नेपाल सरकार
वन तथा वातावरण मन्त्रालय
Government of Nepal
Ministry of Forests and Environment

GREEN CLIMATE FUND

Food and Agriculture Organization of the United Nations

Critical Ecosystem Restoration Plan (CERP)

of

Patnali River System

Building A Resilient Churia Region in Nepal
(BRCRN)
Project Management Unit, Babarmahal, Kathmandu

Building a Resilient Churia Region in Nepal (BRCRN)

National Project Director

मिति २०७८।०२।२७ को वन तथा वातावरण मन्त्रालयको श्रीमान् सचिवस्तरीय निर्णयबाट स्वीकृत भएको Critical Ecosystem Restoration Plan (CERP) Preparation Manual को बुँदा नं. ४ को प्रावधान बमोजिम PPMU हरुको सिफारिशमा PMU को मिति २०८०।०२।२३ को निर्णयबाट प्रारंभिक स्वीकृत (Initially Approve) भएको यस नदी प्रणालीको CERP मिति २०८०।०२।२६ मा बसेको आयोजना निर्देशक समिति (Project Steering Committee) को निर्णय बमोजिम अनुमोदन (Endorse) भएको ।

2020/2/24

National Project Director

Disclaimer:

This CERP report has been prepared based on the extensive field consultations, onsite visit and applying the RS/GIS tools and technologies. This report contains data and information collected and collated from the field applying CERP steps and methodology spelled -out in MOFE approved CERP manual. The draft report was shared in three provincial and one national validation workshops organized from December 2022 to February 2023 and incorporated the suggestions obtained from the workshops.

 As the CERP is public property, therefore, any plans or activities prepared under this report can be implemented by any organizations and institutions. The report attempts for higher precision, however, there may be areas for improvement. Intervention site locations and budget estimations mentioned in report are based on field consultation and observations. During the time of implementation, they are subjected to change based on the changes in field condition at the time of implementation. Considered as the lively planning instrument, the CERP has the window open for the revision along with its implementation at the river system.

Date: June 2023

GRID CONSULT (P) LTD.

APPROPRIATE TECHNOLOGY DEVELOPMENT AND RESEARCH

Reg. No.: 56920/065/066
VAT No.: 302983230

Date: 27th March 2023

DECLARATION OF AUTHENTICITY

We the following team members of CERP formulation process from Grid-ECN-Sunakhari JV hereby declare that the data and information provided in the CERP reports of Koshi province are correct to best of our knowledge and duly in-line as per MOFE approved CERP manual, using participatory approach with sample site verification. Thus, this document is our original outcomes of local, river cluster, province and federal level consultations/ validations. We hereby verify to prove its originality and authenticity; we will not allow our team and other sources to make it copied resources in one way or the other without citing copyright that is GoN-BRCRN project. We duly acknowledge BRCRN'S FAO-TA for their active involvement in every stage of CERP development..

Thanking you
Sincerely,
Angishor Shrestha
Director – Grid Consult (P) Ltd
On behalf of GRID Consult– ECN Consultancy – Sunakhari Research Consult JV

Key experts	Name	Supportive expert
Team Leader/ Watershed expert	Dr. Rabindra Roy	Mr. Gagan Ale (Environmentalist)/ Mr. Nabin Bhattarai (Ecosytem Expert)
Technical Expert (Deputy Team Leader/ River system Expert)	Mr. Niroj Timalsina	Mr. Smaran Dahal (Geometic Engineer)
Workshop facilitators (Environmental Economist)	Mr. Madan Singh Khadayat	Mr. Bikash Gautam (Forester)
GIS Expert	Dr. Bhola Nath Dhakal	Mr. Bishnu Adhikari (Geographer/ Field Coordinator)
Social and GESI	Ms. Apsara Karki	Ms. Kala Rai (Geographer)/ Ms.Saraswoti Byanjankar (NRM Expert)
GIS database preparation: Mr. Uddav Karki (Geographer)		
Field assistants: Mr. Ramsaran Sapkota (Forester/Rural development), & Ms. Ananta Rai (Forester)		
Overall management: Mr. Angishor Shrestha & **Quality control**: Ms. Aruna Taundukar		

Baneshwor-10, Kathmandu
Contact No.:01-4771633, 9851126782,9851125412, Email address: gridconsult.consult@gmail.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AKC	:	Agriculture Knowledge Center
ANR	:	Assisted Natural Regeneration
BRCRN	:	Building a Resilient Churia Region in Nepal
CBFMG	:	Community Based Forest Management Groups
CBO	:	Community Based Organization
CBS	:	Central Bureau of Statistics
CCA	:	Climate Change Adaptation
CCM	:	Climate Change Mitigation
CERP	:	Critical Ecosystem Restoration Plan
CF	:	Community Forest
CFUG	:	Community Forest User Group
CRLUP	:	Climate Resilient Land Use Planning
D&FD	:	Deforestation and Forest Degradation
DFO	:	Division Forest Office
DHM	:	Department of Hydrology and Meteorology
DoS	:	Department of Survey
DRR	:	Disaster Risk Reduction
EIA	:	Environment Impact Assessment
FFS	:	Farmer Field Schools
FGD	:	Focus Group Discussion
FOP	:	Forest Operational Plan
FPIC	:	Free, Prior and Informed Consent
GESI	:	Gender Equality and Social Inclusion
ha	:	hectare
ICIMOD	:	International Centre for Integrated Mountain Development
IEE	:	Initial Environmental Examination
IP	:	Indigenous People
IPacks	:	Intervention Packages
IPM	:	Integrated Pest Management
Km	:	Kilometer
LRP	:	Local Resource Person
m	:	meter
MCA	:	Multi Criteria Analysis
MoFE	:	Ministry of Forests and Environment
PCTMCDB	:	President Chure Terai Madhesh Conservation Development Board
PCTMCMMP	:	President Chure Terai Madhesh Conservation and Management Master Plan
PPMU	:	Provincial Project Management Unit
RS	:	River System
SDFO	:	Sub-division Forest Office
SDG	:	Sustainable Development Goals
SFM	:	Sustainable Forest Management
SNRM	:	Sustainable Natural Resource Management
TOF	:	Training of Facilitators
VDC	:	Village Development Committee

EXECUTIVE SUMMARY

The project entitled "Building a Resilient Churia Region in Nepal (BRCRN)" aims to promote widespread adoption of climate-resilient land use practices; confront the challenges of deforestation and forest degradation (D&FD); better maintain the forest ecosystem in the Chure hills; and build resilience to climate-induced hazards by linking the Chure hills, Bhavar and Terai. BRCRN has adopted the river system-based approach and follows boundaries earlier identified and delineated by President Chure Terai Madhesh Conservation and Management Master Plan 2017. The said master plan projected integrated conservation plan on the basis of river systems. The Critical Ecosystem Restoration Plan (CERP) is prepared to foster Climate Resilient Sustainable Natural Resource Management (CR-SNRM) in the river system so that this CERP will be launched to implement the concept of upstream-downstream linkage based on perspectives of the ecosystem services. The CERP process has followed participatory rural development planning approach including civil society organizations (CSOs), community-based organizations (CBOs), women lead organization, and groups, and government entities at different levels. It is based on 'Theory of change' approach integrating problem and solution tree analysis that explains how a given intervention, or set of interventions, is expected to lead to specific development change, drawing on a causal linkage based on available evidence. From problem and solution tree analysis the main problems along with their causes and effects are recorded, to come up with clear and manageable goals and the strategies to combat them. There are two main stages to this process: (1) the identification of negative aspects of existing situations (or key challenges) in the form of problem trees, and (2) the change of the problems into objectives leading to solution trees showing potential solutions or strategies that respond to the main drivers and underlying causes. In addition, the integrated and gender-specific approach was adopted during the process to ensure gender equality and women empowerment in sustainable natural resource management. The integrated approach adopted gender-inclusive actions such as ensuring equal participation, gender prospect in problem-solution analysis, and ensuring participation of women lead organizations in the consultation workshops. However, due to the limited involvement of women in the integrated approach, a gender-specific approach was adopted, and a separate study focusing only on women and women lead organizations was conducted during the process. In addition, the approach adopted particular research tools such as seasonal calendars, problem and solution community workshops, and focus group discussions among women, Dalits, IPs, women, and other marginalized communities. Also, the consultation process includes a consultation with women and women lead organizations.

Patnali river system constitutes of Chure hill and Bhavar, extended over 26.792230°to 26.876326°N and 87.140442°to 87.239170°E. The river system faces urban expansion at the annual rate of 5.41% during 2000 to 2019. It appears that the total forest area decreased by 64.2 ha at the annual rate of 0.1% during these 19 years. The ecosystem degraded areas termed as "hotspot" areas are identified initially by spatial analysis of 16 different variables from secondary spatial data sources. The variables were categorized into adaptation and mitigation themes and Geographical Information System (GIS) based Multi-Criteria Analysis (MCA) was used to identify preliminary hotspot areas. The maps generated from spatial analysis were taken to problem and solution workshops that took place at the local level. Participants from Community Based Organizations (CBOs) user groups- with a focus on women, indigenous people, poor and Dalit (community and collaborative forest user groups, farmer groups, and climate-induced disaster management groups, soil and water conservation groups) as well as government organizations (forest sub-division offices and local government at community level) were represented in the workshops. Identification of key drivers, problem analysis, solution analysis, and hotspot map delineation were done in two thematic groups of climate change adaptation and mitigation. The mapped hotspot locations were verified/updated in workshops and visited-verified in the field followed by discussions with the local

communities. Additional two-day expert planning workshop in the river system discussed and validated the findings, focusing on identifying drivers and underlying causes of the two thematic problems.

Deforestation and forest degradation are related to climate change and pose threats to biodiversity and livelihood of forest dependent local communities. Forest degradation relates to loss of biomass (carbon) and reduction in the capacity of forests to produce ecosystem services on longer terms. The findings from local stakeholder and expert consultations indicate that forest fire, unsustainable/illegal harvesting of forest products, ineffective forest management practices and infrastructure development are major drivers of deforestation and forest degradation in Patnali river system. Climate-led hazards like erosion/landslide and flood are other drivers contributing to forest loss and degradation. These drivers are the results of several underlying causes- forest resource dependency; poverty and limited livelihood opportunities available to local communities; ineffective forestry sector governance; weak law enforcement; ineffective sustainable forest management; financial and human resource constraints in community based forest user groups and forest offices; and weak coordination and cooperation among concerned agencies that have led to such degradations in this river system.

Climate induced disaster and climate impact on agriculture productivity are two key challenges representing vulnerable ecosystem and community in the river system. Erosion/landslide, flood and weak disaster risk management are major drivers, and are triggered by both natural and anthropogenic factors. Inappropriate land use practices like cultivation in slopy areas more than 30 degree, forest degradation, unplanned and unregulated road construction, and riverbank encroachment are main human-induced causes. Heavy/erratic rainfalls, steep slopes and other topographic conditions are major natural causes. Climate stress on agriculture productivity has direct impact on people's livelihood especially women, elderly and children through low family income and food insecurity. It eventually makes forest ecosystem vulnerable through increased burgeoning pressure on forest resources. The major drivers identified are inadequate farm skills and financial resources; insufficient irrigation; lack of commercial livestock farming; crop and livestock diseases; and loss and damage of agricultural lands and crops.

The strategic actions identified to reduce deforestation and forest degradation include reducing forest dependency by addressing poverty and alternative livelihood issues; promoting agroforestry, livestock management; strengthening forest fire control system; improving law enforcement and overall forestry sector governance; promoting sustainable forest management; and capacity enhancement of user groups and government forestry staffs. Plantation activities are proposed to enhance forest density/tree cover and species richness for improving ecosystem services. One of the important aspects of enhancing adaptation/resilience of ecosystem and community would be climate resilient farming practices and enhancing agricultural productivity. Increase in agriculture productivity will improve livelihood of small holding farmers and at the same time, it will decrease dependency on nearby forest resources. Strategic actions proposed for disaster risk reduction are landslide treatment, erosion control, riverbank stabilization and strengthening disaster risk management. In addition, the focus is also on enhancing gender inclusive governance to mainstream women, Dalits, indigenous people, and marginalized communities in the implementation of ecosystem restoration plans for the river system.

Based on the activities and key results identified from local stakeholder workshops, via problem tree and solution tree analysis, five intervention packages (IPacks) have been developed. This CERP only covers those key results and IPacks that correspond to local level interventions. CERP brings out issues on a number of vital areas of interventions that can take place at national level such as- resolution of land tenure issues; and interventions to regulate infrastructure development in forest area, however does not suggest specific interventions as guided by CERP manual. Feasibility analysis is used to assess the strengths and weaknesses of the IPacks where risks and obstacles to implementation of each IPacks

were assessed. Safeguard analysis is done to identify social and environmental risks or threats, as well as to identify where CERP interventions can contribute to significant social or environmental co-benefits. The measures to mitigate risks and enhance benefits are also assessed. Budget plan and monitoring protocol for CERP are also prepared adopting several matrixes. However, geographic focus of activities is not considered as a primary criterion for activity grouping during IPack formulation.

The IPacks developed mainly focused on reducing deforestation and forest degradation; enhancing adaptation/resilience of vulnerable ecosystem and local communities; raising awareness and enhancing capacity of CBOs and government staffs; and integrating gender and social equity issues. The IPacks provide adaptation and mitigation activities for forest management and subsequent carbon enhancement; climate resilient agriculture and land use practices; and reducing ecosystem and community vulnerability to climate-induced disasters. Since the upstream is not protected, the people at the Bhavar and downstream are facing various problems and hence CERP activities are designed with focus on upstream-downstream linkages based on perspectives of the ecosystem services. The activities such as agroforestry, enhancing forest/tree cover, gulley control, landslide treatment, and climate resilient land use practices to build resilience of smallholder farmers against climate change impacts in upstream are intended to enhance resilience against climate-induced soil erosion, reduce runoff and enhance infiltration, thus reducing risks related to sedimentation and flooding in the downstream. Reducing rate of deforestation and forest degradation in Chure and enhancing tree cover in downstream through public and private land forestry will produce important climate change mitigation benefits while also preserving and enhancing vital ecosystem services that are essential to the resilience of communities throughout the river system.

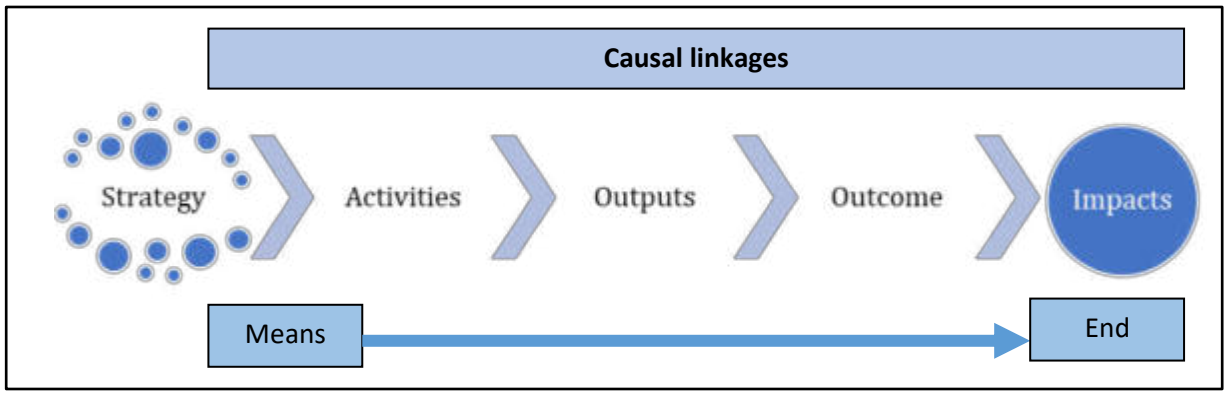
CHAPTER I : INTRODUCTION TO CRITICAL ECOSYSTEM RESTORATION PLAN

1.1 Background

The project entitled "Building a Resilient Churia Region in Nepal (BRCRN)" is implemented in 26 critical river systems (RS) in the southeast region of Nepal, covering parts of Provinces 1, Madhesh and Bagmati. The project will be linking the Chure hills, Bhavar and Terai, and aims to promote widespread adoption of climate-resilient land use practices, confront the challenges of deforestation and forest degradation (D&FD), better maintain the forest ecosystem in the Chure hills, and build resilience to climate-induced hazards so that the ecosystem services perpetuated in the longer terms.

The Chure Hill is an ecologically highly sensitive and risk-prone landscape due to complex geology, tectonics, climate, hydrology, and biodiversity. Ecologically Churia is an integral part of Terai, thus, it should be considered as a landscape. Watershed level institution building and its well-functioning including upstream and downstream stakeholders can contribute in conservation and management of upstream watershed resources. This CERP has been planned in a way which ensures protection of upstream areas and hence downstream will have perpetuated ecosystem services on longer terms. The region is particularly vulnerable to erosion, landslides, drought and flooding due to ongoing tectonic processes, fragile geological composition, and prolonged and intense rainfall during monsoon (Ghimire, 2011). A changing climate is further contributing to landslides, erosion, and flash floods in the hills. These processes in the hills have shaped the active geomorphological activities in the Bhavar region through aggradation and transportation of sediments. Over the last half-century, Bhavar have undergone tremendous changes in demography, land use, settlement and urbanization, and road infrastructures, which have extremely altered the landscape. Moreover, haphazard extraction of the riverbed material has altered the geomorphic processes in the Bhavar (Dahal & Paudyal, 2022). Higher sediment yield in Chure hill and alteration of geomorphological processes in Bhavar have profound impact on the morphology of the river and related disaster in the downstream area of Terai flood plain (Ghimire, 2020). The agricultural land of Bhavar and Terai are already in stress of climate variability, further jeopardizing the livelihoods of the inhabitants.

In these connections, Critical Ecosystem Restoration Plan (CERP) has been prepared to foster Climate Resilient Sustainable Natural Resource Management (CR-SNRM) at river system level. CERP activities are designed with focus on upstream-downstream linkages based on perspectives of the ecosystem services The CERP has followed a participatory rural development planning approach including civil society organizations (CSOs), community-based organizations (CBOs) and government entities at different levels. This methodology and process is based on international best practices, including the 'Theory of change' approach to planning, implementation, monitoring & evaluation and impact assessment in different time intervals.



(Source: CERP manual, 2021)

Figure 1: Establishing casual linkages with theory of change analysis.

Since the "Theory of change" approach explains how a given intervention, or set of interventions, is expected to lead to specific development change drawing on a causal linkage based on available evidence, CERP has translated the field information into the desired activities, outputs, outputs, outcomes and impacts of the project and highlighted the current situations and dynamics including their incentives for change towards expected results.

1.2 River System Concept: Holistic Approach of Integrated Watershed Management

The President Chure Terai Madhesh Conservation and Management Master Plan 2017 projected integrated conservation plan based on river systems. A river system is a land mass of drainage basin where all river and its tributaries meet to have a common outlet. BRCRN follows the river system boundaries earlier identified and delineated by President Chure Terai Madhesh Conservation and Management Master Plan (PCTMCDB 2017). It is a part of watershed management system that should ideally follow hydrological boundary, however, river system delineation in PCTMCMMP also considers land mass as a management unit that is delineated based on the geographical and socio-ecological variability.

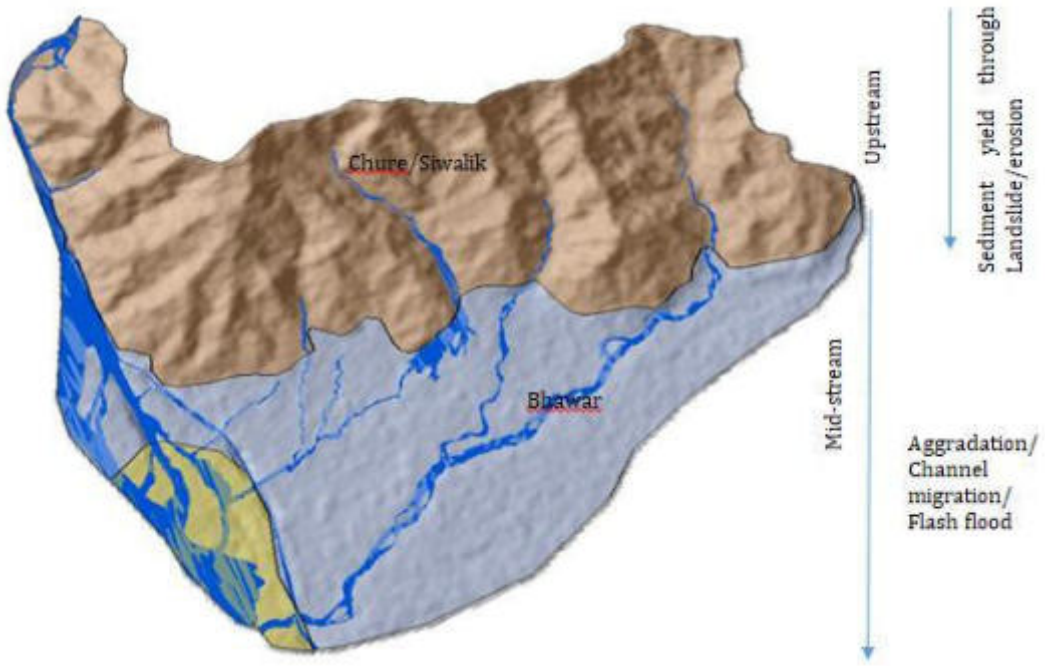


Figure 2: Upstream-downstream linkages in Patnali river system

Sediment generates through erosion and slope failure process in the upstream cause aggradation in Bhavar region, which leads to bank scour/cut/erosion and then channel migration.

1.3 Ecosystem Restoration

Ecosystem degradation is a negative trend in ecosystem condition, caused by direct or indirect human-induced processes including anthropogenic climate change perpetuated by anthropogenic factors, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity, or value to humans in one way or the other.

Ecosystem restoration is any intentional activities that accelerate the recovery of degraded, damaged, or destroyed functional services that an ecosystem provides. The restoration planning requires multi-dimensional observation and analysis of core problems followed by a multi-stakeholder engagement and decision making process. Relating ecosystem services with relevant stakeholders for their perceptions of the services is vital for informed decision making about land use changes and resource management. Likewise, the site-specific information on land use and their changes is equally important. Hence, CERP processes have ensured rigorous field level discussions and consultations in each river system as well as exercised tools and techniques of land use and change dynamics to accommodate all the aspects of ecosystem restoration. The findings of the processes at multiple levels are then turned into the intervention packages of the CERP so that the specific ecosystems are restored.

In fact, CERP focuses on river system scale intervention planning to achieve ecosystem restoration at landscape level. Moreover, the CERP is guided by and perfectly in-line with the principles of ecosystem restoration of United Nations decade 2021-2030 that highlights following 10 principles that underpin ecosystem restoration:

- Ecosystem restoration contributes to the UN SDGs and goals of Rio conventions.
- Ecosystem restoration promotes inclusive and participatory governance, social fairness and equity from the start and throughout the process and outcomes.

- Ecosystem restoration includes a continuum of restorative activities.
- Ecosystem restoration aims to achieve the highest level of recovery for biodiversity, ecosystem health, integrity, and human wellbeing.
- Ecosystem restoration addresses the direct and indirect causes (drivers) of ecosystem degradation.
- Ecosystem restoration promotes knowledge generation and exchange throughout the process.
- Ecosystem restoration is based on well-defined goals.
- Ecosystem restoration is tailored to the local ecological, cultural and socio-economic contexts, while considering larger landscape.
- Ecosystem restoration includes monitoring, evaluation and adaptive management throughout and beyond the lifetime of project.
- Ecosystem restoration is enabled by policies and measures that promote its long term progress, replication and scaling-up.

1.4 Rationale of CERP

Most part of Churia is covered by forests while some parts are inhabited and cultivated. Increasing human interferences and expanding infrastructures coupled with climate vagaries on top of its own fragile-composition are causing serious threats to this region and downstream also. It has varying elevation, climate and vegetation from one to another part. Churia (upstream) area has been considered to be very important for conservation to protect downstream Terai and its agriculture land. CERP has been formulated in a way which implements the concept of upstream-downstream linkage based on perspectives of the ecosystem services. The development of CERPs will contribute to the provision of climate-informed extension, leveraging the resources and advisory services. It ensures that adaptation to climate change (CC) and Disaster Risk Reduction (DRR) has been integrated into provincial and local development planning cycle. The project achieves this through promotion and integration of climate resilient land use practices in agriculture and forestry, subsequently integrating them into local decision-making processes. This will ultimately guide the adoption of prioritized low-carbon and climate resilient – integrated Sustainable Natural Resource Management in the Chure region.

The goal is that government and development partners together improve local and provincial service delivery through river system interventions in CR-SNRM sector. The CERP is also the basis for monitoring and evaluation (M&E) of ecosystem restoration actions at the landscape scale as well as outreach and targeted budgeting on local level. Additionally, the data generated in the annual follow-up of the CERP intervention packages, and their success or failure will inform government reporting on climate change related international commitments and instruments. The reports on the cumulative impacts of the CERPs can also inform country's overall Nationally Determined Contributions (NDC) reporting on land use change and greenhouse gas emissions at a national scale.

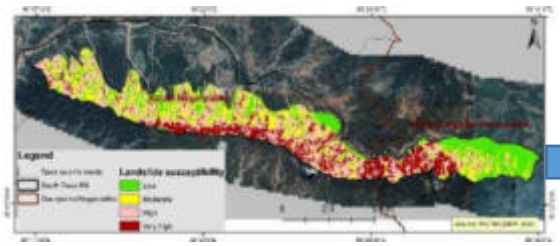
CERP is envisioned at a river system scale to foster upstream-midstream-downstream connectivity by analyzing complex inter-linkage of cause and effect dynamics of climate vulnerability over the specific geographic regions and interventions to help build the climate resilience with interlinked and cascading impact from head to tail of the river systems. In this sense, it adopts a holistic integrated watershed management approach.

CHAPTER 2 : METHODOLOGY AND THE PROCESS

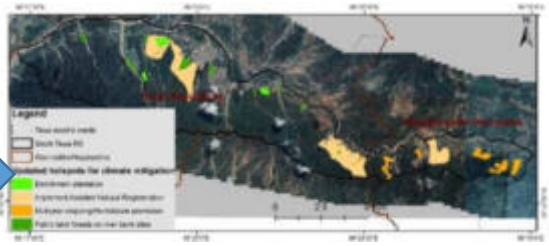
2.1 CERP Development Phase

Following nine steps were followed during the CERP development phases:

Step 1: Preparatory spatial analysis of land cover change, forest loss/gain, forest fires, slopes, landslide, flood, river geomorphology and settlement vulnerability



Step 2: Spatial Multi-criteria Analysis (MCA) to identify problem hotspots

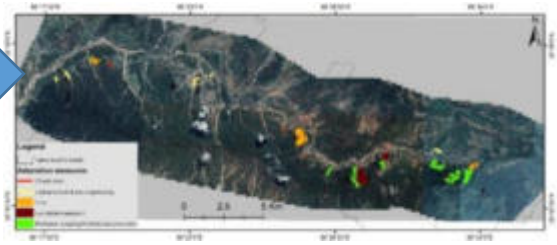


Step 3: Participatory spatial planning using hotspot map for prioritization of drivers, barriers, and identification of specific problem locations

Step 4: Formulation of problem and solution trees, identification, and mapping of solutions

Step 5: Field visits to verify locations of problem-solution

Step 6: Compilation of information and desk verification on problem-solution locations and interventions planned

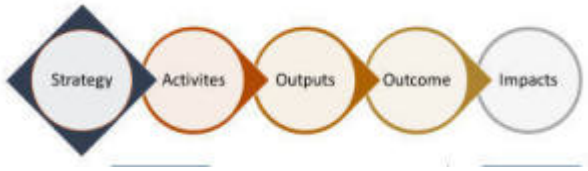


Step 7: Expert planning workshop for finalization of IPacks and analysis of risks & benefits

Step 8: Finalizing monitoring mechanism and budgeting of interventions through expert consultation

Monitor Budget

Step 9: Development of workflow and finalization of intervention packages



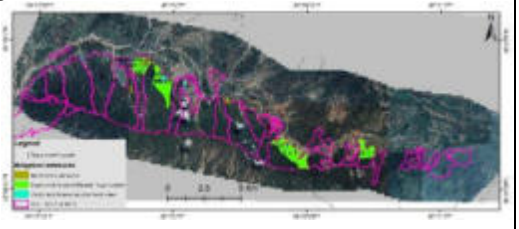


Figure 3: Steps of spatial analysis for CERP development

2.2 Spatial Planning as a Base for CERP

Mapping and spatial analysis have a vital role in the CERP development process. Maps and spatial analysis are generated by a combination of geospatial tools (i.e. GIS, Remote Sensing), desk-based research and fieldwork. Relevant analogue maps and data prepared by national and international agencies were collected and reviewed for the inclusion of the information in the digital spatial data as well as integration in the GIS.

Table 1: Data types, acquisition and their processing methods

Themes	Parameters	Data types	Sources	Processing methods
Climate mitigation	Deforested area	Forest loss (2000-2020)	Global Forest Watch data.globalforestwatch.org	- Revised & update from temporal Google earth images
	Degraded forest	Open forest (Canopy <20%)	Sentinel image, 2021	- NDVI and supervised classification - Inputs, revised & update from temporal Google earth images
	Forest fire	Fire incident	NASA's Website (https://firms.modaps.eosdis.nasa.gov)	- Overlay analysis on temporal GE images and draw tentative burnt area which will verify during participatory workshops
	Potential enhancement area	Private land/Public land forest (Proxy indictors)	Cultivated land & Riverbed (DoS, 1996)	- Abandoned agricultural land (Cultivated land in the 1990's/2000's and barren/bushes in 2020's): Google earth overlay & Mapping - Abandoned river/reclaim (River in 1990's/2000's and other land use in 2020's): Google earth overlay & Mapping
	Firewood consumption	Household using firewood for cooking	CBS, 2011	- Household using firewood attributed in then VDCs and transferred into RS
	Landslide on forest area	Landslide	PCTMCDB (TU-CDG, 2021)	- Landslide distribution in forest
	Road network on Chure hillslope	Road network on Chure hillslope	PCTMCDMP (PCTMCDB, 2016)	- Updated form Google earth
Climate adaptation	Agricultural land in slope area	Agricultural land Slope (Digital elevation model)	ALOS DEM (12.5m) (asf.alaska.edu)	Overlay analysis
	Agricultural land exposed to landslide hazard	Landslide hazard	PCTMCDB (TU-CDG, 2021)	
	Agricultural land exposed to Flood hazard	Flood hazard	PCTMCMMP (PCTMCDB, 2016)	
	Land capability	Land capability	Soil and Terrain Database (SOTER) (FAO, 2009)	

Themes	Parameters	Data types	Sources	Processing methods
	Landslide hazard	Landslide hazard	PCTMCDB (TU-CDG, 2021)	Overlay analysis
	Flood hazard	Flood hazard	PCTMCDMP (PCTMCDB, 2016)	Flood hazard is revised and updated based on recent geomorphic change in flood plain using the temporal images of GE
	Settlement exposed to landslide hazard	Settlement	Land cover, 2015 (PCTMCDB, 2016)	Overlay analysis
	Settlement exposed to flood hazard	Settlement	Land cover, 2015 (PCTMCDB, 2016)	
	Wetland/water recharge	Wetland/water recharge	Wetland (DoS, 1996 & PCTMCDB, 2016)	
	House structure	Indices	CBS, 2011	Spatial representation was created on then VDCs and transferred into river systems
	Ethnicity			
	Female literacy (Gender)			

CERP is the core process of the project in identifying the problems and solutions that lead to project interventions (activities). The CERP objectives were to balance both mitigation and adaptation for climate resilience building of local vulnerable communities. Hence, mitigation and adaptation potentials of the project are considered as primary entry points for MCA to identify hotspot sites and considered as major themes. Mitigation potential is addressed through identifying areas (hotspots) where BRCRN interventions have potential to reduce emissions and enhance the subsequent carbon stock. Similarly, adaptation potentials are addressed through identifying areas (hotspots) where BRCRN interventions have potential to address vulnerable ecosystems and vulnerable local communities.

Following graphics demonstrate adaptation and mitigation logic adopted for which careful choice of themes, variables, process and results were:

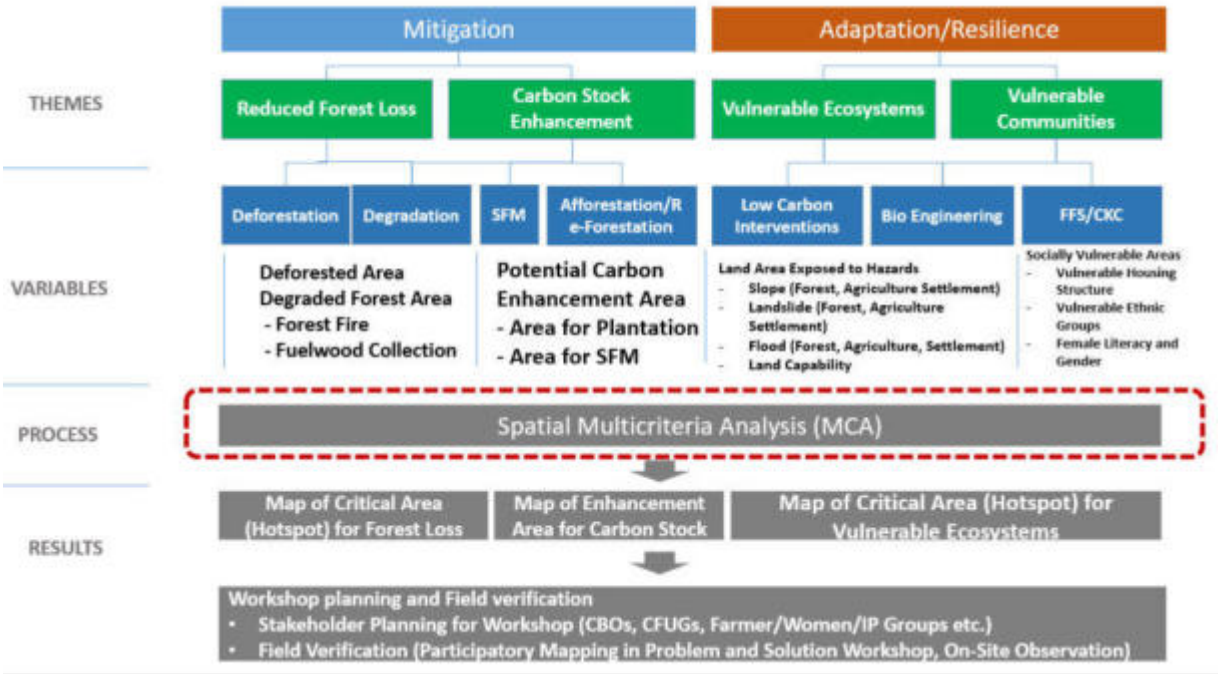


Figure 4: Multi-criteria analysis

2.3 Local Stakeholder Consultation

2.3.1 Selection of Participants

The selection process of participants for the two consecutive workshops i.e. Problem Analysis and Solution Analysis was vital for the validity and quality of CERP process. The selection process was carried out in collaboration with Division Forest Office (DFO), Sunsari district. The selection process prioritized to include women and women lead organizations including Indigenous Peoples and their institutions at the river system level. The DFO informed respective sub-division offices to support in selecting participants, who are well informed about the issues of River System. Similarly, the study team coordinated with local government (P*alikas* and wards) to trace out the representatives who are directly associated with the agriculture and disaster issues. The participants were from Community Forest User Groups and Barahakshetra Municipality Office while considering social inclusion i.e. representatives from women, poor, Indigenous Peoples (IPs) and Dalits. There were 22 participants in total. Among the participants, 5 were from IP groups and altogether 4 females and 18 males (Annex 2).

2.3.2 Workshop

The two-day workshop was organized on 12 and 13 January 2022 at office hall of Barahakshetra Municipality, Ward 2 at Hatkhola, Sunsari. The day one of the workshop was focused to prepare problem tree while day two was dedicated to develop solution tree as per the problem tree developed in day one.

A. Problem Analysis (Day One)

The workshop facilitators firstly briefed about introduction of the BRCRN and the objectives of the workshop. This session was followed by the discussion on the topics of 'Climate Change Mitigation' and 'Climate Change Adaptation'. The aim of this session was to bring common understanding among the participants, facilitators regarding the concept of 'Climate Change Mitigation' and 'Climate Change Adaptation' that would be instrumental to bring clear, and precise local issues associated with River System. This was robust basis to design intervention packages for the BRCRN.

The participants were divided into two groups viz. 'Climate Change Mitigation (CCM)' and 'Climate Change Adaptation-(CCA). Each group nominated their spokespersons for the documentation of thematic issues and women were encouraged to be a spokesperson. Adding to this, CCM group was requested to discuss on the issues of deforestation, forests degradation and enhancement activities whereas CCA group was focused on the issues of agriculture and disaster. Both the groups were oriented on how problem and solution trees were to be formulated. They were asked to identify the key problem, direct and underlying causes of the problem and impacts of problem. The participants were also oriented about mapping of hotspots for interventions. For this map of the river system, overlaying boundary and satellite image were displayed through projector. Printed maps were also used for orientation. Participants were oriented about the features of maps like forest area, cultivation land, river/streams, roads etc.

All issues of four thematic areas (deforestation, forest degradation, agriculture and disaster) were documented in the meta cards. Meta cards were displayed in walls of the workshop hall. Meta card with key problem/challenge was attached at the top. Following it, meta cards with direct drivers were attached and then meta cards with underlying causes at the bottom to prepare a problem tree.

- **Group Exchange**

The problem trees prepared by each groups were displayed and group exchange was done for verification and inputs. The spokespersons of respective CCM and CCA groups were assigned to present their problem trees. During the presentation, CCM groups received inputs from participants of

CCA groups and vice versa. This process provided ample space to refine the local issues on case to case basis mutually.

B. Solution Analysis (Day Two)

On the second day, same participants were asked to remain in their respective groups of CCM and CCA. As informed them on the day before each group was asked to prescribe solutions of respective issues identified in problem analysis. They were asked to identify activities against problems, output of the activities, outcomes and finally impacts. The facilitators played same role as in problem analysis. All solutions were documented in the meta cards and displayed for the group exchange. Meta card with outcomes was pasted at the top followed by outputs and activities at the bottom to develop a solution tree.

- **Group Exchange**

The group exchange processes were carried out same as in Day One.

2.3.3 Identifying and Mapping of Hotspots

In the problem analysis day, the map of River System was displayed in both hardcopy and power point presentation including interactive Google Earth Images and carried out participatory discussion to identify hotspots of the respective River System (RS). These participatory discussions were instrumental to trace out the hotspots in terms of their severity, which would be basis for designing intervention packages for the BRCRN project with reference to climate change mitigation and climate change adaptation discussed in the problem analysis and solution analysis. The study team noted the name and physical location of the hotspots identified by the participants for field verification.

2.3.4 Field Visit and Focus Group Discussions (FGDs)

The study team went to field after the two-day workshops to verify identified hotspots. Maps and checklists were used for field verifications of hotspots. The study team had also conducted key informants interview to understand the depth of the problems in the respective hotspots. The study team discussed with local people on the major problems of the hotspots and rationale interventions to address the problems along with the local safeguard information. Indigenous people (IPs), Dalits social groups, and women were focused in consultations for inclusiveness, customary practices, norms, values and existing indigenous institutions, their roles in community and encourage them for their meaningful participation and insist them to be vocal on their problems in the face of climate change mitigation and climate change adaptation. The study team documented all the issues raised in field consultations, which would be reflected in the CERP.

2.4 Expert Planning Workshop

2.4.1 Expert Planning Workshop Participants

The experts from Division Forest Offices, Sub-division Forest Offices, Province Forest Directorate, President Chure Terai Madesh Conservation Development Board, Agriculture Development Directorate and Agriculture Knowledge Center participated in the two-day workshops. Experts were invited in collaboration with BRCRN-PPMU and FAO-TA and Province ministries. All participants were informed though formal letter from Ministry of Agriculture and Ministry of Forest, Environment and Soil Conservation.

2.4.2 Workshop

The two-day expert planning workshop was conducted at Itahari of Sunsari district on 10 and 11 August 2022. The workshop was conducted for Patnali, Kokaha and Budhi river system of Sunsari district. The workshop was intended to validate the preliminary CERPs prepared from local stakeholder consultations. In the workshop, BRCRN-PPMU firstly briefed about introduction of the BRCRN project

and objectives of the study. This session also included study process followed. In the workshop, detailed outcome derived from problem analysis, solution analysis and hotspot verification were shared. Issue related with deforestation, forest degradation, agriculture and disaster raised in local stakeholder workshops were shared with respective experts. Problem tree, Solution tree, Hotspot map, intervention packages, activities, safeguard analysis matrix, benefit enhancement activities were shared and discussed/verified in the workshop for individual river system. Comments and suggestions collected from the workshops are incorporated in relevant sections for improvement of the Critical Ecosystem Restoration Plan.

CHAPTER 3 : INTRODUCTION TO PATNALI RIVER SYSTEM

3.1 Physiography, Land Cover and Hydrology

Patnali river system (RS), constitute of Chure hillslope and Bhavar, extended over 26.792230°to 26.876326°N and 87.140442°to 87.239170°E.

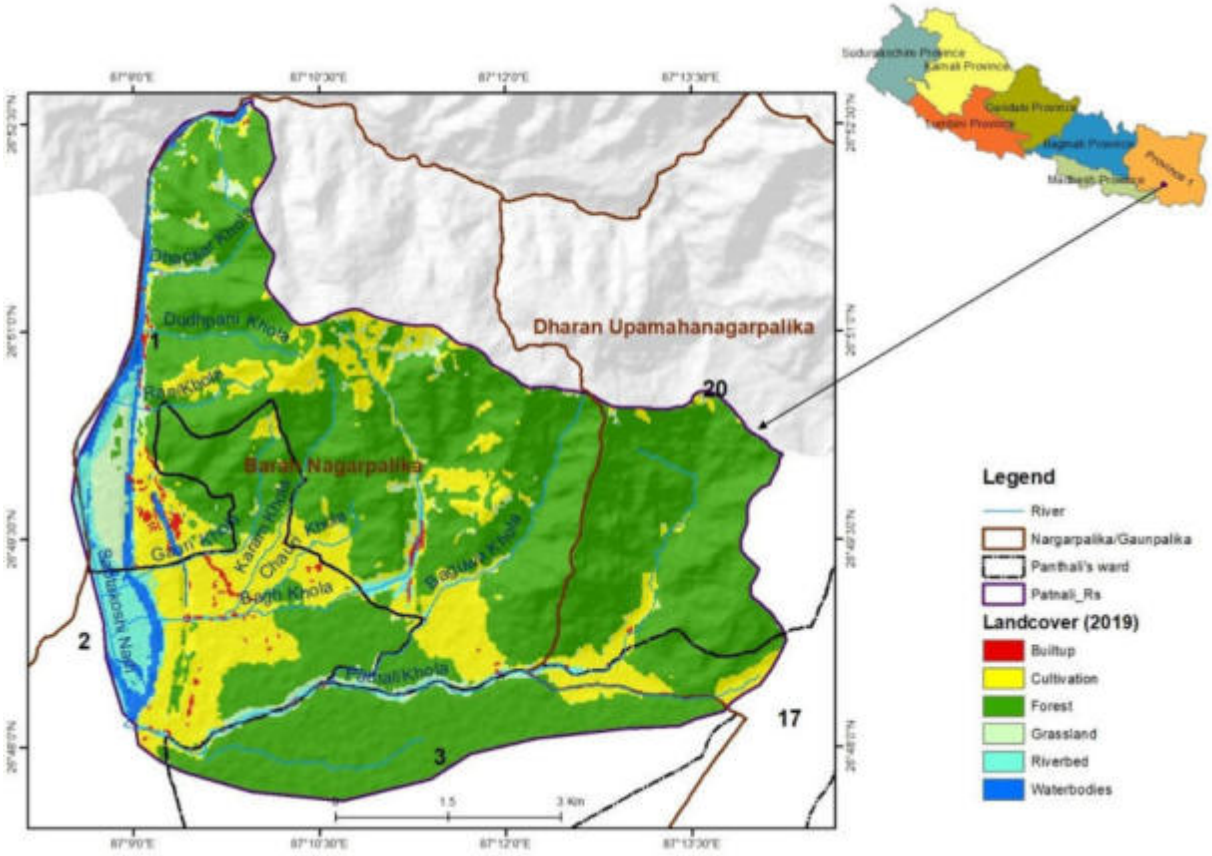


Figure 5: Location of Patnali river system

Bhavar is composed of quaternary alluvial deposit of unconsolidated materials derived from the surrounding Siwalik Hills, except in the Koshi flood plain. Whereas, hillslope is composed of Lower Siwaliks (LS), and Middle Siwaliks (MS) (DMG, 2007). The Lower Siwalik in this RS, composed of alternating beds variegated mudstone, greenish grey to dark siltstone and fine-grained sandstone. Whereas, Middle Siwalik contain alternating beds of fine to coarse grained 'salt-and-pepper' sandstone with greenish to bluish grey siltstone and dark mudstone (Adhikari et al. 2018).

The RS comprise of several small streams (Khahares) originated from the adjacent Chure hillslope, which drain out to Spatakoshi to the west. Surface water in these *Khahares* is very minimum except few hours in raining period. However, high-intensity rainfall can cause the slope failures in the Chure hills, which turn into debris/flash floods in the Bhavar region.

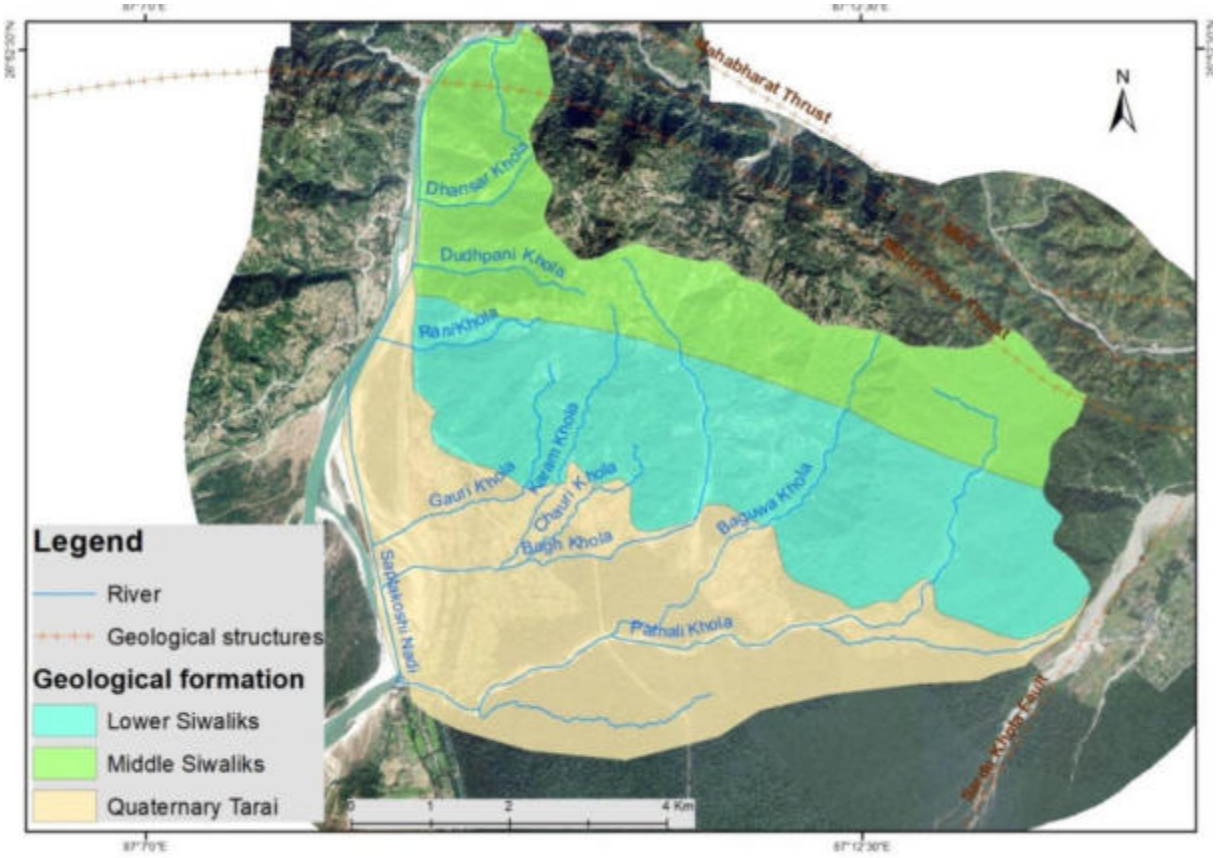


Figure 6: Geology of Patnali river system

Forest[1] is the dominant land cover of RS, covering 68.3 % of total area, which has been decreased by 64 ha at the annual rate of 0.1% during 2000-2019. Both natural and anthropogenic factors are responsible for deforestation and forest degradation in the RS. Natural process includes landslides and erosion in the Chure hillslope and channel migration in the Bhavar region, responsible for reducing forest area in recent year. Besides these, infrastructure development special expansion of road network and expansion of cultivated land are also causing deforestation and forest degradation. This river system is also facing the rapid urbanization along the Madan Bhandari highway, resulting increase of 28.8 ha built-up.

Table 2: Land cover change in Patnali river system

Land cover	2000		2019		Change area (ha)	Rate of Change (%/yr)
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)		
Built-up	16.7	0.3	45.6	0.9	28.8	5.41
Cultivation	1004.4	19.5	1035.5	20.1	31.1	0.16
Forest	3588.9	69.5	3524.6	68.3	-64.2	-0.10

[1] Land with tree crown cover of more that 10 percent and area covering more than 0.5 ha, with minimum height of the trees to be 5 m at maturity and in-situ conditions. The land may consist either of closed forest formations where trees of various storied and undergrowth cover a high proportion of the ground, or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent.

Grassland	191.0	3.7	202.9	3.9	11.9	0.32
Water bodies	161.0	3.1	132.9	2.6	-28.2	-1.01
Riverbed	201.5	3.9	222.1	4.3	20.6	0.51

Source: (ICIMOD & FRTC, 2021)

All of the streams of this river system that drain to Saptakoshi are ephemeral in nature, where surface water is present for few hours during rainfall period.

3.2 Climatic Conditions

The RS has subtropical climate and is heavily influenced by the monsoon (June-September), with an average annual rainfall of 2354.4 mm.

Table 3: Rainfall distribution in Patnali river system

Station	Average long-term rainfall (mm)		
	Annual	Monsoon	Maximum 24 hours
Barahkshetra	2539.2	2163.3	405.3
Chatara	2169.6	1767	348

Source: (DHM, 2021)

The temperature ranges from 10^0 to 40 ^{0}Celsius. Moreover, Climate change scenarios analysis performed for National Adaptation Plan (NAP) process indicated that average annual mean temperature of Sunsari district is likely to rise, Representative Concentration Pathway (RCP) 4.5 projected that increased by 0.83^0C and 1.197^0C in medium-term and long term respectively. The highest rates of mean temperature increase are expected for the post-monsoon season followed by the winter season (MoFE, 2019). Raising temperature further will create the water stress during the dry months through decreasing the agricultural production and thereby increasing food insecurity.

Table 4: Climate change scenario in Patnali river system

Temperature	**^{0}C**	**Change (^{0}C)**			
	RCP 4.5			**RCP 8.5**	
	Reference Period (1981-2010)	Medium Term (2016-2045)	Long Term (2036-2065)	Medium Term (2016-2045)	Long Term (2036-2065)
	23.4	0.83	1.197	1.04	1.75
Precipitation	**mm**	**Change (%)**			
	RCP 4.5			**RCP 8.5**	
	Reference Period (1981-2010)	Medium Term (2016-2045)	Long Term (2036-2065)	Medium Term (2016-2045)	Long Term (2036-2065)
	1773	2.49	3.58	2.68	6.59

Source: (MoFE et al., 2019)

Similarly, average annual precipitation is likely to change in both the medium-term and long-term periods. It is likely to increase by 3.58% and 6.59% in the long period based on RCP 4.5 and RCP 8.5 respectively.

3.3 Socio-ecological Process

According to the local stakeholder consultations, mixed ethnic groups are residing in the RS and they were migrated from adjacent mountain districts such as Dhankuta, Bhojpur and Shankhuwasava. Settlements in the chure hillslope are scatter and practicing subsistence farming. Productivity of the land is limited both in chure and in Bhavar region. The crop production of Bhavar is limited by the inadequate irrigation facilities, which might further decline in future due to the impact of climate change (Kaini et al., 2022). Likewise, cultivation land in Chure is facing the erosion and slope failure problems. For instances, numerous deep-seated landslides are present in the upper ridge, causing failure of the landscape including cultivated land, generating lengthy runout and creating the larger fan in the foot hill. Land creeping are also prominent in the west facing slope in and around of Chawacha, Archale and Jukpakhri villages. Villagers were also left their farmland in those slope failure regions, where primary forest has been succeeded naturally.

Though adaptation of multiyear year cropping such as Amriso (*Thysanolaena maxima)*, Banana and Simal Tarul (*Manihot esculenta*) are being increased in recent years, its full potential is not achieved yet due to inadequate technical and financial capacities. In Bhavar region, lack of surface irrigation has limited the production. Moreover, the agriculture land is now fragmented for housing/building.

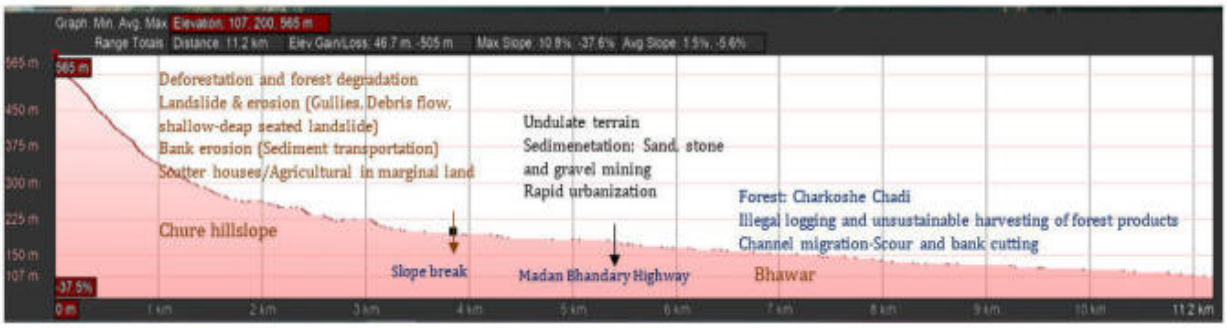


Figure 7: Elevation profile of Patnali river system, showing natural and social process

CHAPTER 4 : PROBLEM AND SOLUTION ANALYSIS

4.1 Problem Analysis

Theme 1: Climate Change Mitigation

4.1.1 Drivers and Underlying Causes of Deforestation and Forest Degradation

The drivers of forest deforestation and forest degradation in Patnali river system are usefully separated into direct drivers and underlying causes. The drivers are mostly associated with anthropogenic activities. Nevertheless, climate-led disaster, ineffective law enforcement and forest governance also contributes to forest loss.

The drivers are prioritized and presented in sequential order in Table 5.

Table 5: Direct drivers and underlying causes of deforestation and forest degradation

Drivers of D&FD	Underlying Causes	
Forest fire	Lack of awareness	
	Carelessness from herders and forest dwellers	Throwing of cigarette butts etc.
	Intentional fire	Intentions of illegal poaching, grass improvement, charcoal production
	Inadequate preparations for forest fire management	Inadequate skilled human resources for firefighting; Inadequate firefighting equipment in CFUGs; Inadequate management of fire lines; Inadequate efforts in removal of dry biomass accumulated in forest floor
Unsustainable harvesting and illegal logging	Demand-supply gap of forest products	Delay in harvest and supply of forest products from community forests (CFs); Increased forest users while the area of CF remains the same; Outdated operation plans for forest management; Households with unregistered lands deprived of timbers and firewood distributed legally
	Poverty and limited income generation opportunities for women, IPs, Dalits, poor and marginalized	Firewood collection and illegal logging as source of income for poor/marginalized household
	Inadequate fodder, firewood in private lands	Small landholdings
	Inadequate financial and technical capacity of CFUGs	Low income of CFUGs; Low support from concerned agencies

Drivers of D&FD	Underlying Causes	
Ineffective forest management practices	Poor forest conservation and enhancement	Outdated forest operational plan (FOPs); Lack of conservation of native species like Kali kath (*Myrsine semiserrata*) and others; Impact on natural regeneration due to forest fire, open grazing, fodder and firewood collectors; Inadequate supply of saplings of demanded species
	Weak forest governance	Declining accountability of CFUG members; Deficiency in forest sector transparency; Presence of political influence in executive committees of CFUGs
Climate-led hazards	Erosion/landslide	Topography; Forest degradation; Construction of road without adopting detail engineering study and design; Heavy/erratic rainfall
	Flood	Heavy/erratic rainfall; Unmanaged excavations of river bed materials
Infrastructure development	Disproportionate population distribution	Construction of roads, playground etc. to serve scattered settlements
	National pride projects	Madan Bhandari highway (Dharan-Chatara road)

❖ **Problem Analysis**

The major challenge of forest loss identified at Patnali river system is forest degradation. The issue of deforestation is minimal and associated with forest loss due to landslides, riverbank cutting and road construction (Figure 8). However, the issue of land ownership cannot be denied.

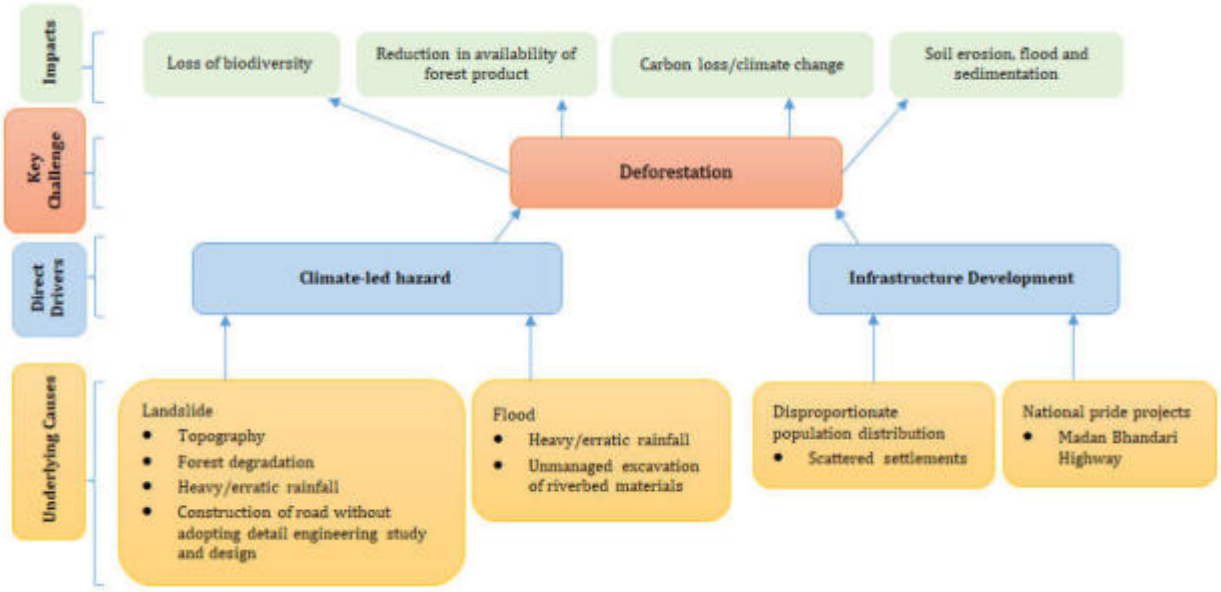


Figure 8: Problem tree for deforestation

Forest fire is one of the drivers of forest degradation. It is caused by lack of awareness, carelessness among forest dwellers and herders. Though the effect of open grazing in forest degradation is found minimal, carelessness of herders sometimes causes forest fire. Numbers of households involved in livestock farming are decreasing due to loss of grazing lands and waterholes. People also have small landholdings for planting fodder and grasses in their own land. Thus, people now-a-days are less interested in livestock farming that has reduced impacts of open grazing. Forest fire is also caused intentionally. Poachers intentionally start forest fire to make easy stalking the prey. Forest fire is also caused intentionally for grass improvement and charcoal production. In some cases, conflict among CFUGs is also reported as the cause for forest fire. The spread of forest fire has been difficult to handle due to inadequate trained human resources and firefighting equipment. The preparations for forest fire management like fire line management and removal of dry biomass are also inadequate. Accumulation of dry biomass in forest floor during dry season speed-up spread of forest fire. Unsustainable harvesting and illegal logging is other direct drivers of forest degradation. Demand-supply gap of forest products through legal channel and limited income generation opportunities for women, IPs, Dalits, poor and marginalized motivate people for illegal and unsustainable harvest. Harvesting of forest products comprise felling of trees and saplings (mostly illegally) for timber and poles and firewood collection for household use and sell. In some cases, people are engaged in illegal logging for income generation. Koshi river is used as route for illegal logging. The other important causes are unregistered lands and insufficient private land forests due to small landholdings. Households with unregistered lands are deprived of timbers and firewood distributed legally. The forest regulation also prohibits felling and sale of forest products from unregistered lands. It has demotivated local people for developing private land forest. The forest area handover to community is also insufficient.

Ineffective governance and forest management have also resulted in forest degradation. It is mainly associated with declining accountability of CFUG members and deficiency in forest sector transparency. The CFUGs are also technically weak in forest management. There is robust legal and policy framework in forest sector but lacks compliance in many ways. There is limited access of CFUG members in decision-making, lack of clarity and uncertainty over forestland use, tenure and resolution of unregistered lands, widespread reports of corruption among different actors and law-breaking in forest sector.

Similarly, inadequate investments, lack of conservation of native species and insufficient promotion for private forestry are identified as problems in forest enhancement. The CFUGs are unable to invest in forest enhancement activities like plantation, weeding, fencing and guarding due to weak financial capacity and low support from concerned agencies. There is lack of conservation of important NTFPs like Kali kath (*Myrsine semiserrata*) and others (Figure 9).

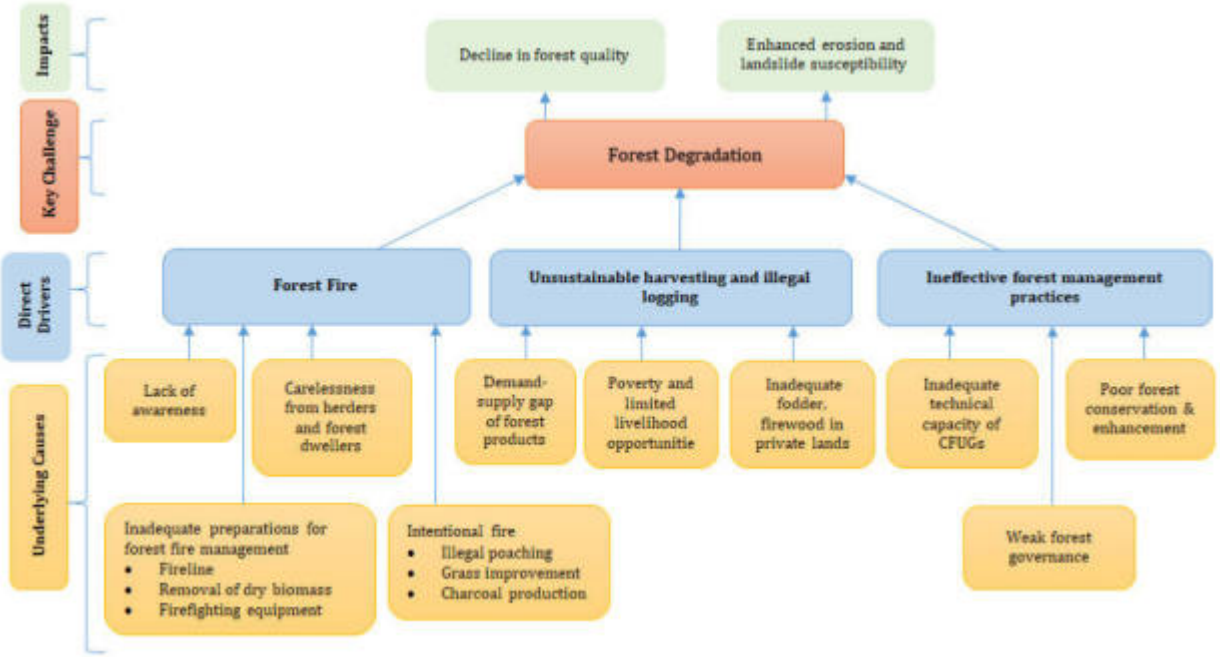


Figure 9: Problem tree for forest degradation

❖ Key Observations

- Now-a-days, in community forests, encroachment is minimal due to regular monitoring of forests by local user groups. Any expansion is limited to minor shifting of boundaries into forestland at some locations.
- Harvesting of forest products from community forests require at least 6-7 months.
- People collect firewood and supply to restaurants for income generation.
- There is sufficient production of saplings in nurseries for supply. However, the saplings of demanded species are inadequate. Nurseries produce saplings of fast growing species due to problem in germination of seeds of on-demand species.
- Women, IPs, Dalits, poor and marginalized groups not having access to finance, technology and skill to address the deforestation problems and policy gaps in addressing gender governance.
- Women are not able to ask for their equal rights to natural resources management. Women and marginalized groups not having adequate knowledge and awareness in policies and law for sustainable forest management.
- Not having sufficient alternative energy programs. Traditional use of energy sources and inadequate alternative energy programs to reduce drudgery of women.

Theme 2: Climate Change Adaptation

4.1.2 Drivers and Underlying Causes of Vulnerable Ecosystem and Community

Climate induced disaster risk and climate stress on agricultural productivity are the two key challenges representing the vulnerable ecosystem and local community in Patnali River System. These two key issues have impacts on the ecosystem and livelihood generation through damage to natural vegetation,

loss and damage of agricultural lands, loss of life and properties, damage to infrastructures, low family income and food insecurity.

The drivers are prioritized and presented in sequential order Table 6.

Table 6: Direct drivers and underlying causes of vulnerable ecosystem and community

Drivers	Underlying Causes	
Climate Induced Disaster		
Erosion/ landslide	Topography	Fragile geological condition and slope terrain
	Forest degradation	Forest fire, unsustainable harvesting, open grazing etc.
	Heavy/erratic rainfall	High intensity rainfall and continuous rainfall for several days
	Cultivation in marginal lands	Limited productive lands for the community
	Road construction without adopting engineering study and design	
Flood	Upstream landslide and erosion	Fragile geological condition and slope terrain
	Heavy/erratic rainfall	High intensity rainfall and continuous rainfall for several days
	Riverbank encroachment	Risk acceptance due to poverty, economic opportunity of land
Weak disaster risk management	Inadequate capacity and coordination	Insufficient and scattered investments; weak coordination and collaboration at national level
	Ineffective Disaster Risk Reduction (DRR) policy and planning	Low capacity of local governments in DRR planning and implementation; Less priority to disaster preparedness
Climate Stress on Agriculture Productivity		
Inadequate capacity and resources	Limited farm skill and technology use	Inadequate agriculture technicians at local level
	Low investment capacity of farmers	
	Inadequate support and promotions	Governments failure to identify and support real farmers (dominance of elites/paper farmers); Inadequate promotional activities (seed money, soft loans, subsidies)

Drivers	Underlying Causes	
	Poor market access and infrastructures	Higher cost of production and low market price of sell; Lack of processing and storage facilities
Insufficient irrigation	Limited water sources	
	Lack of conservation of water sources	
	Limited technological interventions for irrigation	Inadequate efforts to promote alternative irrigation practices like drip irrigation, rainwater harvesting, deep boring etc.
	Inadequate investments in irrigation infrastructures	
Inadequate efforts to promote commercial livestock farming	Lack of specified grazing lands and depletion of waterholes	Lack of grazing land management and promotion of stall feeding
	Inadequate fodder production in private lands	Small landholdings
	Poor market access	Market dominated by intermediaries
Crop and livestock diseases	Low organic inputs in farmlands	Use of chemical fertilizers and pesticides
	Less immune hybrid crops and livestock	Loss or limited availability of native varieties; Low production from local native seeds and livestock; Higher production from hybrid varieties but less immune to pests and diseases
	Inadequate knowledge and skill of farmers for identification and treatment of pest and disease	
Loss and damage of agricultural lands and crops	Climate-led hazards such as erosion, flood and heavy rainfall	
	Agriculture land fragmentation; land use conversion	Unplanned settlement expansion and infrastructure development; Urban growth; Lack of clarity in land use policy and ineffective land use planning
	Crop depredation by wildlife in the field	

❖ **Problem Analysis**

The climate vulnerability to ecosystem and local community in Patnali river system is subject to climate-led disasters- erosion, landslide and flood. Landslide and flood have caused loss and damage of natural

vegetation, agricultural land, properties and physical infrastructures mostly roads affecting local people's livelihood. These disasters are triggered by both natural and anthropogenic causes. The fragile geological condition and slope terrain of Chure hills, high intensity rainfall and continuous rainfall for several days are among natural causes. While forest degradation, construction of roads without adopting engineering study and design, and unmanaged excavations of riverbed materials are major anthropogenic causes. Almost all the river/streams within Patnali river system are dry except in the rainy season. The sudden intense rainfall triggers flash flood with sediments. Unmanaged excavation works in these river/streams add further risk to flood. It intensifies river cutting and sometimes channel migration.

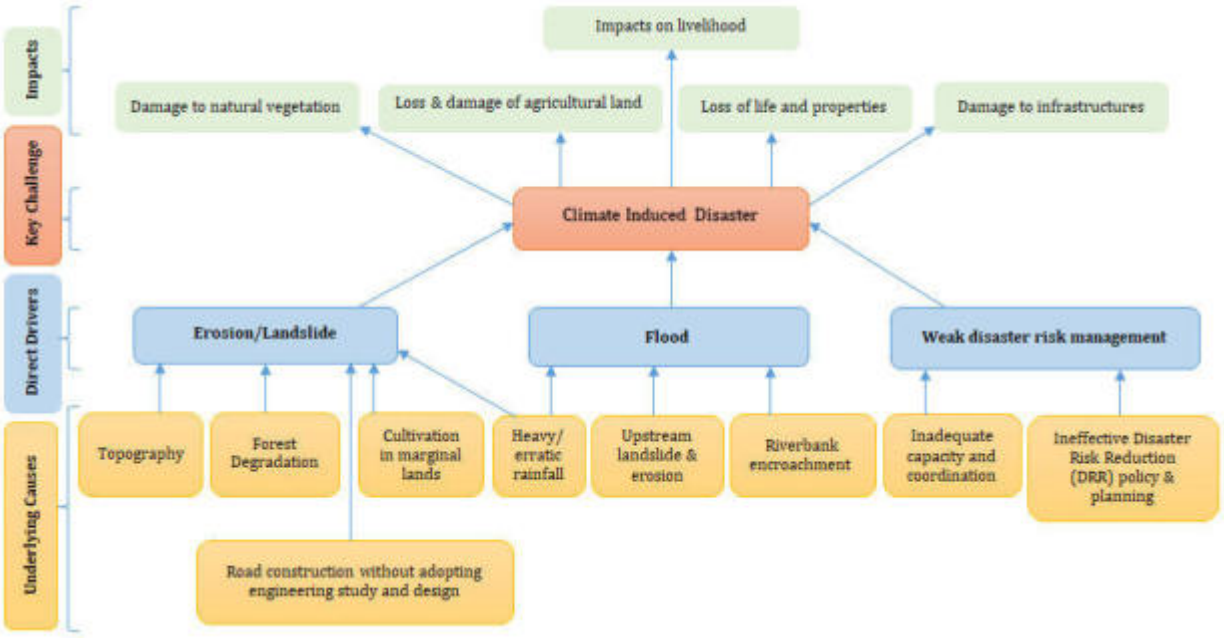


Figure 10: Problem tree for climate induced disaster risk

Weak disaster risk management has further exacerbatedd exposure to these disasters. The reasons behind this are weak coordination and collaboration among concerned sectors, ineffective Disaster Risk Reduction (DRR) policy and planning and settlement expansion in flood prone areas. The investments in DRR are also inadequate and scattered without proper planning (Figure 10).

Climate stress on agricultural productivity is the other aspect of vulnerable community. It has direct impact on people's livelihood through low family income and food insecurity. It eventually makes forest ecosystem vulnerable through increased pressure in forest resources. People now-a-days are less interested in agriculture due to high cost of inputs and low productivity. Inadequate farm labors due to youth migration abroad, insufficient agriculture technicians and inadequate support and promotional programs are other problems for encouraging agriculture. Insufficient irrigation is one of the direct drivers of low agricultural productivity. There are very limited water sources as most of the river/streams remain dry. Existing water sources lacks conservation. The irrigation infrastructure is inadequate. Development of irrigation canal is hindered by river/streams that destroy canals during flood. Moreover, there is lack of technological intervention and promotion of deep boring, rainwater harvesting and drip irrigation. Low productivity is also the result of subsistence and low climate adaptive agricultural practices. The farmers have limited skill and technology for climate adaptive and commercial farming. Their investment capacity is low due to poor financial status. The government support to small farmers is inadequate. There is elite capture of government support by paper farmers. People nowadays are less

involved in livestock farming. The reason behind this is lack of specified grazing lands and loss of waterholes for livestock, insufficient private land forests for fodder and grass, poor market access, lower price in sell due to market domination by middlemen and higher price of animal feeds. Crop and livestock diseases are also the cause of yield loss. Overuse of chemical fertilizers and pesticides along with climate change impacts have increased weeds and diseases in crops. The impact is further enhanced due to hybrid crops and livestock which are less immune to diseases. Farmers have inadequate knowledge and skill on identification and treatments of these diseases. The other diver of low agricultural productivity is land fragmentation. With population growth, agricultural lands are converted for settlement expansion. Land plotting is increasing day by day. Unplanned urbanization has led to decrease in agriculture lands that eventually reduce agriculture production (Figure 11).

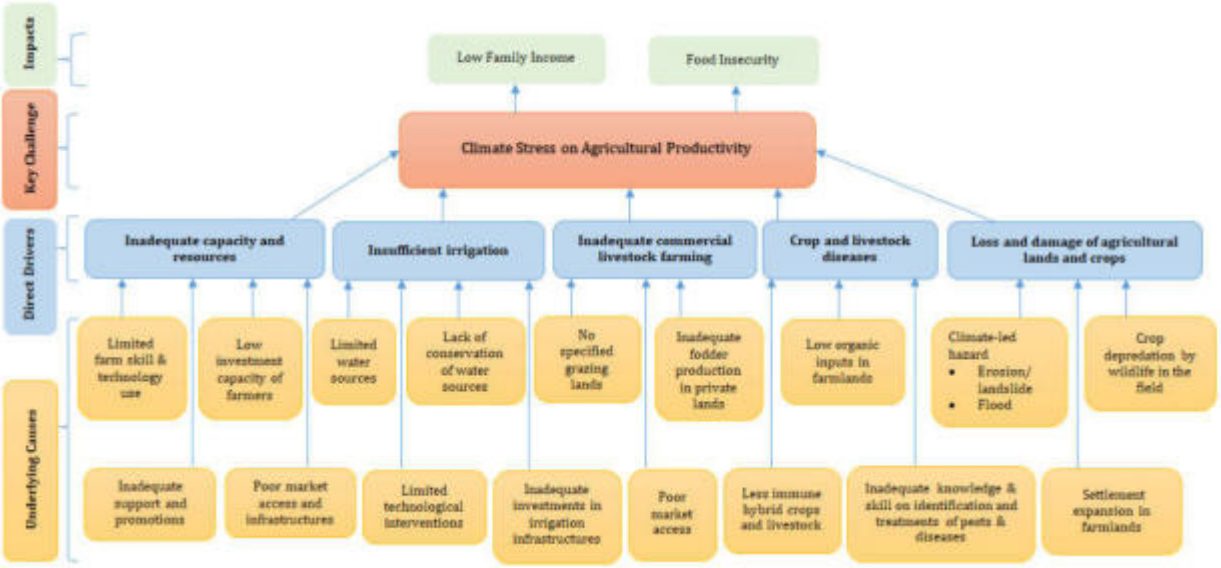


Figure 11: Problem tree for climate stress on agricultural productivity

❖ Key Observations

- The flood of Bagh Khola destroys Dharan-Chatara road every year creating problems in transportation. It also accumulates loads of sediments in the forest area causing damage to vegetation.
- Unregistered lands make difficult for households to receive government incentives in agriculture.
- Gendered governance, participation and integration was found to be low in all the issues and their voices are not heard or skills and technological access is weak.
- Women not having land titles and settlement with unregistered lands do not allow women, IPs or marginalized communities to get benefits from the project interventions.

4.1.3 GESI Issues Observed in Problem Analysis

Feminization of poverty, women's excessive work burden, loss of access to forest resources hindering some women's access to firewood sale, flood and insects damaging crop causing food insecurity and malnutrition, lack of alternative income earning sources and programs, women's economic dependency on male, women 's lack of decision making role on important matters, even for participating in climate adaptation activities, landlessness, specially of the women, lack of awareness on climate change impacts,- all these factors drive marginalization of women from climate adaptation planning processes. These factors create barriers to meaningful participation of women in climate change and disaster management and preparedness plan meetings. The GESI issues identified from problem analysis are presented in Table 7.

Table 7: Problems associated with GESI

Drivers	Underlying Causes	
Inadequate exercise of gender-inclusive governance in climate change, sustainable natural resource management (SNRM) practice	• Male- supremacy and dominance in decisions • Limited access of women to information and communication (especially climate change and SNRM-related information, facility, fund, notice, and subsidies) • Less consultation with women regarding agenda and time of meetings • Unavailability of disaggregated data • Lack of recognition of traditional knowledge of women in climate resilient land use practices (CRLUP)/SNRM • Articulation of CRLUP/SNRM /DRR as scientifically complex subjects • Limited knowledge on gender mainstreaming approach and value among officers/key people • Gendered power relations within households, society and restricted mobility of women	• Hesitation to speak in meeting • Less knowledge on CFUG management • Less knowledge on climate change adaption • Insufficient women participation • Increased vulnerability of women towards environmental changes • Slower women leadership development in natural resource management (NRM), forest management and DRR • Low income of women • Less control of women over high value forest products

4.2 Solution Analysis

Theme 1: Climate Change Mitigation

4.2.1 Activities for Reducing Forest Loss and Enhancing Forest Density

The activities for reducing forest loss are associated with mitigation of deforestation and forest degradation while the forest density can be enhanced through afforestation and reforestation (Table 8).

Table 8: Activities for reducing forest loss and enhancing forest density

Drivers of D&FD	Activities against Drivers	
Forest fire	Sensitization/awareness programs	Sensitize communities on the impacts of forest fire on ecosystem functions/services and their restoration; Strengthen forest monitoring and activities to control illegal activities
	Firefighter training and support firefighting equipment to CFUGs	Coordination and collaboration with DFOs/DRRMC and security forces
	Construction and improvement of fire lines	Capacity development and funding support for fire line construction
	Promote compost production from dry leaf litters and unwanted bushes	Removal of dry biomass

Drivers of D&FD	Activities against Drivers	
Unsustainable harvesting and illegal logging	Enhance income generation opportunities for poor/ marginalized forest users	Skill development trainings for production of Sal leaf plates and bamboo products like stool, baskets etc. for socially and economically marginalized groups
	Promote agroforestry	Seedling distribution of commercial trees, fruits (fast growing and high value/multi-year species), fodder trees
	Enhance forest monitoring	Installation of surveillance cameras (CCTV) in major entry points
	Resolution of unmanaged settlements in Chure	Policy commitments/Policy interventions
Ineffective forest management practices	Implementation of sustainable forest management	Review/upgrade/renewal of forest operation plans (FOPs) of community forest user groups (CFUGs); Training on silvicultural operations and equipment use
	Establish/upgrade nurseries	Demand based seedlings production with priority on native species
	Implement forest enhancement activities	Enrichment plantation, riverbank plantation etc.
	Strengthen forest governance	Joint coordination meeting of government staffs and CFUGs to enhance accountability and transparency
Climate-led hazards	Landslide treatment	
	Erosion/gulley control	
	Riverbank stabilization	Embankments with bioengineering
	Regulate riverbed excavation works	Coordination among local government, other associated government agencies and CFUGs to regulate excavation of riverbed materials; Environment assessment (EIA/IEE) for riverbed excavation
Infrastructure development	Regulate infrastructure development within forest area	Promote environment friendly infrastructures; IEE/EIA & detail engineering study and design for infrastructure development

❖ **Solution Analysis**

Solutions are provided to address D&FD drivers and hurdles of forest enhancement. Various activities are proposed to achieve outputs that eventually lead to desired outcome of reducing forest loss and

enhancing forest density. Forest loss from climate-led hazards can be reduced through landslide treatment, gully/debris torrent control and riverbank stabilization. Infrastructure development in forest areas can be regulated through policy interventions; enhancing inter-agency coordination and cooperation; and provision of environment assessment (IEE/EIA), detail engineering study and designs. Infrastructures in forest areas should be environmentally friendly (Figure 12).

Forest fire, one of the major drivers of forest degradation, can be mitigated by enhancing firefighting capacity and early preparations. Firefighting capacity can be enhanced by mobilizing firefighter groups. This requires firefighting training to those groups. In addition, the CFUGs and firefighting groups should be well equipped with firefighting equipment. Early preparations require construction of fire lines and periodic removal of dry biomass that enhance forest fire. In turn, the bushes, dry leaf litters can be used for bio-briquette and compost production. It can be done through trainings and equipment support. Similarly, apart from penalties and fines, unsustainable harvesting and illegal logging can be mitigated through empowerment and engagement programs. The socially and economically marginalized groups should be provided with skill development programs like production of Sal leaf plates and bamboo products like stool, baskets etc. Promoting agroforestry also reduces forest dependency. This requires sapling distribution of high value and multiyear plant species and technical trainings on plantation, nurturing and harvesting. Reducing forest loss and enhancing forest density also requires strengthening of forest governance and management in Patnali river system. Forest management can be strengthened through implementation of sustainable forest management practices. All the CFUGs should prepare sustainable forest operational plan (FOP) and better would be the production based that increase their income source. They should be provided with technical training on sustainable forest management and silvicultural operations. Governance training should be provided to enhance accountability and transparency of forest sector.

Forest enhancement activities require establishment of nurseries to produce sufficient saplings. Production of native species' saplings must be prioritized. Development of forests with Bamboo, Khayar (*Acacia catechu*), Amriso (*Thysanolaena maxima*) etc. in river corridors enhances forest cover and also reduces impacts of flood. Private forestry can be promoted through sapling distribution of high value and multiyear plant species and technical trainings on plantation, nurturing and harvesting.

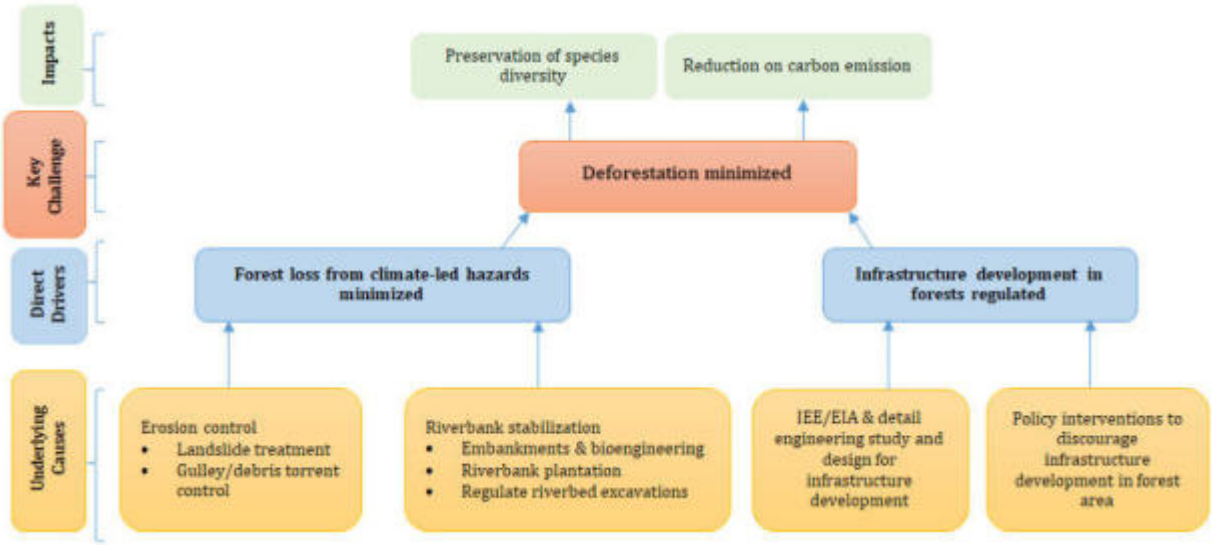


Figure 12: Solution tree to minimize deforestation

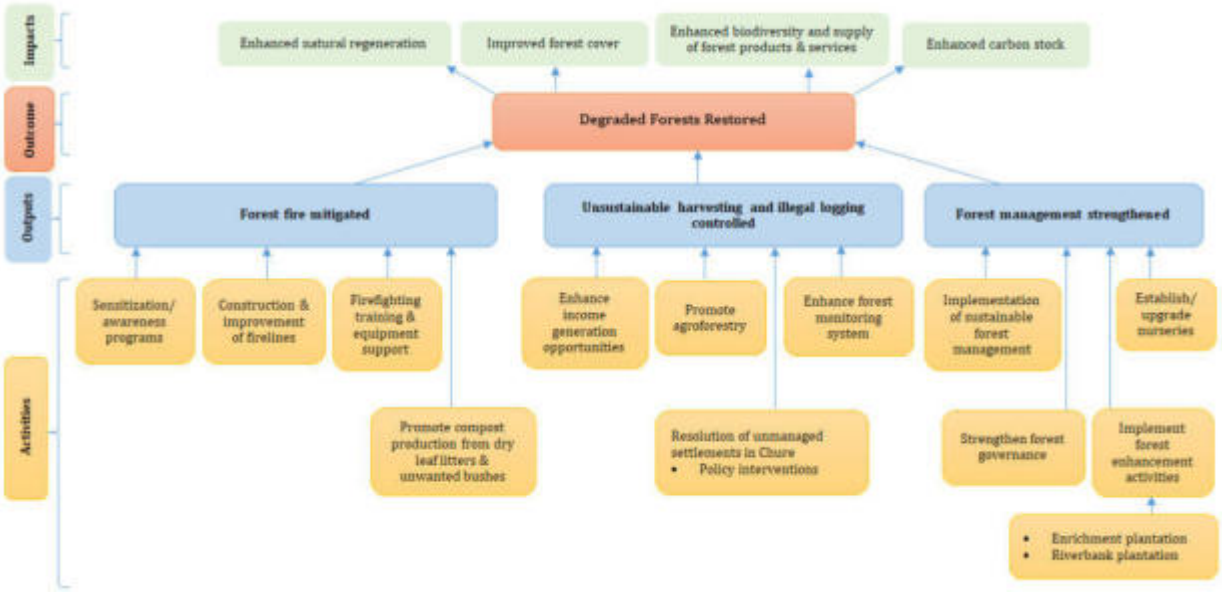


Figure 13: Solution tree for restoration of degraded forest

❖ **Major Activities and Outputs**

The major activities and outputs proposed for reducing forest loss and enhancing forest density are presented in Table 9.

Table 9: Major activities and outputs for reducing forest loss and enhancing forest density

Major Activities	Outputs
Forest fire control	Restored degraded forests area halting forest fire, illegal harvesting and grazing
Agroforestry promotion	
Sustainable livestock and grazing management	
Income source of poor/marginalized forest users enhanced halting illegal harvesting	
Improvement of forest cover within national forest through enrichment plantation/ANR	Improved natural forest management
Strengthening forest management	

❖ **Recommendation from Expert Planning Workshop**

- It would be effective to enhance cooperation and collaboration with security agency for forest fire management. They should be provided with essential equipment like fire extinguisher, fireproof jackets, water jet spray etc. Security agency in turn can also provide firefighting trainings.
- The other solution to mitigate forest fire would be formation of firefighting groups under CFUGs. These firefighting groups can be linked up with Local Emergency Operation Center (LEOC) under local governments and collaborate with emergency response team during disasters too.
- Nurseries should focus on production of most on-demand saplings of high value tree species like Sati sal (*Dalbergia latifolia*), Bijaya sal (*Pterocarpus marsupium*), Raktachandan (*Pterocarpus santalinus*), Shrikhand (*Santalum album*); commercial tree species like Teak (*Tectona grandis*), Arjun (*Terminalia arjuna*), Masala (*Eucalyptus camaldulensis*); fruit tree species like : Aanp (*Mangifera indica*), Litchi (*Litchi chinensis*), Katahar (*Artocarpus heterophyllus*), Kagati (*Citrus aurantifolia*), Jamun (*Syzygium cumini*) and others.

- The focus should also be on addressing human-wildlife conflicts. The forest area within the river system was reported to be corridor for elephants.
- Crop damage from monkeys was also reported. The potential solution would be plantation of fruit tree species Amala (*Phyllanthus emblica*), Jamun (*Syzygium cumini*), Bar (*Ficus benghalensis*), Peepal (*Ficus religiosa*), Chiuri (*Diploknema butyracea*) etc. to enhance food availability within forests.
- Coordination with local government should be ensured for activities such as skill development trainings, entrepreneurship development and others that draw attention of the local governments.

Theme 2: Climate Change Adaptation

4.2.2 Activities for Enhancing Adaptation/Resilience of Ecosystem and Community

The activities for enhancing adaptation/resilience building of ecosystem and local community are associated with minimizing impacts of climate induced disasters and adoption of climate resilient farming system (Table 10).

Table 10: Activities for enhancing adaptation/resilience building of ecosystem and community

Drivers	Activities Against Drivers	
Climate Induced Disaster		
Erosion/ landslide	Landslide treatment	Crown protection, drain management, seed broadcasting, check dam etc.
	Construction of check dams and bioengineering for gully/debris torrent protection	
	Promote agroforestry on marginal land	Promote high value/multi-year species like Bamboo, Amriso (*Thysanolaena maxima*), fodder and grasses
	Regulate infrastructure development	IEE/EIA & detail engineering study and design for infrastructure development
Flood	Riverbank stabilization	Embankments and bioengineering
	Plantation of bamboo & other species along river corridors	
	Regulate riverbed excavation works	Coordination among local government, other associated government agencies and CFUGs; Environment assessment (EIA/IEE) for riverbed excavation
Weak disaster risk management	Enhance coordination and collaboration among concerned agencies for integrated DRR planning	Participatory planning approach including women, Dalit, IPs and poor and marginalized groups; Preparation of bylaws and implementation of setbacks for construction of houses in flood prone areas

Drivers	Activities Against Drivers	
	Strengthen disaster preparedness with equipment support	Hazard risk assessment and preparation of Risk Sensitive Land Use Plan by local government and implementation
Climate Stress on Agriculture Productivity		
Inadequate capacity and resources	Establish Farmer Field Schools to capacitate farmers	Training and incentives to promote commercial and climate resilient farming
	Promote climate resilient land use practices	Provide seed money, soft loans, subsidies in equipment, production based subsidies
	Establishment of collection, storage and processing facilities	
Insufficient irrigation	Promote alternative irrigation practices	Develop groundwater irrigation facilities (Putalitol, Punarbas, Railwayline, Pulkedanda); Construction of plastic-lined/earthbags pond and drip irrigation system
	Conservation of water sources	Conservation of water sources of Rani Khola, Dudhpani Khola, Bagh Khola, Gaurikhola
Inadequate efforts to promote commercial livestock farming	Trainings on commercial livestock farming and shed improvement	
	Promote fodder banks in private and public lands	Distribution of seeds/seedlings of fodder trees and nutrient grasses
Crop and livestock diseases	Promote organic farming and Integrated Pest Management (IPM)	Awareness programs and trainings on IPM and compost production
	Train farmers on identification and treatments of crop and livestock diseases	
	Promote conservation of resilient native crops and local livestock breeds	Training and support selection, grading and storage of seeds; Improvement of local livestock breeds and crop varieties for resiliency and higher production
Loss and damage of agricultural lands and crops	Implementation of mitigation and adaptation measures to minimize impacts of natural hazards	Implement erosion control measures and flood mitigation measures; Promote agroforestry (Bamboo, Amriso, Banana, Litchi, Mango, Guava, Pineapple, Lemon, Amala, Turmeric etc.) in marginal lands

Drivers	Activities Against Drivers	
	Regulate settlement expansion/land plotting in agricultural lands	Policy interventions
	Plantation of wild fruit trees in forests	Plantation of Amala (*Phyllanthus emblica*), Jamun (*Syzygium cumini*), Bar (*Ficus benghalensis*), Peepal (*Ficus religiosa*) etc. in forest to enhance food source for wild animals like monkey

❖ **Solution Analysis**

Various activities are proposed as solution to drivers of vulnerable ecosystem and community. These activities are proposed to enhance adaptation/resilience building of ecosystem and community by minimizing impacts of climate induced disasters and improving agriculture productivity. Landslide and erosion can be mitigated by construction of check dams and bioengineering for gully protection. Plantation of high value, multi-year plant species like Bamboo, Amriso (*Thysanolaena maxima*) in erosion/landslide prone areas can also reduce landslide and erosion risk. And in turn, it also provides the source of income. Flood risk will be minimized through construction of embankments with bioengineering. Plantation of Bamboo, Khayar (*Acacia catechu*), Amriso etc. in river corridors reduces flood risk. It also enhances forest cover. The important activity to minimize disaster risk is to enhance coordination and collaboration between different agencies working for disaster risk management. The disaster risk reduction plans should be integrated that provides solution to inadequate and scattered investments thereby enhancing effectiveness of DRR activities. Settlement vulnerability can be minimized through bylaws and implementation of setbacks for construction of houses in flood prone areas. Moreover, early warning system should be established to strengthen upstream-downstream linkage (Figure 14).

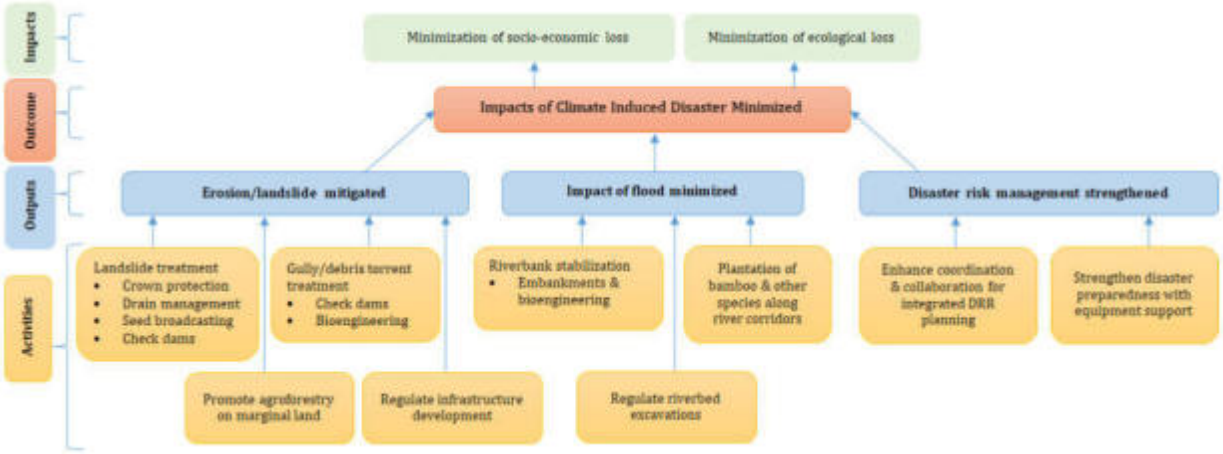


Figure 14: Solution tree to reduce impacts of climate induced disasters

One of the important aspects of enhancing adaptation/resilience building of ecosystem and local community in Patnali river system would be increasing agricultural productivity. It can be done by supporting climate resilient agriculture practices, agriculture commercialization and conservation of agricultural lands. Increase in agriculture productivity will improve livelihood of small farmers and at the same time, it will decrease forest dependency. To achieve this foremost priority should be to enhance irrigation facility. It requires conservation of existing water sources, rejuvenation/reconstruction of

degraded ponds in Chure region, developing groundwater irrigation facilities and introduction of new irrigation technologies. Construction of plastic-lined/earthbags pond and drip irrigation system in dry areas can support climate resilient farming practices where surface water source are scarce. Along with improving irrigation facilities capacity of farmers should be enhanced. Farmer's field school can be the best solution where farmers will be trained on climate resilient farming. Farmers can also be trained on selection and storage of quality seeds of climate resilient indigenous agricultural crops. Such crops could resist the prevalent diseases. Establishing seed bank can be further beneficial. Promoting organic farming can also be beneficial in reducing crop diseases. Organic farming can be promoted by distributing equipment to produce compost and providing technical supports. Promoting commercial livestock farming can further enhance organic farming. It can be done through trainings on commercial livestock farming and shed improvement. To establish fodder banks in private land, farmers should be provided with seeds/seedlings of fodder trees and nutrient grasses. It will be helpful in stall feeding and decreases impact on forest due to open grazing. Nevertheless, agriculture lands should be conserved through strict implementation of land use plan (Figure 15).

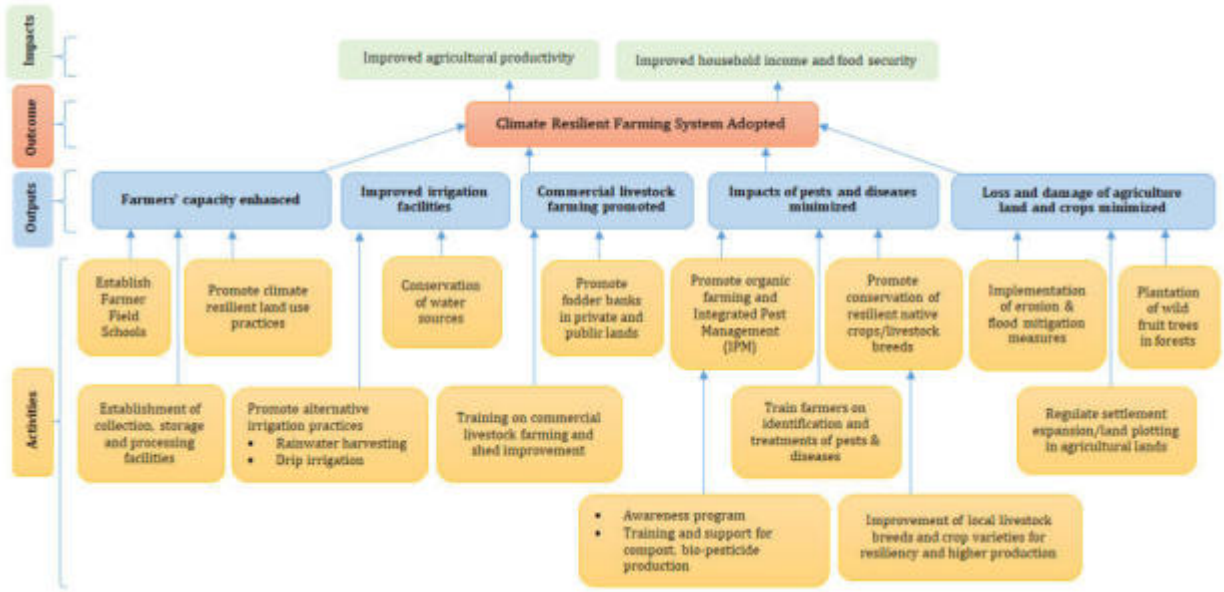


Figure 15: Solution tree for climate resilient farming practices

❖ **Major Activities and Outputs**

The major activities and outputs proposed for enhancing adaptation/resilience building of ecosystem and community are presented in Table 11.

Table 11: Major activities and outputs for enhancing adaptation/resilience building of ecosystem and community

Major Activities	Outputs
Controlling erosion/landslide and management of sedimentation	Minimized impacts of climate induced disasters (erosion, landslides/ sedimentation and flooding)
Agroforestry promotion in marginal/sloping lands	
Strengthening disaster risk management and awareness creation on climate resilient NRM	
Establish and operationalize Farmers Field Schools (FFS)	Farmers adopted climate resilient farming practices
Conservation and management of water sources	
Implementation of climate-resilient land use practices	

❖ **Recommendation from Expert Planning Workshop**

- Gullies/debris torrents are prioritized for treatment considering direct impacts on settlement and agriculture. Gulley treatment should be focused right from the upstream. Only downstream treatments will not be effective.
- Provide equipment support to security institutions for disaster management.
- Construction of concrete structures should be avoided in water source conservation. Rather focus should be on greenery improvement.
- Households with unregistered lands can receive government support for agriculture on recommendation from respective ward offices.
- Address gender inclusive governance which has been the weakness in addressing policy issues and practicing good governance.

4.2.3 Gender Inclusive Action Plan and Process

Gender inequality and social norms limit women's access to resources and sufficient opportunity to participate in the decision-making process, particularly in sustainable natural resource management. Women are playing a significant role in the conservation of forests and increasing the adaptability of climate change impact. The entire CERP process has adopted gender-inclusive actions such as ensuring equal participation during the consultation. The process adopted a gender-specific approach to collect problems, especially among women's user groups, through the Himalayan Grassroots Women's Natural Resource Management Association (HIMAWANTI). The gender-specific approach adopted particular research tools such as seasonal calendars, problem and solution community workshops, and focus group discussions among women, Dalits, IP's women, and other marginalized communities. Also, the consultation process includes a consultation with women and women lead organizations. The male leaders were also involved in advocating gender equality and women's engagement in the climate change planning process. The gender mainstreaming approach is included in problem and solution analysis and the recommendation has been incorporated in the plan. Key issues and solutions on gender equality in SNRM:

Table 12: Gender issues and gender inclusive actions

Key issues	Solution
1. Unequal representation and influence of women in NRM, CCA, and DRR governance	1. Equal representation of women and consideration of specific adaptation needs is a must to realize inclusive SNRM and CCA
2. Women's issues and capacity are not considered in the planning process	2. Involvement and integrating women and women's concerns need to include in the programming process (planning, budgeting, monitoring, evaluation, and redesigning of the plans and project)
3. Women are just counted as vulnerable groups and passive beneficiaries of development interventions	3. Plan/conduct gender mainstreaming training, learning events, and advocacy campaigning for gender integration for the government officers, CBOs executive, local resource persons, and other stakeholders
4. Women are more involved in labour contributions both in conservation and management of natural resources	4. Learning and sharing platforms for grassroots-level women at their settlements can help to identify their issues and problems in the group

Key issues	Solution
5. Women have less control over high-value products such as timber and the commercialization of non-timber forest products as compared to men	5. Provide business opportunities, build the leadership skills to communicate or negotiate with men/leadership/decision makers to access information and resources and initiate entrepreneurship, promote men into governance-related activities, and present men as change makers "Champions."
6. Underrepresentation of women in the process is the major reason and the challenges to women's representation are the gender role, restricted mobility	6. Conduct a rapid assessment to generate the case study and build the capacity of municipality people to keep the record-gender disaggregated data
7. Lack of gender-disaggregated data in government offices	7. Building the technical capacity of women-led organizations helps to raise the collective voice of women contributing to advocating for gender-inclusive planning and budgeting at local levels
8. Lack of equal representation of women in decision-making process	8. Sensitization on the gender differential impact of climate change has been strongly suggested in a community workshop, focused group discussion, and discussion with women-led organizations
9. Loss of women's control over valuable resource	9. Institutionalization of gender analysis as part of program design helps to increase gender-related actions-such as promoting women's participation, providing information, and integrating gender in a planning process
10. Less achievement/progress on gender specific reports, activities, and progress	10. Application of gender budgeting for the effective implementation of gender-inclusive planning
11. Women are not aware about the plan, policy, subsidies, and other facilities	11. Capacity development of local government based on capacity need assessment for gender-inclusive planning and budgeting
12. less agriculture productivity	12. Increased access of women to climate resilient agriculture practices, availability of drought tolerant plants, seeds through farmer's field school
13. Food scarcity and hunger especially among poor, Dalits, and indigenous women.	13. Promote cash crops such as seasonal and off-season vegetable farming through FFS. Promote the concept of community farming or group farming
14. Limited understanding about the socioeconomic impact of gender inequality	14. Advocacy campaign to promote gender equality (community radio, community theatre, communication materials; booklets, best practices, posters, flex with key messages, day celebration (International women's day

Key issues	Solution
	celebration, 16 days of activism against gender-based violence, etc)

4.2.4 Solution to Gender Issues

Gender and women empowerment issues and concerns are integrated into all activities. However, considering the importance of gender-inclusive governance as a key element to mainstream gender into the implementation, the plan is focused on one gender-specific IPack on gender-inclusive governance. Therefore, the solutions to gender issues are associated with enhancing gender-inclusive governance.

The solutions to GESI issues are associated with enhancing gender-inclusive governance.

Table 13: Activities to enhance gender-inclusive governance

Drivers	Activities Against Drivers	
Inadequate exercise of gender-inclusive governance in climate change, SNRM practice	• Create informal learning and sharing platforms for grassroots-level women • Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership • Produce and publish best practices and learning in gendered governance • Conduct rapid assessment on women's contribution and involvement in SNRM/ CRLUP and management • Provide gender mainstreaming trainings/ workshops to local government and CBOs and concerned stakeholders • Conduct GESI focused social audits and public hearing • Conduct advocacy campaign to promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups. This will include day celebration, integration of gender in local radio program, learning events, etc. • Engage male involvement to advocate gender and women's issues and concern in advocacy and media campaign.	• Increase women's participation • Share information about the latest news, update, notice, fund, plans and budget • Time information about training and meetings • Promote and engage leadership • Include and integrate males in advocacy campaigns and radio programs (the radio program will be integrated with other SNRM themes and activities)

❖ Major Activities and Outputs

The activities and outputs proposed for enhancing gender-inclusive governance are presented in Table 14.

Table 14: Major activities and outputs for enhancing gender-inclusive governance

Major Activities	Outputs
Increase access of women to SNRM and knowledge and information	Gender inclusive governance practiced and adopted climate resilient practices
Integrate gender and women's participation in local planning processes in SNRM	

4.2.5 Integration of GESI and IP's Issues into Solution Activities

The following special attention is required to mainstreaming women, Dalits, indigenous people, and marginalized communities in the implementation of ecosystem restoration plans for the river system:

a. Provide opportunities to build capacity in natural resource management for users, particularly women, indigenous peoples, Dalits, and forest-dependent marginalized communities.

b. Improve and synchronize CFUGs' operational plans in order to improve users' capabilities (women, Dalit, IPs, and marginalized users) and build a strong mechanism for GESI in the river system's forestry sector.

c. Provide an opportunity for women with specific, major actions in the restoration of the hotspots, for example:

- Provide women's capacity-building training in nursery establishment and seedling production
- Provide capacity-building training to CFUGs and farmers' groups on gully stabilization
- Provide skill-building training to women for the promotion of agroforestry and other opportunities
- Invest in women's decision-making capacity building, especially in forestry activities for Churia regions' women and agriculture activities for lowland regions' women
- Minimize women's workloads in the collection of fuelwood: a) by providing cost-effective equipment and techniques, especially in alternative energy uses for cooking); b) by providing fodder seeds
- Reduce social barriers (social and economic insecurity and lowered education and understanding level) for Dalit, indigenous, and other vulnerable ethnicity women to participate in ecosystem restoration activities such as sustainable forest management and agriculture land restoration (on both public and private lands)
- Engage women in agroforestry, FFS, IPM and trainings to ensure their incomes and knowledge enhancement.

❖ **Inclusive Process and Plans for Indigenous People**

Special attention is given on FAO, FPIC Manual for Project Practitioners 2016, focused on an Indigenous Peoples' right and a good practice for local communities. Free, Prior and Informed Consent (FPIC) process is required for the implementation of any activities highlighted in the CERP. For this, implementing agency (CBOs) and project manager must follow 6 steps in different actions during CERP implementation in the river system:

Step 1: Identification of Indigenous Peoples' concerns and their representatives

Step 2: Document geographic and demographic information through participatory mapping

Step 3: Design a participatory communication plan and carry out iterative discussions through which project information will be discussed in a transparent way

Step 4: Reach consent, document Indigenous Peoples' needs that are to be included into the project and agree on feedback and complains mechanism

Step 5: Conduct participatory monitoring and evaluation of the agreement

Step 6: Document lessons learned and disclose information about project achievements.

CHAPTER 5 : INTERVENTION PACKAGE

5.1 Formulation of Intervention Packages

From problem and solution tree analysis the main problems along with their causes and effects are recorded, to come up with clear and manageable goals and the strategies to combat them. There are two main stages to this process: (1) the identification of negative aspects of existing situations (or key challenges) in the form of problem trees, and (2) the change of the problems into objectives leading to solution trees showing potential solutions or strategies that respond to the drivers and underlying causes.

It is important to understand and recognize stakeholder engagement and listen to the voices and concerns of forest dependent and poor/marginalized social groups in the process of prioritizing the CERP activities. All these intervention packages (IPacks) were developed based on the activities and key results identified from local stakeholder workshops and verified from expert planning workshops involving most of the key stakeholders. The IPacks developed mainly focused on reducing deforestation and forest degradation; enhancing adaptation/resilience building of vulnerable ecosystem and local community; and integrating gender and equity issues in governance practices in natural resource management and climate resilient land use practices. It provides activities for forest and carbon enhancement; climate resilient agriculture practices and land use practices; and reducing ecosystem and community vulnerability from climate-induced disasters.

Problem, Solution analysis and map demarcations done by participants are considered as a foundational step for formulating IPacks to group the activities. First the similar activities that are identified in solution analysis and their map demarcations are carefully reviewed against the underlying causes obtained in problem analysis. In next step, the activities are grouped based on adaptation and mitigation themes making sure it addresses the underlying causes and major problems (key drivers) identified during problem analysis. In addition, the findings of gender – a specific field study conducted by HIMAWANTI are integrated into the ipack. The gender study identified three key interventions focused on gender and women empowerment. However, the intervention package integrated most of the gender-related concerns in the ipack and added one gender-responsive government ipack as an advocacy campaign in the plan.

Ipacks are formulated based on this grouping such that each Ipacks address the major problems (drivers) and activities relate with solution analysis process. However, all activities identified in solution analysis are not reflected in IPack activities – as in reference to guidance from CERP manual Box 14 and section C1.2 based on which policy level interventions that are already reflected in REDD+ national strategy are not included in IPacks. Ipacks geographic focus and coverage areas were also closely reviewed to make sure that the upstream-downstream linkage issues are addressed, although geographic focus are not considered as a primary criterion for activity grouping.

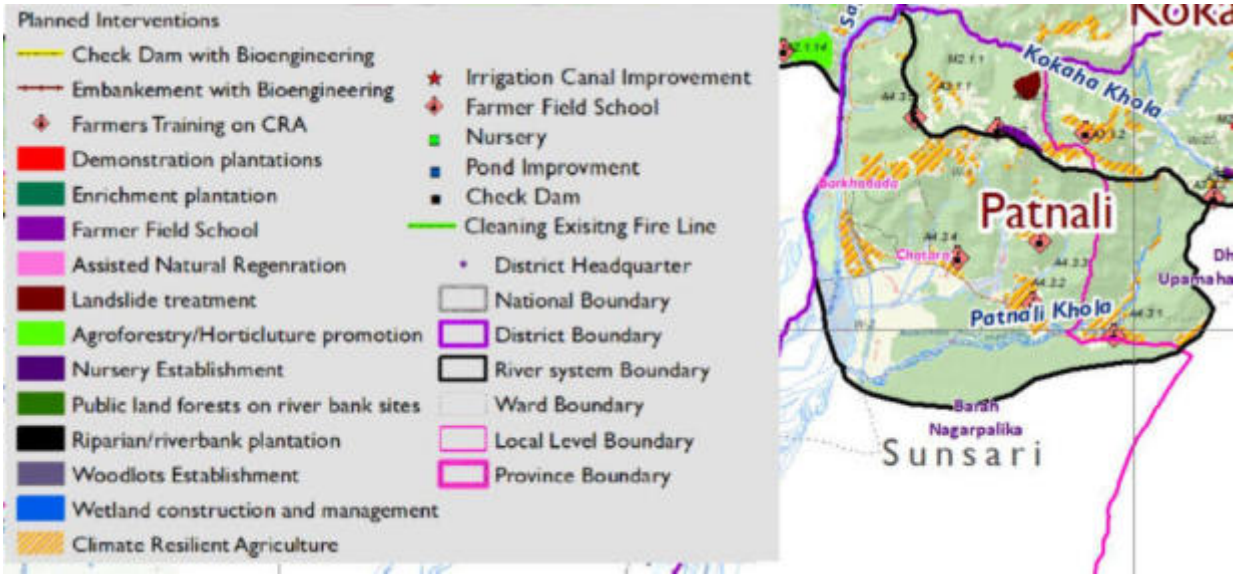
A number of activities that do not directly relate with ecosystem restoration were also noted during the problem-solution analysis process. These activities primarily include large scale infrastructure development along river corridors, revising national/provincial level policies, construction of local infrastructure, irrigation infrastructure, food security, water supply etc. Based on the guidance from project documents and CERP manual most strategic interventions that are feasible through activity prioritization are included in IPack formulation.

Table 15: Intervention packages for CERP

Intervention Packages	Outputs	Drivers or barriers addressed
IPack 1: Capacity enhancement for sustainable forest management	Forest management strengthened	Unsustainable harvesting and illegal logging; Ineffective forest management practices
IPack 2: Restoration and rehabilitation of degraded forests	Improved forest cover through enrichment plantation and ANR	Forest fire; Unsustainable harvesting and illegal logging; Ineffective forest management practices; Inadequate efforts to promote commercial livestock farming
	Forest fire mitigated	
	Sustainable livestock and grazing managed	
	Income source of poor/marginalized forest users enhanced	
IPack 3: Improving/maintaining river system landscape through soil and water conservation	Agroforestry promoted	Unsustainable harvesting and illegal logging; Erosion/ landslide; Flood; Insufficient irrigation
	Erosion/landslide controlled and sedimentation managed	
	Water sources conserved	
	Disaster risk management strengthened	
IPack 4: Climate resilient agriculture and land use practices	Farmers capacitated in climate resilient agriculture	Inadequate capacity and resources; Insufficient irrigation; Crop and livestock diseases
	Improved climate-resilient land use practices	
IPack 5: Advocacy campaign: Gender-inclusive governance campaign	Increased access of women to SNRM and knowledge and information	Lack of gender integration in SNRM, CCA, and DRR planning and implementation process
	Integrated gender and women's participation in local planning processes in SNRM	

This CERP only covers those key results and IPacks that correspond to local level interventions. However, it also reveals a number of vital areas of interventions that can take place at national level such as- resolution of land tenure issues; interventions to regulate infrastructure development in forest area and Chure hillslopes; and others. These higher-level measures or interventions should also be incorporated into national strategies for successful implementation of CERP.

IPack activities also reflect up-mid-downstream linkages to foster integrated management approach. An activity mapped below at river system scale demonstrates that those activities under IPack 2 (such as landslide/erosion control, water sources conservation, flood mitigation) and IPack 3, 4 (such as ANR, Fire control, capacity building SFM) focus on upstream churia hill regions that are expected to reduce sedimentation and have profound impact on the morphology of the river and related disasters in the inner river valley. IPack 1 on CRA and IPack 5 on restoration of riverine landscape with plantation focus on these inner river valleys.



❖ Strategies and Activities

For each of the IPacks there are strategies (Table 16) and activities (Table 17). Strategies are followed by activities and provision of incentives that could encourage stakeholder's participation, as well as change their current practices that would enhance resilience and mitigation benefits (Table 16). All the activities developed are considered realistic and practical as regards their implementation. Ambiguous activities that are difficult to obtain clear and measurable outcomes have been excluded.

❖ Summary of Feasibility Analysis

Feasibility analysis was used to assess the strengths and weaknesses of the IPacks (Table 18), which can lead to desired results of the CERP. In the feasibility analysis, the risks and obstacles to implementation of each IPacks were assessed, and this provided the basis for assessing the overall feasibility of each IPack. Cost-effectiveness is also a vital criterion in feasibility analysis. The scores obtained through overall feasibility analysis at output levels indicate that all the IPs are reasonably feasible (Table 19). The feasibility analysis was duly verified from expert planning workshop.

❖ Summary of Safeguard Analysis

Safeguard analysis was done to identify social and environmental risks or threats (Table 20), as well as to identify where CERP interventions can contribute to significant social or environmental co-benefits (Table 21) Social risks are negative social side effects on poor and marginalized social groups while implementing the proposed IPacks. Women, IPs and marginalized minority groups, including Dalits among others, can experience discrimination and may face additional barriers to their participation and engagement that could limit their engagement within the project. Similarly, environmental risks are potential side effects from proposed interventions such as natural forest conversion, negative effects on biodiversity or other ecosystem services among others. In safeguard analysis, the measures to mitigate risks and enhance benefits were also assessed. The safeguard analysis matrix was duly verified during expert planning workshop.

❖ Budget Plan

The budget plan for CERP activities has been prepared based on approved district rate, and in close coordination with government officials at expert planning workshop, The quantitative implementation targets defined in the planning stage are the starting point for the budgeting process, followed by detail analysis of the activities, tasks and resources needed. The summary of budget plan for each IPacks is presented in Table 22. The detail budget plan with locations for interventions is presented in Annex 3.

❖ **Monitoring**

It is clearly essential to monitor the CERP implementation both for adaptive management of CERP and to be able to compensate or incentivize local stakeholders for their contribution to positive outcomes. For this, a monitoring protocol has been prepared (Table 23).

5.2 General Description of Intervention Packages

Table 16: General descriptions of IPacks

Intervention Packages	IPacks description	Objectives	Strategies	Activities/Incentives for Participation and Changing Stakeholder Practices
IPack 1: Capacity enhancement for sustainable forest management	Forest management regimes within the river system reflect Community Forest and Government Forest. These forest areas in Chure and Bhavar are subject to immense pressure. The problem of unsustainable harvesting and illegal logging prevails due to demand and supply gap. There is robust legal and policy framework in forest sector but lacks compliance in many ways. Limited access of CFUG members in decision-making, lack of clarity and uncertainty over forestland use, tenure, and resolution of households with unregistered land, widespread reports of corruption among different actors and law breaking in forest sector have weakened forest management efforts, accountability and transparency. This IPack focuses on improving forest management to resolve disparity among CBFUGs and government agencies and enrich forest resources.	• To improve forest quality through effective implementation of sustainable forest management • To improve forest governance • To ensure women, IPs, Dalit and marginalized communities participation in sustainable forest management preparation and decision making process • To strengthen forest monitoring	• Improve capacity, institutional performance and service delivery of the forestry sector institutions • Improving capacity of CFUGs as well as other stakeholders for sustainable forest management • Improve collaboration, cooperation and synergy among sectoral policies, sectors and actors • Enhance the role of private sector in forestry to promote forest-based enterprises for livelihood and economic development • Promote GESI and increase access of Indigenous People in sustainable forest management • Use of technology like CCTV for forest surveillance	• Financial and equipment support to encourage CFUGs for climate resilient sustainable forest management • Enhance forest sector transparency thereby, enhancing accountability of forest users and also reducing illegal activities • Promote GESI in participation and benefit sharing • Policy intervention for resolution of land tenure issues • Promote forest-based entrepreneurship • Decentralization of district based timber supply system • Development of compensatory mechanism for accidents during legal forest management activities • Incentive to security forces for capturing loggers and loggings.
IPack 2: Restoration and	Forest fire, unsustainable harvesting and illegal logging, and weak forest management practices are the major	• To enhance forest cover through enrichment plantation	• Reduce carbon emissions, enhance forest carbon stocks,	• Support for nursery establishment and enrichment plantation

Intervention Packages	IPacks description	Objectives	Strategies	Activities/Incentives for Participation and Changing Stakeholder Practices
rehabilitation of degraded forests	D&FD drivers in the river system. It is further worsened by weaknesses in forest enhancement. Limited livelihood opportunities of forest users and management weaknesses of CFUGs have hindered restoration and rehabilitation of degraded forests. This IPack seeks measures to tackle these weaknesses and restore degraded forests.	• To capacitate CFUGs in handling forest fire • To provide forest dependent people with alternative resource and income generation opportunities	and improve supply of forest products • Promote Livelihood improvement programs for women, IPs, Dalits and poor and marginalized forest dependent people	• Enhancing technical capacity of CFUGs in plantation and nurturing of seedlings • Equipment support to strengthen forest firefighting • Provide skill development trainings to increase income source of women, IPs, Dalits and poor/marginalized forest users • Provide incentives for commercial livestock farming, shed improvement and fodder banks • Incentivize women's participation in different programs and workshops
IPack 3: Improving/ maintaining river system landscape through soil and water conservation	Landscape degradation within the river system is combined effect of natural and anthropogenic causes. It is mainly associated with fragile topography, climate instability and unsustainable use of natural resources. Natural hazards like erosion, landslide, flood, forest fire and declining ecosystem services like declining water resource, forest resource and agriculture yield all are associated with landscape degradation. This IPack thus focuses on restoration and maintaining the degraded landscape and livelihood improvement of local communities.	• To mitigate disaster risks to reduce community and ecosystem vulnerability • To enhance restoration of ecosystem services • To enhance local knowledge, awareness and capacity on CRLUP and SNRM	• Increase non-carbon benefits of forest ecosystems • Minimizing erosion, landslide through infrastructure development and also using indigenous knowledge, skills and customary practices • Promote changing annual crop into multiyear crop in Chure hill slopes • Implementation of projects in the collaboration with local government • Awareness raising through schools, media and other relevant measures • Trainings for capacity enhancement in CRLUP and SNRM	• Incentivize multiyear cropping/ horticulture • Promotion of agroforestry in marginal lands • Promote water conservation ponds in Chure hills and Bhavar • Promote fodder grass in slopy public lands • Project implementation in-line with priority of local government • Formation of school based eco-clubs • Training/capacity building on soil and watershed conservation using bio-engineering

Intervention Packages	IPacks description	Objectives	Strategies	Activities/Incentives for Participation and Changing Stakeholder Practices
IPack 4: Climate resilient agriculture and land use practices	Farmers especially women, Dalit and IP's vulnerability have been increasing due to limited farm skill and technology, low investment capacity, inadequate irrigation facilities, increasing pest and diseases and poor market access which relates with inability to cope with climate change impacts. Eventually the result is increased pressure in forest resource. The tendency of abandoned agricultural lands is also increasing. This intervention package thus provides solution to combat climate change impacts and enhance farm sustainability. Farmers are also facing problems of higher cost of agriculture input and low market price on sale of products.	• To capacitate vulnerable farmers such as women, IPs, Dalits and poor/ marginalized to adopt climate resilient agriculture practices • To enhance agriculture yield • To support pro-poor farmers	• Improving resilience of farmers to climate change, disasters, price volatility and other shocks • Increase agricultural productivity of forest dependent and other smallholders (equal participation of men and women)	• Train farmers (prioritizing women) on climate resilient agriculture • Incentivize poor/marginalized farmers (skill development and equipment support) • Promotion of alternative irrigation practice, local livestock breed/crop varieties' improvement and cooperative farming to enhance yield • Promote organic farming with provision of compensating yield loss to reduce chemical inputs • Disease/pest control • Support agriculture commercialization
IPack 5: Advocacy campaign: Gender-inclusive governance campaign	The under-representation of women in the decision-making process has resulted in the exclusion of women's specific needs and capacities in SNRM, CCA, and DRR. Increased influence of women in governance is important to identify and include gender-responsive program interventions to increase the adaptive capacity of vulnerable women. The advocacy campaigns will	• Increase women's leadership in NRM, CCA, and DRR • Building women's knowledge and skills in resource conservation and management Increase women's participation in	• Build network among women and women-led organizations for an enabling environment • Engage male and government representatives in the campaign	• Consider women's convenience while setting meeting agenda and venue • Provide transportation costs for attending the trainings • Ensure that women are aware of meetings or activities in an appropriate way • Provide opportunity to participate in learning events /platforms for women leaders and women champions

Intervention Packages	IPacks description	Objectives	Strategies	Activities/Incentives for Participation and Changing Stakeholder Practices
	include local-level stakeholders and the community and leverage local-level funds and resources.	decision-making forums • Increase common understanding towards gender equality and women empowerment in SNRM		

5.3 Major Activities and Sub-Activities

Table 17: IPacks, major activities and sub-activities

Intervention Packages	Major Activities	Sub-activities
IPack 1: Capacity enhancement for sustainable forest management	**Strengthening forest management**	Support review/upgrade/renew of forest operation plans (FOPs) of community forest user groups (CFUGs)
		Training and capacity development for implementation of FOPs
		Equipment support for implementation of FOPs
		Capacitate government staffs and CBOs on climate resilient forest management (Training of Facilitators-TOF)
		Governance training to government staffs and CFUGs to enhance accountability and transparency
		Handover of government forest to community
		Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)
IPack 2: Restoration and rehabilitation of degraded forests	**Improvement of forest cover within national forest through enrichment plantation/ANR**	Establish and support multi-purpose tree nurseries
		Production of saplings
		Enrichment plantation/ANR
	Forest fire control	Formation of fire fighter group and mobilization
		Firefighter training and support firefighting equipment to CFUGs
		Support firefighting equipment to security institutions (APF, Nepal Police, Nepal Army)
		Training and equipment support to promote compost production from bushes and leaf litters
		Construction and improvement of fire lines

Intervention Packages	Major Activities	Sub-activities
		Customize fire alert system in Community Based Forest Management (CBFM)
	Sustainable livestock and grazing management	Training and support on commercial livestock farming and shed improvement
		Promote fodder banks in private land
	Income source of poor/marginalized forest users enhanced halting illegal harvesting	Skill development trainings and equipment support to poor/marginalized forest users
IPack 3: Improving/ maintaining river system landscape through soil and water conservation	**Agroforestry promotion**	Promote agroforestry with multiyear cropping/horticulture/on-farm conservation
	Controlling erosion/landslide and management of sedimentation	Landslide treatment
		Construction of check dams and bioengineering for gully/debris torrent protection
	Conservation and management of water sources	Conservation of water sources
	Strengthening disaster risk management and awareness creation on climate resilient NRM	Strengthening climate and disaster risk reduction mechanism in collaboration with local government
		Training/capacity building on soil and watershed conservation using bio-engineering
		Climate resilient awareness campaign through Eco-clubs
IPack 4: Climate resilient agriculture and land use practices	**Establish and operationalize Farmers Field Schools (FFS)**	Identification and operationalization of FFS
		Capacity-building in the use of weather information and its application in agricultural practices
	Implementation of climate-resilient land use practices (pest and disease minimized,	Implement climate resilient agriculture practices
		Support development of groundwater irrigation facilities

Intervention Packages	Major Activities	Sub-activities
	soil quality improved, irrigation facility enhanced)	Promotion of drip irrigation system in dry areas
		Establish seed bank to conserve and promote climate resilient native agricultural crops
		Trainings on selection, grading and storage of quality seeds
		Provide technical and financial support to establish community composting center
		Training on Integrated Pest management (IPM)
IPack 5: Advocacy campaign: Gender-inclusive governance campaign	**Increase access of women to SNRM and knowledge and information**	Create informal learning and sharing platforms for grassroots-level women
		Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership
		Produce and publish best practices and learning in gendered governance
	Integrate gender and women's participation in local planning processes in SNRM	Conduct rapid assessment on women's contribution and involvement in SNRM
		Provide gender mainstreaming trainings/ workshops to local government and CBOs
		Conduct GESI focused social audits and public hearing
		Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups
		Engage male involvement to advocate gender and women's issues and concern in campaign

5.4 Feasibility Analysis

Table 18: Feasibility analysis

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
IPack 1: Capacity enhancement for sustainable forest management					
Forest management strengthened	Review/upgrade/ renew of forest operational plans (FOPs) of community forest user groups (CFUGs)	• Unwillingness of CFUGs due to lack of budget and technical knowledge	• Provide financial and technical support	• At least 17 CFUGs receive financial and technical support	• Number of CFUGs receiving financial and technical support
	Training and capacity development for implementation of FOPs	• Disparity in selection of participants (recommendation of participants from CFUGs)	• Build transparent selection criteria for CFUGs	• At least 50 % women, 13 % Dalit and 31 % indigenous peoples representatives trained in implementation of FOPs	• Number of women, Dalits and indigenous representatives trained
	Equipment support for implementation of FOPs	• Inadequate technical knowledge in handling of equipment	• Sensitize about BRCRN project scope and deliverables • Technical trainings on equipment handling	• At least 17 CFUGs receive equipment support with trained individuals	• Number of CFUGs receiving equipment and its handling support
	Capacitate government staffs and CBOs on climate resilient forest management (TOF)	• Level of understanding on climate resilient forest management practices among the trainee and trainers	• Adoption of peer learning method	• At least 2 events of joint training (government staff and CBO representatives)	• Number of joint trainings
	Governance training to government staffs and CFUGs to enhance accountability and transparency	• Gaps in understanding of governance in forest management procedures between government authority & CFUGs	• Joint trainings/ roundtable discussion	• Bi-annual joint trainings for 5 years	• Number of joint training events organized

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	Handover of government forest to community	• Hidden interest and political interference	• Taking consensus from all concerned stakeholders prior handover	• All CFs to be handover are conflict free	• Number of handover CFs free of conflicts
	Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)	• Insufficient skills and technical knowhow	• Joint monitoring committee of community based forest user groups and forest officials • Technological innovations for forest monitoring and governance	• At least 3 trainings on forest monitoring • Use of CCTV for surveillance of forest area	• Number of training events in five years • Number of CCTV installed
IPack 2: Restoration and rehabilitation of degraded forests					
Improved forest cover through enrichment plantation/ANR	Establish and support multi-purpose tree nurseries	• Disparity in site and species selection	• Prior consensus with communities for site and species selection	• At least 1 consultation workshops organized	• Number of consultation workshops conducted to select site and species
	Enrichment plantation/ANR	• Conflict on seedling selection and procedure (either plantation or assisted natural regeneration)	• Prior consultation with CFUGs	• At least 1 consultation meeting with each CFUGs	• Number of prior consultations
Forest fire mitigated	Formation of fire fighter group and mobilization	• Low voluntary participation	• Sensitization and support programs • Provision of financial incentives/reward	• At least 10 CFUGs with fire fighter groups	• Number of CFUGs with fire fighter groups
	Firefighter training and support firefighting equipment to CFUGs	• Lack of technical knowledge in handling of equipment	• Technical trainings on equipment handling	• At least 10 CFUGs are well equipped with trained firefighting groups	• Number of well-equipped CFUGs with trained firefighting groups

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	Training and equipment support to promote compost production from bushes and leaf litters	• Elite capture • Cheaper alternatives to compost in the market	• Transparent selection to include most fire prone CFs • Awareness raising programs on the significance of composting conducted for CFUGs with opportunities to the market linkages	• At least 3 most fire prone CFs are included • At least 3 awareness raising events conducted covering 3 CFUGs	• Number of most fire prone CFs included • Number of awareness raising events
	Construction and improvement of fire lines	• Selected sites might demand cutting of trees in significant number	• Selection of site with minimal tree removals • Improvement of fire lines will be prioritized	• At least 4 km of fire lines constructed/ improved	• Length of fire lines
Sustainable livestock and grazing managed	Training and support on commercial livestock farming and shed improvement	• Non-dedicated persons can capture opportunity	• Ensure participation of real farmers including socially and economically marginalized group (IPs, women, dalit etc.)	• At least 70% IP beneficiaries	• % of IP beneficiaries
	Promote fodder banks in private land	• Higher number of interested farmers	• Build transparent selection criteria to prioritize actual needy households	• At least 100 households establish fodder bank	• Number of households with fodder bank
Income source of poor/ marginalized forest users enhanced	Skill development trainings and equipment support to poor/marginalized forest users	• Low investment capacity of trainees on small and medium enterprise establishment	• Incentivize to develop small and medium enterprise (nursery, agroforestry)	• More than 50% trainees involved in income generation	• % of trainees involved in income generation
IPack 3: Improving/maintaining river system landscape through soil and water conservation					
Agroforestry promoted	Promote agroforestry with multiyear cropping/	• Unwillingness due to higher opportunity cost of land	• Promotion of high value agroforestry	• Agroforestry in 140 ha land • Proportionate sharing of benefits among women, Dalit	• Land area with agroforestry

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	horticulture/ on-farm conservation		• Incentivize socially and economically marginalized households	Janajati and marginalized groups	• % of women, Dalit Janajati and marginalized groups incentivized
Erosion/landslide controlled and sedimentation managed	Landslide treatment	• Local knowledge and practices missing in the stabilization measures • Influential decision in implementation	• Integrate local knowledge and practices • Risk prioritization prior to implementation in coordination with local government	• At least 4 landslides treated with integration of structural & bioengineering measures and risk prioritization • Local knowledge and practices integrated for the landslide treatment	• Number of landslides treated • Number of landslide treatment with local knowledge and practices
	Construction of check dams and bioengineering for gully/debris torrent protection	• Local knowledge and practices missing in the bioengineering for the protection • Influential decision in implementation	• Integrate local knowledge and practices with structural and non-structural (bioengineering) measures • Risk prioritization during mitigation	• At least 7 gullies/debris torrent stabilized with integration of structural & non-structural measures and risk prioritization	• Number of gullies stabilized with local knowledge and practices
Water source conserved	Conservation of water sources	• Resource conflict on water use rights	• Taking consensus prior decision making	• Signed agreement letter	• Signed agreement letter of all concerned water source users
IPack 4: Climate resilient agriculture and land use practices					
Farmers capacitated in climate resilient agriculture	Identification and operationalization of FFS	• Exclusion of poor and marginalized farmers • Lower investment capacity of small farmers • Drop out of participants of FFS	• Build transparent selection criteria • Incentives for small farmers • Encourage and incentivize the participants	• Selection criteria to include poor and marginalized are in place • 100 % farmers attending FFS are incentivized to adopt climate resilient agriculture • At least 80% of FFS participants complete FFS package	• Selection criteria • Proportion of farmers incentivized • % of participants who complete FFS package

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
Improved climate-resilient land use practices	Support development of groundwater irrigation facilities	• Hindrance from local government due to potential overuse	• Prior consultation and coordination with local government for approval	• Approval from local government for all the sites	• Number of sites with approval from local government
	Promotion of drip irrigation system in dry areas	• Disparity among farmers for site selection	• Taking consensus among farmers	• Signed agreement letter	• Signed agreement letter for all sites
	Establish seed bank to conserve and promote climate resilient native agricultural crops	• Disparity in site selection • Hindrance from local government	• Taking consensus • Prior consultation and coordination with local government for approval	• Signed agreement letter • Approval letter from local government	•
	Trainings on selection, grading and storage of quality seeds	• Exclusion of socially and economically marginalized group (IPs, women, dalit etc.)	• Transparent selection criteria	• Inclusion of 50% women, 13% Dalit and 31% Indigenous people	• % of women, Dalit and Indigenous people receiving training
	Provide technical and financial support to establish community composting center	• Disparity on site and design selection	• Prior consultation	• Signed agreement letter	•
	Training on Integrated Pest Management (IPM)	• Unwillingness of farmers due to higher dependency in chemical pesticides	• Sensitize farmers on benefits of IPM and incentivize farmers group to adopt IPM	• At least 10 events of trainings	• Number of trainings
IPack 5: Advocacy campaign: Gender-inclusive governance campaign					
Increased access of women to SNRM	Create informal learning and sharing platforms for grassroots-level women	• Social norms and values restricting women to participate and give time for informal learning and sharing platforms	• Identification of social and structural barriers faced by women through sensitization measures	• At least one gender sensitization learning event per year	• Number of gender sensitization events conducted

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
and knowledge and information	Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership	• Women lack access and resources about local level policies making them vulnerable	• Awareness and sharing of policies	• At least one event held on policy dissemination among women groups • At least 70% of target population participated	• Event/ activity report • Proportion of target population reached
	Produce and publish best practices and learning in gendered governance	• Lack of resources	• Ensure availability of resources	• Allocate budget for production and publication	• At least one report containing five best practices published and disseminated
Integrated gender and women's participation in local planning processes in SNRM	Conduct rapid assessment on women's contribution and involvement in SNRM	• Inadequate budget	• Explore budget availability	• Integrate subcomponents on ongoing studies	• Assessment reports
	Provide gender mainstreaming trainings/ workshops to local government and CBOs	• Gender is not a priority	• Raise awareness about long-term benefits after participating in gender workshops/ workshops	• Conduct in-person meetings with potential participants to understand their needs	• Number of trainings conducted
	Conduct GESI focused social audits and public hearing	• Lack of transparency • Inadequate budget • Exclusion of women and marginalized groups	• Increase practices for transparency through networking meetings, regular meetings • Policy guidance for ensuring inter-sectionality in social audits and public hearing • Adopt participatory tools for public hearing such as role-plays	• Regular meetings/ events conducted to increase transparency	• Number of social audit/ public hearings conducted • Percentage of women including Dalits and IPs participation • Number of issues raised on intersectional issues

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups	Inadequate interest and motivation of concerned institutions	• Raise awareness about long-term benefits of information dissemination	Continuous follow-up meetings between institutions and women groups/ CBOs	• Number of events between institutions and women groups/ CBOs
	Engage male involvement to advocate gender and women's issues and concern in campaign	• Less priority	• Raise awareness about long-term benefits, social prestige	• Continuous follow-up meetings	• Frequency of male involvement in gender and women's issues and concerns

Table 19: Overall feasibility analysis of IPacks

Intervention Packages	Outputs	Implementation risks/obstacles L=3/M=2/H=1	Cost effectiveness of risk reduction measures H=3/M=2/L1	Cost to implement L=3/M=2/H=1	Opportunity cost L=3/M=2/H=1	Incentive Measures H=3/M=2/L=1	Total score
IPack 1: Capacity enhancement for sustainable forest management	Forest management strengthened	2	3	3	3	3	14
IPack 2: Restoration and rehabilitation of degraded forests	Improved forest cover through enrichment plantation and ANR	2	3	1	3	2	11
	Forest fire mitigated	2	2	1	2	2	9
	Sustainable livestock and grazing managed	2	3	2	3	2	12
	Income source of poor/marginalized forest users enhanced	2	3	2	1	3	13
IPack 3: Improving/ maintaining river system landscape through soil water conservation	Agroforestry promoted	2	2	3	3	2	12
	Erosion/landslide controlled and sedimentation managed	1	2	1	2	2	8
	Water sources conserved	1	3	2	2	2	10
	Disaster risk management strengthened	2	3	3	3	2	13

Intervention Packages	Outputs	Implementation risks/obstacles L=3/M=2/H=1	Cost effectiveness of risk reduction measures H=3/M=2/L1	Cost to implement L=3/M=2/H=1	Opportunity cost L=3/M=2/H=1	Incentive Measures H=3/M=2/L=1	Total score
IPack 4: Climate resilient agriculture and land use practices	Farmers capacitated in climate resilient agriculture	3	3	2	3	2	13
	Improved climate-resilient land use practices	3	3	2	3	2	13
IPack 5: Advocacy campaign: Gender-inclusive governance campaign	Increased access of women to SNRM and knowledge and information	2	3	3	3	3	14
	Integrated gender and women's participation in local planning processes in SNRM	2	3	3	3	3	14

5.5 Safeguard Analysis

Table 20: Safeguard analysis (risk)

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
IPack 1: Capacity enhancement for sustainable forest management					
Forest management strengthened	Support review/upgrade/ renew of forest operational plans (FOPs) of community forest user groups (CFUGs)	• Similar FOPs in varying topographical settings	• Incorporate sensitivity analysis including topography, geology & geomorphic process	• 100% updated FOPs are based on sensitivity analysis	• FOPs with sensitivity analysis
	Training and capacity development for implementation of FOPs	• Selection bias of participants can lead to lower level of outcome	• Establish transparent selection criteria	• 100% eligible and efficient personnel	• More than 90% achievement level in sustainable forest management
	Equipment supports for implementation of FOPs	• Occupational health risks (injuries) due to inappropriate safety measures	• Training on OHS good practices, protocols and equipment to Trainers/ extension staff	• 6 trainings to CFUGs	• Number of person trained
	Handover of government forest to community	• Dispute on forest land tenure among adjoining CFUGs	• Avoid handover without resolving dispute	• No dispute in land tenure of handover CFs	• Number of CFs handover without resolving dispute
	Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)	• Question of sustainability if proper partnership with local government is not established	• Establishment of partnership with local government for installation & functioning of such system	• Real time monitoring system in partnership with local government	• Quality of functioning of monitoring system
IPack 2: Restoration and rehabilitation of degraded forests					
Improved forest cover through	Establish and support multi-purpose tree nurseries	• Land tenure issues on nursery site • Limited availability of quality seed of demanded species	• Consultation meetings • Demand analysis for choice of seedlings species	• At least 1 consultation meeting to screen and address the land tenure issues	• Number of nursery sites screened and land

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
enrichment plantation/ANR				• At least 50% seedlings produced are of native species	tenure issue addressed • Proportion of native species' seedlings produced
	Enrichment plantation/ANR	• Introduction of nonnative species can pose a risk to the local biodiversity • Loss of species having current social use can worsen livelihood of marginal households	• Promote tree species which are locally adapted/native • Provision of alternatives to affected marginal households	• 100 % of the species will be locally adapted/native species	• Proportion of local species in enrichment planation
Forest fire mitigated	Firefighter training and support firefighting equipment to CFUGs	• Firefighting without sufficient protective equipment or with inappropriate practices could lead to personal injuries • Possibility of exclusion of women	• Ensure trained groups are well aware of protective measures and procedures of fire controlling in the field through demonstration & examination • Promote inclusion/ participation of women	• All members are trained • At least 20% participants are women	• Number of trained members on the use of firefighting equipment • Proportion of women participants
	Construction and improvement of fire lines	• Excessive construction of fire line can lead to habitat fragmentation and impact on habitat connectivity	• Use existing road/trail/ river/stream as fire line	• 4 Km of fire line constructed/ improved	• Length of fire line constructed/ improve
Sustainable livestock and grazing managed	Training and support on commercial livestock farming and shed improvement	• Women, indigenous peoples, and marginalized minority groups (including Dalits, among other groups) may face barriers	• Ensure the empowerment and engagement of poor and marginalized households	• 40% beneficiaries representation target groups	• Number of poor and marginalized households supported
	Promote fodder banks in private land	• Less beneficial to low landholding members of society, especially poor and marginalized communities	• Dedicated program to poor and marginalized communities such as skill	• 50% beneficiaries of skill development trainings and equipment support	• Poor and marginalized members trained or capacitated

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
			development trainings and equipment support	belong to poor and marginalized communities	
IPack 3: Improving/maintaining river system landscape through soil and water conservation					
Agroforestry promoted	Promote agroforestry with multiyear cropping/ horticulture/ on-farm conservation	• Human-wildlife conflicts due to improved habitat and connectivity	• Sensitization events for human-wildlife conflict	• At least 2 sensitization events (1 at each hotspot) on reducing human wildlife conflict; improving habitat and connectivity)	• Number of sensitization events conducted
Erosion/ landslide controlled and sedimentation managed	Landslide treatment	• Durability of the structure due to fragile geology and climatic extremes	• Ensure technically sound structure following the design guideline	• Number of planned structures follow design guideline	• Number of structure following the guidelines
	Construction of check dams and bioengineering for gully/debris torrent protection	• Durability of the structure due to fragile geology and climatic extremes • Occupational hazard for the construction workers	• Ensure technically sound structure following the design guideline • Provide awareness on the occupational hazards and the protective gear for the construction related works	• Design guideline followed • 100 % construction workers aware about the occupational hazards with the protective gear	• Number of structures following the guidelines • Proportion of the construction workers aware on the occupational hazards with the protective gear
IPack 4: Climate resilient agriculture and land use practices					
Farmers capacitated in climate resilient agriculture	Identification and operationalization of FFS	• Participation from elite groups might be high	• Ensure participation of farmers including socially and economically marginalized group (IPs, women, Dalit etc.)	• At least 50% women, 13% Dalit and 31% Indigenous people are included in group at FFS	• % of women, Dalit and Indigenous people included in group at FFS
Improved climate-resilient land use practices	Support development of groundwater irrigation facilities	• Site-specific impacts due to the construction of small-scale irrigation infrastructures • Groundwater depletion	• Ensure participation of local authorities (local government) in cooperation with local communities from the	• Local authorities will oversee construction plans, implementation of construction & post-construction monitoring	• Ownership of local authorities • Number of recharge ponds

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
			designing phase to implementation and then monitoring • Construction of water recharge ponds to ensure sustainability	• At least 2 recharge ponds	
	Trainings on selection, grading and storage of quality seeds	• Women, indigenous peoples, and marginalized minority groups (including Dalits, among other groups) may face barriers	• Ensure the empowerment and engagement of poor and marginalized households	• 40% beneficiaries from target groups	• Number of poor and marginalized households supported
	Training on Integrated Pest management (IPM)	• Non-dedicated persons can capture opportunity	• Ensure participation of real farmers including socially and economically marginalized group (IPs, women, dalit etc.)	• 50% women, 13% Dalit and 31% Indigenous people are included in training	• Proportion of women, Dalit and Indigenous people included in training
IPack 5: Advocacy campaign: Gender-inclusive governance campaign					
Increased access of women to SNRM and knowledge and information	Create informal learning and sharing platforms for grassroots-level women	• Possibility of elite women capture • Possibility of the exclusion of Dalits and IPs women • Social norms and values restricting women to participate and give time for informal learning and sharing platforms	• Promote inclusion/participation of Dalits and IPs (Women) • Organize sensitization learning events to remove restrictions	• At least 20% participants are Dalits and IPs women • At least one gender sensitization learning event per year	• % of Dalits and IPs women • Number of gender sensitization learning events
	Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership	• Change in gender roles not easily accepted posing threats to social norms and values	• Conduct GESI trainings and awareness campaigns and policy reviews to strengthen the GESI initiatives	• 50% men and women know about the GESI policy and integration strategies	• Province and local level policy reviewed

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
	Produce and publish best practices and learning in gendered governance	• Gendered governance restricting women to participate • Women participation in NRM sectors can pose threat to social change	• Document of good and best practices in gendered governance that has minimized social discrimination and women empowered reducing GBV as well	• Gendered governance best practices documented and learning shared for social change	• Best practices in gendered governance documented and published
Integrated gender and women's participation in local planning processes in SNRM	Conduct rapid assessment on women's contribution and involvement in SNRM	• Women not being empowered could hinder their participation • Leadership discrimination among women and elite captures	• Rapid assessment on women's contribution and involvement in NRM/CRLUP and management to be conducted and shared for minimizing social barriers	• % of women's contribution and involvement analyzed and further plans developed	• Rapid assessment conducted
	Provide gender mainstreaming trainings/ workshops to local government and CBOs	• GESI not prioritized	• Trainings to be provided to mainstream gender increasing the trend of preparing action plans as GESI priority	• % of understanding level and mainstreaming of GESI well adopted	• GESI mainstreaming training and workshops raised awareness
	Conduct GESI focused social audits and public hearing	• Inclusive transparency and practices limited and not prioritized	• Regularly conduct GESI focused audits and public hearing to increase transparency and good governance	• % of local institutions practice GESI focused social audits and public hearing for social and strong governance practice	• GESI focused social audit and public hearing conducted regularly
	Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups	• Gender responsive awareness not shared or available as they are not prioritized	• Awareness promotion on gender responsive information and ensure to make available to all	• % of CBOs and women groups made aware on gender responsive information and access to resources increased	• Gender responsive information and availability access made easy

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
	Engage male involvement to advocate gender and women's issues and concern in campaign	• Men not interested for social change and not supportive too • Women participation not ensured in NRM/CRLUP and management	• Advocating GESI and women's issues among male and inform on transformative change and recognizing women's voice for change, reduce GBV	• % of male engagement in GESI and women's issues help change the social norms and values	• Male involvement increased in advocacy of GESI and women's issues and minimized social disparities

Table 21: Safeguard analysis (benefits)

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
IPack 1: Capacity enhancement for sustainable forest management					
Forest management strengthened	Support review/upgrade/ renew of forest operational plans (FOPs) of community forest user groups (CFUGs)	• Support annual silvicultural operations for sustainable forest management	• Update FOPs with sensitivity analysis based on local scenario • Integrate forest based entrepreneurship development and income generation • Multi-stakeholder sharing for quality assurance of FOPs	• 100% CFUGs update FOPs with sensitivity analysis and integrating forest based entrepreneurship development	• Proportions of CFUGs with updated FOPs
	Training and capacity development for implementation of FOPs	• Enhance capacity of CFUGs on sustainable forest management	• Involve all CFUGs within River System in trainings	• 100% CFUGs participate in trainings	• Proportion of CFUGs participating in trainings
	Equipment supports for implementation of FOPs	• Enhance capacity of CFUGs on sustainable forest management	• Support all CFUGs within River System	• 100% CFUGs receive equipment support	• Proportion of CFUGs receiving equipment support
	Capacitate government staffs and CBOs on climate resilient forest management (TOF)	• Increase skilled manpower on climate resilient forest management	• Sensitize 100% users of community forest on climate resilient forest management	• At least 90% users will be aware of climate resilient forest management	• Proportion of users participating in sensitization program
	Governance training to government staffs and CFUGs to enhance accountability and transparency	• Good forest governance	• Public hearing • Make information available in DFO websites	• Bi-annual public hearing and update of website information	• Number of public hearings annually • Availability of information in websites

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
IPack 2: Restoration and rehabilitation of degraded forests					
Improved forest cover through enrichment plantation and ANR	Establish and support multi-purpose tree nurseries	• Enhance seedling availability for plantation	• Demand based seedling production (fruit, fodder etc.)	• Seedling production will meet 100% demand	• Proportion of seedlings used for plantation
	Enrichment plantation/ANR	• Enhance forest quality and carbon stock	• Plantation of fast growing and locally adapted plant species • Promoting natural regeneration • Bio-fencing for protection	• At least 70% of fast growing and locally adapted/native plant species	• Proportion of fast growing and locally adapted/native plant species
Forest fire mitigated	Firefighter training and support firefighting equipment to CFUGs	• Enhance capacity on forest fire control	• Collaborate with security institutions and also provide equipment support	• At least 5 sets of firefighting equipment to security institutions	• Sets of firefighting equipment supported
	Training and equipment support to promote compost production from bushes and leaf litters	• Increase in soil organic content in farmlands	• Compensate litter collectors and provide subsidy to compost manure • Production based subsidy in organic farming	• At least 50% share of fertilizer is compost manure	• Number of households practicing composting
	Construction and improvement of fire lines	• Provides barrier to slow or stop the progress of wildfire	• Regular maintenance • Construct fire line as forest product collecting route	• Annual maintenance before fire season	• Number of fire line free of litters in dry season
Sustainable livestock and grazing managed	Training and support on commercial livestock farming and shed improvement	• Capacity enhancement for commercial livestock farming • Reduce open grazing	• Promote stall feeding by providing incentives	• 100% participant households practice stall feeding	• % of participant households practicing stall feeding

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
	Promote fodder banks in private land	• Reduce open grazing • Enhance greenery	• Distribution of seeds/seedlings of fodder trees and nutrient grasses	• 100% households receiving support establish fodder bank	• % of households receiving support with fodder bank established
IPack 3: Improving/maintaining river system landscape through soil and water conservation					
Agroforestry promotion	Promote agroforestry with multiyear cropping/ horticulture/ on-farm conservation	• Erosion control • Enhance income generation opportunities • Decrease in forest dependency	• Prioritize cash crops, fast growing fodder trees and grasses	• At least 50% cash crops and fodder trees	• Proportion of cash crops and fodder trees in plantation
Erosion/ landslide controlled and sedimentation managed	Landslide treatment	• Reduce loss and damage • Reduce sedimentation	• Prioritize high value multipurpose plant species for bioengineering	• At least 50% use of high value multipurpose plant species for bioengineering	• Proportion use of high value multipurpose plant species for bioengineering
	Construction of check dams and bioengineering for gully/debris torrent protection	• Reduce sedimentation in downstream • Reduce risks of flash floods and minimize settlement vulnerability	• Prioritize high value multipurpose plant species for bioengineering	• At least 50% use of high value multipurpose plant species for bioengineering	• Proportion use of high value multipurpose plant species for bioengineering
IPack 4: Climate resilient agriculture and land use practices					
Farmers capacitated in climate resilient agriculture	Identification and operationalization of FFS	• Increased farm productivity	• Continuity of FFS for longer period (one crop cycle may not be sufficient) • Integration of FFS in municipal agriculture section2	• FFS operated for whole project period • All FFS will be integrated in respective municipal agriculture section	• Number of FFS operated for whole project period • Number of FFS owned and run by local government

[2] Development of FFS as on-farm learning center in the long run (even after project completion)

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
Improved climate-resilient land use practices	Trainings on selection, grading and storage of quality seeds	• Capacity enhancement of farmers • Enhances seed availability	• Prioritize women, IPs, Dalits, poor/marginalized farmers for training	• More than 80% trainees are women, IPs, Dalits, poor/marginalized farmers	• Proportion of women, IPs, Dalits, poor/marginalized farmers
	Training on Integrated Pest management (IPM)	• Enhance soil organic carbon • Sustain farm productivity	• Provide financial, equipment and technological support to farmers adopting IPM • Promote organic farming	• At least 50% farmers adopting IPM will be supported • At least 50% share of fertilizer and pesticides is organic	• Proportion of farmers supported • Decrease in use of chemical fertilizer and pesticides
IPack 5: Advocacy campaign: Gender-inclusive governance campaign					
Increased access of women to SNRM and knowledge and information	Create informal learning and sharing platforms for grassroots-level women	• Women empowered and their voices being respected	• Create and manage learning platform	• Five learning events	• Number of learning events
	Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership	• Women's participation, access, control and leadership developed and supported	• Interaction held between policy makers and targeted women	• One event	• Number of events
	Produce and publish best practices and learning in gendered governance	• Documentation and publication of gendered governance strengthened and institutionalized	• Sharing and publicity	• One best practice documented	• Number of best practices documented
Integrated gender and women's participation in local	Conduct rapid assessment on women's contribution and involvement in SNRM	• Women's contribution and participation increased	• Gender data disseminated	• One Sharing event	• Number of sharing events

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
planning processes in SNRM	Provide gender mainstreaming trainings/ workshops to local government and CBOs	• Women's capacity enhanced in GESI integration and local government and CBOs take the issues seriously	• Knowledge enhancement, accountability	• One training event for 20 government staffs	• Number of training events
	Conduct GESI focused social audits and public hearing	• Social transparency increased and regularly practiced	• Coverage of wider audience target group	• Two events	• Number of events
	Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups	• Gender responsive information making women and marginalized groups empowered	• Awareness raising sessions	• Three events	• Number of events
	Engage male involvement to advocate gender and women's issues and concern in campaign	• Male roles changing and supportive for women empowerment	• Continues encouragement of male change agent to promote gender	• Two events	• Number of events

5.6 Budget

Note: Budget estimations are tentative and done based on consultation workshops with key stakeholders at river system level during 2022. However, during time of implementation, the rate and amount mentioned in the CERP plans are subjected to change based on the changes in market situation as well as the field condition. Respective Provincial Project Management Offices (PPMUs) can make necessary changes based on field situation following the norms and rates as per the Nepal government rules and regulations

Table 22: Budget plan

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
IPack 1: Capacity enhancement for sustainable forest management				
Support review/upgrade/renew of forest operational plans (FOPs) of community forest user groups (CFUGs)	No	17	200,000	3,400,000
Training and capacity development for implementation of FOPs	No	17	250,000	4,250,000
Equipment support for implementation of FOPs	No	17	200,000	3,400,000
Capacitate government staffs and CBOs on climate resilient forest management (Training of Facilitators-TOF)	Event	2	300,000	600,000
Governance training to government staffs and CFUGs to enhance accountability and transparency	Event	10	240,000	2,400,000
Handover of government forest to community	No	1	500,000	500,000
Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)	Ls	1	1,000,000	1,000,000
Total Budget for IPack 1 (NRs)				**15,550,000**
IPack 2: Restoration and rehabilitation of degraded forests				

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
Establish and support multi-purpose tree nurseries (150,000 capacity)	No	1	1,000,000	1,000,000
Production of saplings	No	150,000	40	6,000,000
Enrichment plantation	ha	38.2	50,000	1,912,197.90
Implement Assisted Natural Regeneration	ha	56	20,000	1,120,000
Formation of fire fighter group and mobilization	CFUG	10	50,000	500,000
Firefighter training and support firefighting equipment to CFUGs	CFUG	10	300,000	3,000,000
Support firefighting equipment to security institutions (APF, Nepal Police, Nepal Army)	Sets	5	150,000	750,000
Training and equipment support to promote compost production from bushes and leaf litters	CFUG	3	150,000	450,000
Construction and improvement of firelines	Km	4	300,000	1,200,000
Customize fire alert system in Community Based Forest Management (CBFM)	No	1	LS	300,000
Training and support on commercial livestock farming and shed improvement	Household	35	100,000	3,500,000
Promote fodder banks in private land	Household	100	20,000	2,000,000
Skill development trainings and equipment support to poor/marginalized forest users	Household	40	25,000	1,000,000
Total Budget for IPack 2 (NRs)				**22,732,197.9**

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
IPack 3: Improving/maintaining river system landscape through soil and water conservation				
Promote agroforestry with multiyear cropping/ horticulture/ on-farm conservation	ha	140	6,000	840,000
Landslide treatment	No	4	2,000,000	8,000,000
Construction of check dams and bioengineering for gully/debris torrent protection	Gully/debris torrent	7	LS	15,000,000
Conservation of water sources	No	4	200,000	800,000
Strengthening climate and disaster risk reduction mechanism in collaboration with local government	Municipality	1	300,000	300,000
Training/capacity building on soil and watershed conservation using bio-engineering	Event	1	500,000	500,000
Climate resilient awareness campaign through Eco-clubs	School	2	50,000	100,000
Total Budget for IPack 3 (NRs)				**25,540,000**
IPack 4: Climate resilient agriculture and land use practices				
Identification and operationalization of FFS	No	2	700,000	1,400,000
Capacity-building in the use of weather information and its application in agricultural practices	No	2	100,000	200,000
Implement climate resilient agriculture practices	ha	800	2,000	1,600,000
Support development of groundwater irrigation facilities	No	20	250,000	5,000,000
Promotion of drip irrigation system in dry areas	No	2	50,000	100,000

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
Establish seed bank to conserve and promote climate resilient native agricultural crops	No	1	2,500,000	2,500,000
Trainings on selection, grading and storage of quality seeds	Event	5	50,000	250,000
Provide technical and financial support to establish community composting centre	No	1	200,000	200,000
Training on Integrated Pest management (IPM)	Event	10	100,000	1,000,000
Total Budget for IPack 4 (NRs)				**12,250,000**
IPack 5: Advocacy campaign: Gender-inclusive governance campaign				
Create informal learning and sharing platforms for grassroots-level women	Event	5	50,000	250,000
Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership	Event	1	50,000	50,000
Produce and publish best practices and learning in gendered governance	Event	1	50,000	50,000
Conduct rapid assessment on women's contribution and involvement in SNRM	Event	1	100,000	100,000
Provide gender mainstreaming trainings/ workshops to local government and CBOs	Event	1	100,000	100,000
Conduct GESI focused social audits and public hearing	Event	2	150,000	300,000

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups	Meeting	3	50,000	150,000
Engage male involvement to advocate gender and women's issues and concern in campaign	Event	2	50,000	100,000
Total Budget for IPack 5 (NRs)				**1,100,000**
Grand Total Budget (NRs)				**77,172,197.90**

Note: Budget estimations are tentative and are subjected to change based on the changes in market situation as well as the field condition.

5.7 Monitoring and Reporting Protocol

River system level monitoring and reporting will be carried out by Ministry of Forest and Environment through PMU and PPMU of BRCRN.

Following monitoring protocol will be adopted to monitor the outputs of the CERP:

Table 23: Monitoring protocol

Results	Indicator	Baseline	Target	Means of verification	Assumption
Output 1: Restored degraded forests area halting forest fire, illegal harvesting and grazing	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0	94.2 ha of natural forest restored through ANR including 38.2 ha enrichment plantation	PMU and PPMUs reports Project report	This river system has 3515.3 ha of forest and 64.7 ha of other wooded land (baseline survey report 2022)
Output 2: Improved natural Forest management and increased forest area outside the forest	xx ha of forest area of xx groups under implementation through updated forest management plan	0	2831 ha area managed by 17 community forestry user groups	PMU and PPMUs reports Project report	17 community forestry user groups manage 2831 ha of forest having 2695 ha (95.20%) of natural forest,96 ha (3.39%) plantation forest and 40 ha (1.41%) degraded forest (CBO profile 2022)
	xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	0	Area: 0 ha. Survival rate: 0% (Demonstration plantation: 0 ha and riverbank plantation: 0 ha and wood lots: 0 ha)	PMU and PPMUs reports Project report	
Output 3: Minimized Impacts of climate induced disasters (erosion, landslides/ sedimentation and flooding)	Volume of sedimentation (Cubic meter of soil volume per unit area)		25% in comparison to before constructing structures	PMU and PPMUs reports Project report	Other climate-resilient SNRM practices (including Activities on climate-resilient land use, sustainable management of forests and reforestation) are successfully implemented,

Results	Indicator	Baseline	Target	Means of verification	Assumption
					further reducing potential for erosion and sedimentation
Output 4: Farmers adopted Climate resilient farming practices	Ha. of agricultural land under climate resilient farming/agriculture system	0 ha	800 ha	FFS record PPPMUs Reports Project report	
	Proportion of farmers trained by the project who begin to apply climate- resilient land use practices on their fields in the relevant season following their respective trainings	0	At least 80% of the farmers involved in project trainings begun to apply project-promoted climate-resilient land use practices in the season following their training	PMU and PPMUs reports Project report	The final selection of practices to be promoted at each specific training site are highly relevant to targeted farmers' cropping systems and conditions, as well as the climate change challenges with which they must contend. Trainings are delivered in a form and manner that is accessible to and relevant for, targeted farmers.
Output 5: Integrated gender and equity issues in governance practices in NRM/ CRLUP and management	% of women in leadership positions of CBO's executive committee	Out of 199 leadership position in CFUGs, 101 (50.8%) are women	At least 60% women in leadership position	DFO/PPMU/Group records	Proportional representation of all social groups ensured
	Access of women in Natural resources management, CRLUP, knowledge and information	0	At least 50% women participation in all events	Group record/PPMU records	Proportional representation of all social groups ensured

Results	Indicator	Baseline	Target	Means of verification	Assumption
	Integrate gender in local planning processes in NRM/ CRLUP and management	0	17 Gender sensitive forest management operational plan of forestry user groups	PPMU/DFO/Group records	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups

Outcome and impact level result assessment will be carried out based on result framework of CERP (Annex-1) using BRCRN monitoring and evaluation framework. Output level results of this CERP fully aligned with the BRCRN outcome and impact indicators.

Activity level monitoring will be carried out based on work plan and budget. Joint monitoring mechanism will be established to monitor the activity and results.

REFERENCES

Adhikari, D., Shrestha, K., Adhikari, P., Paudayal, K. N., & Paudel, L. (2018). Geological Study of Chatara–Barahakshetra Section, Sunsari-Udayapur District, Eastern Nepal. *Bulletin of the Department of Geology*, *20*, 49–58. https://doi.org/10.3126/bdg.v20i0.20723

Dahal, A. & Paudyal, K. (2022). Mapping of Geological Sensitive Areas along the Budhi Khola Watershed, Sunsari/Morang Districts, Eastern Nepal Himalaya.

DHM. (2021). Meterological Observation : Precipitation data. In *Department of Hydrology and Meterology*. https://www.dhm.gov.np/request-data

Ghimire, M. (2011). Landslide occurrence and its relation with terrain factors in the Siwalik Hills, Nepal: Case study of susceptibility assessment in three basins. *Natural Hazards*, *56*(1), 299–320. https://doi.org/10.1007/s11069-010-9569-7

Ghimire, M. L. (2020). Basin characteristics, river morphology, and process in the Chure-Terai landscape. *Geographical Journal of Nepal*, *13*(March 2020), 107–142. https://doi.org/10.3126/gjn.v13i0.28155

ICIMOD, & FRTC. (2021). Landcover of Nepal 2000 and 2019. In *International Centre for Integrated Mountain Development and Forest Research and Training Centre*. http://rds.icimod.org/DatasetMasters/BulkDownload/1972729

Kaini, S., Harrison, M. T., Gardner, T., Nepal, S., & Sharma, A. K. (2022). The Impacts of Climate Change on the Irrigation Water Demand, Grain Yield, and Biomass Yield of Wheat Crop in Nepal. *Water (Switzerland)*, *14*(17), 1–17. https://doi.org/10.3390/w14172728

MoFE, DHM, & ICIMOD. (2019). *Climate Change Scenarios for Nepal for National Adaptation Plan (NAP)*. http://nepal.spatialapps.net/nap

PCTMCDB. (2017). *President Chure-Tarai Madhesh Conservation and Management Master Plan*. http://chureboard.gov.np/en/wp-content/uploads/sites/2/2017/07/Master-Plan_Churia_English_final_24th_Shrawan_2074.pdf

Annex-1: Result Framework of Patnali Critical Ecosystem Restoration Plan

Vision: Climate resilient and sustainably managed Natural Resources and local communities in Patnali River system

Result Framework

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
Impacts					
GCF core indicator (Mitigation) *A4.0 Improved resilience of ecosystems and ecosystem services (proxy indicator 2 to 5)*	Tonnes of carbon dioxide equivalent (tCO_2eq) reduced or avoided. **Proxy indicator**: Area of (1) Deforestation rate: (2) Sustainable forest management area: (3) ANR area (4) Plantation area (5) Area of Climate Resilient Agriculture (CRA)	**Proxy indicators:** Deforestation rate: -0.10 Sustainable forest management area: 0 ha ANR: 0 ha Plantation area: 0 ha Climate Resilient Agriculture: 0 ha	**Proxy indicator**: Deforestation rate: 0 Sustainable forest management area: 2831 ha Plantation area: 0 ha ANR: 94.2 ha (including enrichment plantation: 38.2 ha) Climate Resilient Agriculture: 800 ha	PPMUs/PMU report GCF/BRCRN GHG mitigation calculation tool-based calculation sheet	This river system has 3515.3 ha of forest and 64.7 ha of other wooded land (baseline survey report 2022) CERP land use data shows changes in forest area between 2000 and 2019 is -64.2 ha. Hence, -0.10% deforestation rate. In this river system, 17 forestry user groups are managing 2831 ha of forest (CBO profile 2022)
GCF core indicator (Adaptation)	Total number of direct and indirect beneficiaries (gender disaggregated)	0	Direct Male: 16480 Female: 16284 Total: 32764	PMU and PPMUs reports Project report	In this river system 17 CFUGs are operating with 7270 HHs as members having

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
					16480 male and 16284 female population.
Outcomes					
M9.0 Improved management of land or forest areas contributing to emissions reductions	M9.1 Hectares of land or forests under improved and effective management that contributes to CO_2 emission reductions		Sustainable forest management area: 2831 ha Plantation area: 0 ha ANR: 94.2 ha (including enrichment plantation: 38.2 ha) Climate Resilient Agriculture: 800 ha	PMU and PPMUs report Project reports	Beneficiaries adopt climate-resilient land use practices
A8.0 Strengthened awareness of climate change threats and risk reduction processes	A8.1 Number of males and females made aware of climate threats and related appropriate responses	0 men 0 women 0 total	Male: 16480 Female: 16284 Total: 32764	Project report Workshop/training Attendance sheets and materials	Beneficiaries are interested in adopting climate resilient land use practices
Outputs					
Output 1: Restored degraded forests area halting forest fire, illegal harvesting and grazing	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0	94.2 ha of natural forest restored through ANR including 38.2 ha enrichment plantation	PMU and PPMUs reports Project report	This river system has 3515.3 ha of forest and 64.7 ha of other wooded land (baseline survey report 2022)
Output 2: Improved natural Forest management and increased forest area outside the forest	xx ha of forest area of xx groups under implementation through updated forest management plan	0	2831 ha area managed by 17 community forestry user groups	PMU and PPMUs reports Project report	17 community forestry user groups manage 2831 ha of forest having 2695 ha (95.20%) of natural forest,96 ha (3.39%) plantation forest and 40 ha (1.41%) degraded forest (CBO profile 2022)

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
	xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	0	Area: 0 ha. Survival rate: 0% (Demonstration plantation: 0 ha and riverbank plantation: 0 ha and wood lots: 0 ha)	PMU and PPMUs reports Project report	
Output 3: Minimized Impacts of climate induced disasters (erosion, landslides/ sedimentation and flooding)	Volume of sedimentation (Cubic meter of soil volume per unit area)	NA	25% in comparison to before constructing structures	PMU and PPMUs reports Project report	Other climate-resilient SNRM practices (including Activities on climate-resilient land use, sustainable management of forests and reforestation) are successfully implemented, further reducing potential for erosion and sedimentation
Output 4: Farmers adopted Climate resilient farming practices	Ha. of agricultural land under climate resilient farming/agriculture system	0 ha	800 ha	FFS record PPPMUs Reports Project report	
	Proportion of farmers trained by the project who begin to apply climate-resilient land use practices on their fields in the relevant season following their respective trainings	0	At least 80% of the farmers involved in project trainings begun to apply project- promoted climate-resilient land use practices in the season following their training	PMU and PPMUs reports Project report	The final selection of practices to be promoted at each specific training site are highly relevant to targeted farmers' cropping systems and conditions, as well as the climate change challenges with which they must contend. Trainings are delivered in a form and manner that is

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
					accessible to and relevant for, targeted farmers.
Output 5: Integrated gender and equity issues in governance practices in NRM/ CRLUP and management	% of women in leadership positions of CBO's executive committee	Out of 199 leadership position in CFUGs, 101 (50.8%) are women	At least 60% women in leadership position	DFO/PPMU/Group records	Proportional representation of all social groups ensured
	Access of women in Natural resources management, CRLUP, knowledge and information	0	At least 50% women participation in all events	Group record/PPMU records	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in NRM/ CRLUP and management	0	17 Gender sensitive forest management operational plan of forestry user groups	PPMU/DFO/Group records	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups

Activities

Activities	Description	Sub-activities	Remarks/Deliverables
Output 1: Restored degraded forests area halting forest fire, illegal harvesting and grazing			
1.1 Forest fire control	Support and strengthen forestry-related CBOs to combat forest fire.	1.1.1 Formation of fire fighter group and mobilization 1.1.2 Firefighter training and support firefighting equipment to CFUGs 1.1.3 Training and equipment support to promote compost production 1.1.4 Support firefighting equipment to security institution 1.1.5 Construction and improvement of fire lines 1.1.6 Customize fire alert system in Community Based Forest Management (CBFM)	At least 10 CFUGs of most fire prone community forests supported with firefighting equipment
1.2 Income source of poor/marginalized forest users enhanced halting illegal harvesting	Enhance income generation opportunities for forest dependent women, IPs, Dalits and poor/marginalized people to reduce pressure on forest resources.	1.2.1 Skill development trainings and equipment support to poor/marginalized forest users	Approximately 40 household beneficiaries
Output 2: Improved natural forest management			
2.1 Strengthening forest management	Improving the application of sustainable forest management practices in all forest land managed by forestry-related CBOs within project area, ensuring silvicultural practices are implemented and maximizing ecosystem service provision and resilience, as well as generating significant climate change benefits.	2.1.1Review/upgrade/renew of forest operational plans (FOPs) of community based forest user groups (CFUGs) and provide implementation support 2.1.2 Training and capacity development for implementation of FOPs 2.1.3 Equipment support for implementation of FOPs 2.1.4 Capacitate government staffs and CBOs on climate resilient forest management (Training of Facilitators) 2.1.5 Governance training to government staffs and CFUGs to enhance accountability and transparency 2.1.6 Handover of government forest to community 2.1.7 Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)	Approximately 17 forest operational plans developed and/or strengthened. Approximately 2 ToF events organized to capacitate government staffs and CBOs on climate resilient forest management.

Activities	Description	Sub-activities	Remarks/Deliverables
2.2 Improvement of forest cover through enrichment plantation and ANR	Support different types of forest plantation to build resilience and deliver important mitigation benefits.	2.2.1 Establish and support multi-purpose tree nurseries 2.2.2 Enrichment plantation/Assisted natural regeneration in forest area	1 multi-purpose nursery established Enrichment plantation/ANR implemented on 94.2 ha of community managed forest land.
Output 3: Minimized impacts of climate induced disasters (erosion and landslides/sedimentation)			
3.1 Controlling erosion/landslide and management of sedimentation	Construct local structures, as well as bioengineering that will reduce community vulnerability to erosion and landslides.	3.1.1 Landslide treatment 3.1.2 Construction of check dams and bioengineering for gully/Debris torrent protection	Establish relevant structures and practices to stabilize 4 landslides and 7 gully/debris torrents mostly in Churia hills
3.2 Conservation and management of water sources	Management of existing water sources that will enhance water availability	3.2.1 Conservation of water sources	4 water sources conserved
3.3 Strengthening disaster risk management and awareness creation on climate resilient NRM	Improving disaster risk management in collaboration with local government and capacity strengthening for disaster risk reduction, as well as awareness creation for climate resilient natural resource management	3.3.1 Strengthening climate and disaster risk reduction mechanism in collaboration with local government 3.3.2 Training/capacity building on soil and watershed conservation using bio-engineering 3.3.3 Climate resilient awareness campaign through Eco-clubs	5 days training for Government staffs/CBFMG/Farmer groups on soil and watershed conservation using bio-engineering Student-run eco-clubs established
Output 4: Farmers adopted Climate resilient farming practices			
4.1 Establish and operationalize Farmers field schools (FFS)	Establish training sites on which farmers can be trained on climate resilient farming practices during and after the project.	4.1.1 Operationalize Farmer's Field Schools on adopting climate resilient land use practices 4.1.2 Capacity-building in the use of weather information and its application in agricultural practices	2 FFS established and operational
4.2 Implementation of climate-resilient land use practices (pest and disease minimized, soil quality improved, irrigation facility enhanced)	Support and strengthen farmers' capacities to adopt/apply climate-resilient farming practices in their own fields.	4.2.1 Implement climate resilient agriculture practices (including pest and disease control, soil quality improvement, irrigation facility enhancement) 4.2.2 Support development of groundwater irrigation facilities 4.2.3 Promotion of drip irrigation system in dry areas	Climate-resilient land use practices adopted/applied in 800 ha of farmlands

Activities	Description	Sub-activities	Remarks/Deliverables
		4.2.4 Establish seed bank to conserve and promote climate resilient native agricultural crops 4.2.5 Trainings on selection, grading and storage of quality seeds 4.2.6 Provide technical and financial support to establish community composting centre 4.2.7 Training on Integrated Pest management (IPM)	
4.3 Agroforestry promotion and livestock management	Support and strengthen farmers' capacity to adopt/apply suitable agroforestry and livestock management practices on their own land.	4.3.1 Promote agroforestry with multiyear cropping/horticulture/on-farm conservation 4.3.2 Training and support on commercial livestock farming and shed improvement 4.3.3 Promote fodder banks in private land	Agroforestry established in 140 ha marginal land
Output 5: Integrated gender and equity issues in governance practices in NRM/ CRLUP and management			
5.1 Increase access of women to SNRM and knowledge and information	Establish platforms for women's involvement and access to knowledge and information, as well as build capacity in natural resource management and climate resilient land use practices	5.1.1 Create informal learning and sharing platforms for grassroots-level women 5.1.2 Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership 5.1.3 Produce and publish best practices and learning in gendered governance	With enhanced access to knowledge and information, more women involved in in natural resource management and climate resilient land use practices
5.2 Integrate gender in local planning processes in SNRM	Sensitize CBOs, women groups, local government and other concerned stakeholders on gender responsive information, available provisions and resources to ensure GESI integration in local planning processes for natural resource management and climate resilient land use practices	5.2.1 Conduct rapid assessment on women's contribution and involvement in SNRM 5.2.2 Provide gender mainstreaming trainings/ workshops to local government and CBOs and concerned stakeholders 5.2.3 Conduct GESI focused social audits and public hearing 5.2.4 Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups 5.2.5 Engage male involvement to advocate gender and women's issues and concern in campaign	GESI integration ensured in in local planning processes for natural resource management and climate resilient land use practices

Annex-2: List of Participants

A. Problem and Solution Analysis Workshop

S. N.	Name of Participants	Address	Institution	Designation	Contact No.
1	Hari Krishna BhatTerai	Barahakshetra-2	Barahakshetra Municipality-2	Ward Chairman	9852055864
2	Karna Bahadur Khadka	Barahakshetra-2	Bayarban CFUG	Chairman	9842558014
3	Pushpa Deep Poudel	Barahakshetra-2	Bayarban CFUG	Member	9842034553
4	Nagendra Giri	Dharan-17	Patnali CFUG	Vice Chairman	9817336274
5	Sesh Kumari Ghimire	Dharan-17	Patnali CFUG	Secretary	9819315943
6	Yuvaraj BhatTerai	Barahakshetra-2		Mediator	9841658028
7	Ranjit Lohani	Barahakshetra-1			9804323530
8	Buddharaj Bhandari	Barahakshetra-1	Jalkanya CFUG	Treasurer	9842965579
9	Laxmiram Karki	Dharan-17	Singhadevi CFUG	Chairman	9814380500
10	Tek Maya Pandey (Thapa)	Barahakshetra-2	Adarsha CFUG		9842115042
11	Amar Bahadur Katuwal	Barahakshetra-2	Adarsha CFUG	Secretary	9842093184
12	Mohan Kafle		Adarsha CFUG		9805373558
13	Kaman Singh Rai	Barahakshetra-1	Singhadevi CFUG		9861951336
14	Jitendra Rai	Barahakshetra-2	Adarsha CFUG		9842041254
15	Ambika Gajmer	Barahakshetra-2	Adarsha CFUG		9818226238
16	Ram Bahadur Shrestha	Barahakshetra-2			9842083270
17	Prakash Rai	Barahakshetra-2	Bayarban CFUG		9842114464
18	Laxmi BhatTerai	Barahakshetra-2	Adarsha CFUG		9842145688
19	Garjaman Shrestha	Barahakshetra-1	Bageshwori CFUG	Chairman	9815322459
20	Prahlad Thapa	Barahakshetra-2	Adarsha CFUG	Advisory Committee Member	9842080713
21	Upendra Marek	Barahakshetra-2			9842064373
22	Ambika Karki	Barahakshetra-2	Bayarban CFUG	Treasurer	9815380200

Disaggregated Participants Data

S. N.	Name of Participants	Gender		Ethnicity						
		Male	Female	Janajati	Dalit	Brahmin	Chhettri	Dasnami	Madhesi	Muslim
1	Hari Krishna BhatTerai	1				1				
2	Karna Bahadur Khadka	1					1			
3	Pushpa Deep Poudel	1				1				
4	Nagendra Giri	1						1		
5	Sesh Kumari Ghimire	1				1				
6	Yuvaraj BhatTerai	1				1				
7	Ranjit Lohani	1				1				
8	Buddharaj Bhandari	1				1				
9	Laxmiram Karki	1					1			
10	Tek Maya Pandey		1			1				
11	Amar Bahadur Katuwal	1					1			
12	Mohan Kafle	1				1				
13	Kaman Singh Rai	1		1						
14	Jitendra Rai	1		1						
15	Ambika Gajmer		1		1					
16	Ram Bahadur Shrestha	1		1						
17	Prakash Rai	1		1						
18	Laxmi BhatTerai		1			1				
19	Garjaman Shrestha	1		1						
20	Prahlad Thapa	1					1			
21	Upendra Marek	1								
22	Ambika Karki		1				1			
Total		**18**	**4**	**5**	**1**	**9**	**5**	**1**	**0**	**0**

B. Expert Planning Workshop

River Systems	Patnali, Kokaha and Budhi
Date of Workshop	August 10 - 11, 2022
Venue	Hotel Maden Inn
Location	Itahari, Sunsari

S. N.	Name of Participants	Address	Institution	Designation	Contact No.
1	Bhim Bahadur Kalikote	Sunsari	Division Forest Office, Sunsari	Divisional Forest Officer	9852055363
2	Dilip Prasad Gupta	Dharan, Sunsari	Province Forest Directorate	Assistant Forest Officer	9842552666
3	Mahesh Kumar Shah	Sunsari	Sub Division Forest Office, Tarahara	Assistant Forest Officer	9842990026
4	Shishu Raj Jha	Sunsari	Sub Division Forest Office, Baraha	Forest Ranger	9865175866; 9824055363
5	Khadga Bahadur Tamang	Salakpur, Morang	President Chure Terai Madesh Conservation Development Board, Salakpur	Assistant Soil Conservation Officer	9852051053
6	Chunu Adhikari	Sunsari	Sub Division Forest Office, Tarahara	Forester	9842350178
7	Chandra Bahadur Bamai	Dharan, Sunsari	Sub Division Forest Office, Bishnupaduka	Forest Officer	9860137607
8	Ishwori Bastola	Sunsari	Sub Division Forest Office, Panchkanya		9842497038
9	Desh Bahadur Tamli	Sunsari	Agriculture Knowledge Center, Sunsari	Agriculture Officer	9842116378
10	Alisha Khadka	Biratnagar, Morang	Agriculture Development Directorate, Biratnagar	Crop Development Officer	9861870696
11	Kai Michael Windhorst	Kathmandu	FAO-TA CCLuP	Climate Change Specialist	9802330259
12	Sushil Bhandari	Itahari	BRCRN-PPMU	Coordinator	9852074805
13	Umesh Budhathoki	Itahari	BRCRN-PPMU	Assistant Soil Conservation Officer	9857085564

Annex-3: Activities, Location and Budget Plan

Note: The location coordinates of planned activity sites listed in table below are the result of participatory mapping exercise conducted with local stakeholders who demarcated the intervention location in the map with google image in background. Some of the locations (approximately 30% of the sites) are verified in the field for their accuracy and validity. However, due to time and resource constraint for field verification, all identified location coordinates are not verified in field. Hence, location coordinates mentioned in CERP activity sites need further field verification before the implementation. Locations are subjected to change as per the field findings and verification result. Intervention site coordinate mentioned in this CERP Annexes should be taken only as initial guidance to start the field process and, if they are found inappropriate during the field verification, the technical team from PPMU can conduct location changes with proper documentation of field condition.

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
Support review/upgrade/renew of forest operation plans (FOPs) of community forest user groups (CFUGs)	No	17	200,000	3,400,000	Starting from Community Based Forest Management Groups (CBFMGs) with higher willingness to participate and not having any technical and financial dispute			M1.1
Training and capacity development for implementation of FOPs	No	17	250,000	4,250,000				M1.2
Equipment support for implementation of FOPs	No	17	200,000	3,400,000				M1.3
Capacitate government staffs and CBOs on climate resilient forest management (Training of Facilitators-TOF)	Event	2	300,000	600,000				M1.4
Governance training to government staffs and CFUGs to enhance accountability and transparency	Event	10	240,000	2,400,000				M1.5
Handover of government forest to community	No	1	500,000	500,000	Barahakshetra NP-2			M1.6

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
Establish real time monitoring system to strengthen forest monitoring mechanism (installation of CCTV etc.)	LS	1	1,000,000	1,000,000				M1.7
Establish and support multi-purpose tree nurseries (150,000 capacity)	No	1	1,000,000	1,000,000	Chakargatti Sub-division			M2.1.1
Production of saplings	No	150,000	40	6,000,000				M2.1.2
Enrichment plantation	ha	6.7	50,000	337,315.85	Adarsha CF	87.1643	26.8092	M2.2.1
	ha	3.1	50,000	155,515.25	Adarsha CF	87.172	26.8193	M2.2.2
	ha	1.6	50,000	77,906.40	Adarsha CF	87.1696	26.8159	M2.2.3
	ha	1.6	50,000	79,748.20	Adarsha CF	87.179	26.818	M2.2.4
	ha	4.7	50,000	237,336.65	Bageshwori CF	87.1873	26.8171	M2.2.5
	ha	17.6	50,000	880,272.95	Jalakanya CF	87.1562	26.8453	M2.2.6
	ha	0.6	50,000	28,359.75	Jalakanya CF	87.1554	26.8426	M2.2.7
	ha	2.3	50,000	115,742.85	Jalakanya CF	87.171	26.851	M2.2.8
Implement Assisted Natural Regeneration	ha	18	20,000	360,000	Adarsha cf	87.1699	26.8177	M2.3.1
	ha	17	20,000	340,000	Bageshwori cf	87.184	26.8189	M2.3.2

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
	ha	9	20,000	180,000	Sinhadevi cf	87.2006	26.8448	M2.3.3
	ha	12	20,000	240,000	Jalakanya cf	87.1652	26.8475	M2.3.4
Formation of fire fighter group and mobilization	CFUG	10	50,000	500,000				M2.4.1
Firefighter training and support firefighting equipment to CFUGs	CFUG	10	300,000	3,000,000				M2.4.2
Support firefighting equipment to security institutions (APF, Nepal Police, Nepal Army)	Sets	5	150,000	750,000				M2.4.3
Training and equipment support to promote compost production from bushes and leaf litters	CFUG	3	150,000	450,000	Patnali CF, Bageshwori CF & Bayerban			M2.4.4
Construction and improvement of fire lines	Km	4	300,000	1,200,000	Adarsha CF & Bageshowri CF			M2.4.5
Customize fire alert system in Community Based Forest Management (CBFM)	No	1	LS	300,000				M2.4.6
Training and support on commercial livestock farming and shed improvement	Household (Hh)	10	100,000	1,000,000	Punarbas (Adarsha CF)			M2.5.1
	Hh	25	100,000	2,500,000	Chawacha & Badalbari, Athchale (Jalakanya CF)			M2.5.2
Promote fodder banks in private land	Hh	30	20,000	600,000	Adarsha CF			M2.6.1
	Hh	15	20,000	300,000	Sunkoshi Mahila CF			M2.6.2
	Hh	35	20,000	700,000	Bagawati CF			M2.6.3

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
	Hh	20	20,000	400,000	Patnali CF			M2.6.4
Skill development trainings and equipment support to poor/marginalized forest users	Hh	40	25,000	1,000,000				M2.7
Promote agroforestry with multiyear cropping/horticulture/on-farm conservation	ha	100	6,000	600,000	Athchale-Badalghari-Chawacha	87.1671	26.8452	A3.1.1
	ha	40	6,000	240,000	Katahare	87.1953	26.8312	A3.1.2
Landslide treatment	No	1	2,000,000	2,000,000	Bageshwori	87.1859	26.8311	A3.2.1
	No	1	2,000,000	2,000,000	Katahare	87.1899	26.8318	A3.2.2
	No	1	2,000,000	2,000,000	Suryakunda	87.1886	26.848	A3.2.3
	No	1	2,000,000	2,000,000	Barmanand Khola	87.1627	26.8675	A3.2.4
Construction of check dams and bioengineering for gully/debris torrent protection	No	4	LS	2,500,000	Upstream of Dudhpani Khola	87.1676	26.8508	A3.3.1
	No	1	LS	2,000,000	Upstream of Dudhpani Khola	87.1672	26.8515	A3.3.2
	No	2	LS	2,000,000	Upstream of Dudhpani Khola	87.1657	26.8491	A3.3.3
	No	1	LS	2,000,000	Upstream of Dudhpani Khola	87.1623	26.8493	A3.3.4
	No	3	LS	2,500,000	Upstream of Rani Khola	87.1613	26.8425	A3.3.5
	No	2	LS	2,000,000	Chyabari	87.197	26.8417	A3.3.6
	No	2	LS	2,000,000	Chyabari	87.1954	26.8422	A3.3.7
Conservation of water sources	No	1	200,000	200,000	Rani Khola	87.1641	26.844	A3.4.1

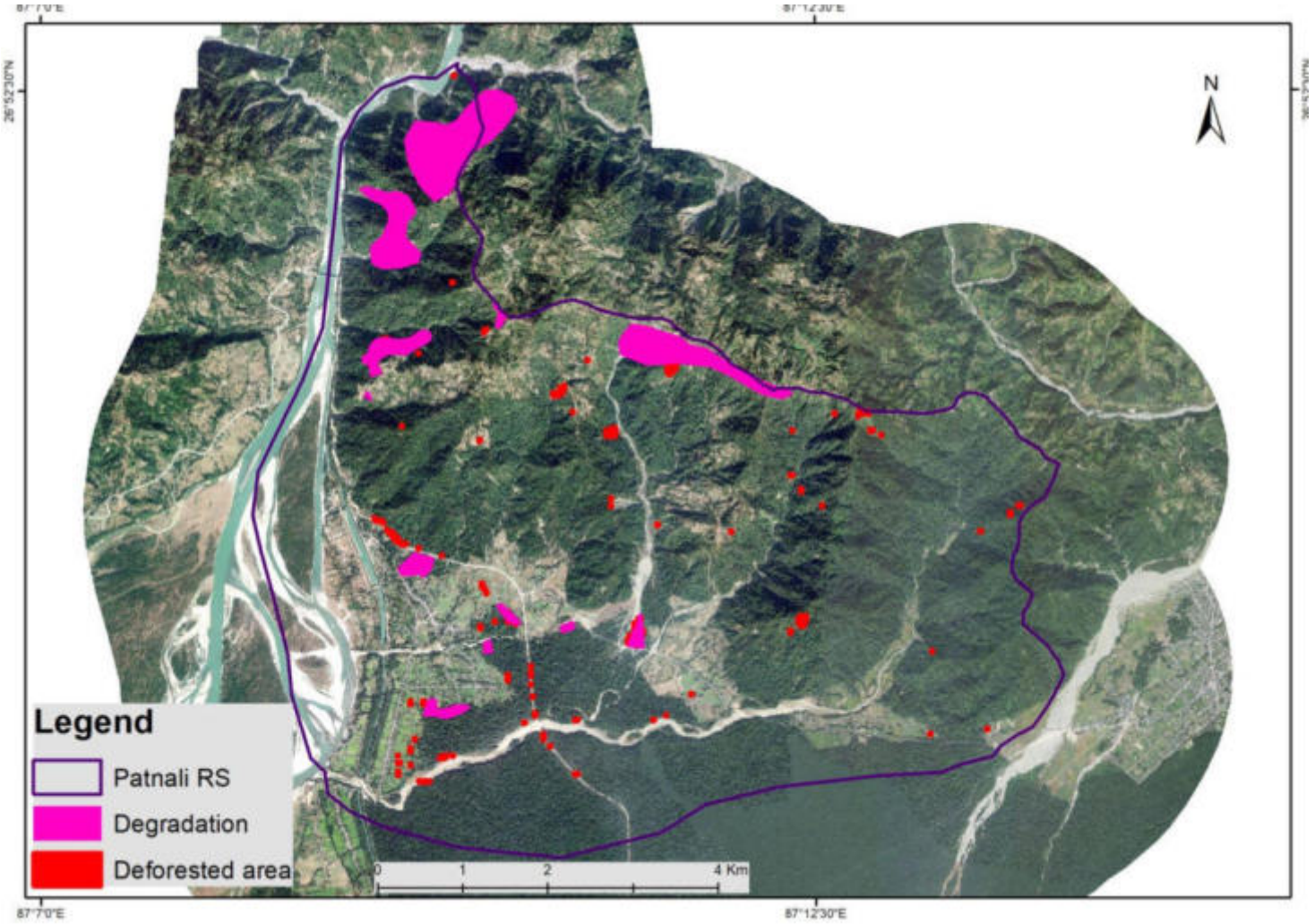
Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
	No	1	200,000	200,000	Gauri Khola	87.1688	26.8372	A3.4.2
	No	1	200,000	200,000	Bagh Khola	87.1963	26.8415	A3.4.3
	No	1	200,000	200,000	Dushpani	87.1699	26.8477	A3.4.4
Strengthening climate and disaster risk reduction mechanism in collaboration with local government	Municipality	1	300,000	300,000	Barahakshetra municipality			A3.5
Training/capacity building on soil and watershed conservation using bio-engineering	Event	1	500,000	500,000				A3.6
Climate resilient awareness campaign through Eco-clubs	School	2	50,000	100,000				A3.7
Identification and operationalization of FFS								A4.1
FFS at Haridwar Agriculture Cooperative	No	1	700,000	700,000	Athchale-Badalghari-Chawacha	87.171	26.8455	A4.1.1
FFS at Balchan Khoriya Agriculture Cooperative	No	1	700,000	700,000	Balchan Khoriya	87.1521	26.826	A4.1.2
Capacity-building in the use of weather information and its application in agricultural practices	No	2	100,000	200,000				A4.2
Implement climate resilient agriculture practices	ha	400	2,000	800,000	Barahakshetra NP-1			A.4.3.1
	ha	400	2,000	800,000	Barahakshetra NP-2			A.4.3.2
Support development of groundwater irrigation facilities (Putalitol, Punarbas, Railwayline, Pulkedanda)	No	20	250,000	5,000,000	Putalitol, Punarbas, Railwayline, Pulkedanda			A4.4
Promotion of drip irrigation system in dry areas	No	2	50,000	100,000	Balchan Khoriya	87.1521	26.826	A4.5

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code
Establish seed bank to conserve and promote climate resilient native agricultural crops	No	1	2,500,000	2,500,000	Bayerban			A4.6
Trainings on selection, grading and storage of quality seeds	Event	5	50,000	250,000				A4.7
Provide technical and financial support to establish community composting centre	No	1	200,000	200,000				A4.8
Training on Integrated Pest management (IPM)	Event	10	100,000	1,000,000				A4.9
Create informal learning and sharing platforms for grassroots-level women	Event	5	50,000	250,000				
Conduct local level policy discourses to ensure gender responsiveness and women's participation, access, control and leadership	Event	1	50,000	50,000				
Produce and publish best practices and learning in gendered governance	Event	1	50,000	50,000				
Conduct rapid assessment on women's contribution and involvement in SNRM	Event	1	100,000	100,000				
Provide gender mainstreaming trainings/ workshops to local government and CBOs	Event	1	100,000	100,000				
Conduct GESI focused social audits and public hearing	Event	2	150,000	300,000				
Conduct advocacy campaign and promote awareness on gender responsive information, available provisions and resources among CBOs/ women groups	Meeting	3	50,000	150,000				
Engage male involvement to advocate gender and women's issues and concern in campaign	Event	2	50,000	100,000				
Total				**77,172,197.90**				

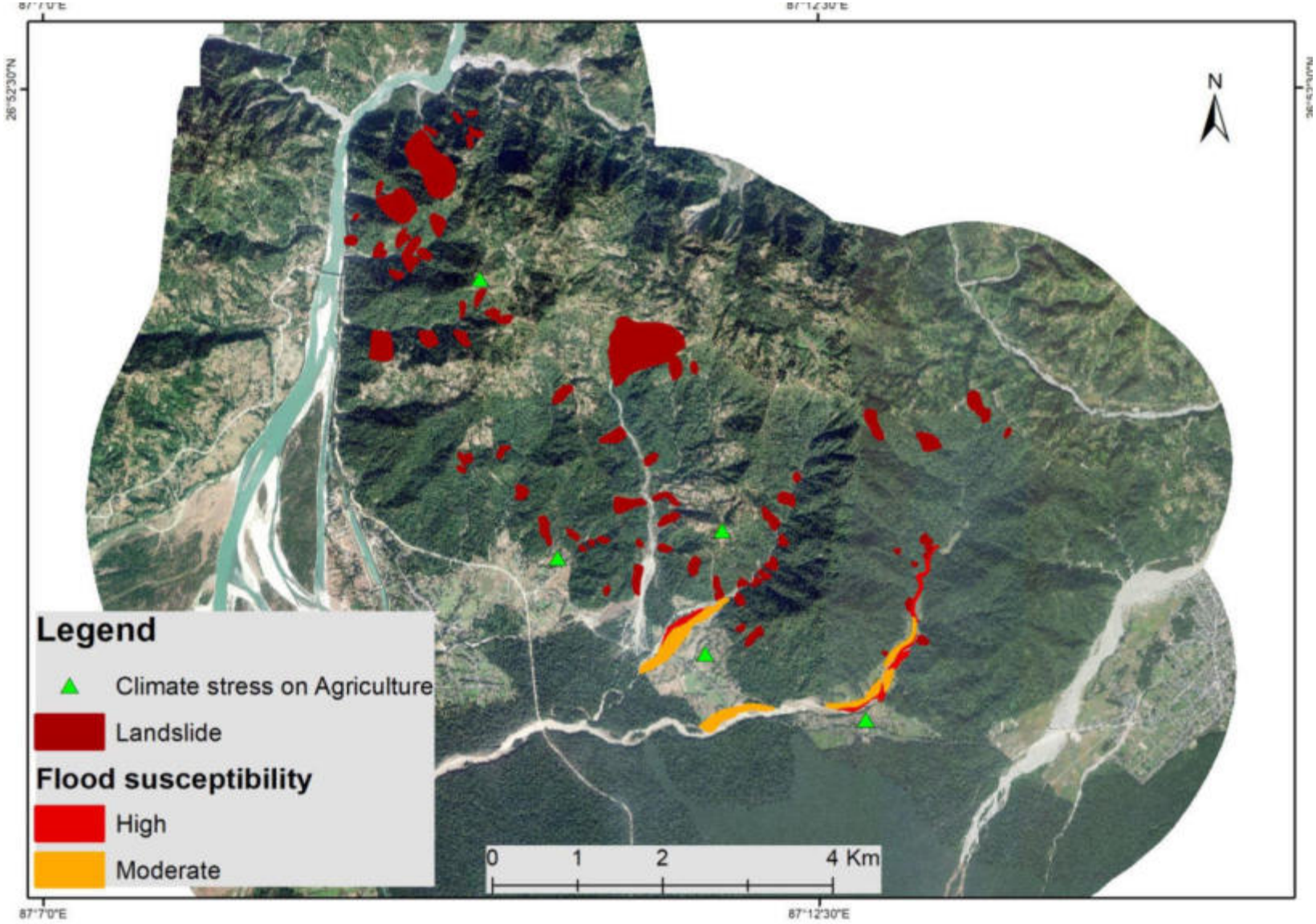
Note: Activity location and coordinates are subjected to change based on field condition before the implementation. BRCRN PPMU offices can make the necessary changes with proper documentation of field condition

Annex-4: Maps

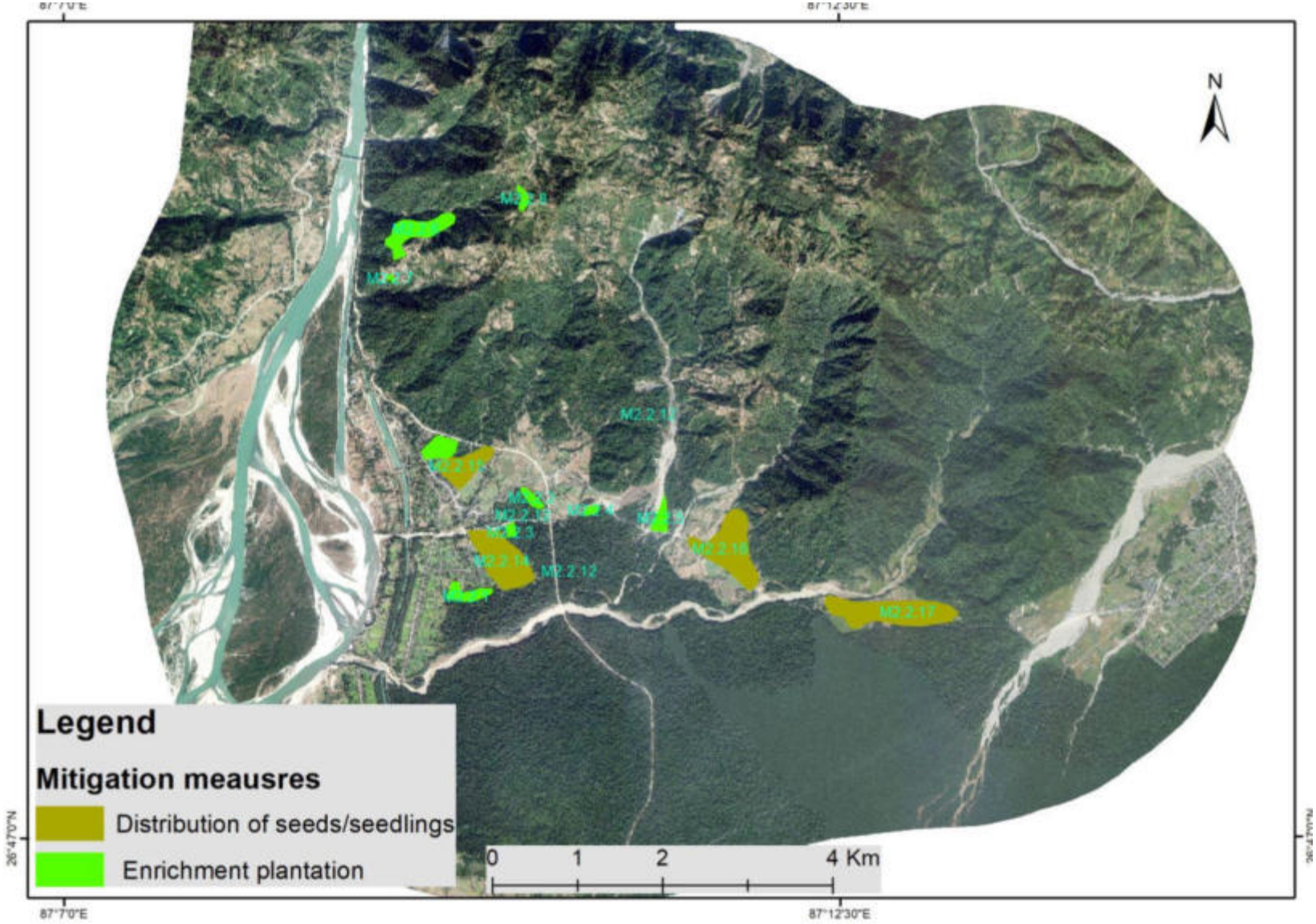
Hotspots for Forest Loss (D&FD)



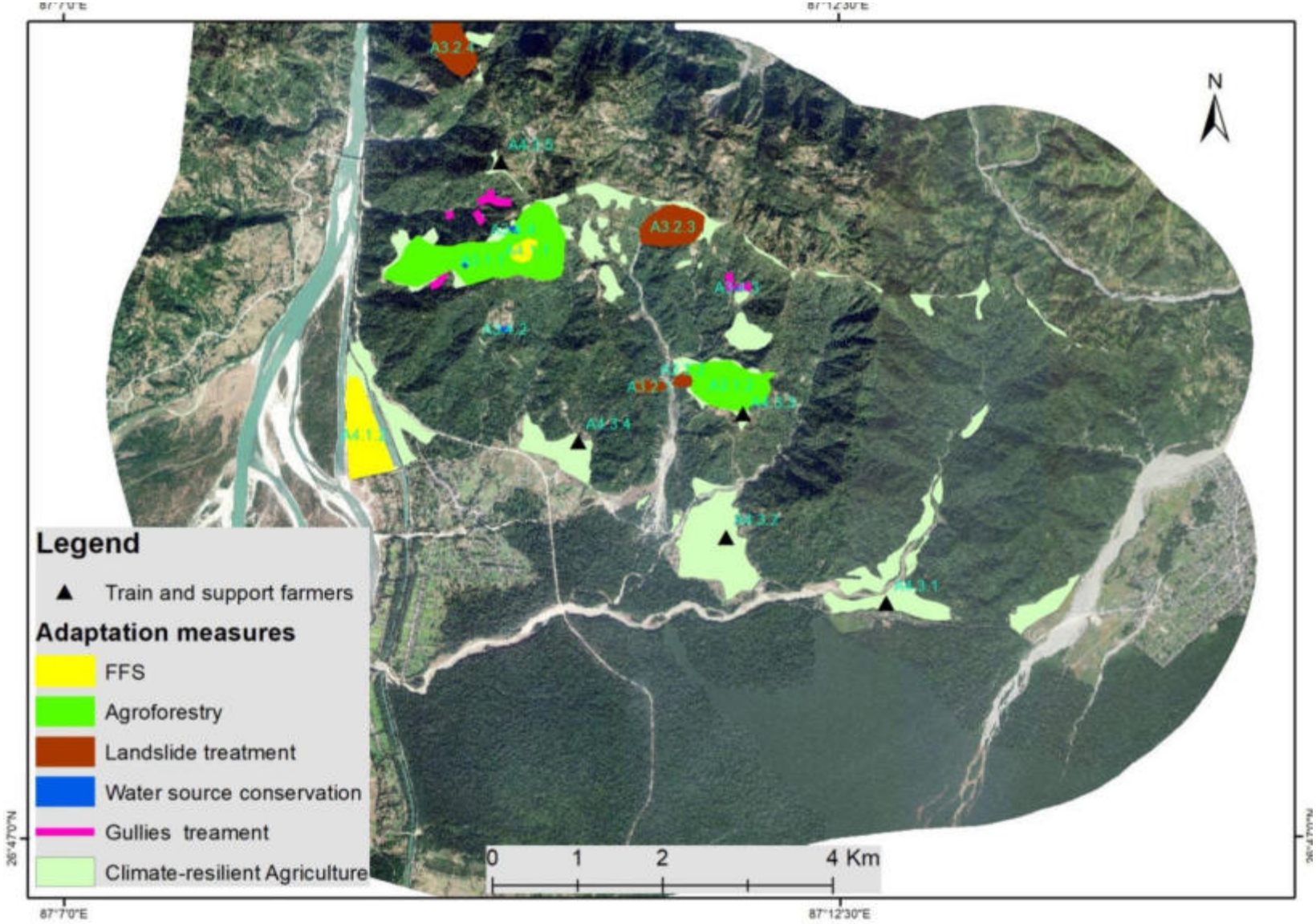
Hotspots for Climate Adaptation



Final Activity Map for Mitigation



Final Activity Map for Adaptation



Annex-5: Photographs

A. Problem and Solution Analysis Workshop

B. Expert Planning Workshop

C. Hotspot Verification

D. Focus Group Discussions and KII