸¹ Understanding Ecosystem-Based Adaptation (EBA): Climate discussion series, meeting the climate change challenge. UNEP.

Importantly, UNEP is different from other agencies (e.g. FAO, IFAD, WB) in that its primary focus is environmental management. There are myriad factors affecting ecosystems, and managing this complexity requires a dedicated focus as well as in-depth ecological expertise. Ecosystem restoration as means for adaptation is particularly challenging in this regard (see below). UNEP can provide both the prerequisite focus and scientific expertise to meet this challenge.

The challenge and complexity of ecosystem restoration for adaptation: effective ecosystem restoration is a potential mechanism for improving the resilience of millions of poor, rural Nepalese people to the negative impacts of climate change. However, ecosystem restoration is complex in that firstly it involves numerous sectors such as water, agriculture and conservation, and secondly unique ecological expertise is required to develop appropriate interventions in different ecosystems. Importantly, different ecosystem restoration protocols need to be tailor-made for each ecosystem. The details of such protocols include for example the appropriate indigenous plant species to be planted, which soil types are appropriate for a particular species and what ecological processes such as forest succession should be capitalized upon. Often this detailed knowledge is not available for a particular ecosystem and consequently demonstration activities need to be piloted in a ‘learning-by-doing’ approach. Importantly, restoration initiatives need to be focused on building resilience of communities, as opposed to merely conserving biodiversity. Innovative approaches in this regard include using EBA and developing ‘multi-purpose’ ecosystems.

UNEP is uniquely positioned to undertake this innovative environmental work. Importantly the adaptation interventions of this LDCF project hinge around knowledge of a wide range of ecosystems. Other parts of the LDCF project such as enhancing water supplies, increasing agricultural productivity and developing alternative community livelihoods are attached to the central theme of managing ecosystems appropriately. UNEP’s core business is providing technical advice on managing environments in a sustainable manner and it thus has a significant comparative advantage in implementing the LDCF project. The technical and scientific knowledge that UNEP brings to the LDCF project will be fundamental for its success. In particular, ecological science will need to drive Outcome 3’s demonstration activities to ensure that the information generated is based on rigorous evidence. UNEP’s experience in revising policy will be important for translating the information generated into appropriate policy, strategy and legislative documents.

The involvement of other sectors such as water, agriculture, energy, conservation and tourism adds to the complexity of implementing the LDCF project successfully. However, UNEP is also uniquely positioned in this regard, because it routinely facilitates dialogue between sectors to ensure that environmental management is conducted taking into account the full range of societal needs. To this end, UNEP will work with a wide range of international partners in Nepal such as FAO, WWF, IUCN, IFAD and UNDP. The philosophy adopted by UNEP of minimizing trade-offs and maximizing synergies between sectors will importantly increase the sustainability of the LDCF project’s interventions.

UNEP in Nepal: UNEP has been active in Nepal since 2000 and has worked closely with government and non-government partners in Nepal through various projects including but not limited to the BMU funded programme on Ecosystem Based Adaptation mountain ecosystems with Nepal being one of the pilot countries; and the global SCCF project recently approved by GEF namely Enhancing Capacity, Knowledge and Technology Support to Build Climate Resilience of Vulnerable Developing Countries (China, Nepal, Seychelles, Mauritania). There are also other GEF and non-GEF project implemented by UNEP in Nepal which have created the basis for a strong partnership and presence of UNEP in the country. In addition, UNEP headquarter office will liaise and work very closely with their Regional Office for Asia Pacific (ROAP) in order to maintain country presence and implement the LDCF project smoothly. During these years of working with Nepal government, UNEP has developed strong relationships with local partners including the Ministry of Environment (MOE), International Centre for Integrated Mountain Development (ICIMOD), the World Conservation Union (IUCN), the World Wildlife Fund (WWF) and the National Trust for Nature Conservation (NTNC). On-going projects with these partners are listed in the table below. The UNEP BMU EBA project is of particular relevance to the LDCF project because of the synergies between the two projects in terms of developing innovative techniques for building resilience of communities via appropriate ecosystem management. Strong links will be forged between the two project management teams to maximize these synergies (see Section B.6).

| Organisation | Projects |
|--------------|---|
| ICIMOD | Kailash Sacred Landscape Conservation initiative |
| IUCN | Mainstreaming Environmental Rights and Sustainable Development into the New Constitution of Nepal |
| WWF | Post Conflict Assessment |
| NTNC | Bagmati River Conservation |
| MoE | Initial National Communication Project Second National Communication Project on Climate Change |
| MoE | Technology Needs Assessment |
| BMU | UNEP BMU EBA project |

The implementation of the LDCF project will be done in conjunction with a wide range of local stakeholders, many of whom have worked closely with UNEP in the past. The working model for implementation will be scientific oversight and guidance from UNEP, and on-the-ground implementation by local partners. This implementation model has been used successfully in Nepal in all projects implemented by UNEP so far.

C.1 INDICATE THE CO-FINANCING AMOUNT THE GEF AGENCY IS BRINGING TO THE PROJECT:

UNEP has secured a grant co-financing commitment of US\$ 9,473,000 from the MoFSC and MoAC baseline projects. The UNEP-BMU project will contribute a further US\$ 2,000,000 in cash co-financing to the project.

C.2 HOW DOES THE PROJECT FIT INTO THE GEF AGENCY'S PROGRAM (REFLECTED IN DOCUMENTS SUCH AS UNDAF, CAS, ETC.) AND STAFF CAPACITY IN THE COUNTRY TO FOLLOW UP PROJECT IMPLEMENTATION:

The LDCF project contributes to the achievement of the following three outcomes from the UNEP's Program of Work for Climate Change Adaptation (2010-2011): i) the generation and mobilization of knowledge for adaptation including through vulnerability and impact assessments; ii) support for capacity building, policy setting and planning; and iii) support for EBA.

The LDCF project will assist Nepal to build the resilience of ecosystems that are most vulnerable to climate change, and maximize ecosystem services for adaptation. It will develop and implement technical, policy and financial interventions including piloting adaptation projects in "hotspots" (most vulnerable ecosystems in most vulnerable regions), targeting the mid-hills and high hills. Implementation of the LDCF project will *contribute to achieving UNEP's Programme of Work Sub-programme 1 on Climate Change, focusing on Output 2: Resilience of key ecosystems vulnerable to climate change is increased through effective adaptation measures in selected dry lands, low-lying areas and mountains*. The LDCF project will contribute substantially to the first phase of the UNEP Flagship programme on EBA. Successful execution of the LDCF project will lay the foundation for the full implementation of the Flagship programme, informing policies and providing information and data to guide the process.

There will be global and regional level benefits from the LDCF project, in that interventions will focus on the development of methods, tools and guidelines to identify ecosystem vulnerabilities, to value ecosystem services for adaptation and to develop payment mechanisms for these services. It will also identify ways to restore ecosystem adaptation functions and manage trans-boundary ecosystems. At a local level, the LDCF project work will focus on piloting the above methods, tools and guidelines, and demonstrating at an ecosystem and community level a combination of good practices: community-based adaptation, micro-finance and ecosystem-based adaptation, among other adaptation instruments. At a national level, the LDCF project work will focus on national analysis, capacity building and technical support for the integration of adaptation through ecosystem restoration into national policy, planning and investment frameworks. Good practices from these interventions will be replicated through the Global Adaptation Network and other regional platforms in other vulnerable regions. Close proximity to UNEP's Bangkok regional office (UNEP-ROAP) and regular communication with the national implementing partners will provide the means for successful project delivery. Furthermore, UNEP is an active partner in the One UN initiative

in Nepal and delivers all its support of projects/programmes in close collaboration with other UN partners. This is evident in the development of the UNDAF, in that UNEP was invited to review and provide comment on the UNDAF for Nepal (2008-2012).

The three project components contribute to all four of the current UNDAF priority areas for Nepal, namely: i) strengthening of national institutions, processes and initiatives to consolidate peace; ii) improved quality of basic services to socially excluded and economically marginalized groups; iii) increase in sustainable livelihood opportunities, especially for socially excluded groups in conflict affected areas; and iv) strengthening of respect, promotion and protection of human rights for all, especially for women and the socially excluded, for sustained peace and inclusive development. Natural disasters are expected to increase in frequency and intensity as a result of the impacts of climate change. These are seen as one of the main risks potentially inhibiting Nepal from achieving the UNDAF outcomes. Through ecosystem restoration the LDCF project will improve the resilience of vulnerable communities to the impacts of such disasters.

In terms of capacity to implement the LDCF project in Nepal, the MoFSC and MoAC have appropriate systems, a country-wide institutional network and necessary staff and infrastructure in place. Both ministries have district and field offices (Range Post/Service Center) in all the 75 districts. The MoFSC has over 8,000 staff within the Ministry and its Departments and Regional Forestry Directorates. The number of staff per district ranges from 60 to 200 depending upon the category of the district. There are 75 District Forest Offices, 55 District Soil Conservation Offices, 7 District Plant Resources Offices, and 19 Protected Area Offices (i.e. 9 National Park Offices, 3 Wildlife Reserve Offices, 1 Hunting Reserve Office and 6 Conservation Area Offices). These offices provide a range of extension services to local communities, such as support to user groups on plan preparation, seedling production, land development and capacity building.

Similarly, the MoAC has over 10,000 staff within the Ministry and its Departments of Agriculture Development and Livestock Services in all 75 districts, including the separate offices of the Agriculture Development and Livestock Services. A central level Nepal Agriculture Research Council (NARC) is mandated in research and technology development while regional research centres and directorates are engaged in research, technology development and human resources development. The district offices work directly with a range of forestry, water and rangeland user-groups at the village level that comprise local villagers. There is consequently a well-developed network from the national level to the village level, which allows for information flow from the ministries to rural communities. Furthermore, each district office works with the District Development Committees and Village Development Committees. Both these committees play an important role in land use planning at the local level. The LDCF project management team will therefore have direct access through the ministries' district offices to local policy- and decision-makers. The team will also be in a position to manage the implementation of 'on-the-ground' interventions through the district offices and their strong working relationships with village user-groups.


Both ministries have research departments (e.g. DPR and Department of Forest Research and Survey in the MoFSC and NARC in the MoAC). These research organisations have qualified professionals to guide both academic and applied research activities which will assist the LDCF project management team to implement the piloting in a scientifically rigorous manner with regards to experimental design, data collection, data analysis and ultimately the write-up of reports and/or papers. In addition, universities could also be involved in project research activities. During the FSP preparation stage, research and study implementation arrangements will be developed. The ministries also employ the services of local NGOs to implement certain parts of their portfolio, such as social mobilization and assistance with rural finance services. During the PPG phase, the implementation arrangements with local NGO, district offices and village user-groups will be established and described in detail. These partnerships will be established during and immediately after the site selection process.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the Operational Focal Point endorsement letter(s) with this template. For SGP, use this OFP endorsement letter [r](#)).

| NAME | POSITION | MINISTRY | DATE(MM/dd/yyyy) |
|-------------------------|-----------------|---------------------|------------------|
| Mr. Lal Shankar Ghimire | Joint-Secretary | Ministry of Finance | |

B. GEF AGENCY(IES) CERTIFICATION

| This request has been prepared in accordance with GEF/LDCF/SCCF policies and procedures and meets the GEF/LDCF/SCCF criteria for project identification and preparation. | | | | | |
|--|---|------------------|---|-------------------|----------------------|
| Agency Coordinator, Agency name | Signature | DATE(MM/dd/yyyy) | Project Contact Person | Telephone | Email Address |
| Maryam Niamir-Fuller, Director, GEF Coordination Office |  | March 15, 2013 | Ermira Fida, Portfolio Manager GEF Adaptation | (254-20) 762 3113 | ermira.fida@unep.org |

ANNEX 1: Further details pertaining to expected outputs, with descriptions of some suggested indicative activities as well as GEF RM links (this information will be further defined during the PPG phase).

| Component | Expected Outcome | Expected Outputs | Indicative activities | Relevant GEF focal area objective |
|---|---|--|--|---|
| Local and national institutional capacity development | <p>Strengthened technical capacity of local and national institutions to reduce the vulnerability and increase the resilience of mid-hill and high mountain communities by restoring the rangelands and forests they rely on for their livelihoods.</p> <p>Target audience: parliament, the National Planning Commission, Ministry of Environment, Ministry of Forests and Soil Conservation, Ministry of Agriculture and Cooperatives and their regional and district offices, District Development Committees, Village Development Committees, Conservation Area Management Committees, Community Forest User Groups, Leasehold Forest User Groups, associated local authorities/user groups and community-based organisations - as appropriate to the geographic locations of the sites selected during the PPG phase, universities, schools and Nepalese public.</p> | <p>A multi-disciplinary national committee established that: i) facilitates cross-cutting national dialogue on adaptation through ecosystem restoration; ii) develops large-scale ecosystem restoration as means for adaptation programmes; and iii) mobilises funds for the implementation of the programmes.</p> | <ul style="list-style-type: none"> • develop ecosystem restoration and climate change adaptation capacity of government line ministries and departments, academic institutions, NGOs and Community Based Organisations (CBOs); • develop capacity of government line ministries and departments, academic institutions, NGOs and Community Based Organisations (CBOs) in order for them to develop implementation plans and business plans for ecosystem restoration; • undertake an institutional mapping exercise; • promote cross-sectoral/ministerial dialogue, conflict resolution management in order to facilitate ecosystem restoration implementation; • undertake cross-sectoral trade-off analysis to determine where ecosystem restoration and other land uses can be implemented; • assess potential for REDD+, the voluntary carbon market and further international ecosystem restoration funding; and • include sub-committee to oversee implementation of pilot projects under Outcome 3. | <p>1.2.1.</p> <p>1.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.1.1.</p> <p>2.1.1.</p> <p>2.2.1.</p> |
| | | <p>Local authorities, committees and user groups, with an emphasis on women and youth, trained on adapting communities to climate change by using specific techniques for restoring local degraded forests and rangelands in the most vulnerable ecosystems.</p> | <ul style="list-style-type: none"> • Undertake socio-economic assessments of managing rangelands; • assess costs and benefits of restoring different ecosystems; • undertake VIAs; • assess potential for REDD+ income opportunities e.g. monitor carbon baselines and carbon sequestration rates; • assess local indigenous knowledge of restoration e.g. terracing and grass seeding; • train local committees, authorities and user groups on outcomes of assessments above; • assess Payment for Ecosystem Services (PES) systems that have been established by IUCN projects that link downstream users of water to upstream communities that manage the watersheds; • assess advantages of locating ecosystem restoration in biodiversity corridors and/or buffer zones around PAs; • assess potential for linking ecosystem restoration with micro-hydro initiatives; • assess potential for ecosystem restoration to generate additional water for irrigation; • assess the effects of soil type on the efficacy of ecosystem restoration; • assess quantification of climate change impacts on target ecosystems and communities i.e. VIAs; • assess cost-benefit assessments of ecosystem | <p>2.2.1.</p> <p>2.2.1.</p> <p>2.1.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> <p>2.2.1.</p> |

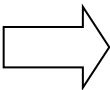
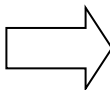
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| | | | <ul style="list-style-type: none"> restoration; and organise orientation programmes for the policy- and decision-makers who will be involved in ecosystem restoration strategy development on above outcomes from assessments. | 2.2.1. |
| | | Policy briefs and technical guidelines developed and distributed for policy- and decision-makers on increasing resilience of local communities to climate change by using appropriate forest and rangelands restoration techniques based on emerging research findings as well as local indigenous knowledge. | <ul style="list-style-type: none"> Produce best practice guidelines on reducing stocking rates to enable rangelands to recover; and management of migratory communities between highland and lower landscapes; and produce policy briefs on above to be disseminated to policy- and decision-makers. | 2.2.1. 2.2.1. |
| | | PhD and MSc theses produced with a focus on the specific climate change risks (increasing temperatures and reduced water availability) and providing technical guidance to reduce these risks by developing suitable ecosystem management plans for the targeted areas. This could include research on appropriate multi-purpose, indigenous plant species for forest and rangeland restoration under this changed climate. | <ul style="list-style-type: none"> Propose selection of PhD and MSc topics on ecosystem restoration in conjunction with the potential supervisors/ universities, Ministry of Environment, Ministry of Agriculture and Cooperative and Ministry of Forests and Soil Conservation's climate change research programme; conduct selection of students and match them to topics; monitor progress of students (funding subject to the continued performance); final thesis to be developed into scientific papers and submitted for publication; and students to present results to local conferences and to Ministry of Forests and Soil Conservation, Ministry of Environment, and Ministry of Agriculture and Cooperatives, as appropriate. | 2.3.1. 2.3.1. 2.3.1. 2.3.1. 2.3.1. |
| | | Community awareness increased in terms of how to adapt to climate change through restoration of ecosystems, including lessons-learned in Component 3. | <ul style="list-style-type: none"> Promote public awareness of the following through an awareness raising campaign: a) benefits of ecosystem restoration; b) how to minimise cross-sectoral trade-offs; c) how to maximise ecosystem restoration synergies; create cross-community forums to aid in cross learning around ecosystem restoration; capture and disseminate lessons learned widely from the LDCF project; include lessons learned from pilot projects; include dissemination to policy- and decision-makers to inform policies; school and university students to visit ecosystem restoration demonstration sites; and ecosystem restoration modules introduced into school curricula and university courses. | 2.3.1. 2.3.1. 2.3.1. 2.3.1 2.3.1 2.3.1 2.3.1 |
| | | | | |
| Policy and strategy strengthening. | Policies and strategies that promote the restoration of degraded forests and rangelands thereby increasing the resilience of local communities to climate change. | Revisions on existing ecosystem management and development policies and strategies produced to identify entry points for promoting adaptation via restoration of degraded ecosystems. | <ul style="list-style-type: none"> Conduct a review of existing policies and strategies related to ecosystem management and national development (e.g. Water Resources Policy, LAPAs and local development plans); identify existing entry points for ecosystem restoration considerations; and assess legal complications, if any, on resource utilisation such as land tenure. | 1.1.1. 1.1.1. 1.1.1. |

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| | | A national up-scaling adaptation strategy through ecosystem restoration developed and institutionalized. | <ul style="list-style-type: none"> • Develop strategy based on information gathered through assessments under Outcome 1; • develop strategy with multi-stakeholder input to ensure government buy-in; • include sustainability mechanism for ensuring upscaling of ecosystem restoration activities and action plan for financing future upscaling; and • link strategy to other policy revisions.. | 1.1.1. 1.1.1. 1.1.1. 1.1.1. |
| | | Current forestry, agricultural and water sector budgets, policies and strategies revised to promote adaptation through ecosystem restoration upscaling. | <ul style="list-style-type: none"> • Conduct workshops to present findings from studies in Outcome 1, to assist policy- and decision-makers on potential revisions required to integrate ecosystem restoration in policies, strategies and budget allocations; • conduct workshop based on above to propose revisions; and • present revisions to local and national policy- and decision-makers through workshops and policy briefs. | 2.2.1. 1.1.1. 1.1.1 |
| Demonstration measures that reduce vulnerability and restore natural capital. | Increased resilience of local mid-hill and high mountain communities to increased temperatures, reduced water availability and intense rainfall events through restoration of degraded rangelands. | Multi-purpose forests and rangelands established in landscapes that were initially highly degraded to increase water infiltration and fodder production in the face of drought conditions and intense rainfall events. | <ul style="list-style-type: none"> • Undertake VIAs in the LDCF project sites to pinpoint most vulnerable communities and ecosystems; • monitor and evaluate progress (including cost-benefit analysis of different approaches) and utilise adaptive management; • inform restoration protocols developed in Outcome 1 with results generated through Outcome 3; • undertake agroforestry and fire management as part of this activity; • strengthen seedling production system; • train community on tree growing and planting; • train community on forest management; • set up committees to oversee restoration; and • prepare and implement restoration plan. | 1.2.1. 1.2.1. 1.2.1. 1.2.1. 3.3.1. 3.3.1. 3.3.1. 3.3.1. 1.2.1. |
| | | Conservation of topsoils achieved in agricultural and natural landscapes despite greater intensity of rainfall events. | <ul style="list-style-type: none"> • Monitor and evaluate progress (including cost-benefit analysis of different approaches) and utilise adaptive management; • implement improved pasture management, construction of sand dams, contouring and stone ridging; • train community on groundwater recharge methodologies; • set up and/or strengthen existing committees to oversee recharge implementation; and • implement groundwater recharge methodologies. | 1.2.1. 1.2.1. 3.3.1. 3.3.1. 3.3.1. |
| | | Alternative livelihoods (e.g. non-timber forest products) developed and promoted based on the benefits of functional forests and rangelands that are resistant to drought and extreme rainfall events. | <ul style="list-style-type: none"> • Monitor and evaluate progress (including cost-benefit analysis of different approaches) and utilise adaptive management; • identify feasible alternative livelihoods particularly related to tourism around pilot areas (forest and rangeland sites); • promote and market tourism based on restored landscapes, increased wildlife habitat particularly for flagship species, such as snow leopards; | 1.2.1. 1.3.1. 1.2.1. 1.2.1. |

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| | | | <ul style="list-style-type: none"> • increase tourism infrastructure to increase tourism livelihood opportunities; • set up committees to oversee implementation of alternative livelihood options; and • pilot water-efficient crop production and/or the installation of micro-hydro power plants (as a spin-off of potentially increased water runoff in rehabilitated rivers). | 1.2.1. 1.2.1 |
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ANNEX 2: Comparison of business-as-usual and adaptation alternative of LDCF project.

| | Business-As-Usual | | Adaptation alternative scenario |
|---------------------|--|---|--|
| Problem Description | <p>Currently, increasing temperatures and decreased rainfall along with widespread degradation of natural ecosystems in the mid-hill and high mountain of Nepal is significantly jeopardizing the livelihoods of rural communities by reducing rangeland and forest productivity and livestock production. Ultimately the Nepalese economy is impacted because the degradation of forests and rangelands in Nepal has negative impacts on a wide range of sectors, including water, agriculture, energy, transport, tourism and conservation. Given the climate change related impacts, it is evident that rural Nepalese communities as well as most economic sectors are vulnerable. This vulnerability is exacerbated by factors such as widespread poverty, a high dependence on rain-fed agriculture, conflict over land use rights, and limited technical capacity of local authorities to take action.</p> | ➔ | <p>The LDCF project will promote the establishment of ecosystems that are firstly more resilient to climate variability and secondly more beneficial to the local community than the original ecosystem. This will be achieved through an ecosystem restoration as means for adaptation. The ecosystems will be more resilient because climate variability is likely to increase in the ensuing decades and will be more beneficial because the demands of local communities for alternative sources of income and food are likely to increase in the face of climate change impacts. The specific benefits of forest and rangeland restoration in the mid-hills and high mountain in Nepal include increased water availability, increased top soils, increased fodder available to livestock and increased availability of non-timber forest products. These improvements to the livelihoods of local communities are beneficial as these communities are very reliant on their natural environments and not currently resilient to climate-induced stressors.</p> |
| Project Outcomes | <p>Outcome 1:</p> <ul style="list-style-type: none"> • Lack of a mechanism for promoting detailed cross-sectoral dialogue between experts in sectors such as water, agriculture, energy, tourism and conservation. • Adaptation interventions involving ecosystem management are largely <i>ad hoc</i>, without the numerous synergies and benefits that could be created by involving a wide range of sectors. • Lack of technical capacity in line ministries for developing the full potential suite of adaptation benefits that can arise from restoring degraded ecosystems. • Limited technical capacity for accessing international funds constituting a bottleneck for upscaling ecosystem restoration for adaptation. • Limited general public and policy- and decision-maker awareness of the adaptation benefits to communities through appropriate tailor-made restoration of degraded environments. • Resultant low priority of ecosystem restoration for adaptation interventions. • Small budget allocations and staff commitment to ecosystem restoration for adaptation. • Limited scientific knowledge of how best to restore degraded forests and rangelands to maximize adaptation benefits for communities. • Limited involvement of women and youth in development and implementation of adaptation interventions. • Indigenous knowledge on appropriate adaptation interventions is not utilized by adaptation projects. | ➔ | <p>The LDCF project will promote cross-sectoral dialogue, develop technical capacity and increase public awareness on ecosystem restoration for adaptation. The interventions in this outcome will form a platform for catalyzing large-scale ecosystem restoration for adaptation initiatives in Nepal across a wide range of ecosystems through <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Undertaking an institutional mapping exercise to determine through consultation with stakeholders the most appropriate institutional framework for cross-sectoral and cross-ministerial dialogue on ecosystem restoration for adaptation. This step will culminate in the establishment of the selected framework/mechanism for taking strategic national decisions on ecosystem restoration for adaptation. • Building the technical capacity of a wide range of stakeholders, with a particular focus on women and youth, to plan and ultimately implement large-scale ecosystem restoration for adaptation programmes. • Promoting awareness of the adaptation benefits of restoring natural capital among the general public as well as policy- and decision-makers. The awareness campaign will stretch from school children in rural areas to parliamentarians and will use a wide range of media including radio, TV, newspapers, magazines, the internet and policy briefs. • Promoting scientific research within Nepalese institutions to determine appropriate restoration techniques from scientific studies and indigenous knowledge, for maximizing the adaptation benefits for communities in different ecosystems. <p>Cost: LDCF US\$ 650,000 USD</p> |
| | <p>Outcome 2:</p> <ul style="list-style-type: none"> • Policy- and decision-makers in Nepal are largely unaware of the considerable benefits of investing in natural infrastructure and do not actively promote ecosystem restoration for adaptation. • Policies and strategies within Nepal do not | | <p>The LDCF project will allow for the development of a policy, strategy and legislative environment within Nepal that actively promotes building the resilience of local communities to the impacts of climate change via ecosystem restoration for adaptation through <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Reviewing existing policies and strategies that is particularly relevant to ecosystem restoration for |

| | | | |
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| | <p>provide an environment conducive to maximizing ecosystem restoration for adaptation benefits on a large scale.</p> <ul style="list-style-type: none"> • Lack of clarity on which policies and/or strategies should be amended to facilitate ecosystem restoration for adaptation, due to its cross-sectoral nature • National approach to ecosystem restoration for adaptation is <i>ad hoc</i>, with various ecosystem restoration-related activities taking place in isolation in different sectors. • Restoration initiatives undertaken by government, the private sector or NGOs invariably focus on biodiversity within the ecosystem, rather than using the ecosystem to maximize adaptation benefits for local communities. • Adapting Nepalese communities to climate change using ecosystem restoration for adaptation is not a strategic priority on the development agenda. |  | <p>adaptation .</p> <ul style="list-style-type: none"> • Developing proposed revisions in a highly consultative manner across a wide range of sectors (e.g. water, agriculture, energy, tourism, conservation). • Developing a national strategy on ecosystem restoration for adaptation. • Developing a financing plan for large-scale ecosystem restoration for adaptation , including work by the National Planning Commission to propose feasible national budget allocations for ecosystem restoration for adaptation and developing business plans and proposals for accessing international funds via carbon markets and adaptation funds. • Ultimately developing an enabling policy environment that strongly promotes the adaptation of Nepalese communities to climate change through large-scale restoration of natural infrastructures in currently degraded ecosystems. <p>Cost: LDCF 525,000 USD</p> |
| | <p>Outcome 3:</p> <ul style="list-style-type: none"> • Restoration of degraded ecosystems is undertaken in an <i>ad hoc</i> manner by a range of stakeholders, including government, NGOs, CBOs and the private sector, focussing on conservation of biodiversity in the face of threats such as deforestation, overgrazing and/or climate change. • Restoration is not tailored to maximize adaptation benefits for local communities. • Appropriate methodologies for maximizing these benefits through restoring different forest and rangeland ecosystems have either not been systematically documented or are not known. • The appropriate plant species to use for developing multi-purpose ecosystems have not been systematically documented or researched. • Opportunities for developing alternative livelihoods using ecosystem restoration for adaptation principles have not been specifically studied. • Restoration initiatives in Nepal will continue to be implemented without: i) focusing specifically on the adaptation needs of rural communities, and ii) taking full advantage of the adaptation benefits that restored natural infrastructure, if appropriately designed, can provide. • Government projects such as LFLP and LSDEP undertake restoration of degraded ecosystems but do not take climate change into account. |  | <p>The LDCF project will implement ecosystem restoration for adaptation demonstrations in a wide range of degraded ecosystems that focus primarily on increasing the resilience of Nepalese communities to climate change, resulting in evidence-based, tailor-made restoration protocols for different forest and rangeland ecosystems that maximize adaptation benefits for communities. This will be achieved through <i>inert alia</i>:</p> <ul style="list-style-type: none"> • Extensive stakeholder consultation during the PPG phase to determine the sites and types of demonstrations • Undertaking Vulnerability and Impact Assessments (VIAs) of the ecosystems involved in the inception phase, to pinpoint the exact geographic locations of the on-the-ground activities. • Implementing demonstration activities such as those identified in Annex 1. LFLP and LSDEP restoration interventions will be adjusted to take climate change into account. • Trialling various land management techniques with a focus on enhancing the adaptive capacity of communities in the face of climate change impacts. • Determining appropriate stocking rates of livestock in different ecosystems in the face of negative climate change impacts on grass productivity. • Undertaking socio-economic assessments to develop appropriate rangeland management protocols that take the needs of sedentary as well as migratory populations into account. • Training local communities on the technical details of establishing and monitoring the demonstrations. • Developing alternative livelihoods based on the restored natural infrastructure at selected sites. • Undertaking demonstrations in a ‘learning-by-doing’ approach, thereby generating information for: i) building the technical capacity of stakeholders under Outcome 1; ii) informing the policy and strategy revisions under Outcome 2; and iii) developing restoration protocols across a wide range of ecosystems in Nepal that focus on maximizing the adaptation benefits from natural infrastructure. <p>Cost: LDCF 3,714,500 USD</p> |
| Cost | Business-As-Usual Development Cost | | Additional Adaptation Cost |
| Financed by: | GoN | | LDCF |

ANNEX 3: List of potential partner projects/projects of relevance to the LDCF project.

- UNEP National Development and Reform Commission (NDRC) International Ecosystem Management Partnership (IEMP) SCCF Project: The objective of the project, entitled “Enhancing capacity, knowledge and technology support to build climate resilience of vulnerable developing countries”, is to build climate resilience in vulnerable developing countries by increasing institutional capacity, mobilizing knowledge and transferring appropriate best-practice adaptation technologies in three pilot countries (Mauritania, Nepal and the Seychelles) in three selected regions (i.e. West Africa, South Asia and the Small Island Developing States (SIDS)).
- The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) - Ecosystem Based Adaptation in Mountain Ecosystems: The objective of this project is to i) strengthen the capacity of countries that are particularly vulnerable to climate change impacts, and ii) to build resilience through promoting EBA options, with particular emphasis on high mountain and coastal regions. The project is being implemented in Nepal, Perú and Uganda. The project will be implemented by UNEP, UNDP and IUCN.
- Hariyo Ban NepalkoDhan (Harriyo Ban) Programme: This programme is funded by USAID and aims to support natural resource management and climate change adaptation to reduce threats to biodiversity and vulnerability to climate change. It will be a five year programme with funding of up to US\$ 30 million.
- UNDP LDCF project: UNDP is in the process of developing a project focussing on Disaster Risk Management at a community adaptation level and Glacier Lake Outburst Floods (GLOFs).
- Pilot Programme for Climate Resilience (PPCR): The PPCR is funded by multilateral development banks through the *Strategic Climate Fund (SCF)*, a multi-donor Trust Fund within the *Climate Investment Funds*. The overall objective of the PPCR is to integrate climate resilience into development planning. Demonstration projects building on the NAPA will be selected in Phase II.
- UK Department for International Development (DFID): The DFID programme in Nepal has four key goals: i) to support a sustainable and inclusive political settlement; ii) to help build a more capable, accountable and responsive state at local and national levels; iii) to promote inclusive, low carbon, economic growth and better jobs for the poor; and iv) to reduce the vulnerability of the poor to improve resilience to climate shock.
- Community-Based Vulnerability Assessment, Risk Mapping & Adaptation Planning: This programme is being implemented and funded by the Asian Development Bank and will develop national models and a scalable tool for community-based vulnerability assessment and action planning.
- International Centre for Integrated Mountain Development (ICIMOD): This is a regional intergovernmental learning and knowledge sharing centre serving eight regional member countries of the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu. ICIMOD aims to assist mountain people to understand the changes affecting these mountain regions as a result of climate change and human interventions. It promotes adaption measures and helps facilitate the capitalisation on benefits of the changes. In addition, ICIMOD assists in dealing with transboundary issues associated with water and resource management. It is an essential partner for knowledge exchange and climate change adaptation information for the LDCF project.
- The Regional Climate Change Adaptation Knowledge Platform for Asia (the Adaptation Platform): The Adaptation Platform is a three-year programme that supports research on climate change adaptation, policy making, capacity building and information sharing to help countries in Asia adapt to the challenges of climate change. The Adaptation Platform also seeks to facilitate climate change adaptation at local, national and regional levels and to strengthen adaptive capacity of countries in the region – while working with existing and emerging networks and initiatives. Nepal has been selected as one of the countries covered in the first phase (2009-2012).
- Community Forest Development Programme (CFDP) implemented by GON, FAO and UNDP is an innovative future-oriented approach to participatory forest management by local people. The programme is widely celebrated as one of the most progressive policy examples of devolving control over forest resources to community based user groups. To date, about 15,000 CFUGs have been legally established.
- Leasehold Forest and Livestock Development Programme (LFLDP): The LFLDP is being implemented by the DoF of the MoFSC and funded by the International Fund for Agriculture Development (IFAD). The programme builds on the success of the Hills Leasehold Forestry and Forage Development Project (HLFFDP)

in helping set up leasehold forestry groups that will eventually become village finance associations. The programme covers the midlands area where a large percentage of the population is poor. It targets poor families in the 22 districts not covered by the ongoing Western Uplands Poverty Alleviation Project, with particular attention to those living in areas adjacent to degraded forest who are food insecure for parts of the year. 44,300 households are benefitting from the programme.

- **Enhancing Capacities on Climate Change Adaptation and Disaster Risk Management for Sustainable Livelihoods in the Agricultural Sector:** Implemented by FAO, the project supports ecosystem restoration activities such as: i) sloping agricultural land technologies (hedge row contour planting, slope stabilization and terrace management, plantation of forages, fodders and fruits in bunds/ridges and crops in terraces/contours); ii) management of waste land and degraded community resources; iii) agro-forestry practices; iv) multi-storied cropping; v) strip cropping; vi) rain water harvesting through water conservation ponds; vii) bio-engineering works along river embankments; viii) mixed/intercropping demonstrations for checking soil-water erosion and for landslide prevention. The project began in 2008 and is ongoing.
- **Western Uplands Poverty Alleviation Project (WUPAP):** Funded by IFAD, the project seeks to promote more resilient livelihoods and basic human dignity of poor and socially disadvantaged groups in the Western Uplands region. In this region, poverty is widespread, the terrain and climate are harsh, communities are often very isolated and infrastructure is poor. The project's objective is to improve and strengthen the livelihoods of the most vulnerable by: i) improving access to services and resources; ii) promoting different livelihood options (such as livestock, forestry and crops); and iii) empowering women and other marginalized people. The project intends to cover 115,000 households (632,500 individuals) in the western and mid-western regions of Nepal.
- **Terai Arc Landscape Programme (TAL):** The TAL programme is being implemented by the DoF in the MFSC, Department of National Parks and Wildlife Conservation (DNPWC), with support from WWF Nepal. The objective of this landscape planning programme is to conserve the biodiversity, forests, soils and watersheds of the Terai and Churia Hills in order to ensure the ecological, economic, and socio-cultural integrity of the region. The TAL encompasses 23,129 km² of 14 districts including 75 percent of the remaining forests of lowland Nepal including Churia Hills and four protected areas. The project uses a science-based approach to focus on bottlenecks and ecological corridors linking protected areas. The TAL has the second largest population of rhinos and one of the highest densities of tiger populations in the world, and covers three Ramsar sites and two World Heritage Sites.
- **Strategic Program for Climate Resilience (SPCR):** The SPCR is a key process towards translating the main objective of PPCR to integrate climate resilience into development planning, budgeting and investments.
- **REDD Programme:** With support from the World Bank, the Ministry of Forests and Soil Conservation is implementing a REDD programme. Nepal has submitted the Readiness Preparation Proposal for funding with the vision of significantly reducing Nepal's greenhouse gas emissions resulting from deforestation and forest degradation by 2013 and beyond.
- **Livelihood and Forestry Programme (LFP):** The LFP is being implemented by the MoFSC / Government of Nepal and NGOs, funded by DFID. The LFP works in 15 districts with the main organisational objective of reducing vulnerability and improving the livelihoods of poor rural people of Nepal.
- **Western Terai Landscape Complex Project (WTLCP):** The WTLCP is implemented by MoFSC, and funded by the Government of the Netherlands. The immediate objective of WTLCP is to establish effective management systems and build capacity for the conservation and sustainable use of Nepal's Western Terai Landscape Complex with stretches from Bardia National Park in the east to Shuklaphanta Wildlife Reserve in the west (3 districts).
- **Conservation and Sustainable Use of Wetlands in Nepal (CSUWN):** The CSUWN is being implemented by MFSC and IUCN, and funded by UNDP, GEF and IUCN. The project has two major demonstration sites: the KoshiTappu area, situated in eastern Nepal and the Ghodaghodi Tal Complex in Kailali district in Far Western.
- Various projects implemented by IUCN, promoting Payment for Ecosystem Services (PES), including i) the **Non Timber Forest Products (NTFP) Conservation Project (Far West Nepal)** aiming to conserve and promote the sustainable use of medicinal plants and other NTFPs in 10 villages of the Doti District; ii) the **Collaborative conservation of critical ecosystem in IlamSiwaliks** (South East Nepal), using Community

Forest User Groups, an Apex Body of Women's Groups and Flood Control Committees (FCC) to halt the ecological degradation in six village development committees of Ilam District and to conserve the ecosystem functions and biodiversity of the fragile Siwaliks; and iv) the conservation and sustainable use of wetlands in Nepal (CoSUWeN) in two of Nepal's four Ramsar sites - KoshiTappu Wildlife Reserve and Ghodaghodi Lake Complex. The latter project is jointly implemented by the MFSC, GEF and UNDP.

- Koshi River Basin Management: This programme is being implemented by WWF Nepal and the Water and Energy Commission Secretariat (WECS), and is funded by WWF. This project is the first initiative to operationalise the recommendations of the National Water Plan (2205) and is piloting Integrated Water Resource Management (IWRM) in Nepal.
- Practical Action is an NGO running numerous climate change-related projects in Nepal.
- Global Sanitation Fund (GSF): The GSF programme in Nepal supports sanitation and hygiene promotion in rural areas and several small towns across eight districts using a combination of Community Led Total Sanitation (CLTS) and sanitation marketing approaches. UN-HABITAT has been selected as the Executing Agency.

ANNEX 4:

Leasehold Forestry and Livestock Programme

2005 to 2013 (an eight-year programme)

Prepared by the Department of Forests, Babarmahal, Kathmandu.

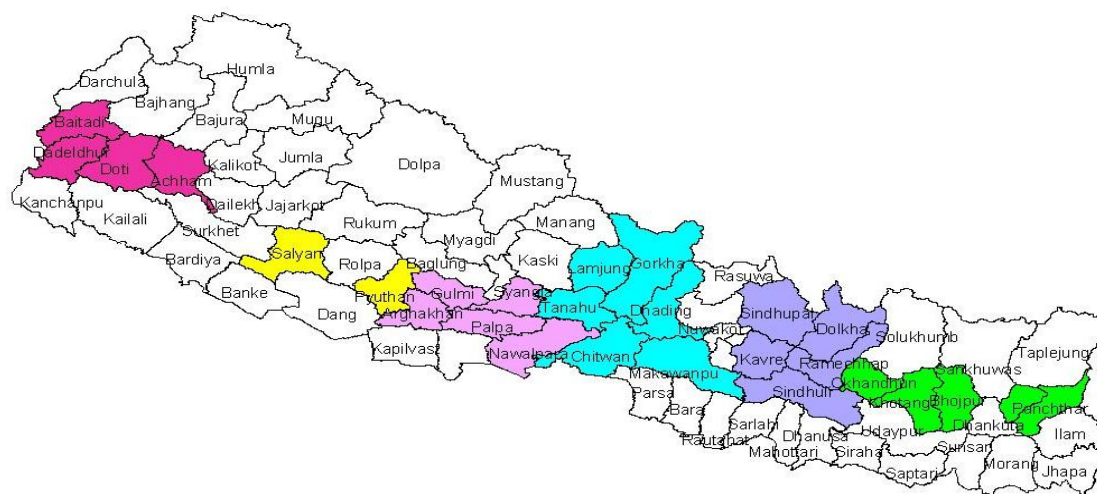
23 June 2011

Introduction

The implementation of the LFLP is a joint responsibility of the Department of Forests (DoF) within the Ministry of Forests and Soil Conservation (MFSC) and the Department of Livestock Services (DLS) within the Ministry of Agriculture and Cooperatives (MoAC). DoF, as a lead programme agency and a coordinator role, has overarching responsibility for the implementation of the programme. For this, DoF is assisted by DLS which is overall responsible for implementing the Livestock Development Component. At the same time, the Rural Finance Service Provider has a major task on Rural Financial services to leasehold forest users group and members. It is undertaken and supervised based on the contract with the programme coordinator office (PCO).

Programme area

The Leasehold Forestry and Livestock Programme (LFLP) is an eight- year programme to be implemented in 22 districts: Pachthar, Terathum, Bhojpur, Khotang, Okhaldhunga, Ramechhap, Dolakha, Sindhupalchok, Kavrepalanchok, Sindhuli, Makawanpur, Chitwan, Dhading, Gorkha, Lamjung, Tanahu, Pyuthan, Salyan, Achham, Doti, Dadeldhura and Baitadi. In addition, since 2009 a Technical Assistant to LFLP Project team has been deployed to assist the programme and to plot the same a cluster each in five districts: Palpa, Shyanja, Gulmi, Arghakhanchi and Nawalparasi in the western region.



Map 1: The 22 programme districts with separate colours for different regions.

Programme Area Description (baseline summary)

The programme area is described in relation to the forest and livestock situation in the rural environment. A detailed description is presented below as per the IFAD programme design document (2005).

Population and Poverty: About 5.31 million people live in these 22 districts in 1.0 million households (average size 5.3 persons). The average population density is 135/km², ranging from 41 to 276/km². Using the poverty line referred to earlier the overall extent of poverty varies with 31-67% of the population in the programme districts

living below the poverty line, a total of 2.55 million poor people or 48% of the population. In 13 districts 50% or more of the population are poor. Other indicators show the extent to which most of the programme districts are poor, high dependence on agriculture for employment (>70%), a significant proportion of marginal farmers (>30%) and illiteracy (>40%). However, there are poor remote villages even in the two districts (Chitwan and Makwanpur) where the average level of poverty is less than the national average, and which have a high market access score, and where other indicators are also more favourable.

Forests: Although deforestation and the resulting environmental degradation have been extensive, few reliable recent forest cover data are available. Most district databases still use data derived from the 1979 Land Resources Mapping Project. According to that data there were 2.09 million ha of forestland in the programme area in 1979, of which 1.67 million ha (80%) was located in the Hills. The estimated area of potential leasehold forest in four districts in 1999/2000 was equal to approximately 10% of the 1979 total Hill forest (and shrub) area. Using this indicative figure for all 22 districts, the total area of potential leasehold forest could be about 160 000 ha.

Livestock: There are large numbers of livestock in the programme districts: 1.99 million cattle, 1.22 million buffaloes and 2.24 million goats are the most important. The average holding is equivalent to 3.2-4.7 animals. Programme districts each have 4-9 livestock centres and 4-12 sub-centres. In each district there are usually a total of 9-12 technicians based in the service centres, 6-10 based in the sub-centres in each district and 15-20 field based technicians. However, activities are overwhelmingly concentrated in the more accessible areas.

Infrastructure: Many villages are remote and lack road access and the terrain is extremely rugged with transport on foot in many places making communications difficult. In terms of infrastructure the programme districts have 3 211 km of road of which nearly 50% are earth roads. While two districts (Bhojpur and Khotang) have no roads at all, and a third (Okhaldhunga) is considered as non-motorable. Programme districts account for 24% of the nations' motorable roads.

Economic Situation: With widespread poverty and with the continuous process of environmental degradation, the hills of Nepal are in a state of crisis from both the human and the ecological perspective. Expansion of the cropped area has reached its limits, and further increases in crop yields are extremely difficult. Accessible areas of forest are progressively being transformed to wastelands. Women, who are the principal collectors of forest products, are disproportionately affected by the loss of forest resources and spend increasing amounts of time in the collection of firewood, fodder and animal bedding material.

In the hills of the programme districts households are typically clustered into small, widely scattered hamlets, with upland fields, forests and grazing land in between. Most cropland is terraced, with irrigated paddy in the valleys and on the lower slopes and rainfed crops on the higher slopes. The average family landholding is under 1 ha, with less than 0.2 ha of arable land per person. Although subsistence farming is the norm, only about 20% of households produce enough food for their own consumption, the rest suffering from food deficits for 3-9 months per year. Even though nearly all households are concerned with subsistence agriculture, all increasingly depend on marketing some production and off-farm income to make ends meet.

Livestock rearing is an important agricultural enterprise among poor families. Women contribute significantly to managing livestock, while the forests provide 40% of livestock nutrition. The expansion of the livestock sector, driven by rising incomes, especially in urban areas, offers the single most important opportunity to bring women into the commercial production system and to raise their incomes. Not only is livestock disproportionately found on small and marginal farms and among the landless, women are also disproportionately represented in those groups.

Programme Objectives and Rationale

Objectives

The overall goal of the programme is a sustained reduction in the poverty of the 44 300 poor households who are allocated leasehold forestry plots in 22 districts through increased production of forest products and livestock. The purpose of the programme components are that: (i) 31,000 ha leasehold plots are managed so as to meet household subsistence and income needs and protect the environment; (ii) livestock have contributed to meeting household food and income needs; (iii) the leasehold groups and village finance associations (VFAs) have become sustainable rural financial institutions providing financial services to leaseholders; (iv) Government has developed the capacity to implement leasehold forestry as a poverty reduction programme in a gender sensitive way.

The overall targets of the project are as follows.

- | | |
|---------------------|-------------|
| • Group formation | 3300 groups |
| ▪ Area hand over | 31,000 ha |
| ▪ Goat distribution | 77486 goats |

The programme's outputs are: (i) leaseholder groups functioning effectively and the leasehold plots developed according to their operational plans; (ii) leaseholders have used improved livestock husbandry systems to manage the livestock distributed with support from the village livestock assistants (VLAs); (iii) VFAS established to provide savings and credit services to leaseholders; (iv) the Leasehold Forestry Division has managed and coordinated programme activities in a gender sensitive way.

Programme Rationale

First, the Interim Evaluation of previous phase of leasehold forestry found that the transfer of land with degraded forests to the very poor can both reduce poverty and reforest the hills. The Sustainable Livelihood Approach (SLA) of leasehold groups supports the general conclusion that leasehold forestry can be an effective approach to poverty reduction. The analysis found that the poor benefit in many ways, while an investment in leasehold forestry is able to provide high returns to poor households. Leasehold forestry has reduced poverty in those areas, which have access to markets, line agencies and other linkages. In remote hill areas households have not seen much change to their income levels but have better availability of food, forage and fodder, improved nutrition, increased social capital, better access to natural and physical resources, improved information and enhanced skills. Overall ownership of livestock and other assets by leaseholders has increased. There has also been an increase in women's empowerment and a reduction in the time that women and children spend collecting fodder and firewood. Experience has shown that a savings-based approach to rural financial services is the most appropriate.

Second, the Interim Evaluation, the SLA and various reports prepared by the FAO technical assistance team have all indicated that there has been a halt to, and a reversion, of environmental degradation at most leasehold sites with an increase in the ground cover, the number of plant species present and in the number of trees and tree species. The exception being some highland sites where degradation of forest continues and the production of forage is insufficient, due to the less favourable climatic and site characteristics, and a greater household reliance on livestock which might induce farmers to re-introduce free grazing in the leasehold sites.

Third, the Poverty Reduction Strategy Plan (PRSP) has designated leasehold forestry and forage development for the poor as a priority sector programme for poverty reduction with the highest priority ranking (P1); a priority that both the Ministry of Finance and the MFSC endorse.

Finally, leasehold forestry is not an alternative to community forestry, which is a well-established and successful approach for forest management and environmental conservation by communities, but a complementary and additional approach specifically designed to benefit the poorest groups in the community. Leasing of land with

degraded forest to poor households on 40-year renewable leases, provides poor households with security of tenure and the confidence to develop the land which then enables them to generate income and other benefits and so to move out of poverty. Both leasehold and community forestry approaches are appropriate, complementary and mutually supportive as they meet different needs and both can be implemented within an overall district forestry management plan.

Target Group Typology

The programme's target groups consist of poor and food insecure households living in the hills in areas adjacent to degraded forest. The SLA has identified three sub-groups within this group all of which include female-headed households. Available data does not record the relative proportions of these groups in the programme districts or the proportion of female headed households.

Poorest (hard-core poor): This group has the highest level of poverty with food security for only 2-3 months a year and lives a hand to mouth existence. Common characteristics include: (i) no land of their own and very few, if any livestock; (ii) a lack of labour in the case of female-headed households with many dependents; (iii) a lack of access to off-farm income-generating activities; and (iv) the lowest social status. The coping strategies of this group include: (i) working as agricultural wage labourers or porters; (ii) selling firewood; (iii) migrating to work in brick kilns; and (iv) borrowing small amounts of money for subsistence.

Poorer (hard-core poor): This group experiences a high level of poverty with food security for 4-5 months a year. Some characteristics of this group are: (i) access to some land for cultivation e.g. 0.15 ha and a few livestock e.g. 1-2 goats or one head of cattle; (ii) a lack of labour in the case of female-headed households with many dependents; (iii) a lack of access to off-farm income-generating activities; and (iv) the low social status. The coping strategies of this group include: (i) cultivating their own land; (ii) working as agricultural and/or non-agricultural wage labourers; and (iii) temporary migration e.g. to work in brick kilns.

Poor (moderate poor): This group experiences a moderate level of poverty with food security for 6-8 months a year. Some characteristics of this group are: (i) access to a small area of land for cultivation e.g. 0.65 ha and several goats and may be a buffalo; (ii) a lack of labour in the case of female-headed households with many dependents; and (iii) a lack of access to off-farm income-generating activities. The coping strategies of this group include: (i) cultivating their own or leased land; and (ii) working as wage labourers, drivers, petty traders or artisans.

Programme Components

The programme has four components, namely: (i) leasehold forestry and group formation; (ii) livestock development; (iii) rural financial services; and (iv) programme management and coordination.

Leasehold Forestry and Group Formation

This component has the following five sub-components: (i) district planning and coordination; (ii) group formation and forest allocation; (iii) social mobilisation; (iv) land and forest development; and (v) forestry implementation support.

Under the *District Planning and Coordination* sub-component the programme finances: (i) mapping and participatory planning exercises to prioritise and select VDCs, communities and sites for programme implementation; and (ii) regular coordination of programme activities both at district and field levels.

Group Formation and Forest Allocation: The programme: (i) demarcate the potential leasehold forest; (ii) identify and form leasehold forestry groups; (iii) prepare and periodically review the operational plans for the leasehold forest in a participatory way; and (iv) formally register the leasehold group and hand over the lease certificates.

Leasehold forestry groups will have 10-15 member households (12.5 average) and the area of leasehold forest per group household should be at least 0.6 ha and average 0.7 ha, although in exceptional cases some plots may be larger or smaller.

Groups prepare the group constitution with the assistance of a forest ranger. The constitutions include stipulations regarding group membership (and include both husband and wife from the same household) and transfer of membership.

Social Mobilisation: The PCO hires service provider(s) (Social Mobilisation Service Provider/s) to provide female GPs, who are the main agents of social mobilisation. GPs are recruited from amongst the target group and build links between the groups and communities and the District Forest Office and other line agencies, assist in the monitoring of the leasehold plots, help illiterate group members to access adult literacy training provided by other programmes and help future leasehold group members without citizenship documents to acquire the necessary certificates.

Land and Forest Development: Land development follows the prescriptions of the site-specific operational plan. Site management starts by ending free grazing and preventing bush fires, which stimulates natural regeneration of the trees and grasses. More intensive productive land development includes group multi-purpose nurseries, planting of improved grasses and leguminous fodder/cover crops, multi-purpose trees, perennial fruits, bamboos, etc. depending upon the priorities of the group and the suitability of the site. The development of leasehold plots are phased over several years so that households from the poorest groups can participate without foregoing existing employment and/or income generation opportunities.

However, after several years increasing tree canopy cover will gradually reduce production of fodder grasses, legumes and certain fruits. Operational plans should anticipate this and include provisions, if so desired by the groups, for timely thinning of the trees to retain the agro-forestry character of the site, in line with provisions of the Forest Act and Regulation.

Livestock Development

Activities included under the livestock development component can be grouped under three sub-components: (i) goat production development; (ii) livestock training and services; and (iii) livestock implementation support. At district level the DLSO will be responsible for the implementation of this component and will receive necessary implementation support.

Goat Production Development: To use the fodder to boost the incomes of the leasehold groups and so reduce their poverty, the programme provides all eligible member households with two mature female goats vaccinated (against PPR) and drenched. The programme also supplies one buck (also vaccinated and drenched) to each of the qualifying leasehold groups. One member of the group assumes responsibility for the management of the buck and receives some compensation from the other group members e.g. service fees (in cash and/or in kind). Every year the leasehold groups do exchange or replace the buck to avoid inbreeding.

Livestock Training and Services: The programme finances the selection, recruitment and training of VLAs (not to be confused with village animal health workers (VAHWs)). They may preferably be mature women (married with children) selected by the community from the households of the group members, but could also include other suitable people.

Environmental Impact

The programme should have a positive environmental impact through the conversion of unproductive degraded forest into productive forest producing fodder, firewood and timber in ways that are sustainable combined with increased water retention and protection of steep slopes. Development proposals do not involve the use of

fertilizers or agro-chemicals, abstraction of large quantities of water, construction of reservoirs or clearing forests. No infrastructure investments are generally to be financed.

The environmental classification for the programme is “B”. This reflects the evidence of a significant positive environmental impact from previous phased leasehold forestry programme. The proposed programme will continue to focus on enhanced natural resource management and is expected to bring similar environmental improvements. Therefore, no further information is deemed necessary to complete the Environmental Screening and Scoping Note and no formal Environmental Assessment is considered necessary.

Major site characteristics

The proposed programme area would cover 22 of the 27 districts which the Government has identified as the priority area for leasehold forestry. They are characterised by a high incidence of poverty, low human development indicators and overall deprivation. These areas are, generally, both food deficit and food insecure as access to other sources of employment and income is very limited. Many areas within these districts are remote and isolated (in terms of goods, people and information), which results in poor access to markets and high food prices, sporadic government services and few economic opportunities.

Terrain: The programme districts are located within three distinct agro-ecological zones in the hills. The terrain is characterized by valleys, plateaux and high ridges with variations of ecosystems depending on soil types, slope, rainfall, altitude and cloud cover supporting different types of vegetation and wildlife. Table 2 presents the main characteristics of these three agro-ecological zones.

Table 2: Main Characteristics of Agro-ecological Zones of the Programme Area

| Agro-ecological Zone | Altitude (m) | Climate Type | Forest Types | Natural Vegetation and Species |
|----------------------|-----------------|--------------|---|--|
| | | | | |
| High Hills | 1 800 – 2 500 m | Temperate | Pure and mixed broad-leaved evergreen forests | A mix of oak, pine and rhododendron. Some important leguminous crops include white clover (<i>Trifolium repens</i>), lucerne (<i>Medicago falcata</i>); grasses such as perennial rye grass (<i>Lolium perenne</i>), wild oats (<i>Avena sativa</i>); fodder trees/shrubs such as ficus trees (<i>Ficus semicordata</i> var. <i>Montana</i> , <i>Ficus roxburghii</i>), and <i>Flemingia macrophylla</i> . |
| Middle Hills | 1 000 – 1 800 m | Sub-tropical | Mainly pine forest with scattered <i>sal</i> trees and broad-leaved forests | The principal coniferous species is chir pine (<i>Pinus roxburghii</i>). The broadleaved forest is a mix of mainly chestnuts, alders and chilaune (<i>Schima wallichii</i>). Among grasses wild oats (<i>Avena sativa</i>), teosinte (<i>Euchlaena mexicana</i>); fodder trees/shrubs such as <i>Flemingia macrophylla</i> , ficus trees (<i>Ficus semicordata</i> , <i>Ficus roxburghii</i>) and <i>Acacia modesta</i> . |
| Low Hills | 610 – 1000 m | Tropical | Tropical <i>sal</i> forests, grassland | <i>Sal</i> trees, predominantly <i>Shorea robusta</i> , other trees such as <i>shis</i> (<i>Dalbergia sissoo</i>), <i>cutch</i> (<i>Acacia catechu</i>) and <i>kapok</i> (<i>Bombax ceiba</i>); Among grasses some short fast-growing grasses such as <i>stilo</i> grasses and baruwa (<i>Saccharum spontaneum</i>), wild oats (<i>Avena sativa</i>), etc. Among leguminous crops lucerne (<i>Medicago falcata</i>), etc. Some fodder trees/shrubs are orchid tree (<i>Bauhinia purpurea</i>), ficus trees (<i>Ficus roxburghii</i>), <i>Acacia modesta</i> etc. In the national park and surrounding areas some endangered wildlife species such as the Royal Bengal tiger (<i>Panthera tigris</i>), greater one-horned rhino (<i>Rhinoceros unicornis</i>), Asian elephant (<i>Elephas maximus</i>), gaur (<i>Bos gaurus</i>), swamp deer (<i>Cervus duvauceli</i>), etc. |

Sources: Integrated Resource Management Consultancy Pvt. Kathmandu, 2002.

Climate: The climate ranges from tropical/sub-tropical to cool temperate. Due to the variations in the altitude and topography of the terrain described in terrain description, there is a wide range of climates and microclimates within very short distances, supporting an extensive range of flora and fauna. Four of the 25 meteorology stations in Nepal are in the programme area. The maximum temperature in summer (June-September) ranges from 24°C-34°C and the minimum temperature in winter (October-May) ranges from 5°C-21°C.

Forests: Forest area is under great pressure in Nepal. Between 1979 and 1994 an estimated 1.3 million ha (24%) of the forest was lost, a significant proportion of which may have been converted to agriculture, but probably at least some 0.9 million ha was degraded to shrubs, an increase of 125%. Assuming a similar rate of forest loss and degradation between 1994 and 2004, the current area of forest may have been reduced by 16% to 3.6 million ha, while shrubs may now cover 2 million ha, an increase of 25%. The reasons behind the destruction are: uncontrolled population growth; increasing numbers of livestock (30% of livestock feed come from the forest); increasing demands for firewood, timber, leaf, litter and other products (firewood provides 78% of total domestic

energy consumption); expansion of agricultural land along the hill slopes; and unsustainable extraction of non timber forest products.

The total programme area is about 3.9 million ha, out of which about 53% is forest and shrub land. Forests provide food and medicinal herbs, mushrooms, etc. for domestic use and as an important source of supplementary income, particularly in the mountain districts where fewer agricultural opportunities exist. However, given the lack of knowledge on resource availability and the lack of proper management practices for a common property resource, the risk of over-exploitation is high. Local people not only exploit forests but they are also exploited in marketing, selling to traders at low prices due to lack of knowledge and marketing skills. Forests also provide indirect services such as watershed protection to advance sales.

Biodiversity: The greatest species diversity in Nepal is in mid-hills. Within the programme area, some endangered species such as Royal Bengal tiger and single horn rhinoceros are found. Nepal has identified 26 areas under forest management plans and nine areas of protected forest wherein the protection of species is ensured. Of these two are in the programme area. Outside these areas, habitats have suffered greatly as a result of habitat alteration, over extraction, illegal collection of species, poaching or hunting, overgrazing and fire. Nevertheless, poaching and other illegal forest activities have decreased during the past 6-7 years as they are now more controlled.

Environmental issues and problems in the Programme Area

As became apparent during the formulation mission, some existing leasehold forestry groups produce annual crops such as sweet potatoes and paddy in leasehold forests although this is prohibited. Cultivation of these crops and their management prevents grass from growing and forest from regenerating. While free grazing of leasehold plots has ceased in the vast majority of situations, there are cases where the leaseholders could not control free grazing and little change has occurred.

Cutting down trees in the leasehold forestry plots is not allowed. However, many people interviewed in programme area stressed the need for flexibility in respect of felling old trees and in clearing fallen trees.

Some data from the programme area show that people's livelihoods are still being threatened by animals such as tigers, wild boars and monkeys. Some training in preventive measures for crop damage by wildlife and conservation for local people has already been provided by the World Wide Fund for Nature in the buffer zone of the Chitawan National Park where there are some leasehold sites which have not been mainstreamed through protected areas.

The above problems and a few issues were assessed prior to the programme beginning; however, a few issues are still to be addressed to increase success for the leasehold forestry programme. These include benefit sharing mechanism of standing trees recorded before leasing the plot, more effort to cultivate or rejuvenate the degraded land and forests and increased attention to the vulnerable livelihood situation of the poorest community members.

ANNEX 5:

Promotion of improved pasture and rangeland management techniques to rehabilitate the degraded mountain ecological regions in the context of ecosystem-based management for climate adaptation in Nepal

Prepared by the Department of Livestock Services

June 2011

1. Background to the Department of Livestock Services

The Department of Livestock Services has livestock development offices in all 75 districts as well as numerous service centers, regional labs and experimental farms. Currently running main projects/programs are listed in the table below.

| Name of Project/program | Command Area | Duration of the project | Funding Source |
|---|-----------------------------|--------------------------------|-----------------------|
| Animal Health Services Program | All 75 districts | Ongoing | GoN/N |
| Livestock Development Services Program | All 75 districts | Ongoing | GoN/N |
| Livestock Development Farms -11 | All 75 districts | Ongoing | GoN/N |
| Livestock Market Promotion Program | All 75 districts | Ongoing | GoN/N |
| Livestock Services Training Program | All 75 districts | Ongoing | GoN/N |
| Livestock Services Extension Program | All 75 districts | Ongoing | GoN/N |
| Karnali Zone Special Agricultural Development Project | 5 districts of Karnali Zone | Ongoing | GoN/N & KR-I |
| Ultra-poor focused special program | 10 districts | 2005/06 onwards and | GoN/N, KR-I and DRF |

The objectives of the department are:

- increase livestock production and productivity and eliminate the problem of malnutrition;
- improve the economic and social condition of the poor, socially disadvantaged people and women through improved livestock farming;
- develop and improve existing livestock farming as the main income source of the farm family and help in maintaining environmental balance and conservation;
- extend disease control services for security and conservation of livestock and public health;
- assist in the production of livestock and products which are exportable and import substitutable;
- involve private sectors in commercial livestock farming; resource centre development and conservation; and market management;
- increase self-employment opportunities by encouraging livestock sector and livestock based industry and trade;
- extend quality control services in favor of livestock sector, livestock industries and the consumers; and
- identify, conserve, promote and develop the indigenous livestock breed which is at present in a decline.

The strategies of the department are:

Profile of the physiographic zones

Nepal, a beautiful country of the *Hindukush* Himalayan region, is characterized by some of the most extreme mountain terrain in the world. In a mere 200 km North-South width of the country, there is a vast range in elevation; less than 100 masl in the South to the world's highest peak of 8,848 masl in the North. Owing to this vast range in elevation, Nepal harbors a vast range of biodiversity.

| MAIN ITEMS | TERAI | SIWALIKS | MIDDLE MOUNTAIN | HIGH MOUNTAIN | HIGH HIMAL |
|--------------------|---|--|--|--|--|
| Geology | Quaternary alluvium. | Tertiary sandstone, siltstone, shale and conglomerates | Phyllite, quartzite limestone & islands of granites | Gneiss, quartzite & mica shists | Gneiss, schist, limestone and Tethys sediments |
| Elevation | 60-330 m. Subtropical | 200-1 500 m. | 800-2 400 m. Relief 1 500 m with isolated peaks to 2 700 m | 2 200-4 000 m. High relief 3 000 m from valley floor to ridges Warm to cool temperate | 4 000 m+ |
| Climate | Subhumid in FW+MWDR; humid in W+C and EDR | Subtropical (but warm temperate in higher hill spurs) | Warm temperate (but subtropical in lower river valleys and cool temperate on high ridges) | Warm to cool temperate | Alpine to Arctic (snow 6-12 months) |
| Moisture Regime | Subhumid in FW+MWDR; humid in W+C and EDR | Subhumid in most of the area; humid in N-aspect of W+C+EDR and Dun valleys | Subhumid; humid above 2000 m N-aspects and 1000 m S-aspects | Subhumid N-aspects; humid throughout the region below 3 600 m | |
| Rainfall intensity | High | High | Medium | Low | Low |
| Vegetation | Sal + mixed hardwoods | Sal + mixed hardwoods + pine forest | Pine forest + mixed hardwood and oak forest | Fir, pine, birch and rhododendron | Open meadows + tundra vegetation |
| Soils | Ustochrepts, Haplustolls, Haplaquepts, Haplustalfs, Ustifluvents & Ustorthents | Ustochrepts, Haplustolls, Rhodustalfs, Ustorthents, Dystrochrepts, Haplaquepts & Ustifluvents. | Ustochrepts, Haplustalfs, Rhodustalfs, Haplubrepts, Ustorthents & Ustifluvents | Eutrochrepts, Dystrochrepts, Haplubrepts, Cryumbrepts, Cryorthents & Ustorthents | Cryumbrepts, Cryorthents & Rock |
| Crops | Rice, maize, wheat, mustard, sugarcane, jute, tobacco, cotton, tea | Rice, maize, wheat, millet, radish, potato, ginger, tea. | Rice, maize, wheat, millet, barley, pulse, sugarcane, radish, potato, ginger, cardamom. | Oat, barley, wheat, potato, buckwheat, yams, amaranthus, medicinal herbs | Grazing (June-Sept.) |
| Horticulture | Mango, litchi, pineapple, jackfruit, imli, palm | Mango, papaya, banana, moringa. | Mango, papaya, banana, orange, lime, lemon, peach, plum, aegal, pomegranate | Chestnut, walnut, apple, peach, plum, apricot | |
| People | Tharus, Brahmins, Chhetris, Mohammedan | Tharus (Dun valley) presently all hill tribes immigrated from Middle Mountain | Gurungs, Magars, Tamangs, Newars, Brahmins, Chhetris, Damais, Sarkis, Sunars, Kumals, Rais, Limbus | Khas chhetris, Tibetan related groups-Thakalis, Bhotias, Sherpas, Tamangs, Ghaes | Temporary herders & Sherpas (in East Nepal) |
| Industry | Matches, jute, cigarette & sugar factories, saw mills, rice & flour mills, soaps, consignments, food processing, furniture, industrial estates. | Saw mills, rice, flour & oil mills, industrial estates, cotton factory; cement factory and wildlife camps. | Rice, flour & oil mills, cement factory, industrial estates, cottage industry-handicrafts, curios, hosiery, plastics, hotels & lodges. | Cottage industry-carpets, blankets, hard woven cloths, trekking & expeditions. | Mountaineering expeditions & trekking. |

(Source: CES, 1998)

Nepal is divided into five physiographic regions based on elevation, namely the *Terai* (below 300 m), *Churia* hills or *Siwalik* (300-700 m), mid-mountains (700-2,000 m), high mountains (2,000-4000 m) and high Himalayas (above 4000 m) (Figure 1). Variations in climate, vegetation, ecology and land use pattern are prominent across the physiographic regions. Seventy percent of the total area of the country is covered by hills and mountain and

around 52 percent of the total population inhabit these two regions. Besides ecological and climatic variation, socio-economic differences are evident among these regions. A brief overview of each physiographic regions of the country is presented below:

Terai

The *Terai* is a flat and valuable stretch of fertile agricultural land in southern Nepal. It lies at an altitude of between 60 to 300 meters. The major parts of Bardiya National Park, Sukla Phanta National Park, Koshi Tappu Wildlife Reserve, Parsa Wildlife Reserve and Chitwan National Park lie in this region. Climate in this region is mostly hot monsoon and tropical. *Terai* is popular as the granary of Nepal. The livestock sector is gradually increasing in *Terai* as more and more commercial dairy and poultry farms are developing. The several pasture lands across *Terai* are under tremendous pressure for grazing.

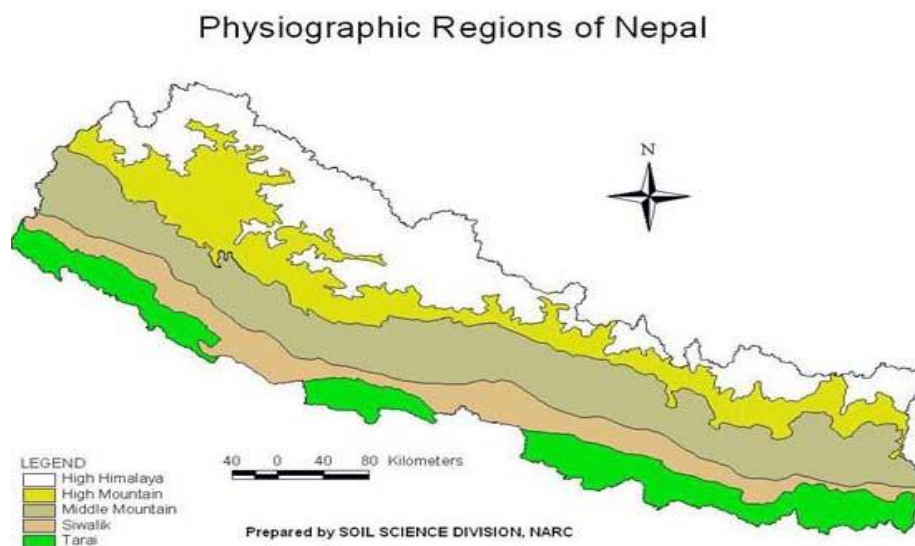


FIGURE 1 PHYSIOGRAPHIC REGIONS OF NEPAL

Churia hills or Siwalik range

The *Churia* hills, which arises abruptly from the *Terai* plains and reaches an elevation between 300 to 700 meters is mainly composed of sedimentary rock and big boulders. This zone which comprises the southernmost hill regions of Nepal rises from the *Terai* in the north and has a narrow but continuous belt of forest. This area is mostly dry except during monsoon when the streams swell up and gravel, boulders, stone and sand are washed down from the foothills. This region, however, merges in some areas with *Mahabharat Lekh* lying next to it in the north. *Mahabhart* and *Siwalik* hills in some areas are separated by valleys, like Dang, Chitwan, and Udaipur. The forests and pasture lands of this region are the major source of fodder and pasture for the livestock of *Terai* and *Siwalik* range. The climate in this region is mainly hot monsoon and subtropical.

The middle hills or mid - mountain

This region has a relatively dense population and has diverse landscapes, soil types and a diverse geology. People in this region depend mainly on crop, horticulture, livestock and forest for their living. There are several dense forests and pasture lands in this region. Pressure on the mid mountain forest is high as there is increased exploitation of the forest land for fuel wood, pasture, fodder, timber etc. Land here is moderately sloping and terraces are common, though plains are also seen along the sides of the river in the river basins. Altitudes of this eco-zone range from 700 to 2000 meters.

The high -mountains

This region extends from an altitude of 2000 to 4000 meters. Land is more sloping and small terraces are visible in some areas but they are not common. Alpine pastures occupying large spaces are found in this region. Livestock is the major source of livelihood of the communities living. Only barley, buckwheat or potato can be grown here. There is however no clear demarcation separating high mountains with middle hills and high Himalayas.

The high Himalayas

This region occupies land with elevation ranging from 4,000 to 8,848 meters. There are few settlements in this region especially in trans-himalayan regions like Mustang and Dolpa. Settlements in other parts of the high Himalayas is also very thin. There are several wide rangelands which are popular for yak and sheep grazing.

Rangeland Resources

Rangelands provide a variety of medicinal and aromatic plants from upper Himalayan region and supply forage or vegetation for grazing or browsing animals. Nepal's rangelands have high biodiversity as they range from subtropical savannas to temperate grasslands and alpine meadows, and a cold, arid steppe north of the Nepal Himalayas. Rangelands are an integral part of mountain societies and they are managed as open access resources through indigenous practices which varies from place to place.

Rangelands in Different Climatic Regions of Nepal

a) Tropical rangelands are dominated by the grasses *Phragmites karka*, *Saccharum spontaneum* and *Imperata cylindrica*. Some also contain 2 m tall *Cymbopogon jwarancusa* and *Bothriochloa intermedia*. Because of man's activities, *Imperata cylindrica* is a dominant species throughout, and the weed *Eupatorium* is gradually replacing many of the palatable species.

b) Sub-tropical rangelands are mostly associated with *Pinus roxburghii* forests. They are heavily grazed and are infested with *Eupatorium adenophorum* (Banmara), *Pteridium aquilinum* (bracken fern), *Urtica parviflora* (Stinging Nettle) and *Artemisia vulgaris*. These grasslands are termed the Themeda-Arundinella type. The main forage species are *Arundinella bengalensis* Druce, *A. nepalensis*, *Bothriochloa intermedia*, *B. pertusa*, *Chrysopogon gryllus*, *Cynodon dactylon*, *Heteropogon contortus*, *Apluda mutica*, *Brachiaria decumbens*, *Imperata cylindrica* and *Eragrostis pilosa* Beauv.

c) Temperate rangelands are associated with oak or mixed broad-leafed species such as *Quercus* or bluepine forests. These pasture lands are very important, but due to heavy grazing for many years, less palatable species such as *Arundinella hookeri* are found. In many areas, *Andropogon tristis* has been replaced with less palatable forage species such as *Arundinella hookeri*. The common forage species are *Arundinella hookeri*, *Andropogon tristis*, *Poa* spp., *Chrysopogon gryllus*, *Dactylis glomerata*, *Stipa concinna*, *Festuca* spp., *Cymbopogon* spp., *Bothriochloa* spp., *Desmodium* spp. and *Agrostis micrantha*.

d) Sub-alpine rangelands are associated with a variety of shrubs. The common genera are *Berberis*, *Caragana*, *Hippophae*, *Juniperus*, *Lonicera*, *Potentilla*, *Rosa*, and *Spiraea* and *Rhododendron*. In many areas, the shrub *Pipthantus nepalensis* has heavily invaded productive pasture lands once dominated by *Danthonia* spp.. The common naturally grown grasses are *Elymus* spp., *Festuca* spp., *Stipa*, *Bromus himalaicus* Stapf., *Chrysopogon gryllus*, *Cymbopogon schoenanthus*, and *Koeleria cristata*. *Elymus nutans*, a native species, is of great importance to pastoral systems at high elevations. Forbs of the genera *Anaphalis* and *Potentilla* have become more common as *Danthonia* is removed from the grassland.

e) Alpine rangelands are associated with *Rhododendron* shrubs. The main types of vegetation, based on the specification of areas, are *Kobresia*, *Cortia depressa*, and *Carex* / *Agrostis* / *Poa* associations. Common plant species are *Kobresia* spp. and *Agrostis* spp..

Settlements and Population by ecological zone

The population pressure and migration has been affecting the rangeland ecosystem. The limited opportunities and resources in the mountain region are making difficult for young people to thrive. Hence they are migrating to urban areas that are leaving the rangeland area more vulnerable.

| Ecological Zone | No. of VDCs ¹ | Settlements ² | Population |
|-----------------|--------------------------|--------------------------|-------------------|
| Mountain | 544 | 6,000 | 1,443,130 |
| Hill | 2,073 | 29,137 | 8,419,889 |
| Terai | 1,431 | 14,915 | 8,628,078 |
| Nepal | 4,048 | 50,052 | 18,491,097 |

Note:

1. Number of Village Development Committee includes municipality.

2. Excluding Okhaldhunga and Darchula districts.

(Source: NPC (1992/93). Settlement Service Inventory)

Department interventions

Resource conservation in the degraded rangeland is very important, with trainings, forage seeds, techniques of making hay /silage, rainwater harvesting etc. The department has covered 15000 ha of degraded rangeland till 2010 in 22 midhill districts of Nepal. Major focuses are on community strengthening, entrepreneurship development, motivating investments towards forage, pasture and livestock development activities.

3. Conditions of natural systems and land use practices in the chosen regions for the baseline programs

Stocking Density by Rangeland Type

| Rangeland Type | Carrying Capacity (LU/ha) | Stocking Density (LU/ha) | Stocking Density over the Carrying Capacity |
|-------------------|---------------------------|--------------------------|---|
| Mid hills | 0.31 | 4.08 | 13.2 |
| Steppe grasslands | 0.01 | 0.19 | 19.0 |
| Open grassland | 0.54 | 7.07 | 13.1 |
| Alpine meadows | 1.42 | 0.64 | 0.5 |

Source: Cited by Pariyar, 1993. Note: LU = Livestock Unit; one LU = 1.1 MT TDN per year.

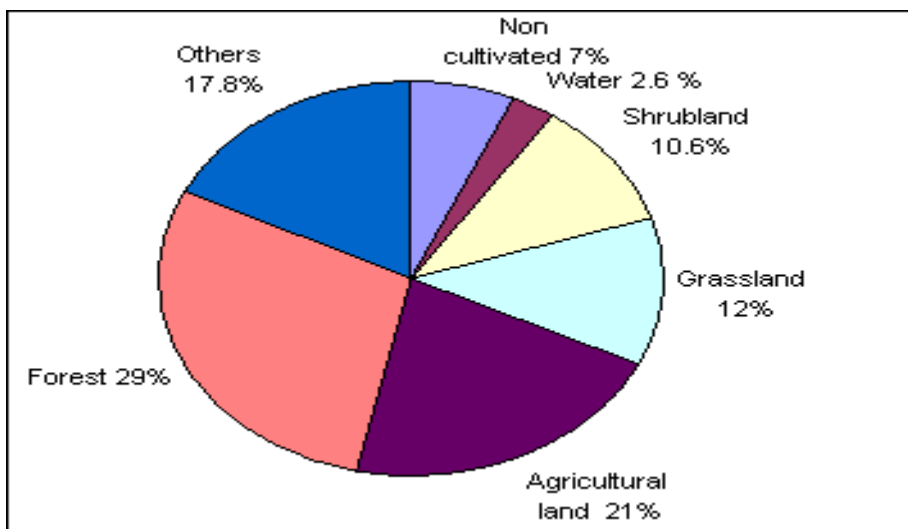
The carrying capacity of the above rangelands could be significantly improved by adopting improved management practices and introduction of improved production species.

Distribution of rangeland in Nepal (LRMP, 1986)

| Physiographic Region | Total Land | Rangeland (grazing land) | | |
|----------------------------|--------------------------------|--------------------------|----------------------|------------------------|
| | Area km ² (percent) | Area (km ²) | Total Land (percent) | Grazing Land (percent) |
| Terai (tropical) | 21220 (14.39) | 496.6 | 0.34 | 2.92 |
| Siwalik (sub-tropical) | 18790 (12.74) | 205.5 | 0.14 | 1.21 |
| Mid - Hills (temperate) | 43503 (29.50) | 2927.8 | 1.98 | 17.20 |
| High Mountain (sub-alpine) | 29002 (19.66) | 5071.3 | 3.44 | 29.80 |
| High Himal (alpine) | 34970 (23.71) | 8315.4 | 5.64 | 48.87 |
| Total | 147181 (100.00) | 17016.6 | 11.54 | 100.00 |

Land use patterns in Nepal

Available statistics show that forest, shrub land and degraded forest, grassland; uncultivated land occupy about 4.27 million hectares (29.0%), 1.56 million hectares (10.6%), and 1.75 million hectares (12%), 3.0 million hectares of the total land area of the country, respectively (Figure 2). It has been reported (HMGN-DFRS 1999) that forest cover in *Terai* and hills during the period between 1978-79 and 1990-91 has decreased at an annual rate of 1.3 and 2.3 % respectively.



About 50 percent of total range/grassland is found in high mountains, 29 percent in high hills, 16.7 percent in mid hills and 4 percent in Siwalik and Terai. By developmental regions, almost 50 percent of rangeland is found in mid western region and about one-fourth in the western region.

Mountain region

People: Bhote, Sherpa, Thakali, Tamang, Gurung etc.

Occupation: Animal husbandry and dairy farming.

Food: Dhindo, Rice, Bread, Potato, Meat.

Dress: Bakkhu and Docha.

Religion: Buddhism.

Festival: Lhosar.

Hill region

People: Brahmin, Chhetri, Newar, Rai, Limbu, Magar, Tamang.

Occupation: Agricultural and horticulture.

Food: Rice, Bread, Meat, Egg, Milk products.

Dress: Daura-Suruwal, coat and topi, Bhoto-kachhad and Patuka for men, Cholo-Fariya majetro for women.

Religion: Hinduism and Buddhism.

Festival: Janai Purnima, Dashain, Tihar, Shiva-ratri etc.

Terai Region

People: Tharu, Danuwar, Sunuwar, Dhimal, Rajpur, Sattar etc.

Occupation: Agriculture, Industry, Trade and Business

Food: Bread, Rice, Milk products

Dress: Dhoti-Kurta, Kamiz, Lungi, for men. Sari, Blouse for women.

Religion: Hinduism and Islam

Festival: Chhath, Raksha Bandhan, Holi, Diwali for Hindus. Id, Bakhridd, Muharram for Muslim.

Soil Erosion

| Location | Land Use | Erosion Rate (Tonnes/km ² /yr) |
|---|--|--|
| A. Siwalik Range | | |
| 1. Eastern Nepal, south aspect sand stone foot hills | 1. Different land use ranging from forest to grazing | 780 to 3,680 |
| 2. Far-west Nepal, south aspect sand stone foot hills of Surkhet | 1. Degraded forest | 2 000 |
| | 2. Degraded forest, gullied land | 4 000 |
| | 3. Severely degraded heavily grazed forest, gullied land | 20,000 |
| B. Mahabharat Lekh | | |
| Central Nepal, very steep slopes on metamorphic and sedimentary Rocks | 1. Degraded forest and Agricultural. Fields | 3,150 to 14,000 |
| | 2. Gullied land | 6,300 to 42,000 |
| C. Middle Mountain | | |
| 1. Northern foot hills of Kathmandu Valley | 1. Degraded forest scrub land | 2,00 to 4,500 |
| | 2. Over grazed scrub land | 4,300 |
| | 3. Severely gullied land | 12 ,500 to 57,000 |
| 2. South of Kathmandu Valley | 75 percent dense forest | 800 |
| 3. Phewatal Watershed | 1. Protected pasture | 920 |
| | 2. Overgrazed grass land | 34,700 |
| | 3. Overgrazed grass land | 2,200 |
| | 4. Gullied overgrazed grass land | 2,900 |

(Source: Water and Energy Commission Secretariat (WECS), 1987, Erosion and Sedimentation in Nepal Himalayas)

4. Details on problems and affected sectors in areas where baseline projects are being implemented

- Degraded rangeland with soil erosion, resulting in less than 1 ton production of dry matter per ha per year.
- High grazing pressure leading to the problem of reseeding of palatable forage species that causes disappearance and extinction of suitable pasture grasses and narrows down the pasture availability.
- Ineffective communication and motivation for local people.
- Indigenous knowledge incorporated into improved technology.
- Research and studies on indigenous pasture species.
- Changes in rainfall and relative humidity.
- Changes in cloud characteristics, sunshine and diurnal temperature range.
- High elevation fire events and deforestation.
- Inaccessibility to the rangeland.
- Grasslands remain under snow for about 6 months in a year. This provides only a short summer to undertake all the improvement works.
- Motivation for young herders.
- Local market for cheese and other niche products at high altitudes.
- Shifting cultivation in very steep soil is causing over utilization and soil erosion.

Nepal has a number of climatic regions characterized by six climatic features (Manandhar, 1989).

- Rainfall is unevenly distributed through the country.
- As Nepal is located in the northern limit of the tropics, it receives both summer and winter rain.
- When the monsoon trough remains stationary along the foot of the Himalayas, the whole country receives heavy continuous rain for two to three days resulting in flooding and land-slides.
- Cyclonic storms, formed in the Bay of Bengal during the monsoon period, result in a high probability of climatic disasters in the eastern part of the country.
- There is remarkable change of wind direction from season to season.
- There is great variation in the amount of rainfall from region to region due to mountain barriers which force the ascent of moisture bearing winds leading to precipitation on windward slopes.

Rangeland Loss and Major Threats

The total area under rangeland provides 36% of the total feed requirement for livestock in the country. Estimated forage production of high altitude grazing lands is comparatively higher as reflected in their carrying capacity. However, enormous grazing pressure exists and estimates suggest that there are nine times more grazing animals than land can viably support (Shah, 1981). This high grazing pressure depletes palatable species especially legume components. With extremes of wind, rainfall and temperature, arid mountain rangelands are especially prone to drying out, which can be caused or accelerated by overgrazing.

Most mountain rangeland ecosystems are relatively susceptible to degradation because they are less resilient in response to disruption than subtropical ecosystems. Moderately degraded range can usually be restored over time through integrated management systems, but severely degraded rangeland may require both investment and improvement techniques to make them economically viable and ecologically restored.

Initial situation in the regions of baseline projects especially with respect to ecosystems and local economies

The mountain region is insecure in terms of food availability. There is very little production of rice, paddy, and wheat etc., due to which there is only availability of foods for less than six months. The existing support programme under Department of Livestock Services is not sufficient in the region matching the demand. The programme is nominal as per the population and growing demand of the area.

ANNEX 6.

Concept paper on the Climate Change Research Programme

Prepared by the Department of Plant Resources

June 2011

Introduction

The Department of Plant Resources under the ministry of Forest and Soil Conservation (formerly known as Department of Medicinal Plants) was established in 1960. This organization is conducting and providing services in the field of research and development of plant resources in Nepal. It is a multidisciplinary organization comprising mainly of botanists, chemists and pharmacists.

Ever since its establishment, many of its activities have concentrated on:

- Resource survey and collection of plant materials and preservation of the specimens in the National Herbarium.
- Maintenance of Botanical Gardens in various parts of the country.
- Chemical and biological researches for the utilization of medicinal, aromatic and other valuable plants.
- Biotechnology research, improvement and propagation of plants of economic value.
- Agro-technology development on plants to provide services to the farmers on techniques of commercial cultivation of important medicinal and economic plants.
- Conduction of trainings on resource (plant) conservation, management and provide garden services.
- Information dissemination through publications on various aspects of Nepalese plant resources.
- Bio-prospecting of plants of economic value.

Goal

Research and development on plants and a database on plant resources for the promotion of Trade and Industry based on plant and plant products.

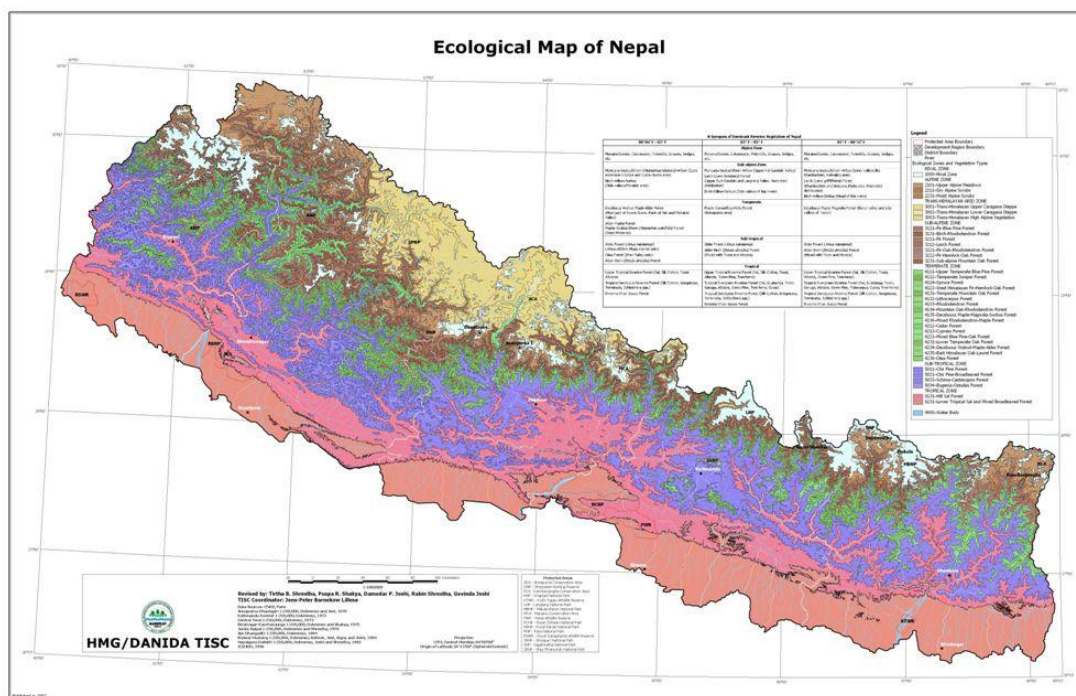
Objectives

- Bio-prospecting of plant resources.
- To carry out research on isolation of chemical constituents and biological effects of the plant.
- To carry out research for the promotion of Trade and industries based on plants and plant products.
- To help in the development of industries based on plant resources.
- To help in value addition of the medicinal plants.
- To help in supply chain management of the plants.
- To develop the standards for plants and plant products.

Programme/Activities

- To manage the museum of plant specimen and different parts of plants.
- To carry out pharmacognostical research and identification of plant and plant products.
- Promotion of integrated research on plants especially endemic and indigenous plant species.

- ### Geographical Region of Research Area



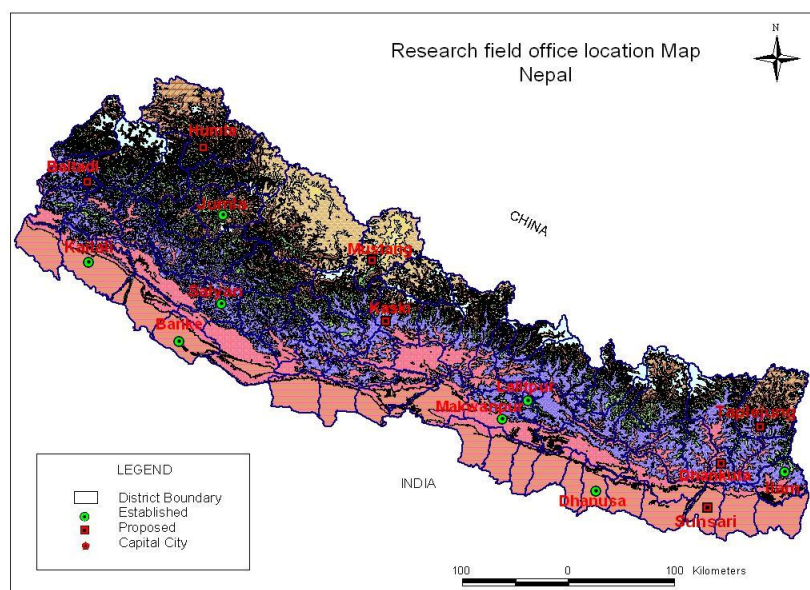
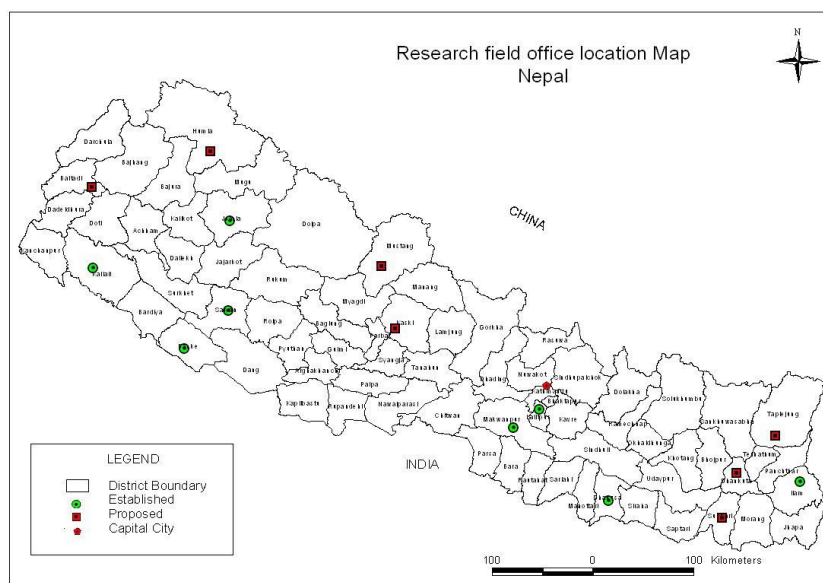
The seven district offices are:

- District Plant Resources Office, Ilam (Eastern Development Region)
- District Plant Resources Office, Dhanusha (Mid Development Region)
- District Plant Resources Office, Makmanpur (Mid Development Region)
- District Plant Resources Office, Banke (Mid Development Region)
- District Plant Resources Office, Salyan (Mid Development Region)
- District Plant Resources Office, Jumla (Mid Development Region)
- District Plant Resources Office, Kailali (Far Western Development Region)

Some botanical gardens under DPR promoting In-Situ Conservation

- National Botanical Garden, Godawari, Lalitpur
- Maipokhari Botanical Garden, Ilam, 2200 m [1992]
- Dhanusha Botanical Garden, Dhanushadham, Dhanusha, [1998]
- Daman Botanical Garden, Daman, Makwanpur, 2140m [1962]
- Tistung Botanical Garden, Tistung, Makwanpur, 1700 m, [1962]
- Dhakeri Botanical Garden, Banke, 130 m [1990]
- Mulpani Botanical Garden, Kapurkot, Salyan, 2000 m, [1990]
- Dhitachor Botanical Garden, Jumla, 2500 m [1990]
- Godavari Botanical Garden, Godavari, Kailali [1998]
- Deoria Botanical Garden, Dhangadhi, Kailali, 100 m [1998]
- Taliaum Botanical Garden, Jumla, [1990]

Beside these Research stations Department has proposed 8 more places covering all ecological regions of Nepal. Overall stations and working area are given below



| | Political Location | Ecological Zone | Major Vegetation Covered | Associated Vegetation Type | Representative Vegetation Legend | Area (Ha) | Percentage | Representative NTFP | Remarks |
|---|--------------------|-------------------------------|--|---|----------------------------------|---|--------------------------------|---|-------------|
| 1 | Sunsari | Tropical Zone | Lower Tropical Sal and Mixed Broad Leaved Forest | Tropical rivervine, Terai Sal forest, Terminalia forest | 6231 | 2655250 | 17.9% | Sarpagandha, Pipla, Chobo, Bel, Khayar, Sikakai, Kurilo, Gurjo, Amala | Proposed |
| 2 | Dhanusa | Tropical Zone | Lower Tropical Sal, Hill Sal Forest | Terai Sal Forest, Churia range, Termanila forest | 6231 6131 | 2655250 2617551 | 17.9% 17.7% | Sarpagandha, Pipla, Chobo, Bel, Sikakai, Kurilo, Gurjo | Established |
| 3 | Banke | Tropical Zone | Lower Tropical Hill Sal | Terai Sal Forest, Termanila forest | 6231 6131 | 2655250 2617551 | 17.9% 17.7% | Sarpagandha, Pipla, Orchid, Gurjo | Established |
| 4 | Kailali | Tropical Zone | Lower tropical sal and Mixed Broad Leaved | Terai Sal Forest, Terminalia, Acacia forest | 6231 5011 | 2655250 745516 | 17.9% 5.0% | Sarpagandha, Pipla, Gurjo, Amala | Established |
| 5 | Makwanpur | Tropical Zone | Mountain Oak, Chire pine | Hill sal forest | 5021 6131 4131 6231 | 1314895 2617551 412448 2655250 | 8.9% 17.7% 2.8% 17.9% | Khayar, Sikakai, Kurilo | Established |
| 6 | Ilam | Sub tropical, Lower temperate | Hill Sal, Schima Castanopsis, East himalayan Oak laurel forest | Mixed broad leaf, Rhododendron, Laurel forest | 6131 4235 5033 | 2617551 237856 1234505 | 17.7% 1.6% 8.3% | Bel, Khayar, Kurilo, Chiraito, Okhar, Bojho, Dhasingre | Established |
| 7 | Dhankuta | Sub tropical, Lower temperate | Rhododendron, Oak, Laurel | Mixed broad leaf, Rhododendron, Laurel forest | 4235 4133 | 237856 9575 | 1.6% 0.1% | Bel, Khayar, Kurilo, Chiraito, Okhar, Bojho, Dhasingre | Proposed |
| 8 | Lalitpur | Sub tropical, Lower temperate | Schima Castanopsis, Chir pine, Broad leaved | Mixed broad leaf, Oak forest, Rhododendron, Laurel forest | 5033 5021 | 1234505 1314895 | 8.3% 8.9% | Chiraito, Orchid, Titha, Taxus, Bojho, Dhasingre | Proposed |

| | | | | | | | | | |
|--------------------------|-----------|-------------------------------|--|---|---------------------|----------------------------|---------------------|---|-------------|
| 9 | Kaski | Sub tropical, Lower temperate | Schima Castanopsis, Hill sal | Schima castanopsis, Laurel forest | 5033 6131 | 123450 5 261755 1 | 8.3% 17.7% | Chiraito, Orchid, Majitho, Sugandawal, Bojho, Dhasingre | Proposed |
| 10 | Salyan | Sub tropical | Chir pine | Chir pine forest | 5011 | 745516 | 5.0% | Timur, Kurilo, Orchid, Sugandakokila, Bhayakur, Ritha, Sugandawal | Established |
| 11 | Baitadi | Sub tropical, Lower temperate | Lower temperate, Pine, broad leaf | Mixed broad leaf, chir pine forest | 4231 5021 | 657169 131489 5 | 4.4% 8.9% | Orchid, Morchella, Amala | Proposed |
| 12 | Jumla | Temperate, Lower sub alpine | Sub alpine vegetation type | Oak, Spruce, Betula forest | 3131 3231 4111 | 563006 98010 107725 | 3.8% 0.7% 0.7% | Jatamansi, Kutki, Panchaunle, Atis, Bikhma, Bisma, Morchella, Lichen, Taxus | Established |
| 13 | Humla | Temperate to alpine zone | Alpine vegetation | Oak, Spruce, Betula forest | 2101 2231 | 627084 508772 | 4.2% 3.4% | Padamchal, Kutki, Bhutkesh, Yarsagumba, Taxus | Proposed |
| 14 | Taplejung | Alpine zone | Alpine vegetation, temperate | Betula, Alpine meadow | 2101 2231 3211 | 627084 508772 540706 | 4.2% 3.4% 3.7% | Kutki, Jatamansi | Proposed |
| 15 | Mustang | Sub Arid and Alpine zone | Transhimalayan vegetation types, Nival | Rhododendron, Cotoneaster bush and arid grassland | 3003 3002 3001 1000 | 853116 39194 222131 793132 | 5.8% 0.3% 1.5% 5.4% | Kutki, Nirmasi, Bikhma | Proposed |
| Total Vegetation covered | | | | | | 142376 41 | 96.2% | | |

Information about Natural Systems

With about 7000 species of vascular plants, Nepal is a globally important biodiversity hot-spot.

Although Nepal is a small country it boasts a huge diversity of plant species because of its enormous range of habitats. Most famous for the alpine vegetation of its high mountains, Nepal rises from subtropical lowland forests only 60 m above sea level. The effects of the monsoonal climate vary widely across the country, with lush

rhododendron forest on the southern slopes of the Himalayas receiving over 5000 mm of rain annually, while semi desert areas to the north of the main ranges receive barely 250 mm per year.

Diversity of Ecosystems

Various types of land and water ecosystems are found according to geographical region. There are different types of ecosystems in Nepal according to geographical features. Nepal is divided into the Himal, the Hills, and the Terai. The Himalayan range is extended northern part. Mount Everest. The highest peak is also located in it. The mid hilly region is located between the Himalayan region in the north and the terai in the south. About half of the country's land is represented by the hilly region. The region comprise of hills hillock and tar. The lowland is located in southern part. The region is extended from Mechi in the east to Mahakali to the west. The climate differs in each of geographical region. Therefore, there is a diversity in the land and water ecosystem of Nepal due to her physiography and climate. Various types of world ecosystem except those of the oceans and desert are found in Nepal. Ecosystem differs from the one geographical region to another depending on relief features, soil, slope of the land and steepness, face and altitude. This difference has created a great diversity in the ecosystem of each geographical region. Due to the diversity of ecosystem, there are great differences in vegetation and animals of Nepal.

There are glacial lakes in the Himalayan region. In the same way, lakes, ponds, and cool places are located in various places of the hilly region. Similarly, there are wet lands and small ponds along the sides of the stream and rivers flowing through the Hills and the Terai regions. There are big and small ecosystems in each of the regions of Nepal. The wet land ecosystem is regarded important for the growth and conservation of bio-diversity. A variation appears in vegetation and animals due to the physiography and chemical properties of water in various ecosystems.

Livelihoods and Ecosystems

Since ancient times, the people of Nepal have depended upon plants and plant products as a mainstay of everyday life. Today, almost 90% of Nepalese rely on subsistence agriculture, with plants performing a vital role as arable crops, fodder, fruit and vegetables, fuel, building materials and medicines. Nepal is a multiethnic and multilingual country, with more than 60 different ethnic groups speaking about 75 languages. As one would expect, associated with this is a great diversity in plant lore. However, with increasing urbanisation and uptake of modern medicines and agricultural practices, much of this indigenous knowledge is now dwindling and largely only retained by village elders. There is real danger that this will be lost to future generations, and ethnobotanists are busy documenting the wealth of indigenous knowledge for posterity. So far over 1500 plants (1434 flowering plants, 65 ferns and their allies, and 8 conifers and their allies) have been recorded as having at least one use, including more than 650 used as food plants and over 1000 species of wild plants used for medicine.

Pressure on Ecosystems

The geographical diversity with different climatic conditions and difficult transport and communication have resulted in the social and cultural diversity. The geography of a country has a big hand in developing diverse communities, castes, ethnic groups having different customs, traditions and beliefs.

People of different races, castes, ethnic groups and communities such as Brahman, Chhetri, Magar, Newar, Rai, Limbu, Gurung, Tharu, Tamang, Sherpa, Thakali, Yadav, Rajbanshi, Dhimal and Muslim live in different parts of the country. Unity in diversity is another specially of the Nepalese culture and tradition. People of different ethnic groups have their own cultures, mother tongue, festivals, songs, dances, dresses, customs, rites and rituals.

Through there is diversity in culture, there is unity in traditions, social values and norms. For example, we (Nepali people) all share the common tradition of respecting the seniors, loving the juniors. We regard parents and teachers as God. We all welcome our guests. We respect all the religions equality. We are always ready to help

each other when needed. Above all, we love our nation and nationhood.

Nepal is divided into three geographically regions.

- a) Mountains Regions.
- b) Hill Region and
- c) Terai Region.

Different communities and ethnic groups having different language, religions, customs and traditions are living together. All these people share the common characteristics of love, peace and feeling of brotherhood and cooperation.

A brief description of the social, religion and traditions of each geographical region are presented below.

Mountain region

People: Bhote, Sherpa, Thakali, Tamang, Gurung etc.

Occupation: Animal husbandry and dairy farming.

Food: Dhindo, Rice, Bread, Potato, Meat.

Dress: Bakkhu and Docha.

Religion: Buddhism.

Festival: Lhosar.

Hill region

People: Brahmin, Chhetri, Newar, Rai, Limbu, Magar, Tamang.

Occupation: Agricultural and horticulture.

Food: Rice, Bread, Meat, Egg, Milk products.

Dress: Daura-Suruwal, coat and topi, Bhoto-kachhad and Patuka for men, Cholo-Fariya majetro for women.

Religion: Hinduism and Buddhism.

Festival: Janai Purnima, Dashain, Tihar, Shiva-ratri etc.

Terai Region

People: Tharu, Danuwar, Sunuwar, Dhimal, Rajpur, Sattar etc.

Occupation: Agriculture, Industry, Trade and Business

Food: Bread, Rice, Milk products

Dress: Dhoti-Kurta, Kamiz, Lungi, for men. Sari, Blouse for women.

Religion: Hinduism and Islam

Festival: Chhath, Raksha Bandhan, Holi, Diwali for Hindus. Id, Bakhrud, Muharram for Muslim.

Summary

As per the Concept of DPR on Climate Change Research Programme the following areas of research will be covered:

- Species regeneration and adaptation in the Alpine meadows and forests.
- Dendrochronological studies of selected plant species.
- Ethnoecological knowledge on climate change adaptation.
- Species richness vs endemic species distribution along the landuse and altitudinal gradients.
- Investigation on shifting of vegetation due to climate change.