Critical Ecosystem Restoration Plan (CERP)
of
Kokaha River System

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

Building a Resilient Churia Region in Nepal (BRCRN)

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 ।

२०८०।२।२६

National Project Director

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

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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 led 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.

Kokaha river system originates from Mahabharat range, flows west, and drains to Saptakoshi River at Barahakshetra. It constitutes of Lesser Himalaya and Chure hillslope, extended over 26.833863°to 26.896373°N and 87.164217°to 87.275092°E. Forest is the dominant land cover, covering 69.8 % of total area, which has been increased at the annual rate of 0.5% during 2000-2019. 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 Kokaha 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; pests and 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. The activities are also designed with focus on upstream-downstream linkages. The activities such as agroforestry, plantation to improve forest/tree cover, gulley control, landslide treatment, and climate resilient land use practices to build resilience of farming households against climate change impacts in Chure hills are intended to enhance resilience against climate-induced soil erosion, reduce soil runoff and enhance infiltration thus reducing risks related to sedimentation and flooding in lowlands. However, geographic focus of activities are not considered as a primary criterion for activity grouping during IPack formulation, as river systems such as Kokaha, that entirely fall in upstream Churia region and has similar terrain, topography and geological variations throughout where similar problems and solutions apply across the entire river system area.

CHAPTER 1 : 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.
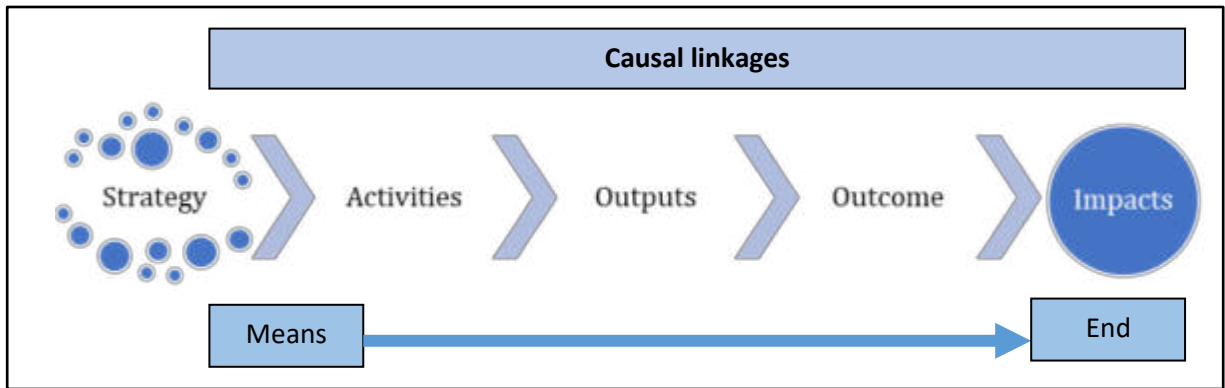
(Source: CERP manual, 2021)

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.
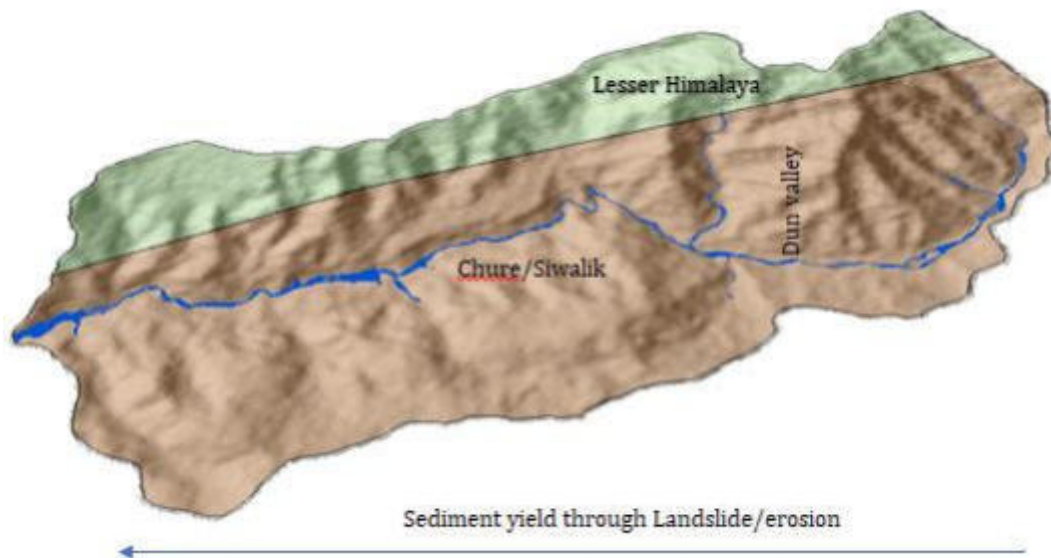
Figure 2: Upstream-downstream linkages in Kokaha river system

Sediment generates through erosion and slope failure process in the upstream cause temporary aggradation and transport to Saptakoshi River.

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

Step 9: Development of workflow and finalization of intervention packages
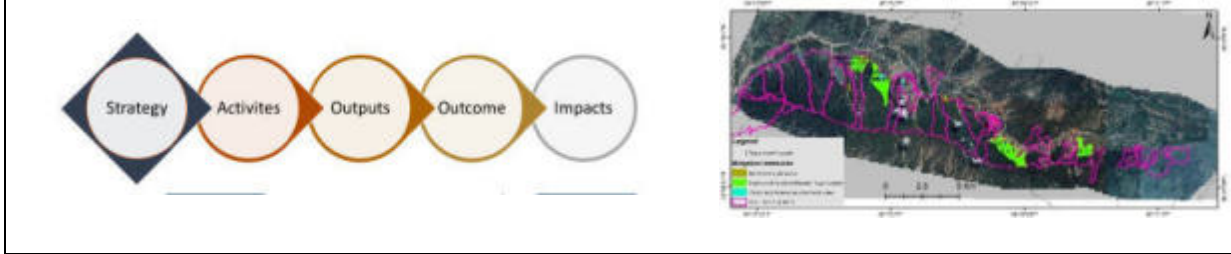
Figure 3: Steps of spatial analysis for CERP development

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)	
	Settlement exposed to flood hazard	Settlement	Land cover, 2015 (PCTMCDB, 2016)	Overlay analysis
	Wetland/water recharge	Wetland/water recharge	Wetland (DoS, 1996 & PCTMCDB, 2016)	
	House structure			Spatial representation was created on then VDCs and transferred into river systems
	Ethnicity	Indices	CBS, 2011	
	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:
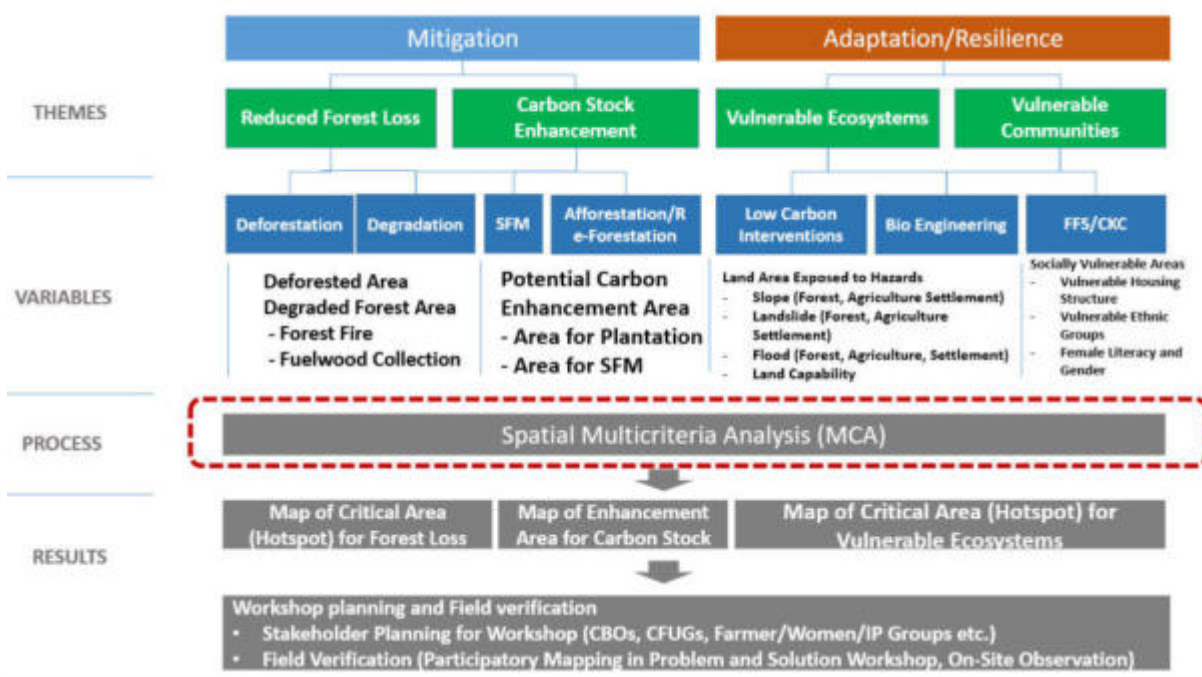

Figure 4: Multi-criteria analysis

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, School Management Committee and Dharan Sub-metropolitan City, ward-20 office while considering social inclusion i.e. representatives from women, poor, Indigenous Peoples (IPs) and Dalits. There were nine participants in total. Among the participants, all of them were from IP groups, and altogether two females and seven males (Annex 2).

2.3.2   Workshop

The two-day workshop was organized on 14 and 15 January 2022 at ward 20 office yard of Dharan Sub-metropolitan City, Bishnupaduka, 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 Madhesh 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 KOKAHA RIVER SYSTEM

3.1 Physiography, Land Cover and Hydrology

Kokaha river system originates from Mahabharat range near to Dharnegaun, flows west, and drains to Saptakoshi river at Barahakshetra. It constitutes of Lesser Himalaya and Chure hillslope, extended over 26.833863° to 26.896373°N and 87.164217° to 87.275092°E.
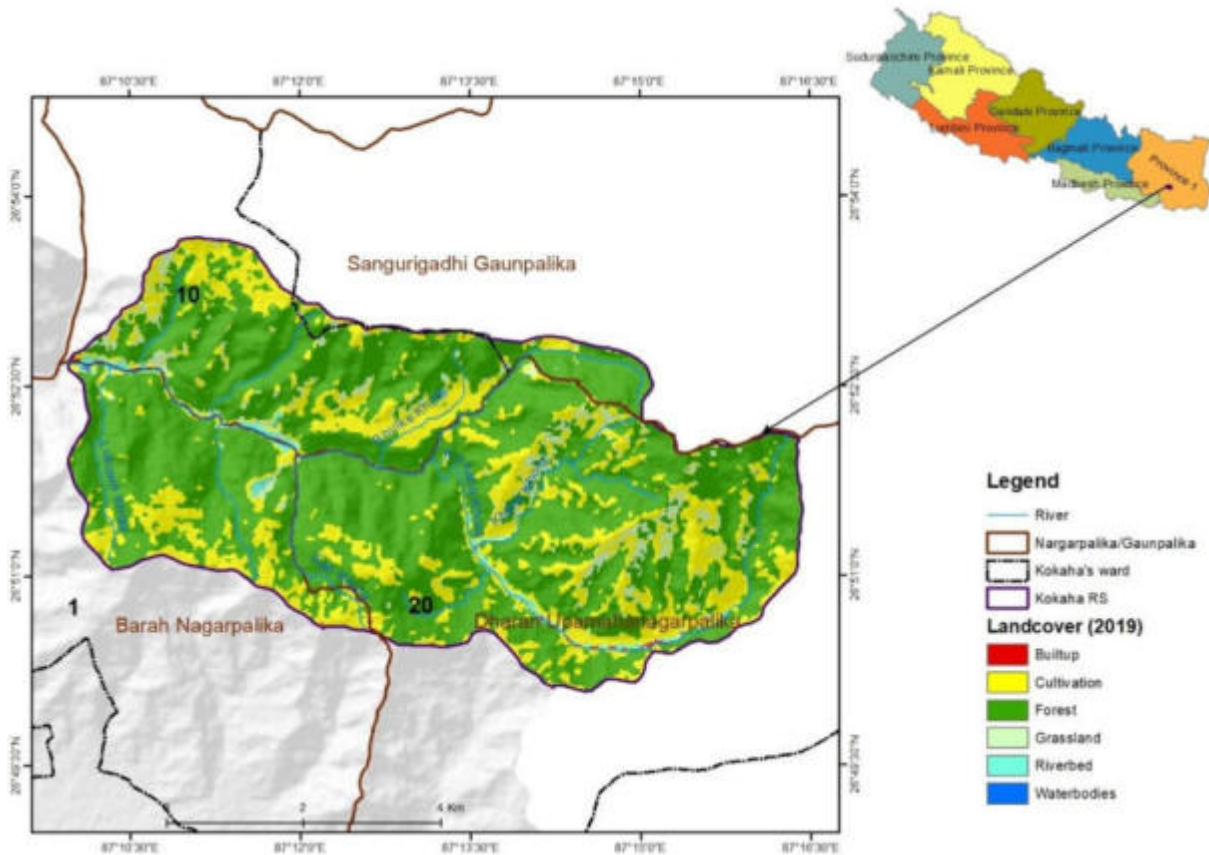
Figure 5: Location of Kokaha river system

The Kokaha RS is composed of Lesser Himalaya group in the north and Siwalik group to the south. Thus, Chure hillslope is composed of Lower Siwaliks (LS), and Middle Siwaliks (MS) (DMG, 2007). The Lower Siwalik in this river system is 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).
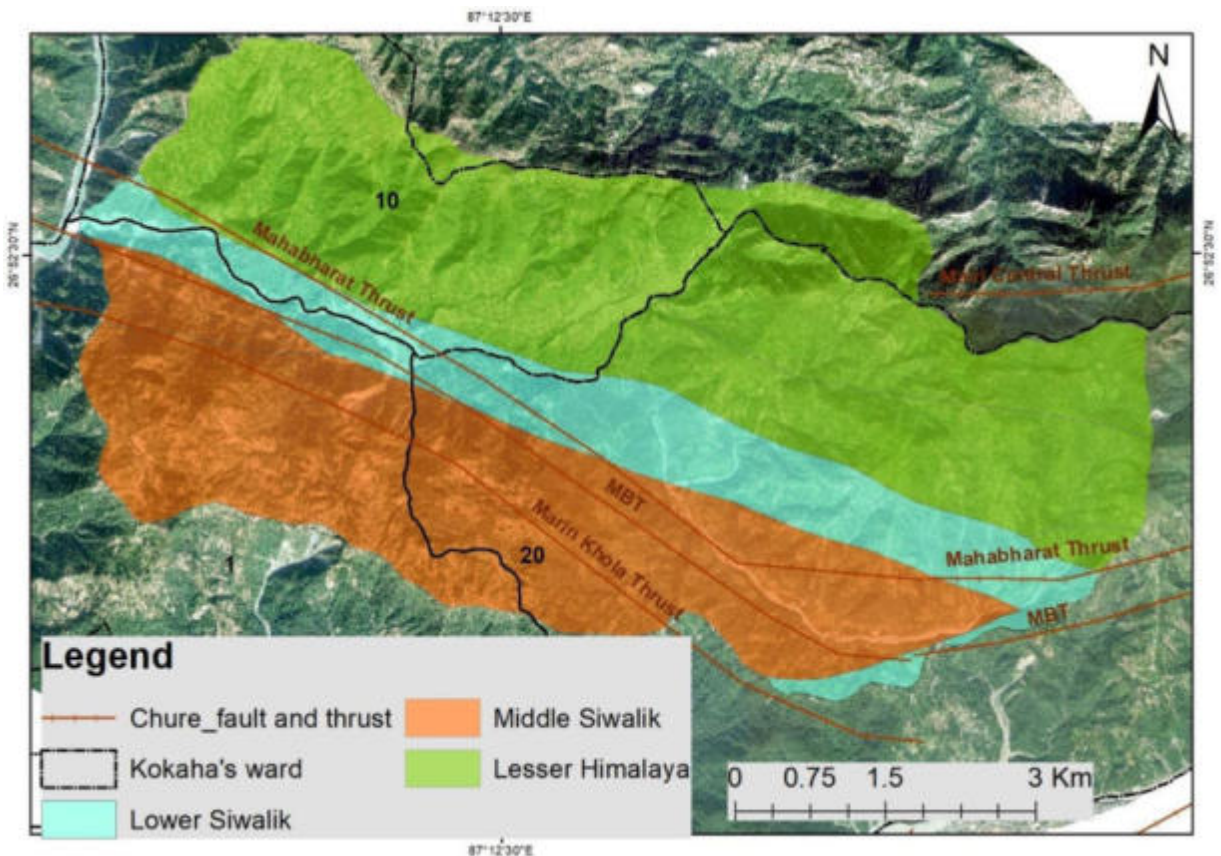
Figure 6: Geology of Kokaha river system

Forest[1] is the dominant land cover of RS, covering 69.8 % of total area, which has been increased by 272.6 ha at the annual rate of 0.5% during 2000-2019. More than 400 ha of cultivated land has been abandoned during last two decades, out of which few patches have been converted into forest through natural succession. Likewise, farmers are increasingly adopting agroforestry, also contributing to increase greenery in RS.

Table 2: Land cover change in Kokaha river system

Land cover	2000		2019		Change area (ha)	Rate of Change (%/yr)
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)		
Built-up	4.2	0.1	5.6	0.1	1.4	1.50
Cultivation	1288.0	29.6	1052.2	24.2	-235.8	-1.06
Forest	2763.1	63.5	3035.7	69.8	272.6	0.50
Grassland	234.1	5.4	202.0	4.6	-32.0	-0.77

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[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.

| Water bodies | 0.5 | 0.0 | 0.8 | 0.0 | 0.3 | 2.57 |
| Riverbed | 60.0 | 1.4 | 53.6 | 1.2 | -6.5 | -0.60 |

Source: (ICIMOD & FRTC, 2021)

Kokaha is perennial stream and Hydest WEC-DHM method estimated that overall discharge at the driest month (April) is 0.42m³/s and high discharge (7.97m³/s) occurred on August. However, the surface discharge across aggradation region is not visible during dry period.

Table 3: Average monthly discharges in Kokaha and its tributaries

Month	Long Term Average Discharge (m³/s)
January	0.58
February	0.50
March	0.44
April	0.42
May	0.53
June	2.11
July	6.49
August	7.97
September	6.20
October	2.71
November	1.24
December	0.81

3.2 Climatic Conditions

The RS has subtropical climate and is heavily influenced by the monsoon (June-September), with an average annual rainfall of 2159.6 mm (DHM, 2021). The temperature ranges from 10^0 to 32^0 Celsius. The south facing hillslope in the eastern part of RS are relatively dry because of less rainfall and poor retention of soil water moisture.

Table 4: Rainfall distribution in Kokaha river system

Station	Average long-term rainfall (mm)		
	Annual	Monsoon	Maximum 24 hours
Barahkshetra	2539.2	2163.3	403
Dharan Bazar	2242.8	1760	405.3
Chatara	2169.6	1767	348

Source: (DHM, 2021)

The 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 5: Climate change scenario in Kokaha river system

	⁰C	Change (⁰C)			
Temperature	**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
	mm	**Change (%)**			
Precipitation	**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

The Janajati/ethnic (Rai, Magar, Tamang, etc.) are the main indigenous groups in RS comprising more than 90 % of the total household. People are increasingly practicing commercial vegetable farming together with pig and goat farming. In recent year, multiyear cropping such as Amriso (*Thysanolaena maxima)*, Turmeric, Ginger, Akabare (Cherry chili) and horticulture including citrus fruits are increased due to proximity of Dharan bazar.

The upper half of the RS characterized by the debris flow and aggradation in the river channel is high, whereas channel incision is seen along the lower half, resultant the complex slope failure. Furthermore, incision phenomenon has been exaggerated by the sand, stone and gravel mining in the downstream.
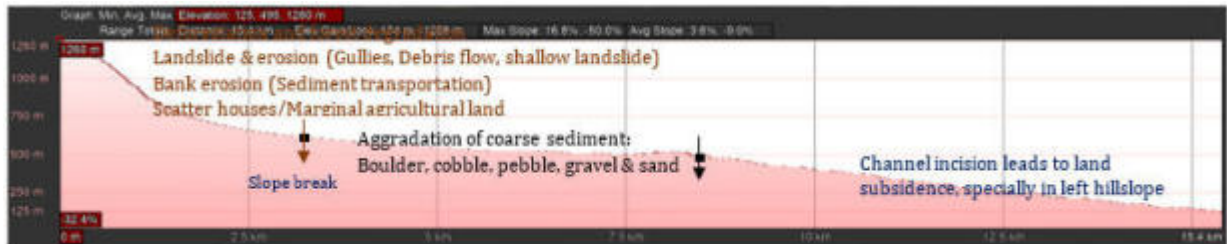
Figure 7: Elevation profile of Kokaha RS, showing natural and social process

CHAPTER 4 : PROBLEM AND SOLUTION ANALYSIS

3.1 Problem Analysis

Theme 1: Climate Change Mitigation

3.1.1 Drivers and Underlying Causes of Deforestation and Forest Degradation

The drivers of forest loss in Kokaha river system are usefully separated into direct drivers and underlying causes. The drivers are mostly associated with anthropogenic activities. Nevertheless, natural disaster, ineffective law enforcement and weak forest governance also contribute to forest loss.

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

Table 6: 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, destroy insects like ticks; Intentional fire to avoid fire spread to settlements
	Inadequate preparations for forest fire management	Inadequate skilled human resources for firefighting; Inadequate firefighting equipment in CFUGs; Inadequate efforts in removal of dry biomass accumulated in forest floor
Unsustainable/ illegal harvesting	Demand-supply gap of forest products	Delay in harvest and supply of forest products from community forests (CFs); Outdated operational plans for forest management
	Poverty and limited income generation opportunities for women, IPs, Dalits, poor and marginalized	
	Inadequate fodder, firewood in private lands	Small landholdings
Ineffective forest management practices	Inadequate financial and technical capacity of CFUGs	Low income of CFUGs; Low support from concerned agencies
	Problems in forest enhancement	Outdated forest operational plan (FOPs); Impact on natural regeneration due to

Drivers of D&FD	Underlying Causes	
		forest fire, open grazing, fodder and firewood collectors; Inadequate supply of saplings of demanded species; Expansion of invasive species
	Weak governance	Declining accountability of CFUG members; Deficiency in forest sector transparency
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 to serve scattered settlements

❖ **Problem Analysis**

The major drivers of forest loss identified at Kokaha River System are erosion, landslides, riverbank cutting road construction and forest fire. However, the issue of land ownership cannot be overlooked.

Fragile geological condition and slope terrain of Chure hills together with forest degradation make the river system vulnerable to erosion and landslide. It is further enhanced by high intensity rainfall, continuous rainfall for several days and anthropogenic activities like construction of road without adopting detail engineering study and design. High intensity rainfall and continuous rainfall for several days trigger flash floods. Unmanaged excavation of riverbed materials enhances riverbank cutting during the flood, which is one of the causes of forest loss (Figure 8).
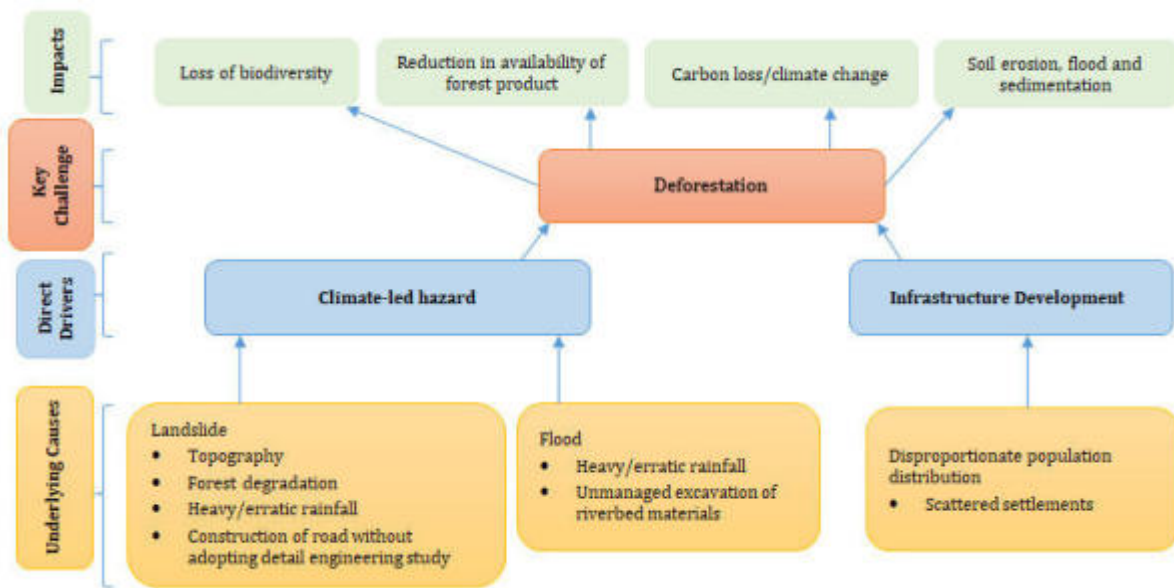
Figure 8: Problem tree for deforestation
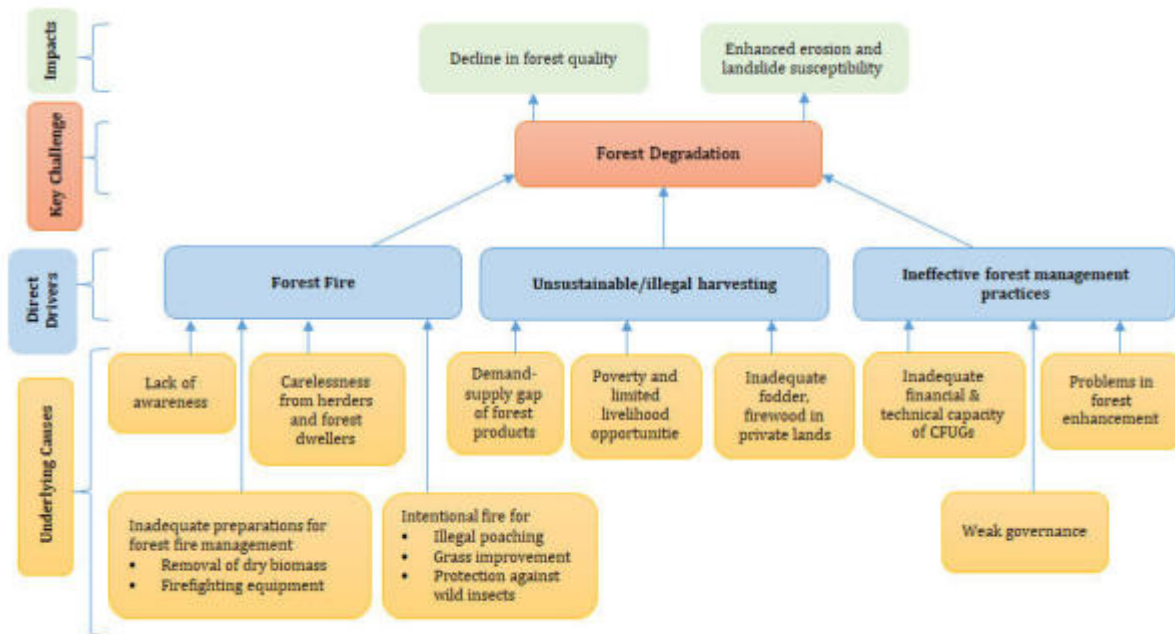
Figure 9: Problem tree for forest degradation

Forest fire is other 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 lack of specified grazing lands and inadequate fodder and grasses in private lands. It has reduced impacts of open grazing. Forest fire is also caused intentionally. Poachers intentionally start forest fire to make easy stalking the prey. It is also caused for grass improvement. In some cases, forest fire is caused intentionally to destroy insects like ticks. The spread of forest fire has been difficult to handle due to inadequate preparations for forest fire management like fire line management, removal of dry litters, twigs, and bush clearance. Besides, CFUGs also lack firefighting equipment. The active involvements of CFUGs have gained huge success in control of open grazing, unsustainable harvesting, illegal logging and encroachment. However, illegal harvesting of forest products and open grazing still exists. It is because of poor, marginalized people whose livelihood depends on forest resources. Ineffective forest management practice is also one of the drivers of forest degradation. It is mainly associated with institutional weakness caused by lower financial capacity and technical resources of CFUGs; poor forest enhancement; and weak forest governance due to deficiency in forest sector transparency, declining accountability, and weak coordination and cooperation among forest stakeholders (Figure 9).

❖ **Key Observations**
  • Nowadays, 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.
  • There is sufficient production of saplings in nurseries of sub-division forest offices 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 are 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

3.1.2 Drivers and Underlying Causes of Vulnerable Ecosystem and Community

Climate induced disaster risk and climate impact on agriculture are the two key challenges representing the vulnerable ecosystem and local community in Kokaha River System. These two key issues have impacts on the ecosystem and livelihood generation through damage to natural vegetation, physical properties and low agriculture productivity and yield loss.

The drivers are prioritized and presented in sequential order and presented in Table 7.

Table 7: 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

Drivers	Underlying Causes	
	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 promotion	Governments failure to identify and support real farmers (dominance of elites/paper farmers); Inadequate promotional activities (seed money, soft loans, subsidies)
	Poor market access and infrastructures	Higher cost of production and low market price of sale; Lack of processing and storage facilities
Insufficient irrigation	Limited water sources	Dry area
	Lack of conservation of water sources	
	Limited technological interventions for irrigation	Inadequate efforts to promote alternative irrigation practices like drip irrigation, rainwater harvesting etc.
	Inadequate investments in irrigation infrastructures	
Pest and diseases	Decline in organic content of soil	Use of chemical fertilizers and pesticides
	Less immune hybrid crop varieties	Loss or limited availability of native varieties; Higher production from hybrid varieties but less immune to pests and diseases
	Inadequate knowledge and skill on identification and treatments of pests and diseases	
Loss and damage of agricultural lands and crops	Climate-led hazards such as erosion, flood and heavy rainfall	
	Crop depredation by wildlife in the fields	

❖ **Problem Analysis**

The climate vulnerability to ecosystem and local community in Kokaha river system is subject to climate-led disasters- erosion, landslide and flood. 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 road without adopting detail engineering study and design and unmanaged excavations of riverbed materials are major anthropogenic causes. The sudden intense rainfall triggers flash flood with sediments. Haphazard excavation works add further risk during flood. It intensifies riverbank cutting resulting in loss of agriculture land and vegetation along the riverbanks. Weak disaster risk management has further increased exposure to these disasters. The reasons behind this are weak coordination and collaboration among concerned sectors and inadequate, scattered investments in DRR (Figure 10).
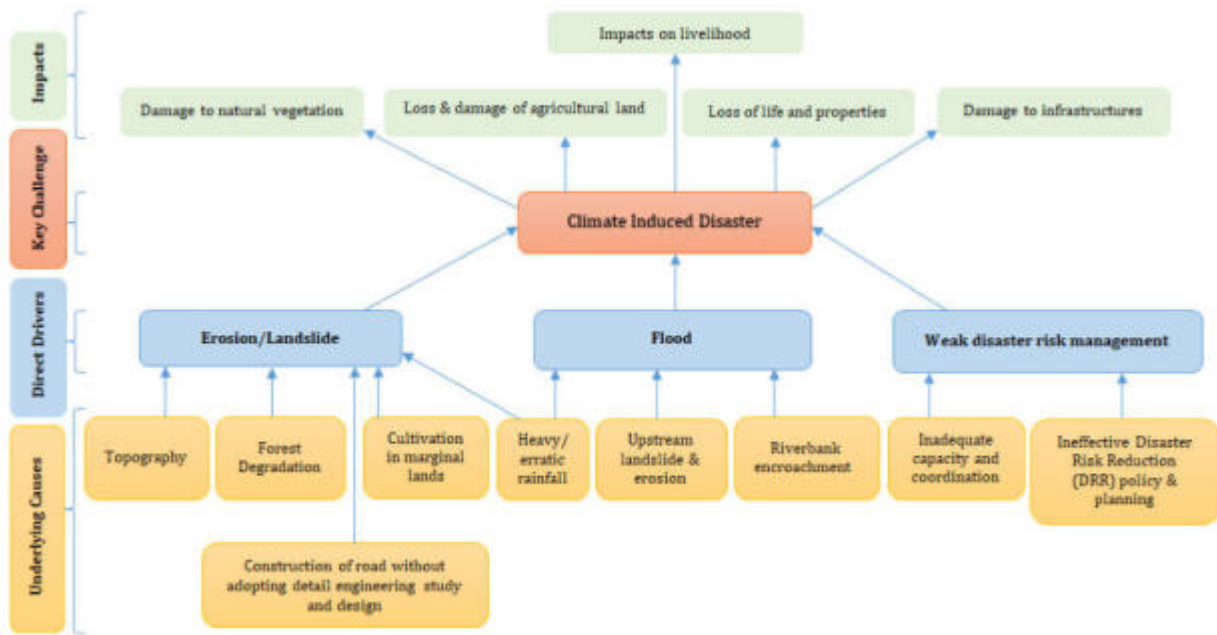

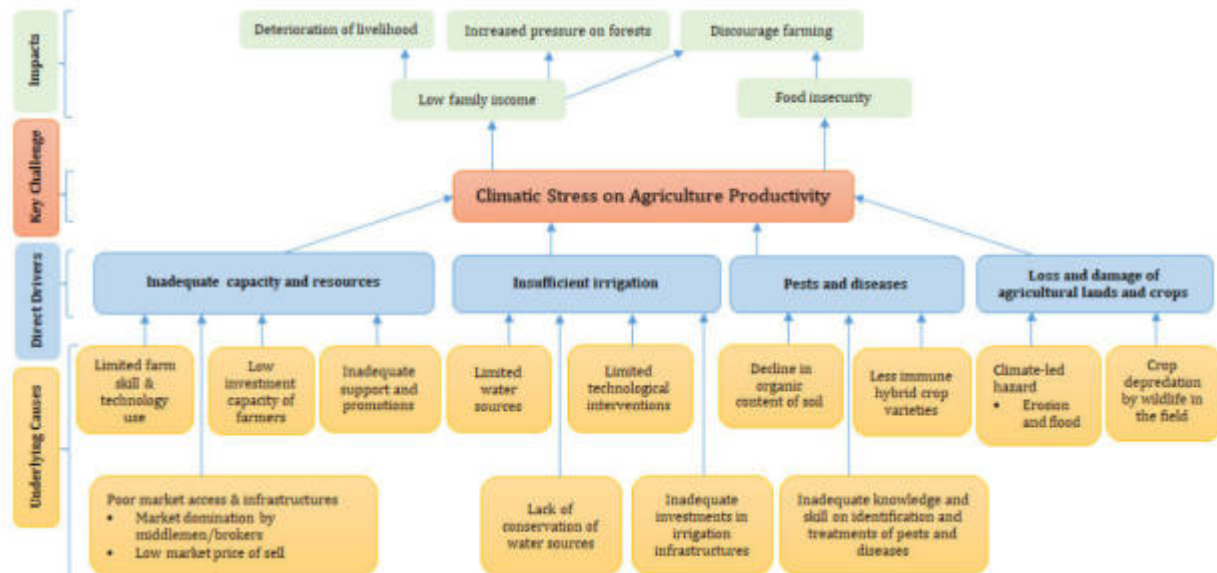**Figure 10: Problem tree for climate induced disaster risk**

Figure 11: Problem tree for climate stress on agricultural productivity

Climate change impacts in agriculture are the other aspect of vulnerable community. It has direct impact on people's livelihood through low agricultural productivity and yield loss. People nowadays are less interested in agriculture due to high cost of inputs and low productivity. Rather they are involved in vegetable farming, high value agroforestry (Banana, Amriso), goat farming and piggery. Lack of farm labors due to youth migration, lack of agriculture technicians, inadequate government support, lack of market access and market domination by intermediaries are problems in encouraging agriculture. Insufficient irrigation is one of the direct drivers of low agricultural productivity. The region is dry and has very limited water sources. There is lack of technological interventions and promotion of 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 while real farmers do not receive the support due to elite capture from paper farmers. 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. Insufficient sanitation in sheds/stalls and factory produced animal feeds are also the cause for livestock disease. Farmers lack knowledge and skill on identification and treatments of these diseases. Crop damage from wild animals (monkey, porcupine, wild boar) is among the causes of yield loss (Figure 11).

❖ **Key Observations**
- The water flow in Kokaha river can be observed in upstream and downstream region only while, the midstream seems dry due to high sediment load. The cultivation lands and houses adjoining to riverbanks in the midstream are prone to flash floods during monsoon. Few households as in Shirise are vulnerable to such flood due to bank erosion.
- Unregistered lands (without land ownership certificates) 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.

3.1.3 GESI Issues Observed in Problem Analysis

Lack of education among the women because of which even if they are selected as the committee members they could not exercise their rights or raise their voices strongly to address the issues of women dependent on forest based resources. It is also observed that, women, IPs, Dalits and marginalized group not having access to land ownership hinder them to become eligible to the government subsidies on agricultural loans and facilities. One of the problems where women participation is low in climate change and disaster management, and preparedness plan meetings due to lack of knowledge, skills, their voices are not heard, and their participation in decision-making has been low. Besides, lack of source of income to the women increases their poverty level. The GESI issues identified from problem analysis are presented in Table 8.

Table 8: Problems associated with GESI

Drivers	Underlying Causes	
Inadequate exercise of gender-inclusive governance in	• Male- supremacy and dominance in decisions • Limited access of women to information and communication (especially climate	• Hesitation to speak in meeting • Less knowledge on CFUG management

Drivers	Underlying Causes	
climate change, sustainable natural resource management (SNRM) practice	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	• 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

3.2 Solution Analysis

Theme 1: Climate Change Mitigation

3.2.1 Activities for Reducing Forest Loss and Enhancing Forest Density

The activities for reducing forest loss are associated with mitigation of forest degradation while the forest density can be enhanced through afforestation and reforestation. The major activities identified for reducing forest loss and enhancing forest density are presented in Table 9.

Table 9: 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
	Promote compost production from dry leaf litters and unwanted bushes	Removal of dry biomass
Unsustainable/ illegal harvesting	Enhance income generation opportunities for poor/ marginalized forest users	Skill development trainings and equipment support (such as Tailoring, Carpenter, Masson and others); Training & support for off-seasonal vegetable farming (Earthbag/drip irrigation/tunnel/quality seeds etc.)

Drivers of D&FD	Activities against Drivers	
	Promote agroforestry	Seedling distribution of commercial trees, fruits (fast growing and high value/multi-year), fodder trees
	Resolution of unmanaged settlements in Chure	Policy commitments/Policy interventions
Ineffective forest management practices	Implementation of sustainable forest management	Review/upgrade/renewal of forest operational 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, dry land conservation plantation etc.; Control of invasive species
	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).
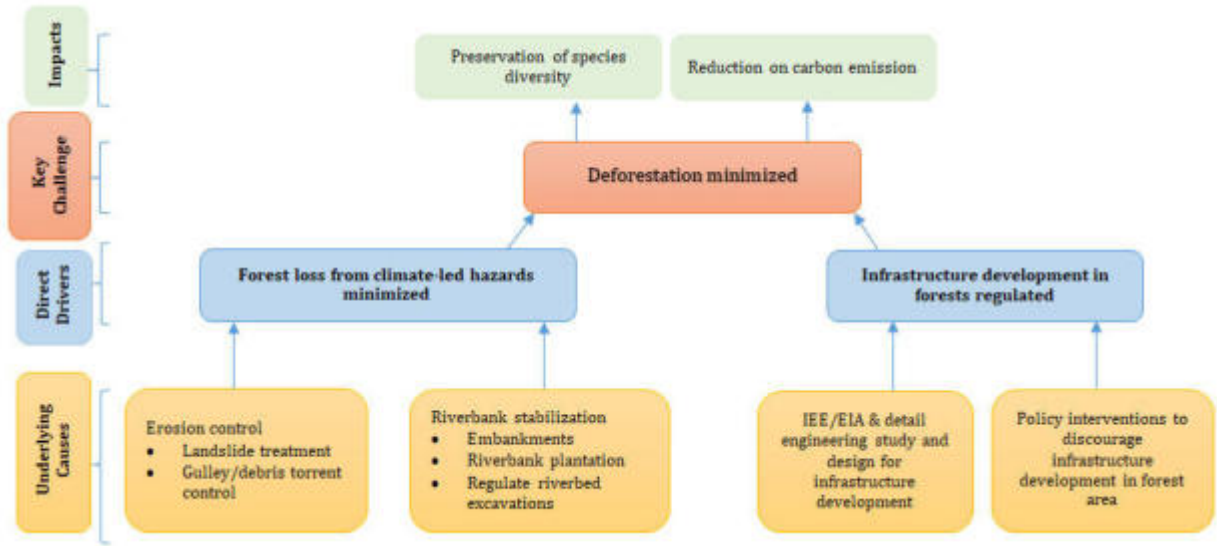
Figure 12: Solution tree for minimizing deforestation
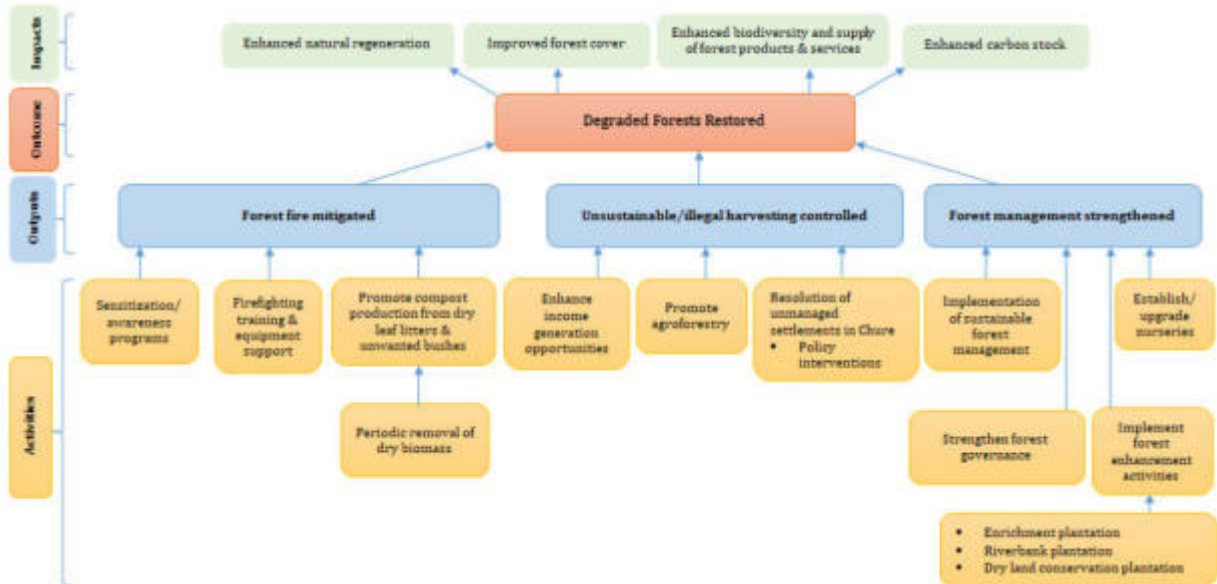
Figure 13: Solution tree for rehabilitation and restoration of degraded forests

Protective landscape management using vegetative and structural measures is proposed to address forest degradation from climate-led hazards. Forest fire, one of the major drivers of forest degradation, can be mitigated by awareness programs, enhancing firefighting capacity and early preparations. Firefighting capacity of CFUGs can be enhanced through firefighting trainings and equipment support. Early preparations require periodic removal of dry biomass that enhances forest fire. Similarly, apart from penalties and fines unsustainable harvesting and illegal logging can be mitigated through income generation programs. The socially and economically marginalized groups should be provided with skill development programs like tailoring, carpenter, mason and others. Income source can also be enhanced through training and support for off-seasonal vegetable farming (earthbag/drip irrigation/tunnel/quality seeds etc.). Forest management can be improved through implementation of FOPs and strengthening of sustainable forest management practices, implementation of forest enhancement activities and strengthening of forest sector governance. All the CFUGs should have valid sustainable forest

operational plan. They should be well trained and equipped for its implementation. Forest enhancement can be done through afforestation and reforestation. Sapling availability can be ensured by construction/upgradation of nurseries. Priority should be given to local native species while other commercial species like can also be introduced through proper study. Governance training to government staffs and CFUGs can enhance accountability and transparency of forest sector (Figure 13).

❖ **Major Activities and Outputs**

The major activities and outputs proposed for reducing forest loss and enhancing forest density are presented in Table 10.

Table 10: 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	
Rehabilitation/Reclamation of degraded land	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.
- Vegetative and structural measures should be applied to maintain or reestablish the productive function of degraded land (agriculture, forest, grass and shrub). Long-term goal should be landscape restoration without human inference. Sand, stone and gravel quarrying and mining should be regulated.
- Planting of vegetation especially trees species along with necessary moisture conservation and protection measures mainly on degraded lands including forests, barren lands and shrub land.
- 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.
- 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

3.2.2 Activities for Enhancing Adaptation/Resilience of Ecosystem and Community

The activities for enhancing adaptation/resilience of ecosystem and community are associated with minimizing impacts of climate induced disasters and adoption of climate resilient farming system. The major activities identified are presented in Table 11.

Table 11: 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, Amrisho (*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/landslide prone areas
	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		
	Establish Farmer Field Schools to capacitate farmers	Training and incentives to promote commercial and climate resilient farming

Drivers	Activities Against Drivers	
Inadequate capacity and resources	Promote climate resilient land use practices	Provide seed money, soft loans, subsidies in equipment, production based subsidies
	Establish of collection, storage and processing facilities	
Insufficient irrigation	Construction of water conservation pond	Construction of rainwater harvesting ponds
	Promote alternative irrigation technologies	Construction of plastic-lined/earthbags pond and drip irrigation system
Pests and 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 in marginal lands
	Plantation of wild fruit species 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 local community. These activities are proposed to enhance adaptation/resilience 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. Flood risk can be minimized through construction of embankments with bioengineering. Plantation of Bamboo, Khayar (*Acacia catechu*), Simali (*Vitex negundo*) etc. in river corridors reduces flood risk. It also enhances forest cover. Multiyear cropping and horticulture promotion- Avocado, Aanp (*Mangifera indica*), Litchi (*Litchi chinensis*), Katahar (*Artocarpus heterophyllus*), Kagati (*Citrus aurantifolia*), Amala (*Phyllanthus emblica*), Shajiwan (*Moringa oliefera*) can also reduce disaster vulnerability and at the same time provide income generation opportunities. The other 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 (Figure 14).
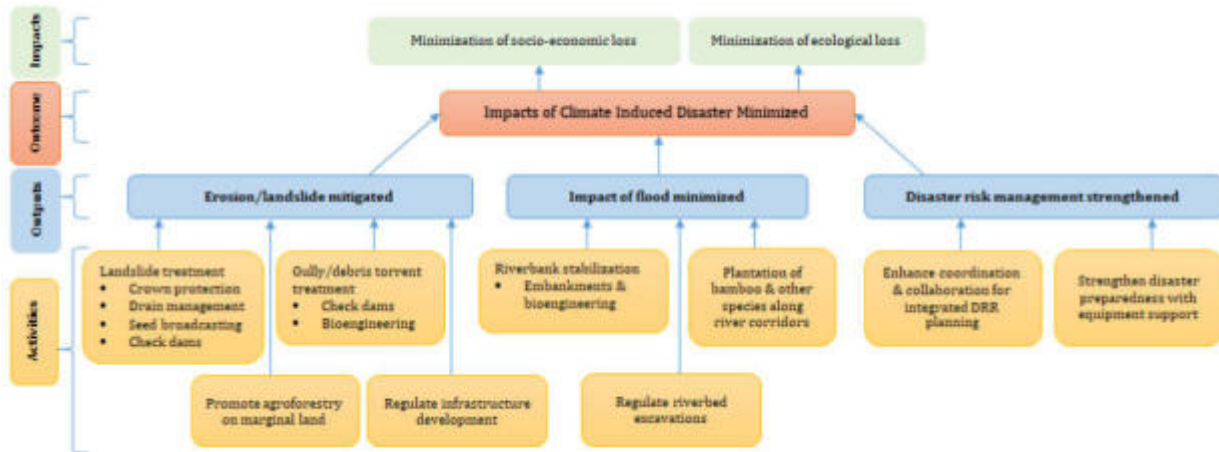
Figure 14: Solution tree to minimize impacts of climate induced disasters

One of the important aspects of enhancing adaptation/resilience of ecosystem and local community in Kokaha river system would be increasing agricultural productivity. It can be done by supporting climate resilient agriculture practices and agriculture commercialization. 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 is challenging, as the water sources are very limited. Introduction of new irrigation technologies; construction of plastic-lined/earthbags pond and drip irrigation system can support climate resilient farming practices where surface water source are scarce. Along with improving irrigation facilities capacity of farmers should be enhanced. Farmer field school can be the best solution where farmers will be trained on climate resilient farming. FFS can be focused on addressing problems and encouraging vegetables farming, commercial goat farming, pig farming, paddy pocket area and commercial farming o banana, ginger, turmeric, strawberry, coffee and others. Moreover, training on Integrated Pest Management (IPM) can reduce the use of chemical fertilizers and pesticides.

Besides, establishment of collection centers with price display board for buy and sell of agriculture products, provision of collective investment funds, incentives on modern agriculture tools and equipment, soft loans, conservation of climate resilient native seeds and discouraging import of hybrid seeds can encourage agriculture and enhance production and productivity. Yield loss from wild animals can be minimized by plantation of fruit species in forest area near agricultural lands hence, it may also minimize human-wildlife conflict on the longer terms since they get food right on the forest floor and will not go out of their habitats (Figure 15).
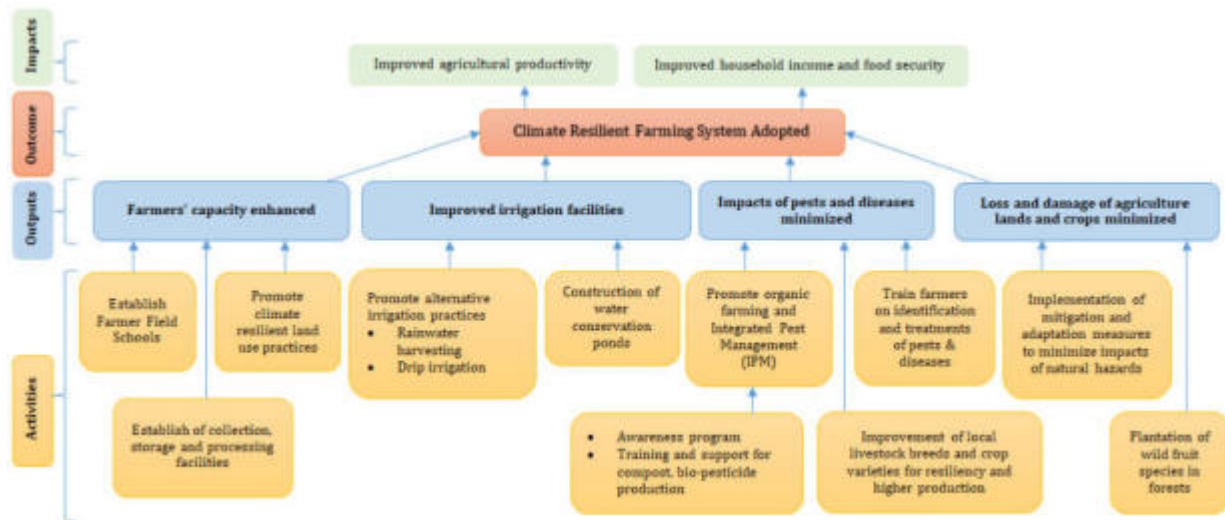
Figure 15: Solution tree for climate resilient farming practices

❖ **Major Activities and Outputs**

The major activities and outputs proposed for enhancing adaptation/resilience building of ecosystem and community are presented in Table 12.

Table 12: 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	
Minimization of negative impact of flood	
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.
- Farmers are interested in cultivation of ginger, turmeric, dragon fruit, ground apple and others. Tejpat (*Cinnamomum tamala*) plantation can be promoted in the north facing slopes of the river system.
- Market linkage should be ensured along with the skill development trainings such as off-seasonal vegetable farming and others. Enhance coordination and collaboration to involve local government for such activities.
- 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.

3.2.3 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 13: 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
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

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

3.2.4 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 14: 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 15.

Table 15: 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	

3.2.5 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 and agriculture activities
- 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 16: Intervention packages for CERP

Intervention Packages	Outputs	Drivers or barriers addressed
IPack 1: Capacity enhancement for sustainable forest management	Forest management strengthened	Unsustainable/ illegal harvesting; Ineffective forest management practices
IPack 2: Restoration and rehabilitation of degraded forests	Degraded land rehabilitated/reclaimed	Forest fire; Unsustainable/ illegal harvesting; Ineffective forest management practices
	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/ illegal harvesting; Erosion/ landslide; Flood; Insufficient irrigation
	Erosion/landslide controlled and sedimentation managed	
	Negative impact of flood minimized	
	Water conservation enhanced	
	Disaster risk management strengthened	
IPack 4: Climate resilient agriculture and land use practices	Farmers capacitated in climate resilient agriculture	Inadequate capacity and resources; Pests and 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. Ipack 6 being an advocacy-Gender governance package, focuses on the entire river system.
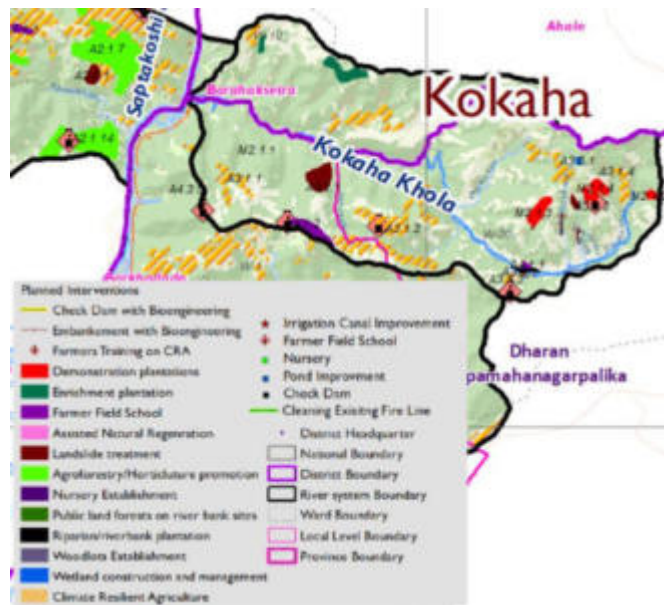
❖ **Strategies and Activities**

For each of the IPacks there are strategies (Table 17) and activities (Table 18). 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 17). 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 19), 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 20). 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 21), as well as to identify where CERP interventions can contribute to significant social or environmental co-benefits (Table 22) 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 23. 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 24).

5.2 General Description of Intervention Packages

Table 17: 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 rehabilitation of	Forest fire, unsustainable harvesting and illegal logging, and weak forest management practices are the major D&FD drivers in the river system. It is	• To enhance forest cover through enrichment plantation	• Reduce carbon emissions, enhance forest carbon stocks, and improve supply of forest products	• Support for nursery establishment and enrichment plantation • Enhancing technical capacity of CFUGs in plantation and nurturing of seedlings

Intervention Packages	IPacks description	Objectives	Strategies	Activities/incentives for Participation and Changing Stakeholder Practices
degraded forests	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	• Promote Livelihood improvement programs for women, IPs, Dalits and poor and marginalized forest dependent people	• 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 • 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
IPack 4: Climate resilient	Farmers especially women, Dalit and IP's vulnerability have been increasing due to limited farm skill and technology,	• To capacitate vulnerable farmers such as women, IPs, Dalits and poor/ marginalized to adopt	• Improving resilience of farmers to climate change, disasters, price volatility and other shocks	• Train farmers (prioritizing women) on climate resilient agriculture

Intervention Packages	IPacks description	Objectives	Strategies	Activities/incentives for Participation and Changing Stakeholder Practices
agriculture and land use practices	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.	climate resilient agriculture practices • To enhance agriculture yield • To support pro-poor farmers	• Increase agricultural productivity of forest dependent and other smallholders (equal participation of men and women)	• 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 include local-level stakeholders and the community and leverage local-level funds and resources.	• 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 decision-making forums • Increase common understanding towards gender equality and women empowerment in SNRM	• 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

5.3 Major Activities and Sub-Activities

Table 18: IPacks, major activities and sub-activities

Intervention Packages	Major Activities	Sub-activities
IPack 1: Capacity enhancement for sustainable forest management	**Strengthening forest management**	Review/upgrade/renew of forest operational 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
IPack 2: Restoration and rehabilitation of degraded forests	**Rehabilitation/Reclamation of degraded land**	Protective landscape management with vegetative and structural measures
		Dry land conservation plantation
	Forest fire control	Firefighter training and support firefighting equipment to CFUGs
		Support firefighting equipment to security institutions
		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 (such as Tailoring, Carpenter, Masonry and others)
		Training & support for off-seasonal vegetable farming (Support earthbag/drip irrigation/tunnel/quality seeds etc.)
	Agroforestry promotion	Promote agroforestry with multiyear cropping/horticulture/on-farm conservation

Intervention Packages	Major Activities	Sub-activities
IPack 3: Improving/maintaining river system landscape through soil and water conservation	Controlling erosion/landslide and management of sedimentation	Landslide treatment
		Construction of check dams and bioengineering for gully/debris torrent protection
	Minimization of negative impact of flood	Construction of embankments with bioengineering; bamboo plantation along the riverbanks
	Conservation and management of water sources	Construction of water conservation pond
	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
	Implementation of climate-resilient land use practices	Training on Integrated Pest Management (IPM)
		Capacity-building in the use of weather information and its application in agricultural practices
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
		Conduct rapid assessment on women's contribution and involvement in SNRM
		Provide gender mainstreaming trainings/ workshops to local government and CBOs

Intervention Packages	Major Activities	Sub-activities
	Integrate gender and women's participation in local planning processes in SNRM	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 19: 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 6 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 6 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
IPack 2: Restoration and rehabilitation of degraded forests					

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
Degraded land rehabilitated/ reclaimed	Protective landscape management with vegetative and structural measures	• Unwillingness from local community due to limitations in resource use	• Sensitization/ awareness programs	• At least 2 sensitization/ awareness programs in protective landscape management	• Number of sensitization/ awareness programs
	Dry land conservation plantation	• Disparity in species and technology selection	• Suitability study for species and technology selection	• 31.7 ha of dry land conservation plantation after suitability study for species and technology selection	• Study report for species and technology selection • Area of dry land conservation plantation
Forest fire mitigated	Firefighter training and support firefighting equipment to CFUGs	• Lack of technical knowledge in handling of equipment	• Technical trainings on equipment handling	• At least 6 CFUGs are well equipped with trained firefighter groups	• Number of well-equipped CFUGs with trained firefighter groups
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 105 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	• Exclusion of ethnic minority and poor members of CFUGs	• Transparent selection criteria	• Inclusion of 50% women, 13% Dalit and 31% Indigenous people	• % of women, Dalit and Indigenous people receiving training and equipment support
	Training & support for off-seasonal vegetable farming	• Elite capture in selection of farmers	• Ensure participation of socially and economically marginalized group (IPs, women, dalit etc.)	• 50% women, 13% Dalit and 31% Indigenous people receive support for off-seasonal vegetable farming	• % of women, Dalit and Indigenous people receive support for off-seasonal vegetable farming
IPack 3: Improving/maintaining river system landscape through soil and water conservation					

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
Agroforestry promoted	Promote agroforestry with multiyear cropping/ horticulture/ on-farm conservation	• Unwillingness due to higher opportunity cost of land	• Promotion of high value agroforestry • Incentivize socially and economically marginalized households	• Agroforestry in 194 ha land • Proportionate sharing of benefits among women, Dalit Janajati and marginalized groups	• Land area with agroforestry • % 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 2 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 3 gullies/debris torrent stabilized with integration of structural & non-structural measures and risk prioritization	• Number of gullies stabilized with local knowledge and practices
Negative impact of flood minimized	Construction of embankments with bioengineering; bamboo plantation along the riverbanks	• Higher cost of mitigation (higher opportunity cost of investment)	• Integrate indigenous knowledge, skills and customary practices and resources for low- cost solutions	• 3 ha of protective plantation with riverbank stabilization measures	• Area of protective plantation with riverbank stabilization measures
Water conservation enhanced	Construction of water conservation pond	• Possible conflict in site selection and size of the pond between the local communities and proposed sub activity • Community may be uninterested due to	• Prior consultation with local community and local government • Incorporate ecotourism promotion in project design	• At least 1 consultation meeting • One conservation pond constructed with focus on ecotourism promotion	• Number of consultation meeting for site screening and addressing dispute • Number of conservation pond with ecotourism potential

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
		uncertainty of direct water use benefits			
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
Improved climate-resilient land use practices	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 3 farmers group trained and incentivized	• Number of farmers group trained and incentivized
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	• 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
	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

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	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
	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

Outputs	Activities	Implementation Risk or Obstacle	Risk Reduction Measures	Risk Reduction Targets	Indicators
	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 20: 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	Degraded land rehabilitated/reclaimed	2	3	2	2	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	Agroforestry promoted	2	2	3	3	2	12
	Erosion/landslide controlled and sedimentation managed	1	2	1	2	2	8
	Negative impact of flood minimized	2	2	1	1	2	8

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
water conservation	Water conservation enhanced	2	2	3	2	1	10
	Disaster risk management strengthened	2	3	3	3	2	13
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 21: 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	• 2 trainings to CFUGs	• Number of person trained
IPack 2: Restoration and rehabilitation of degraded forests					
Degraded land rehabilitated/ reclaimed	Protective landscape management with vegetative and structural measures	• Continuous human interference due to lack of alternative opportunities	• Livelihood supporting interventions (multi-year high value plant species)	• More than 50% dependent households benefit from livelihood supporting interventions	• Proportion dependent households benefiting from livelihood supporting interventions
	Dry land conservation plantation	• Low survival rate due to inappropriate species and technology selection • Introduction of nonnative species and thereby pose a risk to the local biodiversity	• Promote tree species which are already locally adapted	• At least 50% of plantation will use native species	• Proportion of native species in planation

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
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
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 from target groups	• Proportion 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 development trainings and equipment support	• 50% beneficiaries of skill development trainings and equipment support are from poor and marginalized groups	• Proportion of poor and marginalized people trained or capacitated
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 4 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	• Durability of the structure due to fragile geology and climatic extremes	• Ensure technically sound structure following the design guideline	• Design guideline followed • 100 % construction workers aware about	• Number of structures following the guidelines

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
	for gully/debris torrent protection	• Occupational hazard for the construction workers	• Provide awareness on the occupational hazards and the protective gear for the construction related works	the occupational hazards with the protective gear	• Proportion of the construction workers aware on the occupational hazards with the protective gear
Negative impact of flood minimized	Construction of embankments with bioengineering; bamboo plantation along the riverbanks	• Improper design & implementation can lead to further degradation • Occupational health risks	• Ensure such infrastructure is planned in an integrated manner with involvement of DRR/ land use management/ engineers and/or watershed planning experts • Occupational Health and Safety training and equipment support	• 100% of planned structures follow design guideline • At least one OHS trainings for a site	• Proportion of structures following design guideline • Number of OHS trainings
Water conservation enhanced	Construction of water conservation pond	• Damage from siltation • Drowning of children and adults as well	• Continuous monitoring and maintenance of ponds • Fencing around the pond	• Annual maintenance at least during monsoon (extraction of sediments, drainage management) • No cases of drowning	• Number of ponds damaged due to siltation • Number of drowning cases
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	Training on Integrated Pest management (IPM)	• Non-dedicated farmers (paper farmers) 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

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
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
	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	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

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
planning processes in SNRM	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
	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 22: 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
IPack 2: Restoration and rehabilitation of degraded forests					

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
Degraded land rehabilitated/ reclaimed	Protective landscape management with vegetative and structural measures	• Enhanced vegetation cover and associated natural resources • Erosion control and reduction in sedimentation	• Prioritize multi-year cash crops, fast growing fodder trees and grasses	• At least 50% multi-year cash crops and fodder trees	• Proportion of cash crops and fodder trees in plantation
	Dry land conservation plantation	• Enhanced vegetation cover and soil moisture	• Use of moisture retaining species and technology	•	•
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 • Customize fire alert system in Community Based Forest Management (CBFM)	• At least 5 sets of firefighting equipment to security agency	• Sets of firefighting equipment supported
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
	Promote fodder banks in private land	• Reduce open grazing	• Distribution of seeds/seedlings of fodder trees and nutrient grasses	• 100% households receiving support establish fodder bank	• % of households receiving support with fodder banks established
IPack 3: Improving/maintaining river system landscape through soil and water conservation					
Agroforestry promoted	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
	Landslide treatment	• Reduce loss and damage • Reduce sedimentation	• Prioritize high value multipurpose plant species for bioengineering	• At least 50% use of high value multipurpose	• Proportion use of high value

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
Erosion/ landslide controlled and sedimentation managed				plant species for bioengineering	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 • Training/capacity building on soil and watershed conservation using bio-engineering	• At least 50% use of high value multipurpose plant species for bioengineering • At least 1 training	• Proportion use of high value multipurpose plant species for bioengineering • Number of trainings
Negative impact of flood minimized	Construction of embankments with bioengineering; bamboo plantation along the riverbanks	• Reduce riverbank erosion and loss and damage from flood	• Construction of sedimentation dams in midstream • Extraction and utilization of siltation through detail environmental assessment • Use of bamboo/other income generating plants for bioengineering	• At least 3 sedimentation dams • 100% embankments with plantation	• Number of sedimentation dams • Proportion of embankments with plantation
Water conservation enhanced	Construction of water conservation pond	• Enhance water availability and recharge	• Support ecotourism promotion	• At least 2 environment friendly tourism infrastructure developed	• Number of environment friendly tourism infrastructure developed
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

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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	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 planning processes in SNRM	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
	Provide gender mainstreaming trainings/	• Women's capacity enhanced in GESI	• Knowledge enhancement, accountability	• One training event for 20 government staffs	• Number of training events

Outputs	Activities	Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
	workshops to local government and CBOs	integration and local government and CBOs take the issues seriously			
	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 23: 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	6	200,000	1,200,000
Training and capacity development for implementation of FOPs	No	6	250,000	1,500,000
Equipment support for implementation of FOPs	No	6	200,000	1,200,000
Capacitate government staffs and CBOs on climate resilient forest management (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
Total Budget for IPack 1 (NRs)				**6,900,000**
IPack 2: Restoration and rehabilitation of degraded forests				
Protective landscape management with vegetative and structural measures	ha	623.98	30,000	18,719,324.37
Dry land conservation plantation	ha	31.7	70,000	2,220,993.88
Firefighter training and support firefighting equipment to CFUGs	CFUG	6	300,000	1,800,000

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
Support firefighting equipment to security institutions	Sets	5	150,000	750,000
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	20	40,000	800,000
Promote fodder banks in private land	Household	105	5,000	525,000
Skill development trainings and equipment support to poor/marginalized forest users	Household	40	25,000	1,000,000
Training & support for off-seasonal vegetable farming	Household	40	10,000	400,000
Total Budget for IPack 2 (NRs)				**26,515,318.25**
IPack 3: Improving/maintaining river system landscape through soil and water conservation				
Promotion of agroforestry with multiyear cropping/horticulture	ha	194	6,000	1,164,000
Landslide treatment	no	2		4,500,000
Construction of check dams and bioengineering for gully/debris torrent protection	gullies/debris torrents	3	LS	8,000,000
Construction of embankments with bioengineering; bamboo plantation along the riverbanks	ha	3	400,000	1,200,000
Construction of water conservation pond	No	1	2,000,000	2,000,000
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

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)
Climate resilient awareness campaign through Eco-clubs	School	2	50,000	100,000
Total Budget for IPack 3 (NRs)				**17,764,000**
IPack 4: Climate resilient agriculture and land use practices				
Identification and operationalization of FFS	no	2	700,000	1,400,000
Train and support farmers to adopt and apply climate-resilient land use practices	Event	4	450,000	1,800,000
Capacity-building in the use of weather information and its application in agricultural practices	No	2	100,000	200,000
Total Budget for IPack 4 (NRs)				**3,400,000**
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)				**55,679,318.25**

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 24: 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	623 ha of natural forest restored through ANR and enrichment plantation	PMU, PPMUs report Project report	This river system has 2889.2 ha of forest and 212.6 ha of other wooded land
Output 2: Improved natural Forest management and increased forest area outside the forest	xx ha of forest area of 6 groups under implementation through updated forest management plan	0	852 ha area managed by 6 groups	PMU, PPMUs report Project report	This river system has 6 community forest user groups managing 852 ha forest area including 769 (90.22%) natural forest, 14 ha 91.64%) plantation and 69 ha (8.14%) degraded land
	xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	0 ha.	At least Area: 75 ha. Survival rate: 80%	PMU, PPMUs report Project report	Local government supported and owned public land and private forestry initiatives under their own jurisdiction
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, PPMUs report 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

Results	Indicator	Baseline	Target	Means of verification	Assumption
					for erosion and sedimentation
Output 4: Farmers adopted Climate resilient farming practices	Ha. of agricultural land under climate resilient farming system	0 ha	194 ha	PMU, PPMUs report 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		At least 80% of the farmers involved in project begun to apply project-promoted climate-resilient land use practices in the season following their training	PMU, PPMUs report 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 64 leadership positions in 6 CFUGs , 31 (48.4%) are women	At least 50% women in leadership position	PMU, PPMUs report Project report	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	PMU, PPMUs report Project report	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in	0	6 Gender sensitive plan including forest	PMU, PPMUs report Project report	Gender dimensions ensured in climate resilient plan

Results	Indicator	Baseline	Target	Means of verification	Assumption
	NRM/ CRLUP and management		management operational plan of forestry user groups		including forest management operational plan of groups This river system has 6 CFUGs.

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

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 Kokaha Critical Ecosystem Restoration Plan

Vision: Climate resilient and sustainably managed Natural Resources and local communities in Kokaha 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 (proxi indicator 2 to 5)*	Tonnes of carbon dioxide equivalent (tCO₂eq) 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: 0.0% Sustainable forest management area: 0 ha ANR: 0 ha Plantation area: 0 ha Climate Resilient Agriculture: 0 ha	**Proxy indicator**: At least: Deforestation rate: 0 Sustainable forest management area: 852 ha Plantation area: 75 ha ANR: 624 ha Climate Resilient Agriculture: 194 ha	PPMUs/PMU report GCF/BRCRN GHG mitigation calculation tool-based calculation sheet Project report	This river system has 2889.2 ha of forest and 212.6 ha of other wooded land CERP shows 272.6 ha of foret cover increased between 2000 and 2019 showing 0% deforestation rate
GCF core indicator (Adaptation)	Total number of direct and indirect beneficiaries (gender disaggregated)		Direct: Male: 3383 Female: 3392	PMU and PPMU report Project report	This river system has 6 community forestry user groups having 6775 population (3383 male and 3392 female)
Outcomes					

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
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	0	Sustainable forest management area: 852 ha Plantation area: 75 ha ANR: 624 ha Climate Resilient Agriculture: 194 ha	PMU and PPMU report Project reports	In forest management area, 2% density of forest will increase.
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	Direct: Male: 3383 Female: 3392	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	623 ha of natural forest restored through ANR and enrichment plantation	PMU, PPMUs report Project report	This river system has 2889.2 ha of forest and 212.6 ha of other wooded land
Output 2: Improved natural Forest management and increased forest area outside the forest	xx ha of forest area of 6 groups under implementation through updated forest management plan	0	852 ha area managed by 6 groups	PMU, PPMUs report Project report	This river system has 6 community forest user groups managing 852 ha forest area including 769 (90.22%) natural forest, 14 ha 91.64%) plantation and 69 ha (8.14%) degraded land
	xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	0 ha.	At least Area: 75 ha. Survival rate: 80%	PMU, PPMUs report Project report	Local government supported and owned public land and private forestry initiatives under their own jurisdiction

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
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, PPMUs report 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 system	0 ha	194 ha	PMU, PPMUs report 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		At least 80% of the farmers involved in project begun to apply project- promoted climate-resilient land use practices in the season following their training	PMU, PPMUs report 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 64 leadership positions in 6 CFUGs , 31 (48.4%) are women	At least 50% women in leadership position	PMU, PPMUs report Project report	Proportional representation of all social groups ensured

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
	Access of women in Natural resources management, CRLUP, knowledge and information	0	At least 50% women participation in all events	PMU, PPMUs report Project report	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in NRM/ CRLUP and management	0	6 Gender sensitive plan including forest management operational plan of forestry user groups	PMU, PPMUs report Project report	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups This river system has 6 CFUGs.

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 Firefighter training and support firefighting equipment to CFUGs 1.1.2 Support firefighting equipment to security institutions 1.1.3 Customize fire alert system in Community Based Forest Management (CBFM)	At least 6 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 1.2.2 Training & support for off-seasonal vegetable farming (Support earthbag/drip irrigation/tunnel/quality seeds etc.)	Approximately 80 household beneficiaries
Output 2: Improved natural forest management and enhanced tree cover outside national forest			
2.1 Strengthening forest management	Improving the application of sustainable forest management practices in all forest land managed	2.1.1Review/upgrade/renew of forest operational plans (FOPs) of community based forest user groups (CFUGs) and provide implementation support	Approximately 6 forest operational plans developed and/or strengthened.

Activities	Description	Sub-activities	Remarks/Deliverables
	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.	2.1.2 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	Approximately 2 ToF events organized to capacitate government staffs and CBOs on climate resilient forest management.
2.2 Improvement of forest/tree cover	Support different types of plantation to build resilience and deliver important mitigation benefits.	2.2.1 Protective landscape management with vegetative and structural measures 2.2.2 Dry land conservation plantation	About 624 ha of protective landscape management 31.7 ha of dry land conservation plantation
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 2 landslides and 3 gully/debris torrents mostly in Churia hills
3.2 Minimization of negative impact of flood	Construct local structures, as well as bioengineering that will reduce community vulnerability to flooding	3.2.1 Construction of embankments with bioengineering; bamboo plantation along the riverbanks	Establish relevant structures and practices for riverbank stabilization
3.3 Conservation and management of water sources	Construction and management of conservation ponds that will enhance water availability and the at the same time supports groundwater recharge	3.3.1 Construction of water conservation pond	1 conservation pond
3.4 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	3.4.1 Strengthening climate and disaster risk reduction mechanism in collaboration with local government 3.4.2 Training/capacity building on soil and watershed conservation using bio-engineering 3.4.3 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

Activities	Description	Sub-activities	Remarks/Deliverables
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	2 FFS established and operational
4.2 Implementation of climate-resilient land use practices	Support and strengthen farmers' capacities to adopt/apply climate-resilient farming practices in their own fields.	4.2.1 Train and support farmers to adopt and apply climate-resilient land use practices 4.2.2 Capacity-building in the use of weather information and its application in agricultural practices	
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 194 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	Maniram Rai	Dharan-20, Bishnupaduka	Dharan Sub-Metropolitan City-20	Ward Chairman	9842167551
2	Tirthaman Tamang	Dharan-20, Bishnupaduka	Gaudhara CFUG	Chairman	9818914971
3	Yamuna Kumari Rai	Dharan-20, Bishnupaduka	Jalkanya CFUG	Chairman	9800936859
4	Buwan Singh Rai	Dharan-20, Bishnupaduka	Bhaldhunga CFUG	Joint Secretary	9864551272
5	Buddhiman Tamang	Dharan-20, Bishnupaduka	Bhaldhunga CFUG	Chairman	9815326245
6	Sudesh Rai	Dharan-20, Bishnupaduka	Jalkanya CFUG		9804306235
7	Om Kumar Rai	Dharan-20, Bishnupaduka	Bhaldhunga Ma.Vi. School Management Committee	Chairman	9842060535
8	Punam Tamang	Dharan-20, Bishnupaduka	Dharan Sub-Metropolitan City-20	Ward Staff	9866074497
9	Karna Bahadur Tamang	Dharan-20, Bishnupaduka	Dharan Sub-Metropolitan City-20	Ward Member	9862361724

Disaggregated Participants Data

S. N.	Name of Participants	Gender		Ethnicity						
		Male	Female	Janajati	Dalit	Brahmin	Chhettri	Dasnami	Madhesi	Muslim
1	Maniram Rai	1		1						
2	Tirthaman Tamang	1		1						
3	Yamuna Kumari Rai		1	1						
4	Buwan Singh Rai	1		1						
5	Buddhiman Tamang	1		1						
6	Sudesh Rai	1		1						
7	Om Kumar Rai	1		1						
8	Punam Tamang		1	1						
9	Karna Bahadur Tamang	1		1						
Total		**7**	**2**	**9**	**0**	**0**	**0**	**0**	**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: 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.

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
Support review/upgrade/renew of forest operational plans (FOPs) of community forest user groups (CFUGs)	No	6	200,000	1,200,000	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	6	250,000	1,500,000				M1.2	
Equipment support for implementation of FOPs	No	6	200,000	1,200,000				M1.3	
Capacitate government staffs and CBOs on climate resilient forest management (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	
Protective landscape management with vegetative and structural measures	ha	623.98	30,000	18,719,324.37	Koka CF, Singhadevi CF, Bhawani CF & adjoining area	87.191364	26.864849	M2.1.1	Barah M-1 & Dharan Sub-metro-20

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
	ha	2.9	70,000	204,566.95	Dingletol	87.271356	26.855799	M2.1.2	Dharan Sub-metro-20
Dry land conservation plantation	ha	14.6	70,000	1,022,105.56	Thulo Khaire	87.245488	26.85327	M2.1.3	Dharan Sub-metro-20
	ha	14.2	70,000	994,321.37	Bangsilagaun	87.258618	26.857057	M2.1.4	Dharan Sub-metro-20
Firefighter training and support firefighting equipment to CFUGs	CFUG	6	300,000	1,800,000				M2.2.1	
Support firefighting equipment to security institutions	Sets	5	150,000	750,000				M2.2.2	
Customize fire alert system in Community Based Forest Management (CBFM)	No	1	LS	300,000				M2.2.3	
Training and support on commercial livestock farming and shed improvement	Household (Hh)	10	40,000	400,000	Shirise			M2.3.1	
	Hh	10	40,000	400,000	Katahare			M2.3.2	
	Hh	15	5,000	75,000	Bangsligaun			M2.4.1	
	Hh	15	5,000	75,000	Bishnupaduka			M2.4.2	
Promote fodder banks in private land	Hh	35	5,000	175,000	Khaire			M2.4.3	
	Hh	20	5,000	100,000	Bulung			M2.4.4	
	Hh	20	5,000	100,000	Dandagaun Dharne			M2.4.5	

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
Skill development trainings and equipment support to poor/marginalized households (such as Tailoring, Carpenter, Masonry and others)	Hh	20	25,000	500,000	Kokaha CF (Silipakha, Pakhatol & Chaudanda)			M2.5.1	
	Hh	20	25,000	500,000	Sinhadevi & Bhawati CF (Suryakunda, Dhap, Chiyabari, Swanra, Hade)			M2.5.2	
Training & support for off-seasonal vegetable farming (Support earthbag/drip irrigation/tunnel/quality seeds etc.)	Hh	40	10,000	400,000	Bishnupaduka			M2.5.3	
Promote agroforestry with multiyear cropping/horticulture/on-farm conservation	ha	30	6,000	180,000	Kokaha CF (Silipakha, Pakhatol & Chaudanda)	87.175031	26.860519	A3.1.1	Barah M-1
	ha	127	6,000	762,000	Sinhadevi & Bhawati CF (Suryakunda, Dhap, Chiyabari, Swanra, Hade)	87.211537	26.849589	A3.1.2	Barah M-1 & Dharan Sub-metro-20
	ha	20	6,000	120,000	Shirise-Bhaludhunga	87.239621	26.839641	A3.1.3	Dharan Sub-metro-20
	ha	17	6,000	102,000	Dharne	87.265014	26.857947	A3.1.4	Dharan Sub-metro-20
Landslide treatment	No	1	2,500,000	2,500,000	Rithe	87.195327	26.861109	A3.2.1	Barah M-1
	No	1	2,000,000	2,000,000	Bangsilagaun	87.189887	26.83178	A3.2.2	Dharan Sub-metro-20
	No	4	LS	2,500,000	Khahare (Khaire)	87.244959	26.85109	A3.3.1	Dharan Sub-metro-20
	No	5	LS	3,000,000	Katahare (west)	87.250629	26.850284	A3.3.2	Dharan Sub-metro-20

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
Construction of check dams and bioengineering for gully/debris torrent protection	No	4	LS	2,500,000	Katahare (East)	87.254082	26.847923	A3.3.3	Dharan Sub-metro-20
Construction of embankments with bioengineering; bamboo plantation along the riverbanks	ha	3	400,000	1,200,000	Shirise	87.242401	26.841009	A3.4	Dharan Sub-metro-20
Construction of water conservation pond	No	1	2,000,000	2,000,000	Kanyadanda	87.254713	26.86327	A3.5.1	Dharan Sub-metro-20
Strengthening climate and disaster risk reduction mechanism in collaboration with local government	Municipality	1	300,000	300,000	Dharan Sub-metropolitan city			A3.6	
Training/capacity building on soil and watershed conservation using bio-engineering	Event	1	500,000	500,000				A3.7	
Climate resilient awareness campaign through Eco-clubs	School	2	50,000	100,000				A3.8	
Identification and operationalization of FFS								A4.1	
FFS at Kokaha Bahu-udeshiya Krishak Samuha	No	1	700,000	700,000	Shirise	87.242133	26.84179	A4.1.1	
FFS at Hamrogaun Krishak Samuha	No	1	700,000	700,000	Bulung	87.193288	26.850384	A4.1.2	
Train and support farmers to adopt and apply climate-resilient land use practices	Event	1	450,000	450,000	Bhaludhunga			A4.2.1	Dharan Sub-metro-20
	Event	1	450,000	450,000	Swanra			A4.2.2	Dharan Sub-metro-20
	Event	1	450,000	450,000	Suryakunda			A4.2.3	Baraxetra M-1

Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
	Event	I	450,000	450,000	Bangsilagaun			A4.2.4	Dharan Sub-metro-20
Capacity-building in the use of weather information and its application in agricultural practices	No	2	100,000	200,000				A4.3	
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	I	50,000	50,000					
Produce and publish best practices and learning in gendered governance	Event	I	50,000	50,000					
Conduct rapid assessment on women's contribution and involvement in SNRM	Event	I	100,000	100,000					
Provide gender mainstreaming trainings/ workshops to local government and CBOs	Event	I	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					

| Sub-activities	Unit	Quantity	Unit Cost	Budget (NPR)	Location	Lat.	Long.	Activity Code	Local government
Engage male involvement to advocate gender and women's issues and concern in campaign	Event	2	50,000	100,000					
Total				**55,679,318.25**					

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
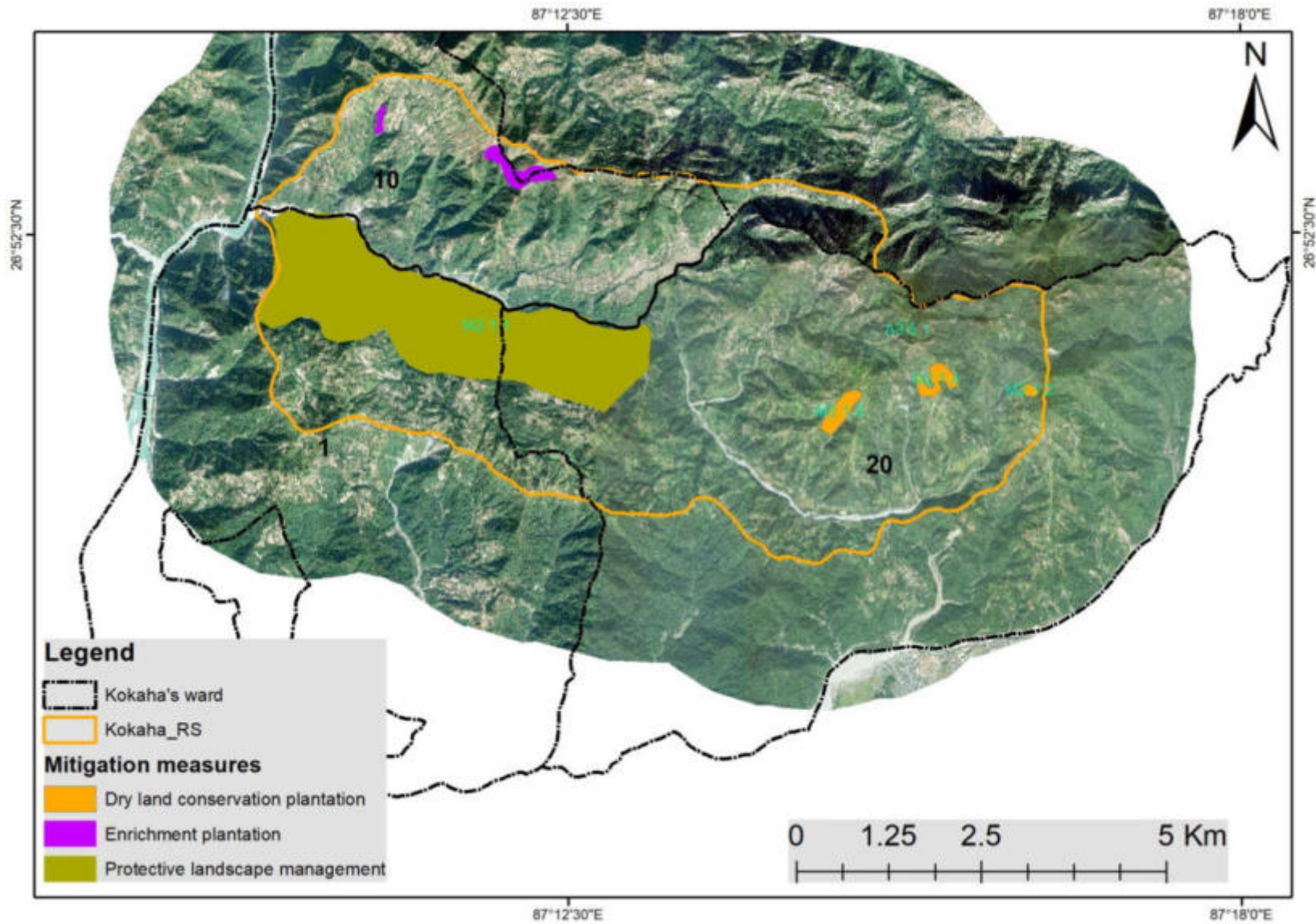
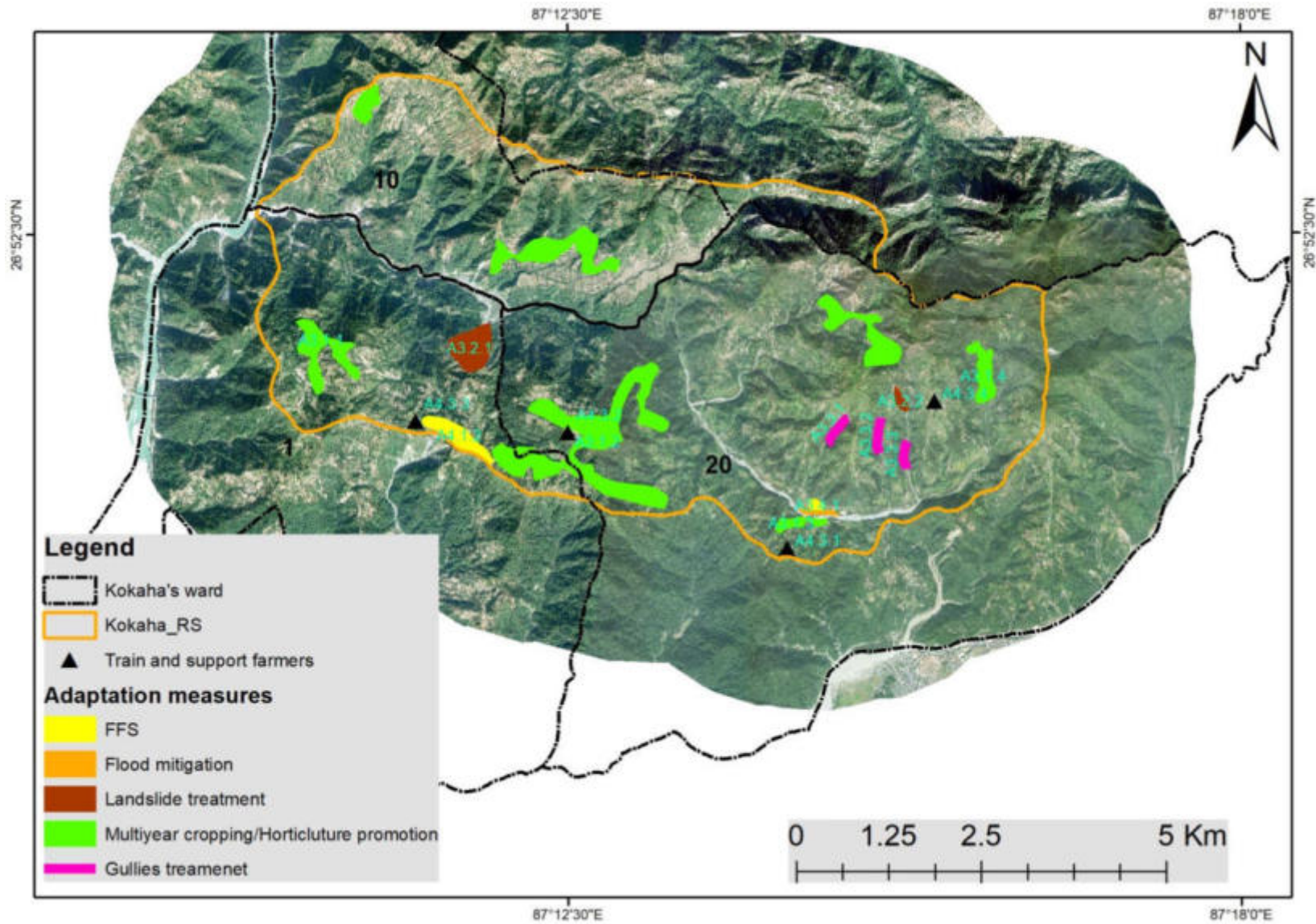**Annex-4: Maps**

Hotspots for Forest Loss (D&FD)
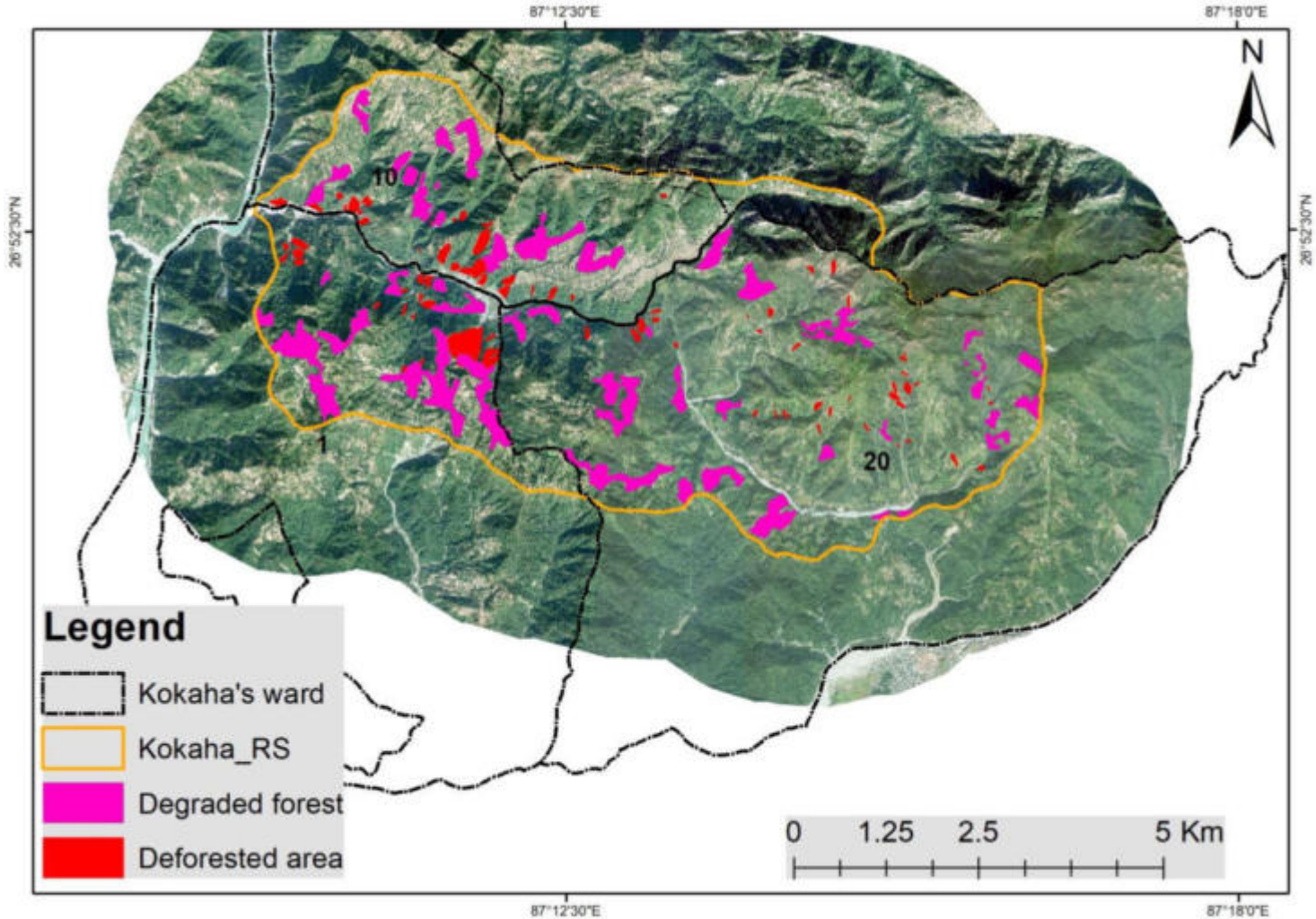
Hotspots for Climate Adaptation
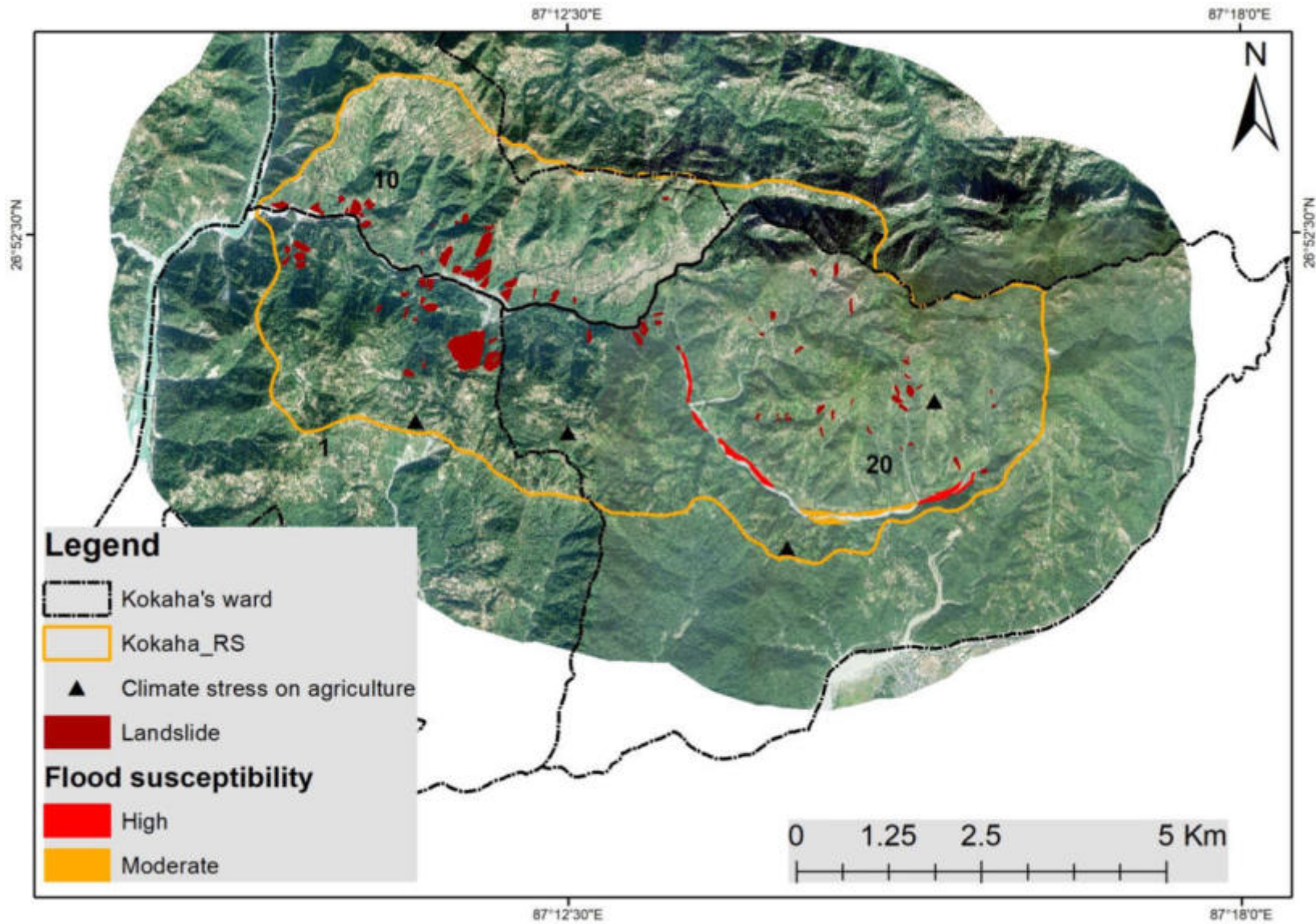
Final Activity Map for Mitigation

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