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Critical Ecosystem Restoration Plan (CERP) of Bihul River System



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

Building A Resilient Churia Region in Nepal (BRCRN)



National Project Director

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


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National Project Director

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

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DECLARATION OF AUTHENTICITY

To the best of our knowledge and in accordance with the MOFE approved CERP manual, we, the service provider Nature's Conservation (P) Ltd. , Kathmandu, hereby confirm that this CERP report is our original outcomes and the data and information provided in the reports of the Madhesh and Bagmati provinces are based on advice from FAO-TA, the expertise of the service provider , community user groups, district expert consultation sessions, provincial and federal validation consultation meetings, and other secondary sources. Without citing the GoN-BRCRN project's copyright, we won't give permission for our team or any other sources to use it as copied material.

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Contents

Executive summary.....	iii
Chapter 1: Introduction.....	1
1.1 Background.....	1
1.2 Rationale of CERP.....	1
1.3 CERP and Theory of Change.....	1
1.4 A River System and Ecosystem Restoration.....	3
1.5 Spatial planning as base for CERP.....	3
1.6 Mitigation and adaptation logic in CERP.....	5
Chapter 2: Introduction to Bihul River System.....	8
2.1 Physiography, Land Cover and Hydrology.....	8
2.2 Climate Variables.....	10
2.3 Socio-ecological process.....	11
2.4 Problem analysis.....	11
Theme 1: Climate change mitigation.....	11
2.4.1 Direct and underlying drivers of Deforestation and Forest Degradation (D & FD).....	11
1.1.2 Hotspot for forest loss (Multi-criteria Analysis Result Map 1).....	15
2.4.3 Enhancement area for carbon stock -MCA Result Map 2.....	17
Theme 2: Climate change adaptation.....	19
2.4.4 Direct drivers and underlying causes of vulnerable ecosystem and community in the River System.....	19
2.4.5 Hotspot for vulnerable ecosystems- MCA Result Map 3.....	23
2.4.6 Linkage of GESI and IPs specific issues to forest loss and vulnerable ecosystems.....	25
Solution Analysis.....	25
2.5.1 Climate change mitigation: solution analysis of D&FD.....	25
2.5.2 Climate change adaptation: solution analysis.....	29
2.5.3 Map of Planned interventions MCA Result Map 4:.....	33
2.5.4 Integration of GESI and IP's issues into solution activities.....	35
Chapter 3. Overall observations and findings.....	35
Chapter 4: Intervention Packages (IPacks) of Bihul River System.....	37
IPack 1: Restoration of degraded forest (reforestation) and afforestation in river reclaimed land.....	38
IPack 2: Soil and Water Conservation.....	54
IPack 3: Agroforestry System.....	61
IPack 4: Climate resilient agriculture and land use practices.....	68
IPack 5: Advocacy campaign: Gender-inclusive governance.....	76
Annexes.....	90
Glimpses of the events and site visits in Bihul River System.....	110

List of Tables

Table 1: Variables considered as input data for Multi criteria spatial analysis (MCA)	6
Table 2: Land cover change in Bihul River System	10
Table 3: Climate change scenario (MoFE, 2019).....	10
Table 4: Drivers and underlying causes of D&FD in Bihul River System	11
Table 5: Drivers and underlying causes of vulnerable ecosystem and community in Bihul River System .	19
Table 6: Activities, outputs and outcomes for reducing degraded forest and enhancing forests in the Bihul River System	27
Table 7: Activities, outputs and outcomes for reducing vulnerable ecosystem and communities in Bihul River System	31

List of Figures

Figure 1: Establishing causal linkages with theory of change analysis	2
Figure 2: Upstream and downstream linkages in three distinct zones	3
Figure 3: Spatial Planning as a base for CERP in Bihul River System	4
Figure 4: MCA process.....	5
Figure 5: Location map of Bihul River System	8
Figure 6: Geology of Bihul River System.....	9
Figure 7: Direct drivers and underlying causes of D & FD in Bihul River System	14
Figure 8: Map of Hotspot for Forest Loss in Bihul River System.....	16
Figure 9: Enhancement for forest carbon stock in Bihul River System	18
Figure 10: Direct drivers and underlying causes of vulnerable ecosystem and associated community in Bihul River System	22
Figure 11: Map of Hotspot for Vulnerable Ecosystem and Community in Bihul River System.....	24
Figure 12: Solution tree analysis in Bihul River System: Climate change mitigation.....	26
Figure 13: Solution tree analysis in Bihul River System: Climate change adaptation.....	30
Figure 14: Map of Planned intervention (Mitigation and Adaptation) in Bihul River System.....	34

Executive summary

The Critical Ecosystem Restoration Plan (CERP) is based on participatory and results-based planning methodology with a robust monitoring protocol, to help leverage support and facilitate budget planning from the federal to the provincial and local level for investments in ecosystem restoration. The CERP methodology covers all steps in the planning process, from the identification of stakeholders, collection of data and information, processing, analysis, discussion, and evaluation including participatory stakeholder consultations and negotiations. Multiple stakeholder workshops are instrumental in the CERP preparation process in the targeted ecosystems within River Systems. In addition, the project adopted a gender-integrated approach to mainstream gender into the plan. The project has conducted additional gender study mainly focused on women, Dalits women, and indigenous women to identify the gender-specific problem and local-level solution for the intervention. The gender-specific study adopted research tools such as a seasonal calendar for gender analysis, problem, and solution community workshops, and focus group discussions among the community. Also, the process includes a consultation with women and women lead organizations.

The Siwalik hills are the source of several significant tributaries to the Bihul River System, including Chapin, Surunga, Patharwa, Amaha, Singesara, Musaharniya, Bairago, and Bihul. The Patharwa River, which has its source at 325.6 masl in Chure Hill in Khadak Municipality-4 and flows south, is known as the Bihul River once it reaches Surunga Municipality-II at an elevation of 99 masl in Saptari district, finally it drain out through Nepal-India boarder in Bode-Barsain Municipality. Aerial distance from North to South is approximately 20.33 km, and the total length from its farthest point to the outlet at 68 masl is approximately 30.75 km.

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 in one locations in Bihul River System: Ranjitpur, Khadak Municipality-5, Saptari. Participants from Community Based Organizations (CBOs) user groups-with a focus on women, indigenous people, poor and Dalit (community 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 the workshops and 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. Additionally, the workshop also discussed and drafted the CERP with solution-activities to overcome the problems observed (drivers) and restore the ecosystem of the River System. The participants in the expert planning workshop represented the government authorities and other networks working in forests and natural resource management sector, agriculture sector and disaster risk reduction sector in the River System.

Based on the problem analysis workshops, following key problems were identified in River System:

- a. Over the past 19 years (2000-2019), forests has decreased at the rate of 0.108 percent per year, while built-up area has increased at the rate of 0.046 percent per year in the River System (Source: ICIMOD,

2000 and ICIMOD, 2019). However, the cumulative area in the River System where the forest loss has been detected in upstream, which is about 111 ha, has been identified in various places. Field observations show large area degraded and lost in the river system which is not properly reflected in national forest data, one of the reason being the national data does not show degraded areas. Forest fires, open grazing, illegal logging, encroachment, fuelwood collection, climate led hazards- (flash flood, landslide), are the main causes of forest loss within this River System.

- b. About 15 Community/Local Forest User Groups (CFUGs/LFUGs) are functional in the River System, which is a significant in terms of number of forest user groups. However, there is inadequate technical human resources, tools and techniques, knowledge and skills, and financial resources, and hence there is an ineffective forest management in this River System .
- c. About 23 landslides covering about 11 ha in Khadak Municipality-5 and Surunga Municipality-4 & 6 are the major landslids in the River System. About 11 number of torrents is having a number of gullies that have led to degraded forest ecosystems; for example, mainly in Khadak Municipality-4 & 5 and Surunga Municipality-6 are the major ones in the locations that need to be stabilized by using local and appropriate technologies (such as Bamboo and Amriso plantations, bio-engineering, checkdams, contour plantation, channel drainge or trenches).
- d. A total of 91 ha of River side land, including a flood plain and agricultural land downstream, have been deposited by the riverbed materials (like sands, boulders and pebbles), which contributes to degraded agriculture lands and reduces the fertility in the River System.
- e. Lack of access to climate-informed decision-making in agriculture practices, ineffective practices with no access to commercialization of agricultural production, intense and frequent short-duration rainfall with a risk of flash flood, inefficient irrigation facilities, infestation of pest and disease pests, and diseases, and inadequate support for improved livestock management practices are all examples of inadequate climate adaptation practices in the River System.
- f. Women and marginalized communities need access to and control over forest and community resources and information to participate in climate change and forestry-related actions at the river systems.
- g. The involvement of women in the overall planning, leadership, and decision-making process is affected by poor gender-inclusive governance. This affects the performance of CBO's women members/leader to participate in the SNRM intervention actively.

The identified solutions with intervention activities (solutions-activities) are grouped into five Intervention Packages (IPacks) based on guidance from CERP manual to address the drivers of: a) climate change mitigation—hotspot of forest loss in upstream; b) climate change adaptation—. Each IPack contains a general description of the drivers, a list of the most significant initiatives for resolving problems with outputs and outcomes to address the drivers and the underlying causes and effects of the hotspots, implementing strategies, 5-year budget plan for carrying out the initiatives, monitoring plans, analyses the feasibility of the implementation and a brief safety precaution. Additionally, there are two categories of solution activities: capacity buildings and solution-activities in spatial mappings with activities area code (GIS data layers: polygons, lines, and points). The suggested solution-activities in the plan also include beyond the Building a Resilient Churia in Nepal (BRCRN) priority.

Following are a brief glimpse of the Intervention Packages and key activities:

IPack I: Restoration of degraded forest and afforestation in River reclaimed land

- a. Enrichment plantation in the degraded forest: the potential native tree species,
- b. Natural regeneration management- Assisted Natural Regeneration (ANR) through:
 - Reduction of forest fire hazards through weeding, cleanings and improvements (extraction of bushes, leaf litters and forest residues) (about 9 km);

- c. Mesh-wire fencing in the riverside lands (91 ha) plantation, including community land plantation (34 ha), demonstration plantation (8 ha), riparian plantation (11 ha), and woodlot plantation (38 ha).
- d. Support for alternative energy sources, priority for Women and marginalized communities
- e. Capacity building for local government on monitoring for sustainable extraction of River bed materials.

IPack 2: Soil and water conservation

- a. Landslide treatments in 23 sites with bio-engineering and vegetative measures
- b. Stabilization of gully in the torrent (11 torrents)
- c. Construction of water conservation new ponds (11 ponds)
- d. Improvement of existing ponds (10 pond)
- e. Irrigation channel improvements (6 locations)
- f. Wetland Improvements (4 locations of cumulative area 3.5 ha)
- g. Construction of water harvesting structure (2 locations)
- h. Riverbank stabilization(9 km)
- i. Capacity buildings in water and soil conservation practices (Skill based trainings, orientation and demonstration visits, success stories collection and sharing)

IPack 3: Agroforestry System

- a) Adoption of Agroforestry System in the potential areas of the riverside (about 69 ha) and link with livestock promotion with establishment of agroforestry nursery-focus on the local fodder species
- b) Providing supports for irrigation facilities
- c) Formulation of groups called Agroforestry Groups (AFGs), if no any agroforestry group existed currently
- d) Capacity building trainings on Agroforestry and Institutional support

IPack 4: Climate resilient agriculture technologies and practices.

- a. Establishment of Farm Field Schools on the basis of crop problems and failures for several reasons.
- b. Support for the conservation and utilization of water source for irrigation facility using climate resilient technology
- c. Capacity building trainings on CRA (composting, manuring, mulching, water retention techniques), livestock management, protection of cultivation lands from wildlife threats and use of weather information:

IPack 5: Gender-inclusive governance

- a. Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities
- b. Collect local-level best practices for learning and policy influence to ensure gender responsiveness and women's participation, access, control, and leadership.
- c. Provide gender mainstreaming training/ workshops to local government and CBOs and concerned stakeholders.
- d. Conduct GESI-focused social audits and public hearings.

The intervention packages are targeted to improve the overall ecosystem functions of the River System and are designed as guided by CERP manual. The CERP manual guides: *“IPacks are to be composed of activities that can be operationalized at River System or site level, they should not include national level policies and measures (PAM) even though the solution trees will naturally contain these, since they respond to the policy and governance failures that are the main underlying causes of D&FD”*. Based on the CERP manual guidance, policy related interventions identified in solution analysis are reviewed against already existing REDD+ national strategy and found that most of them align with the national strategy. Hence, policy level interventions are not emphasized in CERP, rather a local level intervention focusing on restoring degraded ecosystems is prioritized.

CERP being a River System level plan, its interventions (IPacks) are designed to foster upstream-downstream linkages and address issues covering entire River System area. Although the core focus of the IPacks are the upstream and mid-stream regions as guided by Building a Resilient Churia Region in Nepal (BRCRN) project documents, the interventions to be done in upstream area are expected to bring positive change in downstream ecosystem. In case of Bihul River System, majority of activities under IPack 1 (forest restoration and afforestation) as well as IPack 2 (soil and water conservation) focus on upper and midstream regions where hill slopes are high and large degradation occurs in form of forest and soil loss. Interventions to control the forest and soil loss in upstream hilly regions will control the ecosystem degradation, thus reducing sedimentation in the downstream regions in Terai. This will subsequently reduce the flooding and damage of fertile land, River reclaimed areas and old floodplains in midstream and downstream regions. In this sense CERP IPack designs also consider the connectivity and upstream-downstream linkages for ecosystem restoration.

Chapter I: Introduction

1.1 Background

Churia landscape comprises 36 districts and extends from east to west covering 13.6% of the total landscape of the country and is regarded as home to about 60% of the total population of the country (NAST, 2012). It has significant social, ecological environmental and paleontological values as this region provides important source of biodiversity, fossils, and a basis for knowledge on evolution of Asian fauna. Bhavar ecological zone which allow recharges water for flat lands (Terai) via infiltration but newly emerging settlements, road network and urbanization in this area is hindering infiltration and contributing to flash floods in Terai plains of Nepal. Despite its significant importance, the fragile composition of Churia region is degrading at an alarming rate due to increased (livestock grazing, timber smuggling, illegal tree felling, etc.). Consequently, these anthropogenic factors have accelerated the loss of soil biodiversity, floods, riverbank cutting and decreased farmland productivity and which aggravated poverty and land degradation.

With accumulation of degradation on ecosystems in recent years, approaches towards ecosystem restoration have grown significantly with new ideas and opportunities (Choi, 2007; Davis and Slobodkin, 2004). Ecosystem restoration is an intentional human activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability (SER, 2004). Ecosystems have been degraded, damaged, transformed or entirely destroyed as direct or indirect result of human activities. In some cases, these impacts to ecosystems have been caused or aggravated by phenomena such as landslide, drought, erosion, wildfire, floods, to the point at which the ecosystem cannot recover to its prior-condition or its historic developmental trajectory (SER, 2004). The ecosystems sometimes may recover remarkably well without human inputs, especially enough to incorporate the changes and recover ecological processes. But where profound physical, chemical and/or biotic changes have occurred, restoration may require substantial and viable human intervention.

1.2 Rationale of CERP

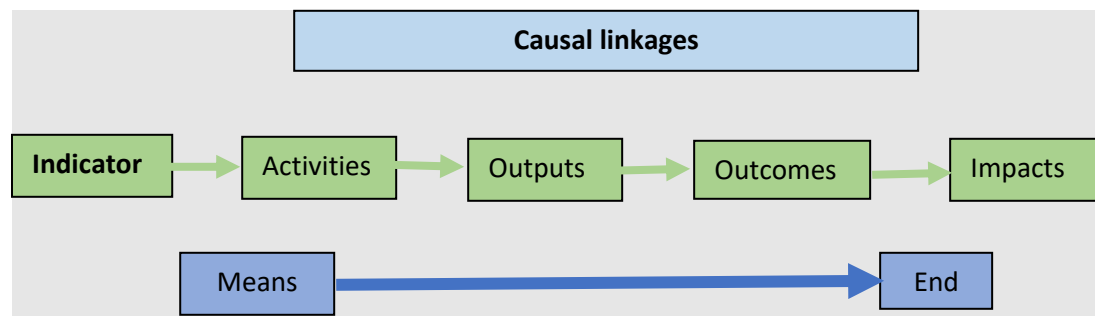
The development of CERPs will contribute to the provision of climate-informed extension and advisory services. It ensures that adaptation to Climate Change (CC) and Disaster Risk Reduction (DRR) has been integrated into provincial and local development planning. The project achieves this through promoting 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 – Sustainable Natural Resource Management (CR-SNRM).

The goal is that government and development partners together improve local and provincial service delivery through River System investments in integrated SNRM interventions. The CERP is also the basis for Monitoring and Evaluation (M&E) of ecosystem restoration actions in the landscape as well as outreach and targeted budgeting on local level. Additionally, the data generated in the annual follow-up of the CERP implementation packages, and their success will bring an array of ground level information in the areas of ecosystem restoration, SFM, sedimentation and forest gain in the River System. The reports on the cumulative impacts of the CERPs should be a part of the country's overall Nationally Determined Contribution (NDC) reporting on land use change and greenhouse gas emissions at national scale.

1.3 CERP and Theory of Change

The overall CERP development is based on the “Theory of change” approach which 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. A theory of change helps to identify solutions to effectively address the causes of problems that hinder progress and guide decisions on which approach should be

taken (Figure 1). A theory of change also helps to identify the underlying assumptions and risks that will be vital to understand and revisit throughout the process of M&E of CERP at River System level.



(Source: CERP Manual, 2021)

Figure 1: Establishing causal linkages with theory of change analysis

Theory of Change can be seen as an “on-going process of discussion-based analysis and learning that produces powerful insights to support programme design, planning, strategy, implementation, evaluation and impact assessment, communicated through diagrams and narratives which are updated at regular intervals” (Vogel 2012, p5). It plays a strong role in cause-and-effect analysis using problem trees and solution trees. It helps in monitoring information and in learning framework development including indicators and in scaling up. The theory of change approach therefore encourages strategic and cost-effective interventions in the long run. Theory of change is reflected in CERP monitoring plan that is presented that consists of following elements:

- Intervention Package (IPacks) and intended key result
- Risk reduction and benefit enhancement targets
- More than one indicator for each target
- Data source or data collection method
- Location of data to be collected
- Frequency of data to be collected
- Responsible person for data collection
- Relative cost of data collection: High, Medium or Low.

1.4 A River System and Ecosystem Restoration

A River System is a land mass of drainage basin where all River and its tributaries accumulate to have a common outlet. BRCRN follows the River System boundaries earlier identified and delineated by President Churia Master Plan (PTCMDB 2017). It is a part of watershed System that should ideally follow hydrological boundary, however River System delineation by president Churia also considers land mass as a management unit that is delineated based on the geographical and socioecological variability. In that sense, all River System boundaries may not be true hydrological units.

A typical Churia River System can be divided into three zones based on the its landform and River geomorphic behaviors as shown in figure (Figure 2). Upstream region which is the major source of sediment production acts as a sediment collection zone (Zone 1). Midstream region where meandering rivers transport sediment causing riverbank cutting and erosion (Zone 2). Downstream region where the sediment dispersal takes place forming River delta and rise of riverbed causing large flooding (Zone 3).

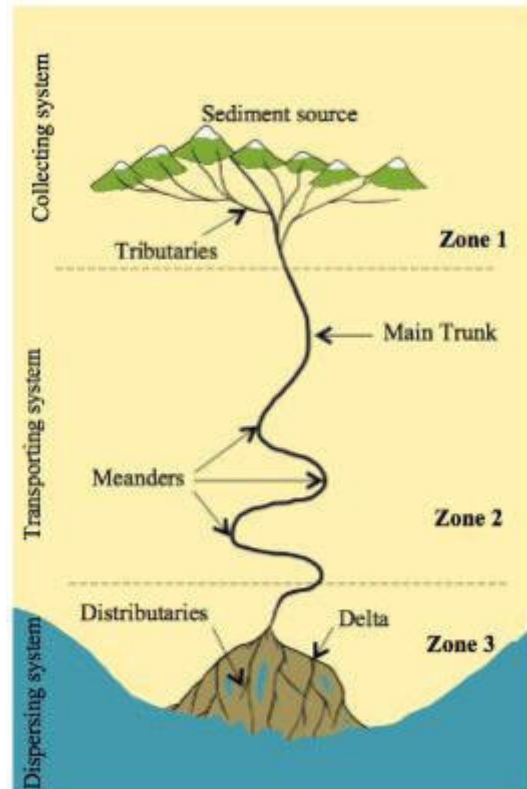


Figure 2: Upstream and downstream linkages in three distinct zones

Ecosystem restoration is the process of halting and reversing degradation, resulting in improved ecosystem services and enriched biodiversity. Ecosystem restoration encompasses a wide range of activities that contribute to protecting integral ecosystems and repairing degraded ecosystems. Such activities include, for example, enhancing organic carbon in agricultural soils, increasing fish stocks in overfished zones, remediating polluted sites, restoring ecological processes, restoring biodiversity and conserving fauna and flora that can assist in the restoration process. In landscapes where restoration is implemented, the economic benefits from restoration will need to be shared on equitable benefit-sharing mechanisms., according to rights particularly with those segments of society previously marginalized on the basis of gender, race, age, nationality or economic status. Land tenure policies and the rights of indigenous peoples will be critical importance given that many landscapes eligible for restoration are currently used by indigenous peoples without land tenure security. The three main goals are:

- Enhancing global, regional, national and local commitments and actions to prevent, halt and reverse the degradation of ecosystems;
- Increasing our understanding of the multiple benefits of successful ecosystem restoration;
- Applying this knowledge in our education Systems and within all public and private sector decision-making.

CERP focuses on River System scale intervention planning to achieve ecosystem restoration at landscape level. CERP is also in-line with the United Nations decade 2021-2030 of ecosystem restoration's principles (FAO, IUCN CEM and SER. 2021).

1.5 Spatial planning as base for CERP

Mapping and spatial analysis have a vital role in the CERP development process. Maps and spatial analysis are often generated by a combination of Geospatial tools (i.e. GIS, Remote Sensing), desk-based research

and fieldwork. Large-scale maps were developed as working tools to be annotated during the workshops and these new digitized maps can be developed by the spatial planning team for further participatory analysis or inclusion in the final CERP document for implementation (Figure 3).



Figure 3: Spatial Planning as a base for CERP in Bihul River System

The CERP starts with preliminary assessment of climate variables to access the impacts of climate induced disasters over the changing land use/land cover patterns in River Systems using Spatial Multi-Criteria Analysis (MCA). MCA process of CERP analyses a number of climate variables to pre-identify ‘hotspot’ sites of climate impacted locations to prepare ecosystem hotspot maps within the River Systems that require interventions. These interventions are then planned and validated through a participatory process through problem and solution-tree analysis workshops. The stakeholders use the ecosystem hotspot maps as a base to demarcate the problem and solution sites, conduct site visits, identify interventions, perform suitability analysis, safeguards analysis, set monitoring protocols and identify budget for the appropriate interventions leading to an effective ecosystem restoration plan.

1.6 Mitigation and adaptation logic in CERP

Noting the role of CERP as the core process of the project in identifying the problems and solutions that lead to project interventions (activities), the CERP objectives will be to balance both mitigation and adaptation resilience building, as well as the social objective of building resilient communities. In this regard, Mitigation and Adaptation potentials of the project are considered as primary entry points for MCA to identify hotspot sites and hence considered as major themes. Mitigation potential is addressed through identifying areas (hotspots) where BRCRN interventions have potential to reduce emissions and enhance the carbon stock. Similarly, Adaptation/Resilience potentials are addressed through identifying areas (hotspots) where BRCRN interventions have potential to address vulnerable ecosystems and vulnerable communities. The variables related to key mitigation and adaptation themes are chosen based on joint discussions with project team considering the availability of spatial data across the 26 River Systems. The results of MCA process to identify maps of critical area (hotspots) for forest loss, carbon stock enhancement and vulnerable ecosystems across the 26 River Systems. The participatory mapping process in field to plan the interventions during multi- local stakeholder consultative workshops.

Below graphics demonstrate adaptation and mitigation logic adopted for which careful choice of themes, variables, process and results were guided by Ministry of Forest and Environment (MoFE) approved CERP manual (Figure 4).

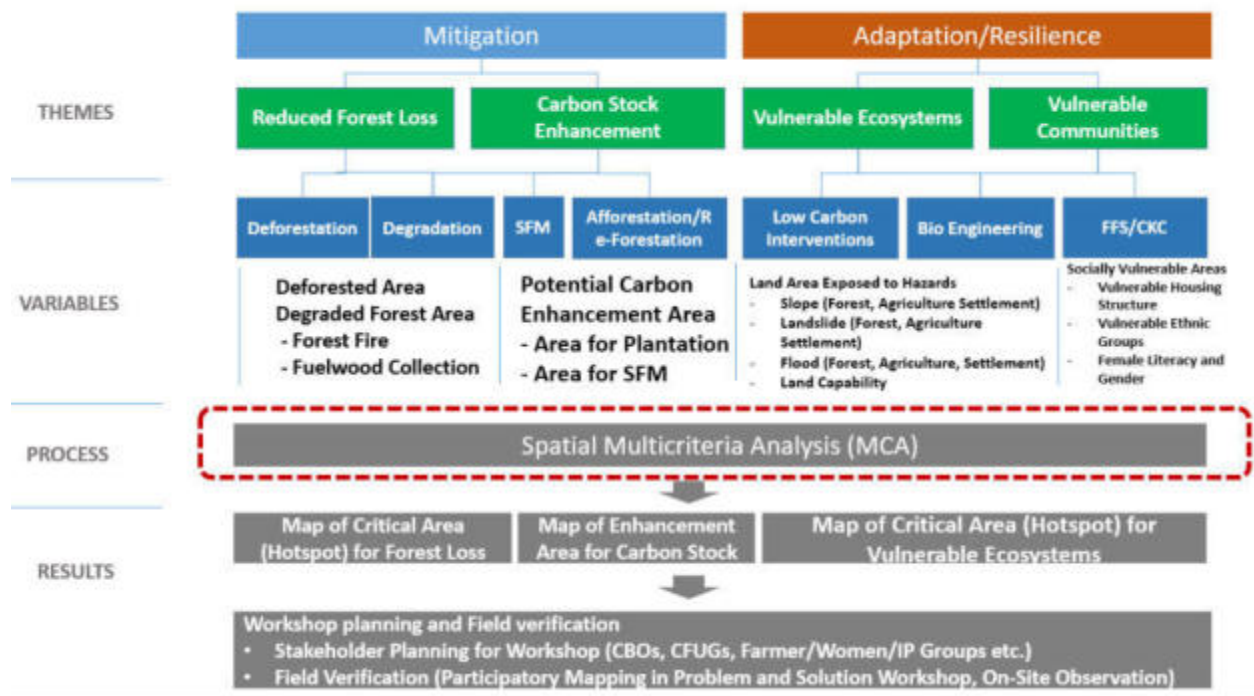


Figure 4: MCA process

The problems are especially concerned with the two thematic issues: climate change mitigation focused on deforestation and forest degradation; and climate change adaptation focused on agriculture, livestock management, and climate-induced disaster risk, vulnerable local communities, and ecosystems. A pair-wise ranking template was used to prioritize the listed problems and drivers in each working group. Discussion with interaction was done on the basis of prioritized problems to assess causes and effects. Discussion and interaction were also done with respect to GESI and IP issues related to the River System. The themes

with the possible relevant indicators of the hotspot was discussed and finalized during the stakeholder's expert consultation workshop (Table I).

Table I: Variables considered as input data for Multi criteria spatial analysis (MCA)

SN	Theme	Indicators	Data available in terms of	Data Type/features	Source
1	Climate Change Mitigation	Deforested area	Forest loss present Forest gain present	Polygon	Hansen
		Degraded Forest Area	Present Absence	Polygon	Google Earth Imageries (2021)
		Forest Fire	Present Absence	Point	MODIS
		Fuelwood Collection	Household using firewood for cooking	Polygon	CBS, 2011
		Forest exposed to landslide hazard	Landslide Inventory in terms of coverage area depending on the River System: High Medium Low	Polygon	Google Earth Imageries (2021)
		Enhancement Area	Pond areas in terms of: Pond exist No Pond Abandoned cultivated land & Riverbed	Polygon	PCTMCDMP (PCTMCDB, 2016) DoS, 1996
2	Climate Change Adaptation	Agriculture land in slope area	Slopes in 3-classes: <20° 20-30° >30°	Raster	ASTER (DEM 30m resolution)
		Agriculture exposed to landslide hazard	Landslide Inventory in terms of coverage area depending on the River System: High Medium Low	Polygon	Google Earth Imageries (2021)
		Agriculture exposed to flood hazard	Flood susceptibility in terms of: Very High (Riverbed) High Medium	Raster	PCTMCDMP (PCTMCDB, 2016)
		Land capability	Land class in 8 classes	Polygon	Soil and Terrain Database (SOTER) (FAO, 2009)

		Settlement exposed to landslide hazard	Settlement area exist Non-settlement area exist	Polygon	Maps.qed.ai
		Settlement exposed to flood hazard	Settlement area at Flood susceptibility: Very High (Riverbed) High Medium	(Raster)	Maps.qed.ai
		Landslide hazard Inventory	Landslide inventory: High Medium Low	Raster	PCTMCDMP (PCTMCDB, 2016)
		Flood hazard	Flood susceptibility in terms of: Very High (Riverbed) High Medium	Raster	PCTMCDMP (PCTMCDB, 2016)
		House structure	Indices	Polygon	CBS, 2011
		Female literacy (Gender)	Indices	Polygon	CBS, 2011

Chapter 2: Introduction to Bihul River System

2.1 Physiography, Land Cover and Hydrology

The Siwalik hills are the source of several significant tributaries to the Bihul River System, including Chapin, Surunga, Patharwa, Amaha, Singesara, Musaharniya, Bairago, and Bihul. The Patharwa River, which has its source at 325.6 meter above mean sea level (masl) in Chure Hill in Khadak Municipality-4 and flows south, is known as the Bihul River once it reaches Surunga Municipality-II at an elevation of 99 masl in Saptari district. The total area coverage of the river system is about 14637.1 hectare (ha) and it covers three physiographic regions as-Churia 1161.6 ha (7.9%), Bhabar 5912 ha (40.4%), and Terai 7563.5 ha (51.7%). The several thematic maps, including the River network of the River System is given in the report (Annex I).

The River System is dominant with tropical mixed hardwood forest-dominant species Sal (*Shorea robusta*), Asna (*Terminalia tomentosa*), Karma (*Adina cordifolia*) Jamun (*Syzygium cumini*), and forest in low land Sisau (*Dalbergia sissoo*), Khayer (*Acacia catechu*), Simal (*Bombax ceiba*) and Tuni (*Toona ciliata*).

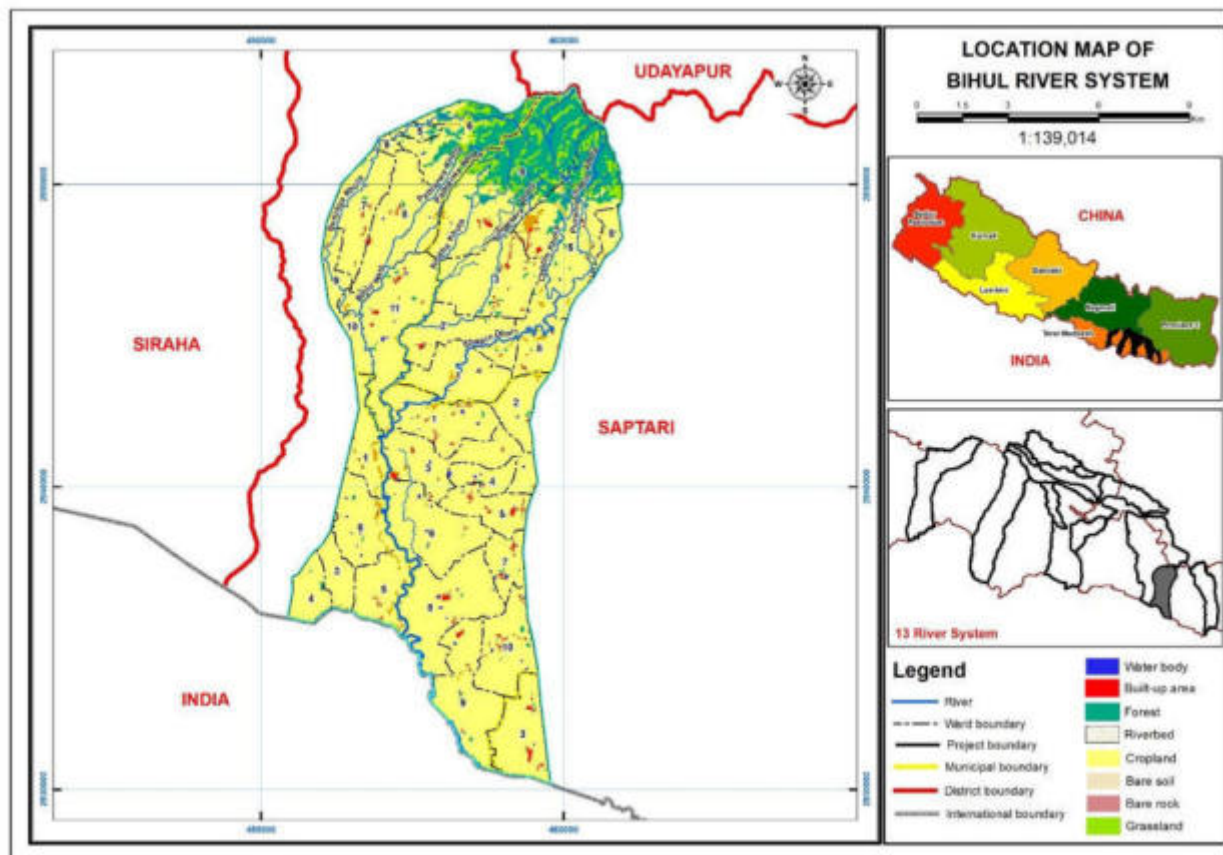


Figure 5: Location map of Bihul River System

The hillslope is composed of Upper Siwalik (LS) and Middle Siwaliks (MS) (DMG, 2007). The US of Bihul River System (RS) consists of interbedded mudstones and fine sandstones or siltstones. Similarly, MS comprises higher proportion of sandstone in a sequence of interbedded sandstone and mudstone. A very low part of the hill lie in the Middle Siwaliks, which is attributed to a higher proportion of beds of thick massive hard and resistant sandstones (Figure 6).

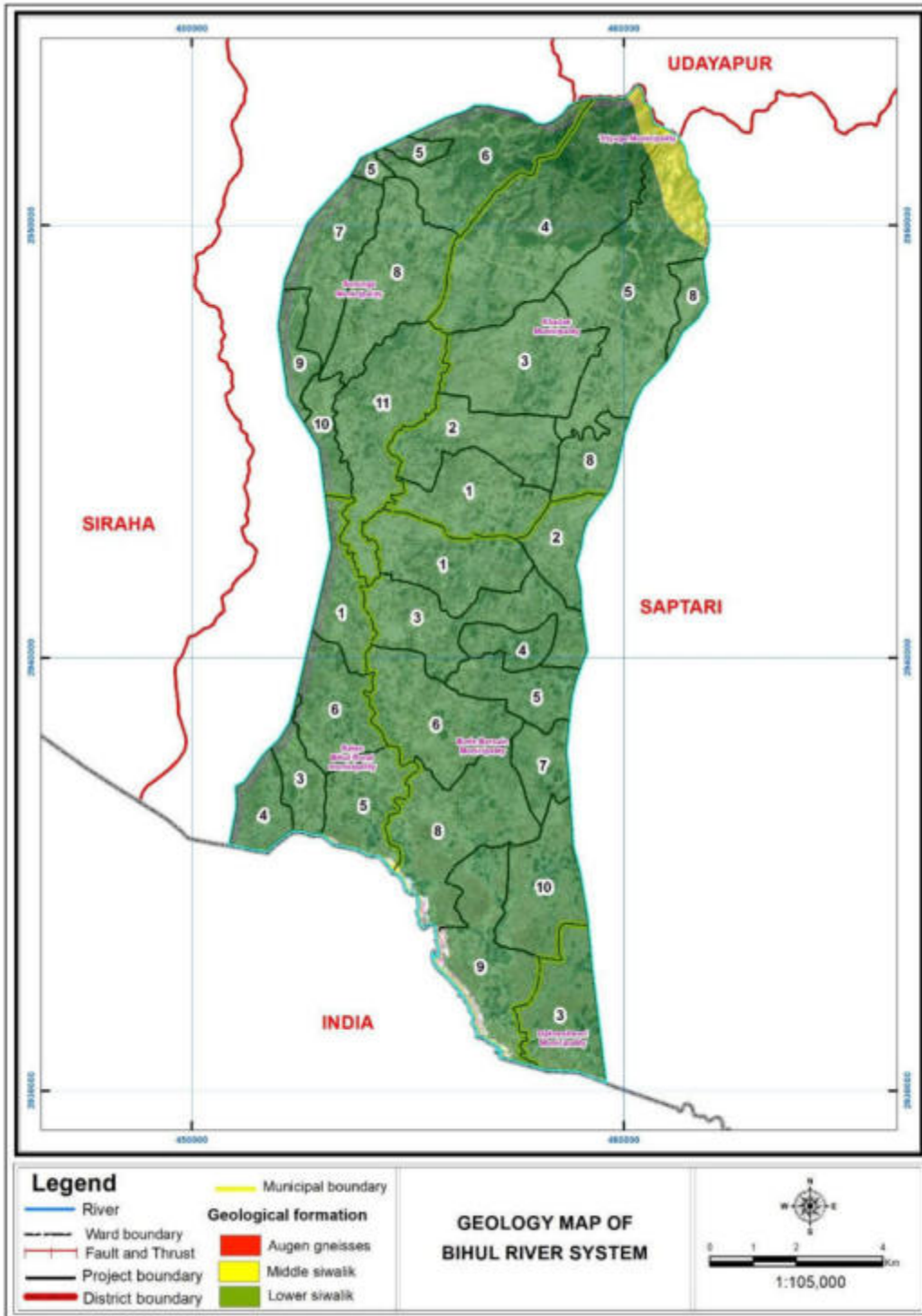


Figure 6: Geology of Bihul River System

Predominant land use of this River System are cultivation land, covering 44.2% of total area in 2000, which has been decreased at the rate of 0.05 percent per year in 19 years (2000-2019). Forest area is also decreased at the rate of 0.24 percent per year over the period (Table 2). Based on local consultation,

potential reasons for decreased cultivation areas are out migration causing labor shortage and abandonment of land.

Table 2: Land cover change in Bihul River System

Land cover	2000		2019		Change area (ha) in 19 years	Rate of Change (% per yr)
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)		
Built-up area	79.4	0.20	186.7	1.08	107.3	0.046
Cropland	23071.0	87.92	22538.4	85.74	-532.6	-0.115
Forest	19324.9	6.42	16904.3	4.36	-2420.5	-0.108
Grassland	5612.1	3.58	5549.2	3.40	-62.9	-0.009
Other wooded land	476.7	0.53	3388.0	3.90	2911.3	0.177
Riverbed	3595.1	1.24	3480.6	1.17	-114.5	-0.004
Waterbody	47.8	0.11	159.8	0.35	111.9	0.013

Source: ICIMOD, 2021

2.2 Climate Variables:

The river system is located in Saptari district and has a tropical climate with significant monsoon influence (June-September), which received higher rainfall (1000-1500mm) (DHM, 2017). A recent study by DHM Nepal on observed climate trend analysis for the period of 1975- 2014 suggested a significant positive trend in annual maximum temperature data at the rate of 0.030° C/ year in Saptari district (DHM, 2017). Moreover, Climate change scenario analysis performed for the National Adaptation Plan (NAP) process indicated that average annual mean temperature of Saptari district is likely to rise, Representative Concentration Pathway (RCP) 4.5 projected that the temperature would increase by 0.85°C and 1.22°C in the medium-term and long term respectively (Table 3). The highest rates of mean temperature increase are expected for the post-monsoon season followed by the winter season (VRA MoFE, 2019).

Table 3: Climate change scenario (MoFE, 2019)

Temperature	District	°C	Change (°C)			
		RCP 4.5	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)
	Saptari	24	0.85	1.22	1.06	1.79
Precipitation	District	mm	Change (%)			
		RCP 4.5	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)
	Saptari	1567	3.26	4.57	3.76	7.87

Source: MoFE 2019

Similarly, average annual precipitation is likely to change in both the medium-term and long-term periods. It is likely to increase by 4.57% and 7.87% in the long period based on RCP 4.5 and RCP 8.5 respectively in Saptari district.

2.3 Socio-ecological process

Originating from and covering a significant area of Bhavar and plain region of the River System. The cultivated land in Bhavar and Terai regions) are at risk to flooding and is a considerable impact on the livelihood of the local people. The main indigenous populations and other ethnicity in the River System are IPs (Hilly and Terain), Madheshi, and Dalit (Hill and Terain) in Bhavar and Terai regions. Even though IPs and Dalit in upstream are in community forest users' groups, they have inadequate capacity for effective forest management. The most of the community from Terai region goes to Bhavar region for grazing and fuelwood collection. The major market centers along the River System are Lahan, Padariya Kadmaha, Chharpatti, Maheshbari, Thadhi Bishwaspatti, Bhediya bazar, Putali bazar are the major market centers of the River System.

2.4 Problem analysis

Theme I: Climate change mitigation

2.4.1 Direct and underlying drivers of Deforestation and Forest Degradation (D & FD)

Several drivers and underlying causes of D&FD were identified in the problem tree analysis in the local user's consultative workshop and verified in the expert consultative workshop held at the River System level. The drivers and underlying causes also identified through community workshop, focus group discussion and consultation meeting with women led organization gender specific concerns, issues. The identified drivers and underlying causes are listed below (Table 4). Riverbank cutting and gully erosions, forest fire, open grazing, and encroachment are the major drivers contributing to forest loss in the River System.

Table 4: Drivers and underlying causes of D&FD in Bihul River System

Drivers	Priority	Underlying causes
Multi-hazards- River bank cutting and gully erosion, drought	1	a) Fragile geology b) Intense and frequent rainfall c) Spatial rainfall variability d) Limited capacity of community for controlling riverbank, torrent, streams, gullies erosion
Excessive fuelwood collection	2	a) Inadequate alternative energy sources especially among women of marginalized groups. b) Lack of commercial fodder practices c) Weak capacity of CFUGs for forest management (for example: not able to effectively operate rules and operational plans) d) Vulnerable communities depend on fuelwood for income generation.
Open grazing	3	a) Inadequate alternative energy sources especially among women of marginalized groups b) Lack of grazing land allocation c) Lack of fodder (about 20% famers have no lands for fodder plantation) d) Intensed graging (about 600 goats-cattles grazed daily from different locations)

Forest fire	4	<ul style="list-style-type: none"> a) Inadequate management of fire lines and trails b) Limited resources for the provision of forest watchers c) Limited forest fire control tools and equipment with users d) Lack of practices for the removal of dried leaves and branches e) Unavailability of water sources in and around forests f) Users' overconfidence in the emergence of new species and regrowth of grasses after forest fire g) Lack of forest management and service training, skills, and knowledge specially for women. h) Inadequate forest management training, skills, and knowledge among men and women. i) Carelessness and unawareness of herders/users
Encroachment and Illegal logging	5	<ul style="list-style-type: none"> a) Ineffective forest management governance of user groups b) Inadequate resources for the provisions of forest watchers c) Inactiveness of Community Based Organization (CBOs) d) Absence of concern from local governments and communities e) Lack of sensitization and awareness f) Lack of coordination among CFUGs members and the general users

Source: Field consultation in the Problem Analysis Workshop, Bihul River System

Problem tree analysis was done in the workshop and is presented here (Figure 7). The first 5 drivers are briefly discussed below:

Multi hazard (flash floods, landslides, and erosion): According to the land features of the River System, it comprises of around 11 torrents (DoS, 1996 topo-sheet and Google earth). Sheet erosion found to get transformed into small channels with runoff water—called rill erosion and then gully erosion—which swept away trees and bushes, especially in the pre-monsoon (March-May) and monsoon period (June-September). The gullies are increasing in number as well as in width in the River System.

Likewise, the occurrence of floods, landslides, and soil erosion has been increasing, expanding their area in the River System. Flooding, landslides, and soil erosion have all been exacerbated by the heavy rainfall. These hazardous events have degraded the forest area in the River System. In addition, landslides and erosion are observed in Khadak Municipality-5 and Surunga Municipality-4 & 6 (information based on Problem Workshop and field visit, 2022).

Excessive fuelwood collection: Local community have lack of alternative energy sources for cooking and other domestic energy consumption uses, lack of skilled trainings with equipment to maintain alternative energy sources and biogas, ineffective fuelwood management among the users are the causes of the dependency of the users on fuelwood collection from the forest areas. Around 150Kg of fuelwood are collected daily from community forest which has contributed in forest loss.

Open grazing: Open grazing is another major driver in the River System. According to local stakeholders: about 300-400 goats grazed daily in Surunga Municipality-5, 6, 7 & 9. Open grazing directly affects seedling, saplings and vegetation regrowth within forest through trampling effect resulting in soil compaction. Open grazing of livestock mainly goats cause damage of saplings through browsing effects. Due to soil compaction, there is less infiltration on the upstream that increases runoff and results in flash flood downstream.

Forest fire: In the River System, every year (from March to May), two to three fire events happen in all community forests. In addition, careless human activity has also increased the occurrence of forest fires. Other underlying causes of forest fires in the River System include people's misconceptions about: sprouting of new grass after fire, limited resources for the provision of forest watchers; limited forest fire control tools and equipment with users; lack of practices for the removal of dried leaves and branches; and unavailability of water sources in and around forests.

Encroachment: According to the local people, forest encroachment is noted in the Bihul River System. Increased encroachment is primarily the result of poor forest management governance of user groups, inactivity of community forest user groups (CFUGs), informal political support contributing to encroachment, an inadequate role of local government in forest management with less emphasis on controlling forest encroachment, and lack of sensitization and awareness.

Illegal logging: Logging is in practice due to weak institutional capacity of forest user groups, lack of livelihood and income-generating options for vulnerable community and interference of downstream communities in the River System. According to the locals, around 20% of the timber smugglers are the local residents while 80% the smugglers are outside residents. Similarly, the underlying causes are inadequate forest operation plan implementation, insufficient skilled human resources, a lack of budget, insufficient coordination among committees, users, and Sub-Division Forest Offices (SDFOs), a lack of awareness, carelessness, a lack of income generation sources, a high reliance on timber and wood, excessive fodder and fuelwood collection, open grazing, and so on.

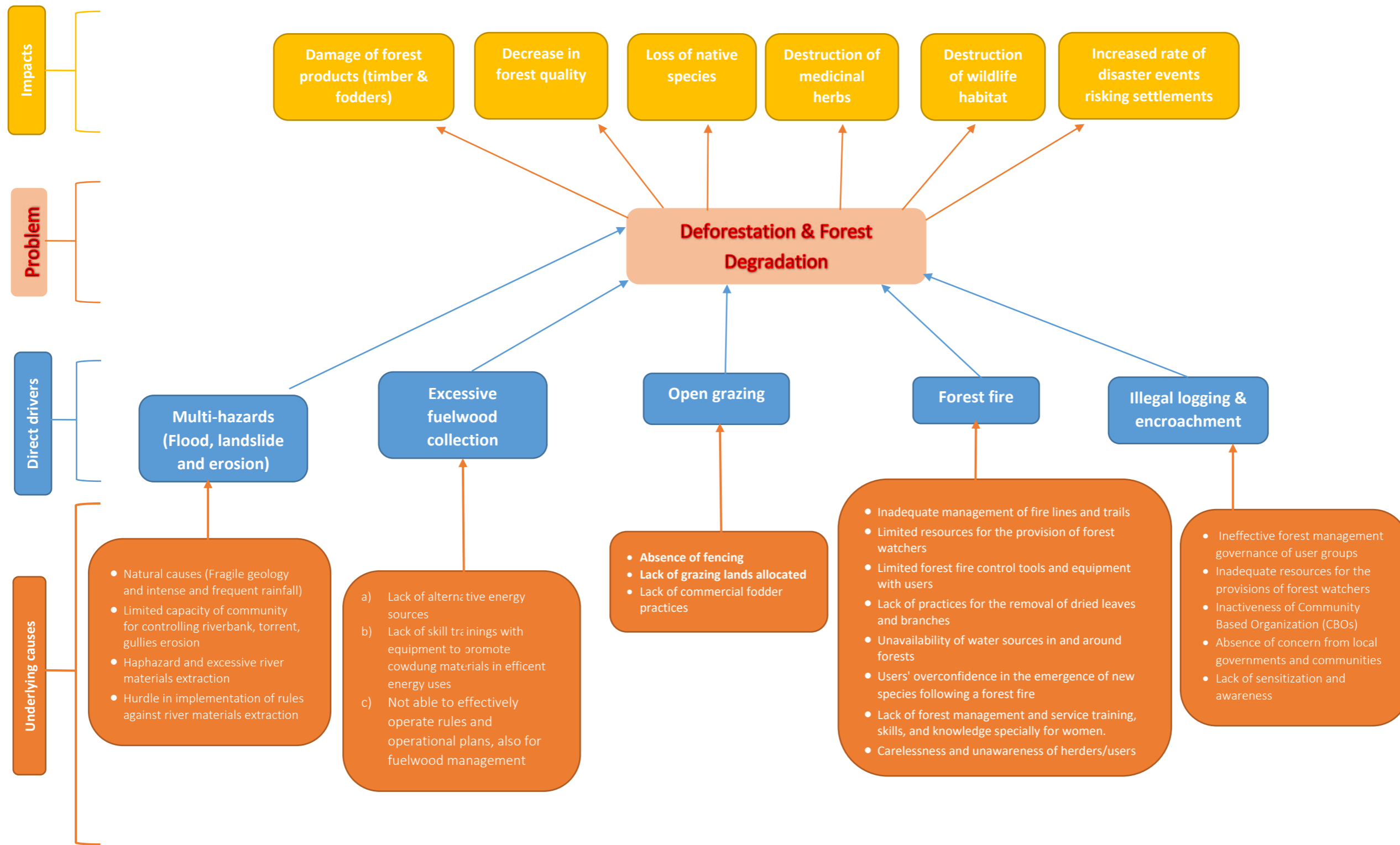


Figure 7: Direct drivers and underlying causes of D & FD in Bihul River System

1.1.2 Hotspot for forest loss (Multi-criteria Analysis Result Map 1)

- The forest covered area has decreased at the rate of 0.108 percent per year in the last 19 years (2000–2019) while built-up area has increased at the rate of 0.046 percent per year in the River System (Source: ICIMOD, 2000 and ICIMOD, 2019). However, the primary information (grazing areas, encroachment areas, and illegal logging, the major forest loss has been concentrated in small patches in the River System. In addition, the several drivers and underlying causes might have contributed to the degraded forest areas (111 ha), mainly in Khadak Municipality-5 and Surunga Municipality-4 & 6.
- Major landslides and rapid formation of gullies, mainly in: Khadak Municipality-5 and Surunga Municipality-4 & 6 have rapidly expanded and eroded the forest lands. The degraded forest region is geologically fragile and has steep slopes.
- Midstream and downstream River bed levels rise rapidly (for example, at Balan Bihul Rural Municipality-6; Bode Barsain Municipality-1, 5, 6, 8 & 9; Khadak Municipality-1 & 5 and Surunga Municipality-5, 6, 10 & 11 silt deposition exposes River bed agriculture lands.
- Encroachment, fuelwood collection, and illegal logging, mainly in Surunga Municipality and Khadak Municipality in upstream in the River System and open grazing are the major driver in the River System. According to local stakeholders: every day, 500-600 goats and 400-500 cattle grazed along the highway and upstream free grazing along the Chapin khola at Ranjitpur, Khojpur, Gauraha, and Kharchuya).

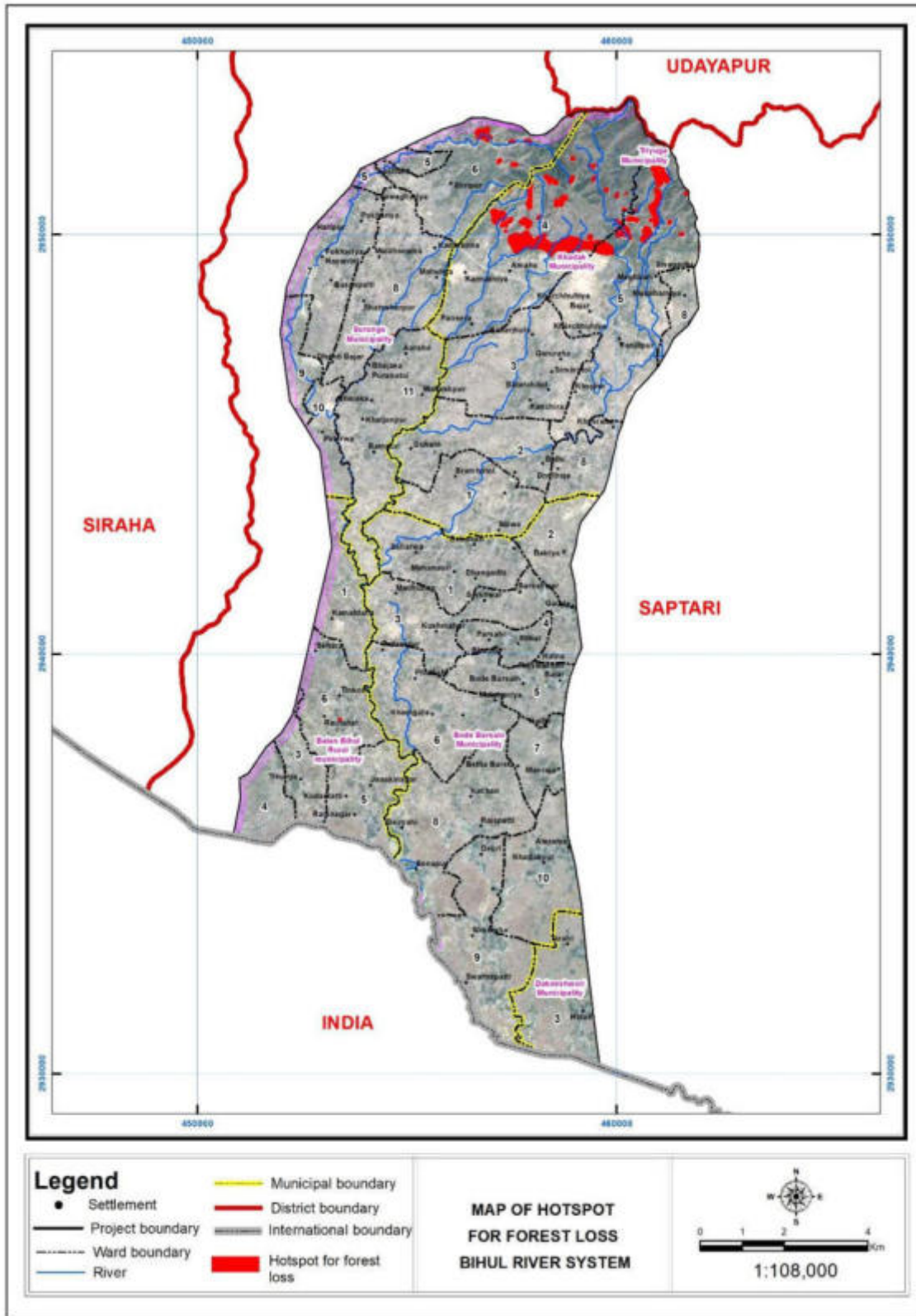


Figure 8: Map of Hotspot for Forest Loss in Bihul River System

2.4.3 Enhancement area for carbon stock -MCA Result Map 2

- About **111 ha** of area are degraded forests that can be restored through forest regeneration activities that contribute to both adaptation and mitigation targets. The degraded forest is situated on different catchments, including Amaha, Patharwa, and Purano Chapin, as well as Musharniya in Khadak Municipality-5 and Surunga Municipality-4 & 6.
- The River side plantation (afforestation) could be done on approximately **91 ha**. Furthermore, afforestation needs to be carried out with different aspects of plantation, including including community land plantation (34 ha), demonstration plantation (8 ha), riparian plantation (11 ha), and woodlot plantation (38 ha). Here, the potential demonstration plantation area is determined on the basis of access to roads (priority along the road), nearby community, and users' priority.

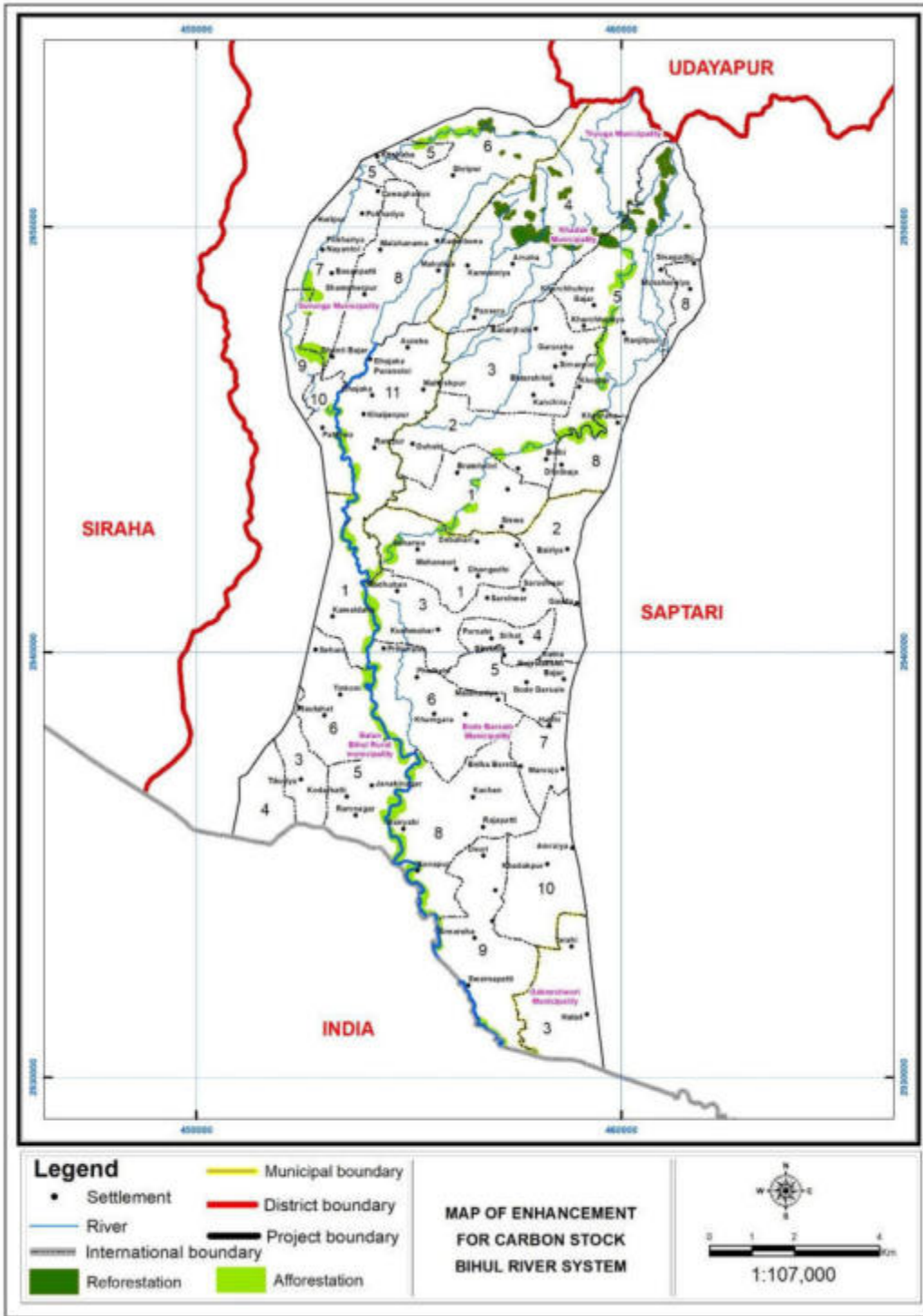


Figure 9: Enhancement for forest carbon stock in Bihul River System

Theme 2: Climate change adaptation

2.4.4 Direct drivers and underlying causes of vulnerable ecosystem and community in the River System

Direct drivers and underlying causes of vulnerable ecosystems and communities in the River System were identified from the problem-tree analysis carried out in the user's consultation problem tree workshop and site verification. The drivers and underlying causes also identified through community workshop, Focus Group Discussion (FGD) and consultation meeting with women led organization gender specific concerns, issues. The major drivers are associated with degraded agricultural landscapes; the uncertainty of climate extremes and their impacts on water sources; agriculture production; crop insects, pests, and diseases; traditional livestock rearing practices; flooding, erosion, and landslide risks; poor irrigation facilities; anthropogenic activities in the extraction of river-induced resources; and capacity-related activities. The identified major drivers with rankings and the underlying causes are listed in the table (Table 5). Here, the drivers were ranked by the participants themselves using participatory Problem Ranking Matrix.

Table 5: Drivers and underlying causes of vulnerable ecosystem and community in Bihul River System

Drivers	Priority	Underlying causes
Inefficient irrigation facilities	1	<ul style="list-style-type: none"> a) Water shortage at sources b) Lack of well-managed irrigation infrastructure c) Flooding occurs on a regular basis and damaging canal headworks in various tributaries of the River System. d) Women, Dalit and marginalized are not getting the access, information and support. e) Inadequate access, information and support to women, IPs, Dalit and marginalized people
Inadequate climate adaptation practices in the agriculture System, especially among women, IPs, Dalit and marginalized community	2	<ul style="list-style-type: none"> a) Inadequate technical knowledge, skills, tools, and technologies for agricultural practices on slope lands; b) Women farmers and marginalized farmer are not included in Sustainable Natural Resource Management (SNRM), technology and practices. c) Not easily accessible to the climate services to support decision making in agriculture practices. Gender roles affect to decide to adopt new practices. d) Inadequate skills and knowledge of compost manure, organic manure, and fertilizer formation e) Inadequate support and priority for crop seed production f) Deterioration of soil nutrition in riverside and farmlands
Multi-hazards- Riverbank, erosion, landslide and deposition and drought and inundation	3	<ul style="list-style-type: none"> a) Frequent and intense rainfall triggers b) Fragile geology c) Excavation of river-induced mining materials in a haphazard manner d) Inadequate community capacity for flood and riverbank cutting control measures; e) Inundation due to rapidly River course changes to low lands in shreerampur, Judi bajar and Sanau khola to Bharatpur f) Lack of resources for water boring

		<ul style="list-style-type: none"> g) Inadequate practices with vegetative measures in soil erosion (low priority of plantation of bamboo, broom grass (<i>Amrisho</i>)) h) Plantation is lacking in gabion wall construction for River control measures. f) Lack of plantation in gabion wall construction for River controls measures
Infestation of crop insects, pests and diseases	4	<ul style="list-style-type: none"> 1. Lack of skills and knowledge for the selection of healthy seeds 2. Lack of understanding of pesticide applications 3. Unavailability of pesticides on time 4. Lack of access, service, and information, specially among women, Dalits and vulnerable communities/households
Decreases soil fertility	5	<ul style="list-style-type: none"> a) Inadequate resources and knowledge to restoration of soil nutrition in riverside and farmlands b) Inadequate knowledge of how to use fertilizer properly in changing environmental conditions;
Wild animal threats to agricultural production	6	<ul style="list-style-type: none"> a) Declining quality of wildlife habitats in the forests b) Inadequate crop farming practices, which are usually not damaged by wildlife, g) Lack of coping measures like fencings to protect agriculture crop from wildlife threats (<i>Neel Gai. Badel, Dumsi</i>)
Inadequate knowledge with no access to the commercialization of agricultural production	7	<ul style="list-style-type: none"> a) Lack of agricultural production collection centers and storage b) In access to the market center and information directly c) Becoming expensive to use tools/machines in agriculture mechanization <p>Insufficient knowledge, agri-extension service/materials targeted to women and vulnerable groups.</p>
Inadequate gender-inclusive governance	8	<ul style="list-style-type: none"> a) Male- supremacy and dominance in decisions b) Limited access of women to information and communication (especially climate change and irrigation, information about existing facilities, fund, notice, and subsidies) c) Less consultation with women regarding agenda and time of meetings d) Unavailability of disaggregated data e) Lack of recognition of traditional knowledge of women in SNRM f) Articulation of CRLUP/SNRM /DRR as scientifically complex subjects g) Limited knowledge on gender mainstreaming approach and value among officers/key people d) Gender power relations within households and in society and restricted mobility of women

Source: Problem tree analysis workshop,2022

The River System suffers from multi-hazards (drought, riverbank cutting, flood and landslide) due to climate impact and the impacts are magnifying due to its topographic settings and land use change. These

phenomena cause the degradation of land resulting into decreased agricultural production resulting in community vulnerability.

The agriculture ecosystem in the River System is vulnerable to River bank cutting in agriculture lands. In addition, the agricultural land is threatened by River cutting and heavy sediment deposition, resulting in the loss of soil and soil fertility. These drivers play a negative role in decreasing agricultural production in the River System. Mainly, in Khadak Municipality-4, 5 & 6 and Surunga Municipality-7 & 8 the agriculture production has decreased in the river system. The River bank cutting is mainly identified in different locations, particularly in the near Bode Barsain Municipality-1, 3, 5, 6 & 8; Khadak Municipality-1, 5 & 8 and Surunga Municipality-4 & 11 regions. The sediment deposition is on 91 ha area in the River System.

Surface and sub-surface water and ground water are the sources for irrigation in agriculture in the River System. However, the irrigation structures at the head are threatened regularly due to the floods in the monsoon season in Khadak 1, 2, 3 & 4 and Surunga Municipality-5 & 6. The drinking water issues is also observed in Khadak Municipality-4 & 5 and Surunga Municipality—5, 6 & 8. Lack of grazing lands and inadequate technical knowledge and skill on livestock management has decreased people's interest on livestock rearing. For example: issues in livestock rearing practices are observed in Bode Barsain Municipality, Khadak Municipality, Balan Bihul Rural Municipality and Surunga Municipality.

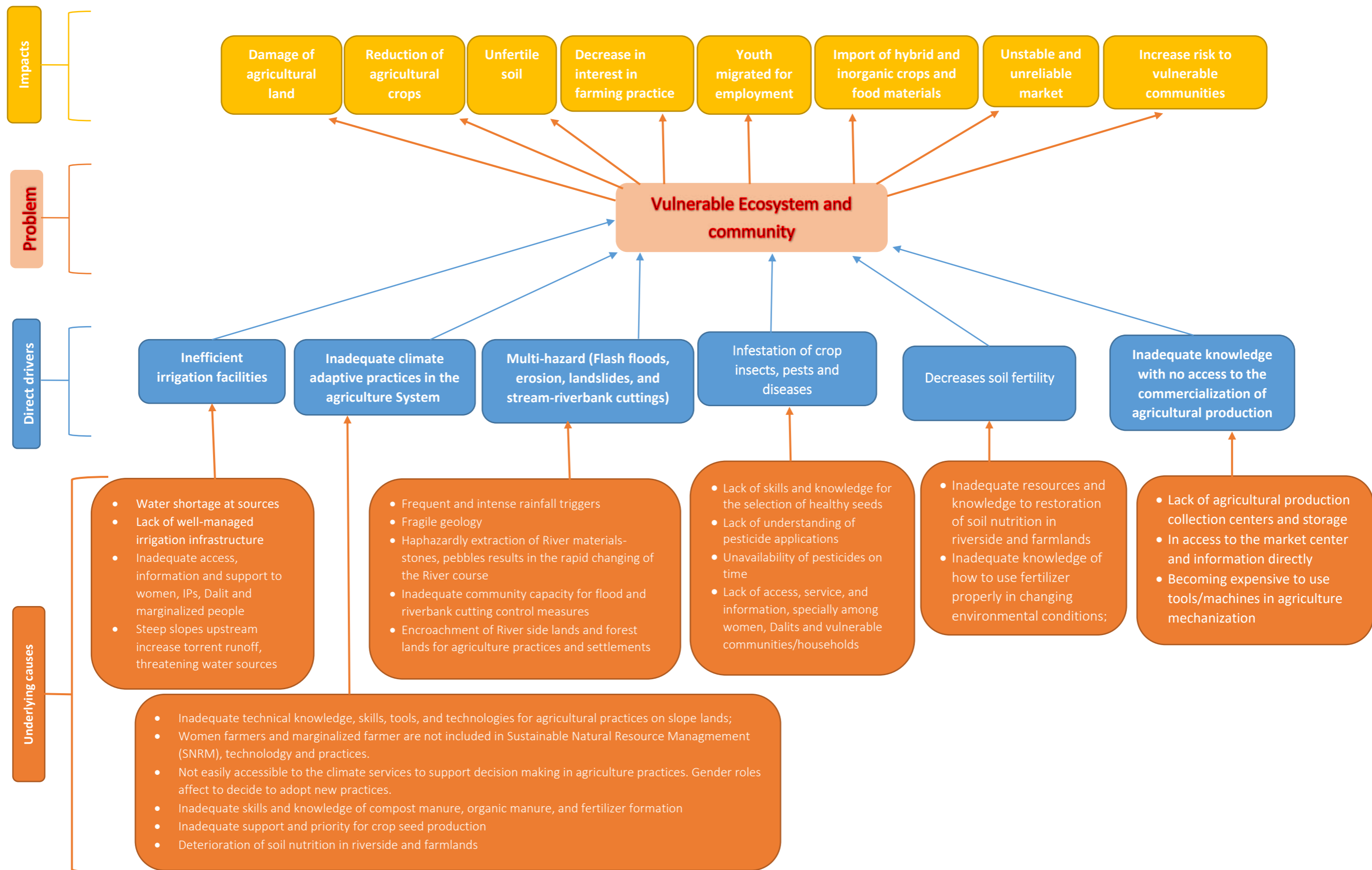


Figure 10: Direct drivers and underlying causes of vulnerable ecosystem and associated community in Bihul River System

2.4.5 Hotspot for vulnerable ecosystems- MCA Result Map 3

- Primary data on sediment deposition area, River bank cutting zone, landslides were also integrated into the hotspot maps;
- Sediment deposition has been identified in the agricultural lands covering 91 ha, mostly in Balan Bihul Rural Municipality-6; Bode Barsain Municipality-1, 5, 6, 8 & 9; Khadak Municipality-1 & 5 and Surunga Municipality-5, 6, 10 & 11 of the River System;
- The spatial distribution of the hotspot map showed the distribution of hotspot areas along gullies, the River bank with the most vulnerable communities with respect to riverbank cutting and flooding in the River System. The consequences of such a phenomenon reflect on social vulnerability, including:
 - Around 2.71 ha agricultural lands are exposed to flooding and river bank cutting by Chapin khola in Khadak Municipality-5.
- The vulnerable ecosystem and associated community have been classified into three classes of vulnerability, i.e., high, medium, and low. The high vulnerability refers to settlement risk and forest loss due to multi-hazards; the medium vulnerability means agricultural land risk to floods and landslides; and the low vulnerability refers to the low impact of agriculture and settlements from floods and erosion risks (Figure 11).

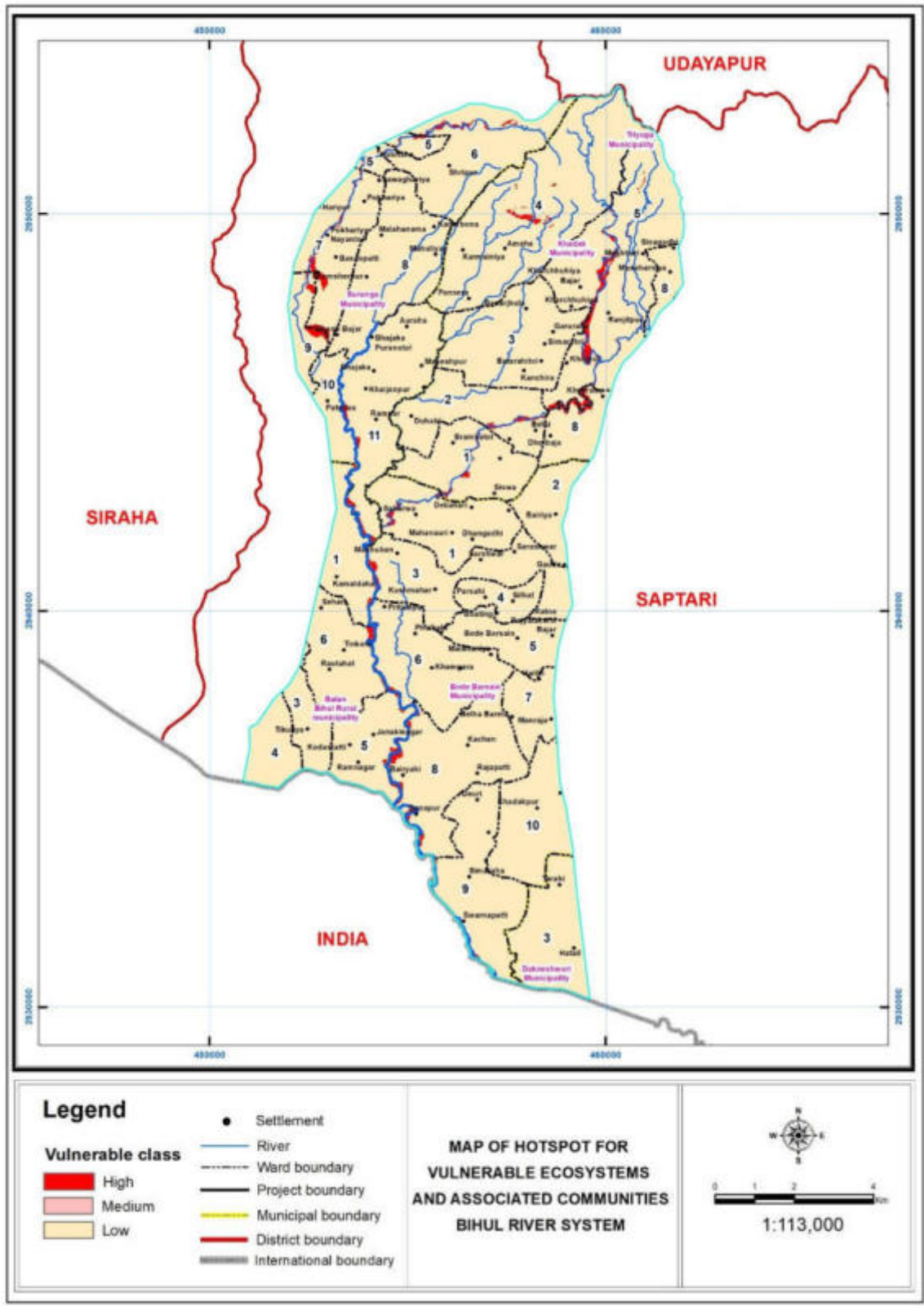


Figure 11: Map of Hotspot for Vulnerable Ecosystem and Community in Bihul River System

2.4.6 Linkage of GESI and IPs specific issues to forest loss and vulnerable ecosystems

Mainstreaming of Gender Equality and Social Inclusion (GESI) and Indigenous Peoples (IPs) are needed in the implementation of the restoration of the ecosystem in the River System. Because of some limitations, women and men have direct and indirect roles in degraded forests and ecosystems. Women in the River System have suffered from the impact of climate change and vulnerability. Women lacked relevant information on agriculture to share their views in planning, and women suffered during the disaster. Some of factors that indirectly contributes to forest loss and vulnerable ecosystems include:

- Usually, power imbalances happen when women, the elderly, and marginalized communities are excluded from capacity-building trainings and orientations on forest management-related activities.
- According to the local women, their active participation is limited because: a) training materials usually do not favor them; and b) women are not given more time to express their views on forest and natural resource management.
- Women have felt difficulty continuing the use of improved cooking stoves because they do not have skill in the maintenance of cooking stoves.
- Women from marginalized communities are not interested in vegetable cultivation and agricultural practices in the River System due to a lack of knowledge about crop pest and disease management, ineffective irrigation facilities, and insufficient skills for the preparation and use of pesticides and organic fertilizers.
- Low participation of women in fire control and management measures and training;
- Some other drivers related to vulnerable ecosystems that posed constraints for women's capacity enhancements with respect to power in decision making and access to government facilities, including:
 - Increased climate-induced disaster risks in water management and human settlement;
 - Lack of technical knowledge and skills and irrigation problems
 - The minimum role given to women in irrigation management
 - The training location and general time allocation are unsuitable for female participants.
 - lack of women's involvement in CFUGs for forest management and also for soil and water conservation;
 - Women have little or no decision-making power in agricultural practices downstream.
 - Women have less knowledge about improved seed varieties and have less access to fertilizers.
 - Women's time is spent, which is prominent in livestock rearing and feeding, but they could not take their decisions in earning money by selling cattle and goats.

Solution Analysis

2.5.1 Climate change mitigation: solution analysis of D&FD

Environmental impacts of D & FD include-damage and fragmentation of habitat, loss of biodiversity, disruption of water cycles, soil erosion, and desertification. The potential mitigation activities determined by the local users' community in the solution analysis workshop are presented in the graphics (Figure 12) in order to promote forest development for reducing D &FD in the River System. Such mitigation activities include- afforestation, Assisted Natural Regeneration (ANR) for reforestation, and capacity building for sustainable management of existing natural forest, with key supportive activities.

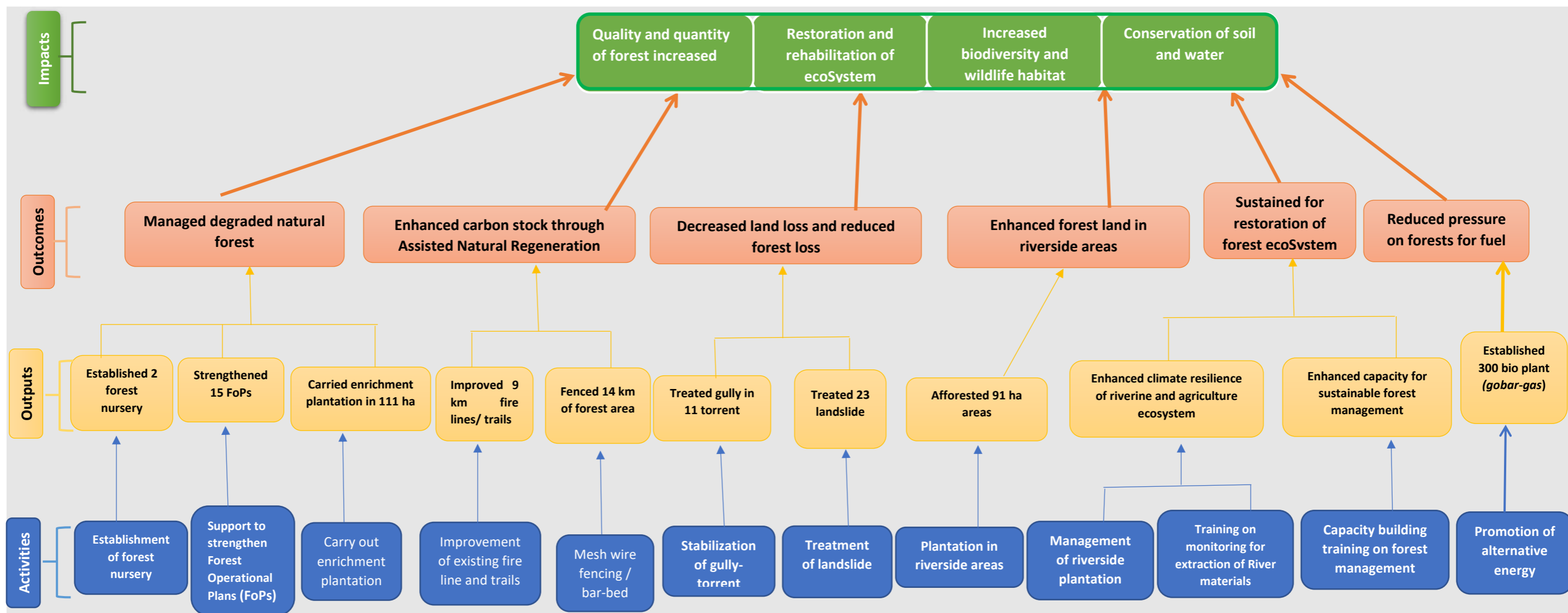


Figure 12: Solution tree analysis in Bihul River System: Climate change mitigation

Activities, Outputs and outcomes for reducing degraded forest and enhancing forests

Several activities are proposed in the solution tree workshop to reduce degraded forest and increase carbon stock for enhancing canopy cover and forest density. The details of the activities are given in the Intervention Packages (IPacks) with their feasibility and safeguards matrix (details given in Section 5). And the details solution with the location and activity code in the map with BRCRN priority are also given in the separate data spread-sheet. The outputs and outcomes of the activities in climate change mitigation are given in the table (Table 6).

Table 6: Activities, outputs and outcomes for reducing degraded forest and enhancing forests in the Bihul River System

Sub-activities	Activities	Outputs	Outcomes
Forest nursery establishment and enrichment plantation in degraded forest		Output 1: Natural forest ecosystems are better maintained and protected within the project area	
Natural regeneration Management-Assisted Natural Regeneration (ANR) activities <ul style="list-style-type: none"> ➤ Reduction of forest fire hazards through cleanings and improvements of existing fire line and existing trails (extraction of bushes, leaf litters and forest residues) ➤ Fencing with mesh wire ➤ Provisions for forest watcher, ➤ Minimize grazing with alternatives; ➤ Provisions for forest fire response toolkits (toolkit include gloves, boots, first aid medicine, accidental insurance) ➤ Adoption and linking of new technology (for example: Forest Watcher mobile app-the dynamic online forest monitoring and alert Systems) for fire controls, ➤ Strengthening and reviewing forest operation plans to reinforce the forest management System. ➤ Empower CFUGs /LFUGs (considering women member) on forest management and forest governance; ➤ Prioritize women members of CFUG's in providing training, capacity development and other activity that affect 	Restoration of degraded natural forests		<ul style="list-style-type: none"> ➤ Degraded forest managed ➤ Enhanced climate resilient in forest ecosystem ➤ Enhanced carbon stock in natural forest region

Sub-activities	Activities	Outputs	Outcomes
sustainable natural resource management.			
Orientation sensitization on forest fire control and management for herders and forest users groups	Enhancement of capacity for sustainable forest management		Reduced barriers of sustainable forest management Sustained for restoration of forest ecosystem and services
Capacity buildings on forest management for: <ul style="list-style-type: none"> • users groups prioritizing women • government entities 			
Capacity-buildings for local government on monitoring for sustainable extraction of River induced materials and mines;			
Facilitating support for sustainable extraction of riverbed materials at River System level in collaboration with the concerns (for examples: municipal government, province government and division forest offices, River mining's industries private sectors and relevant stakeholders)			
Plantation in River site areas Post plantation management with irrigation facility and fencing	Enhancement of forest land in River side areas	Output 2: Forests and tree cover are restored and maintained in the River System landscapes.	<ul style="list-style-type: none"> ➤ Enhanced forest cover and contributed in carbon stock (in 20-30 years from the plantation period) ➤ Enhanced livelihood capacity of vulnerable community ➤ Reduced human pressure on natural forest for woods, fodders and buildings materials ➤ Enhanced soil fertility of degraded lands in River site lands
Capacity buildings trainings for users on the management of plantation in new areas-River side areas			

Sub-activities	Activities	Outputs	Outcomes
			➤ Enhanced climate resilience of riverine and agriculture ecosystem
Stabilization of gullies with torrent controls in the torrent through innovative technology and local vegetative protective measures	Conserve soil and water source and Improve water retention	Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks	
Treating landslides with vegetative conservation measures(priority basis)			
Facilitation for the Promotion of alternative renewable energy sources (improved cooking stoves, biogas, electric stoves) for women and vulnerable communities' dependent on the fuelwood for energy			

2.5.2 Climate change adaptation: solution analysis

The major solutions are associated with climate resilience in agriculture and land use practices; risk reduction of climate induced hazard floods, landslides, and droughts; and capacity building of farmers and users to enhance their climate resilience.

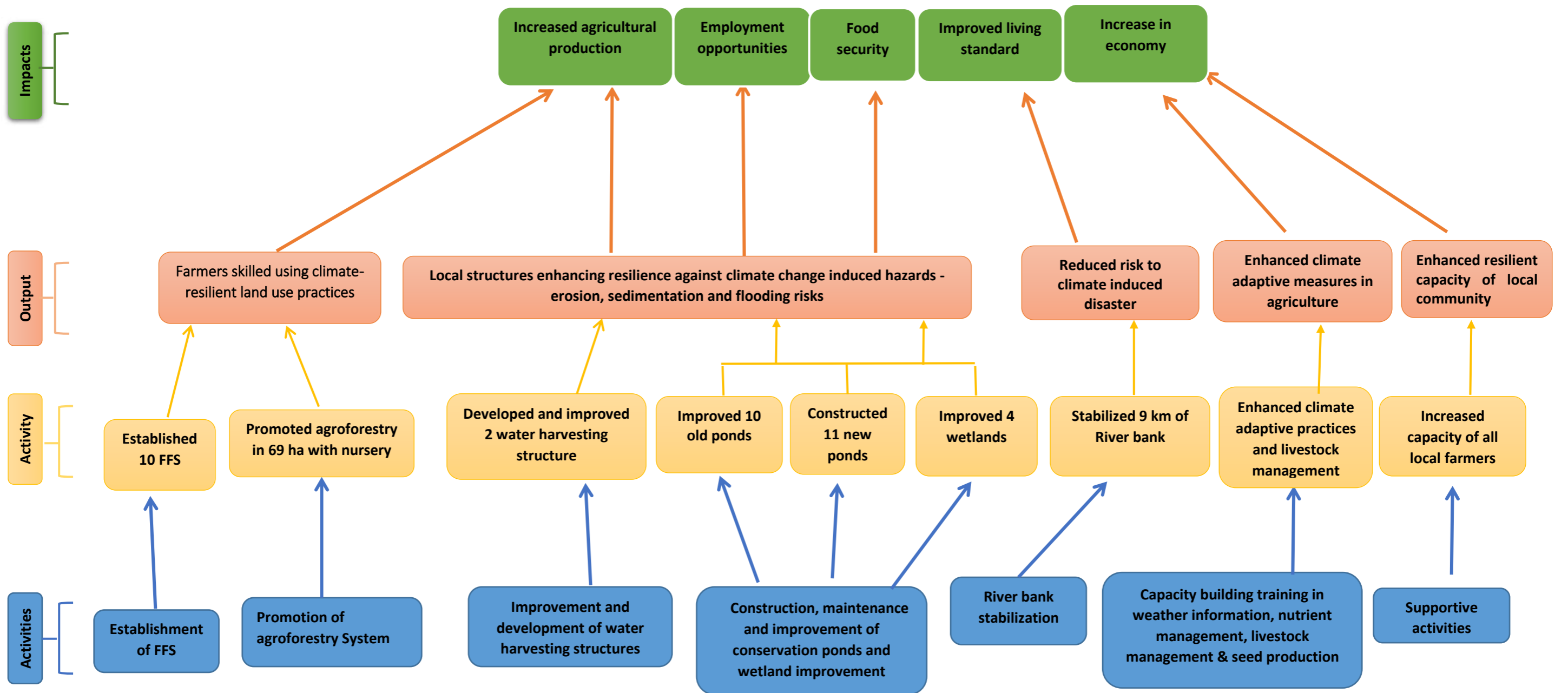


Figure 13: Solution tree analysis in Bihul River System: Climate change adaptation

Activities, outputs and outcomes for reducing vulnerable ecosystem and communities

In order to address drivers listed (Ref section 2.4), several activities have been proposed to reduce vulnerable ecosystem and increase climate resilience of local vulnerable communities in the River System. The details activities are given in the Intervention Packages (IPacks) with their feasibility and safeguards matrix (details in Chapter-5). And the details solution with the location and Activity Code in Map with BRCRN priority are also given (provided the separate data sheet-excel in Appendix of the report). The outputs and outcomes of the activities in climate change adaptation and resilience is presented in the table (Table 7).

Table 7: Activities, outputs and outcomes for reducing vulnerable ecosystem and communities in Bihul River System

Sub-Activities	Activities	Outputs	Outcomes		
Construction of conservation ponds	Improve water and water retention and conserve water sources	Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.	Enhanced coping and adaptation capacity of farmers to disaster risks		
Improvements and development of water harvesting local structures					
Riverbanks and torrent banks stabilization using local materials and bio-engineering					
Support on small irrigation facilities especially for small and medium enterprise farmers (for examples: support for surface flow management using cutoff wall chamber, irrigation canal headwork maintenance)					
Pond improvement					
Wetland improvement	Reduce risk to water induced disasters and enhance coping capacity of vulnerable community	Increased soil fertility	Ensured water sources conservation and continuation of its services		
Capacity buildings for users and government entities Promotion of rainwater harvesting in upstream regions to increase water availability and reduce flash floods, as well as connecting them to community income generation-farming System.				Capacitate stakeholders in water and soil conservation	
Establishing agroforestry System with mixed cropping in multi-year crop; fodder and grasses with horticulture plants	Establish agroforestry activities	Output 4: Farmers are skilled in using climate-resilient land use practices.	Enhanced climate resilient capacity of farmers		
Institutional support for improved agroforestry groups				capacitate farmer groups and government officers to promote agroforestry System	Enhanced the capacity of women in agriculture System and livestock management
Capacity buildings for Agroforestry Users Groups and government staffs				Increased income capacity of women and IPs	

Sub-Activities	Activities	Outputs	Outcomes
			Ensured markets of the agricultural productions
Establishment of FFS on several crops addressing several pests and diseases and facilitation for soil testing	Reduce risk to crop pests and diseases Increase agriculture production		
Support to farmers for seed production in the FFS locations			
Support for the conservation and utilization of water source by using local friendly technologies: Irrigation facilities improvement and drinking water sources improvement	Utilize water sources and improve irrigation services		
Capacity-building training in the use of weather information and its application in agricultural practices;	Enhance climate agricultural adaptive practices and increase livestock management practices		Enhanced climate adaptive measures in agriculture
Provide training nutrition management landuse practices- (Following customary laws and practices adopted by Indigenous Peoples in land use patterns) - compost manure preparation, mulching, water retention capacity, green manure)			
Livestock management through FFS with and fodder bank and shed improvements			
Support to farmers' sensitization to save agricultural practices and production from wildlife threats	Develop wildlife risk friendly agricultural practices		
Support to link farmers with the market centers and market information;	Enhance farmers capacity in commercialization of agricultural productions		Ensured income of small farmers through the agricultural production
<ul style="list-style-type: none"> • 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 learnings in gendered governance, <ul style="list-style-type: none"> • Conduct rapid assessment on women's contribution and 	Promote gender-inclusive governance		<ul style="list-style-type: none"> • Increase women's participation • Share information about the latest news, update, notice, fund, plans and budget • Time information about training and meetings

Sub-Activities	Activities	Outputs	Outcomes
<p>involvement in NRM/ CRLUP and management.</p> <ul style="list-style-type: none"> • Provide gender mainstreaming trainings/ workshops to local government and CBOs and concerned stakeholders. • Conduct GESI focused social audits and public hearing. • 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. 			<ul style="list-style-type: none"> • Promote and engage leadership • Male engagement

2.5.3 Map of Planned interventions MCA Result Map 4:

The enhancement activities in the Bihul River System are divided into five intervention packages in the River System: I) Restoration and rehabilitation of degraded ecosystem through sustainable forest management, ii) Soil and water conservation iii) Agroforestry Systems, and iv) Climate resilient agriculture technologies and practices. The major enhancement activities include: restoration of degraded forest and forest lands, plantation in River site lands and promotion of woodlots and increasing soil fertility in River site lands through agroforestry System and enhancement of farmers’ capacity to adopt to climate change impacts on agriculture through the establishment of Farmer Field Schools (FFSs) in the River System. The “M” code in the planned intervention map referred to mitigation activities and “A” stands for adaptation activities in Bihul River System (Figure 14).

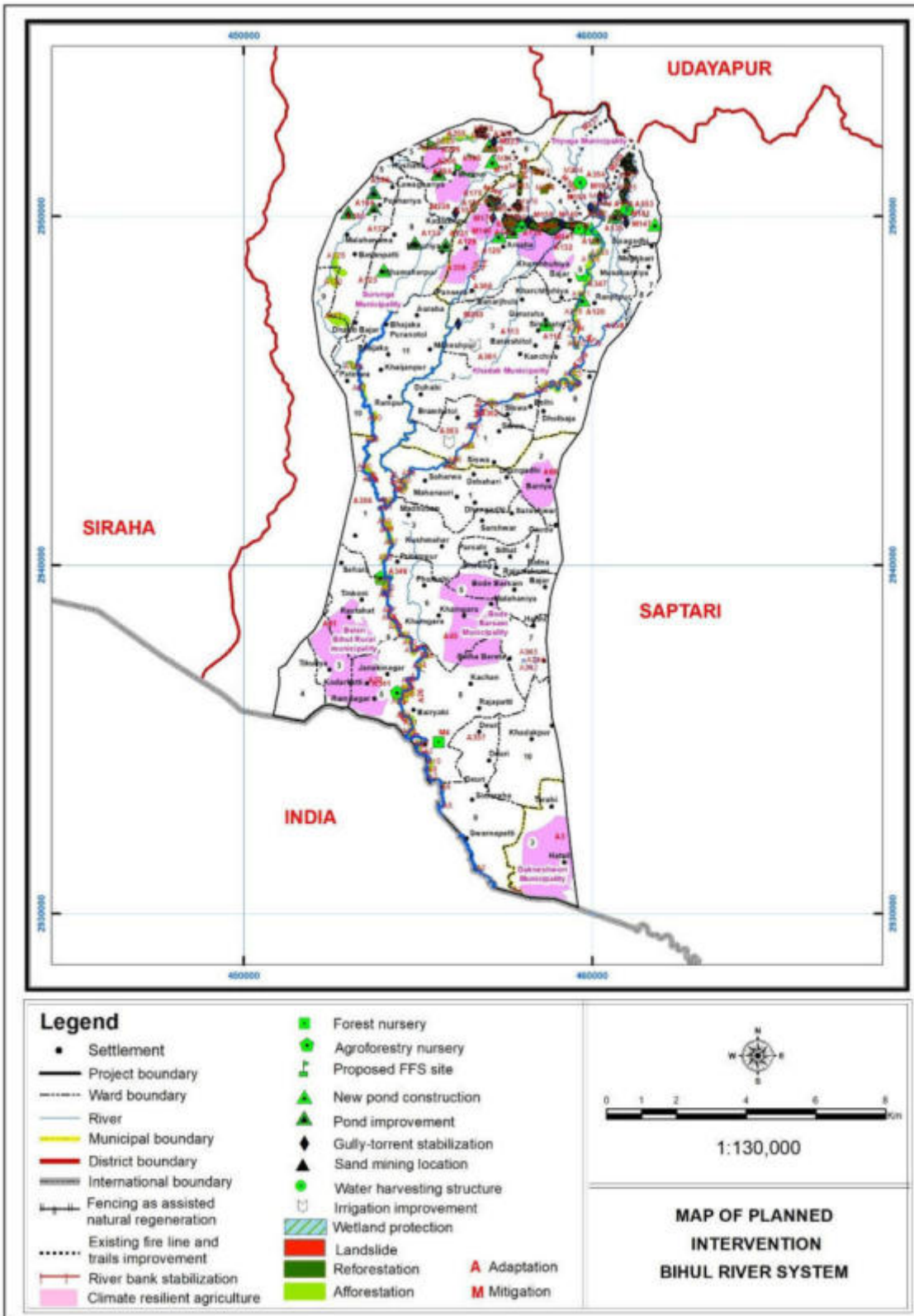


Figure I4: Map of Planned intervention (Mitigation and Adaptation) in Bihul River System

2.5.4 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, the 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 natural resource management sector.
- c. Provide an opportunity for women with specific, major actions in the restoration of the hotspots, for example:
 - Increase financial investment in women's decision making capacity buildings, especially in forestry activities and horticulture for Churia's and Terai region women groups.
 - Provide women's capacity-building training in nursery establishment and seedling production.
 - Provide capacity-building training to CFUGs and farmers' groups on River bank and gully stabilization.
 - 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 and access to woodlots in public and private lands
 - Minimize women's workload by engaging men in household or farm activities.
 - Reduce social barriers (gender inequality, social and economic insecurity and lowered education and understanding level) for Dalit, indigenous people, 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);
- d. Special attention on Free, Prior, and Informed Consent (FPIC) process is required for the implementation of the any activities highlighted in the CERP. For this, the following 6 steps that the implementing agency (CBOs) and project manager must consider in different actions during the CERP implementation in the River System, they include:
 - **Step 1:** Identification the Indigenous Peoples' concerns and their representatives based on land and territory
 - **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 a feedback and complaints mechanism
 - **Step 5:** Conduct participatory monitoring and evaluation of the agreement
 - **Step 6:** Document lessons learned and disclose information about project achievements

Chapter 3. Overall observations and findings

- The major drivers of deforestation and forest degradation in the river system are landslides, erosion, riverbank cutting, excessive fuelwood collection, forest fire, illegal logging, overgrazing and encroachment,.
- Low involvement of forest users committees, especially women and users' groups in reducing major drivers of deforestation and forest degradation (free grazing, encroachment, forest fire, illegal logging).
- People's belief in the re-growth of new plant species once incidents of forest fire happen;

- To meet the requirements of soil conservation, water retention, enhancement of incomes of women and marginalized communities, woodlots and fodder in the river system, some demonstration models for restoration practices such as the construction of conservation ponds and riverbed plantations with intercropping and agroforestry systems are required.
- Assisted Natural Regeneration (ANR) and enrichment plantation is needed to carry out the restoration of degraded forest in the natural forest region of the river system.
- A strong collaboration with the local government unit and other concerned government agencies helps to make the implementation of the activities sustainable.
- Governance relating to SNRM, CRLUP and forest management has inadequate gender-inclusive governance. It lack gender responsiveness in action.
- A strong collaboration with the concerned municipal governments (Surunga Municipality, Khadak Municipality, Bode Barsain Municipality, Balan Bihul Rural Municipality) and other concerned government agencies is required to make the implementation of the activities sustainable and for financial collaboration with the BRCRN project.

Chapter 4: Intervention Packages (IPacks) of Bihul River System

The identified solutions with intervention activities (solutions-activities) are grouped into five packages known as Intervention Packages (IPacks) for Building a Resilient Churia River in Nepal (BRCRN) to address the drivers of: a) climate change mitigation—hotspot of forest loss in upstream; b) climate change adaptation—hotspot of vulnerable ecosystems and associated communities in downstream and across the River System.

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 tree analysis and their map demarcations are carefully reviewed against the underlying causes obtained in problem tree 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 tree analysis. 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-midstream-downstream linkage issues are addressed.

The Bihul River System falls in Churia region Terai region. The River System also features a variety of terrains, including fragile geology with upstream sources of boulders, pebbles, and sand, boulder-pebble deposition terrain where the River is fan-shaped, and silt and clay deposition in the middle and lower Terai regions in 71 masl in Bode Barsain and it drain out from Nepal-India border.

Five IPacks contain the activities that connect the three streams (upstream, midstream, and downstream). In this sense CERP IPack designs also consider the connectivity and upstream-downstream linkages for ecosystem restoration. The first two IPacks, IPack 1 (forest restoration and afforestation) and IPack 2 (soil and water conservation), primarily concentrate on the upstream and midstream regions of the River System, where hill slopes and forest degradation are primarily observed. Additionally, these two IPacks will definitely and primarily control upstream soil and forest loss, restoring the degraded land and forest ecosystems, and reducing sediment deposition in the midstream and downstream regions.

IPack 3 (Agroforestry System) concentrates on the midstream and downstream regions that will improve the fertility of agricultural lands in River reclaimed areas in the regions of the River System. The IPack 3 also focuses on the livestock-dependent livelihoods of marginalized farmers by prioritizing fodder species and encouraging horticulture in riverside agricultural lands. IPack 4 (Climate resilient agriculture) deals with the agricultural sector's adaptation to climate change and primarily focuses on downstream farmers. In addition, the IPack 4 will help to enhance adaptation capacity of marginalized and small farmers through climate resilient technology and knowledge and skills in agriculture and water management. Finally, other two IPacks to address gender and women specific focus drivers are proposed, including, IPack 5: Maximize women participation in climate adaptation actions, IPack 6: Advocacy campaign: Gender-inclusive governance campaign. Each IPack contains a general description of the drivers, a list of the most significant initiatives for resolving problems with outputs and outcomes to address the drivers and the underlying causes and effects of the hotspots, implementing strategies, 5-year budget plan for carrying out the initiatives, monitoring plans, analyses the feasibility of the implementation and a brief. Additionally, there are two categories of solution activities: capacity buildings and solution-activities in spatial mappings with activities area code (GIS data features: polygons, lines, and points). The suggested solution-activities in the plan also include beyond the BRCRN priority. Details about problem-solution-activities with the BRCRN priority code are given in the excel file (Referring appendix of the Plan).

IPack I: Restoration of degraded forest (reforestation) and afforestation in river reclaimed land

Why this IPack is needed?

Drivers and General Description : The natural forest loss is about 111 ha, mainly reported in Khadak Municipality-5 and Surunga Municipality-4 & 6 in the River System (Source: ICIMOD, 2015 and Google Earth Imageries, 2021). This IPack is proposed to address the following drivers and underlying causes of Deforestation and Forest Degradation and exposures of river site regions for restoration and afforestation in the River System.

- **Multi hazard (flash floods, landslides, and erosion):** According to the land features of the River System, it comprises of around 11 torrents (DoS, 1996 topo-sheet and Google earth). Sheet erosion found to get transformed into small channels with runoff water—called rill erosion and then gully erosion—which swept away trees and bushes, especially in the pre-monsoon (March-May) and monsoon period (June-September). The gullies are increasing in number as well as in width in the River System.
- Likewise, the occurrence of floods, landslides, and soil erosion has been increasing, expanding their area in the River System. Flooding, landslides, and soil erosion have all been exacerbated by the heavy rainfall. These hazardous events have degraded the forest area in the River System. In addition, landslides and erosion are observed in Khadak Municipality-5 and Surunga Municipality-4 & 6 (information based on Problem Workshop and field visit, 2022).
- **Excessive fuelwood collection:** Local community have lack of alternative energy sources for cooking and other domestic energy consumption uses, lack of skilled trainings with equipment to maintain alternative energy sources and biogas, ineffective fuelwood management among the users are the causes of the dependency of the users on fuelwood collection from the forest areas. Around 150Kg of fuelwood are collected daily from community forest which has contributed in forest loss.
- **Open grazing:** Open grazing is another major driver in the River System. According to local stakeholders: about 300-400 goats grazed daily in Surunga Municipality-5, 6, 7 & 9.
- **Forest fire:** In the River System, every year (from March to May), two to three fire events happen in all community forests. In addition, careless human activity has also increased the occurrence of forest fires. Other underlying causes of forest fires in the River System include people's misconceptions about: sprouting of new grass after fire, limited resources for the provision of forest watchers; limited forest fire control tools and equipment with users; lack of practices for the removal of dried leaves and branches; and unavailability of water sources in and around forests.
- **Encroachment:** According to the local people, forest encroachment is noted in the Bihul River System. Increased encroachment is primarily the result of poor forest management governance of user groups, inactivity of community forest user groups (CFUGs), informal political support contributing to encroachment, an inadequate role of local government in forest management with less emphasis on controlling forest encroachment, and lack of sensitization and awareness.
- **Illegal logging:** Large scale logging is in practice due to weak institutional capacity of forest user groups, lack of livelihood and income-generating options for vulnerable community and interference of downstream communities in the River System. According to the locals, around 20% of the timber smugglers are the local residents while 80% the smugglers are outside residents. Similarly, the underlying causes are inadequate forest operation plan implementation, insufficient skilled human resources, a lack of budget, insufficient coordination among committees, users, and Sub-Division Forest Offices (SDFOs), a lack of awareness,

carelessness, a lack of income generation sources, a high reliance on timber and wood, excessive fodder and fuelwood collection, open grazing, and so on.

Key activities include:

- a. Enrichment plantation in the degraded forest: the potential native tree species, includes Bamboo (*Dendrocalamus species*), Kimbu (*Morus alba*), Tanki (*Bauhinia purpurea*), Badhar (*Artocarpus lakoocha*), Nimaro (*Ficus auriculata*), Gutel (*Trewia nudiflora*), Sisau (*Dalbergia sissoo*), Satisal (*Dalbergia latifolia*), Khayer (*Acacia catechu*), Jamun (*Syzygium cumini*), Simal (*Bombax ceiba*), Sal (*Shorea robusta*), Karma (*Adina cardifolia*); Asna (*Terminalia tomentosa*)
- b. Establishment of forest nursery is recommended nearest to the potential areas of plantation (approaches: private, community and promotion in forest sub-divisions): Balan Bihul Rural Municipality-1 & 5 and Khadak Municipality-5
- c. Natural regeneration management-ANR (Assisted Natural Regeneration) is needed by promoting several actions such as;
 - a. Reduction of forest fire hazards through cleanings and improvements (extraction of bushes, leaf litters and forest residues) (about 9 km);
 - b. Mesh-wire fencing for protection of existing forest as priority ANR activity (14 km),
 - c. Provision of forest watcher,
 - d. Minimizing grazing with alternatives;
 - e. Provisions for forest fire response toolkits
 - f. Adoption of new technology (for example: Forest Watcher mobile app-the dynamic online forest monitoring and alert Systems) for fire controls,
 - g. Strengthening and envisioning of forest management operation plans to reinforce the forest management System.
 - h. Empower CFUGs on forest management and forest governance;
 - i. In addition, the riverside lands (91 ha) have potential for plantation with different aspects in the River System, including community land plantation (34 ha), demonstration plantation (8 ha), riparian plantation (11 ha), and woodlot plantation (38 ha).
 - j. Women and marginalized communities have depended on the forest for fuelwood collection for energy uses and income generation, which needs to be minimized and controlled by supporting them with alternative energy sources;

Objectives of the IPacks

- Improve forest cover through enrichment plantation;
- Improve forest quality through proper management;
- Build capacity of CFUGs to reduce forest fire hazard and risk;
- Reduce natural forest based fuelwood dependency;
- Increase forest cover in riversite area and link the production to the local community in income generation;

Strategies:

- Ensuing accessibility and availability of desirable forest species for plantation with priority to native species;
- Enhancing technical capacity of CFUGs/LFUGs in nursery establishment and seedlings production
- Adopting local measures for River bank stabilization to protect forest loss from flood risk in the riversite plantation
- Reducing grazing by providing alternatives (for examples: supports in fodder nursery in private lands and in community/local forest areas)

- Assisting alternative energy sources for the forest dependent communities in fuelwood collection;
- Ensuring irrigation facilities in plantation areas, especially in riverside plantation
- Enhancing capacity of government forest agencies through the support of equipments, skill based forest management training
- Developing collaboration with the concerned local governments in the River System for the intervention activities in public lands in River site;
- Assuring long-term management of plantations in riverside areas (for example: a community based three-year action plan can be developed and approved in coordination with local government and DFO).
- Visiting to successful demonstration model
- Facilitating on sustainable mining and River materials extraction to reduce environmental impacts, as well as physical infrastructure development in and through forest areas to reduce forest degradation; and for reducing illegal logging.

Incentives for participation & changing stakeholder practices:

- Fair and equitable distribution of benefit of resource to the CF users especially, marginalized forest users;
- Incentives for women and economically marginalised community for their active engagement in nursery establishment and enrichment plantation;
- Incentives for alternative bio-energy;
- Incentives for livestock sustainable management activities (promotion of profit making livestock farming, sheds improvement, fodder nursery- plantings of high quality fodder species)

Output, Activities and Sub-activities:

Output	Activity	Sub-Activities	Sub-Activity Area code	Remarks
Output I natural forest ecosystems are better maintained and protected within the project area	Activity I.1 : Restore degraded natural forests	Forest nursery establishment/promotion (2) in Bode Barsain Municipality-8and Khadak Municipality-5	M4,M141	
		Natural forest regeneration management and Enrichment plantation in degraded forest lands (111 ha) in Khadak Municipality-5 and Surunga Municipality-4 & 6.	M144, M157, M162, M166, M169, M177, M185, M189, M193, M203, M207, M234, M238	
		Natural regeneration management-ANR (Assisted Natural Regeneration): <ul style="list-style-type: none"> • Cleaning of existing fire line and existing trails (9 km) in Bode Barsain Municipality-6; 	M194,M190,M237, M205,M236,M197,M49	Toolkit for forest fire control in accordance with government packages (Trolley with Water Tank if

		<p>Khadak Municipality-5 and Surunga Municipality-4 & 5</p> <ul style="list-style-type: none"> • Fencing around the natural forest lands (14 km) in Khadak Municipality-5 and Surunga Municipality-4 & 6 • Support on forest firefighting equipment/tools sets- (15 sets) • Support for fodder nursery approach-seedlings for fodder trees (400 HHs) • Support on the provisions of forest watcher (at least one in each CFUGs) (15persons) • Linking with existing ICIMOD mobile apps (Forest fire App) for forest fire monitoring and forest management (I) 	<p>M188,M139,M348,M349, M350,M351,M352</p>	<p>possible at district level) the River System has 15 CFUGs/LFUGs and forest firefighting equipment is proposed for one package for each 1 CFUGs</p>
	<p>Activity 1.2 Enhance capacity for sustainable forest management</p>	<p>a. Development of Community Based Forest Fire Fighting Groups (CB-FFFG) 15 events</p>		<ul style="list-style-type: none"> • The total number of CFUGs/LFUGs in the River System is about 15

		<p>b. Provide skill trainings on forest fire control and management (15*3)=45 person for firefighter trainings)</p> <p>c. Support for forest operational plan developments/reviews (15 plans)</p> <p>d. Coaching on forest operational plan for forest users (15 events)</p> <p>e. Provide 1-day orientation trainings for herders/livestock farmers on forest management (500 herders);</p> <p>f. Provide skill trainings on compost preparation using forest based resources-bushes and leaf litters- 5 days training (one for each CFUGs)</p> <p>g. Develop Training of Facilitators (ToF) in sustainable forest management (10 people in the River System);</p> <p>h. Capacity building trainings on forest management for government staffs (DFOs/ SDFOs) (1 event-3 days residential)</p> <p>i. Provide refresher trainings for CFUGs/LFUGs in forest management-3 days for each</p>		<ul style="list-style-type: none"> • Operational plan will be reviewed with respect to climate change, regeneration management, enrichment plantation, forest pests & diseases management, GESI integration, promotion of native species, proportional benefit sharing to marginalized users, respect to culture and social values of IPs and other ethnicity...)- • Production through media/online publications in local language/printings leaflets-pictorial contents for general forest users) • One coaching class events for each CFUGs/LFUGS
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		<p>CFUGs/LFUGs (15 events); each event include 20 persons/users</p> <p>j. Celebration of Churia Conservation day (5 events)</p> <p>k. Capacity-buildings trainings on monitoring of sustainable extraction of riverbed materials and mines (with site demonstration)-3days residential for local governments</p> <p>l. Facilitation for School course programme on sustianable forest management (1 event)</p> <p>m. Production and dissemination of extension material on sustainable management of natural resources. Produce gender friendly materials.</p> <p>n. Facilitation support for alternative energy uses / biogas plants installation(500 HHs)</p>		
Output 2 Forests and tree cover are restored and maintained in the River System landscapes.	Activity 2.1 : Enhance forest land in riverside areas (afforestation)	Plantation in River site area through sustainable management (91 ha) in Balan-Bihul Rural Municipality, Bode barsain Municipality, Surunga Municipality, Khadak Municipality, Surunga Municipality	AI, AI0, AI4, AI9, A2, A20, A217, A218, A219, A221, A227, A229, A230, A29, A34, A36, A40, A42, A43, A46, A47, A5, A50, A52, A55, A57, A59, A6, A60, A61, A64, A67, A69 A7, A70, A74, A78, A8, A80, A81, A82, A83, A85, A86, A88, A9, A97, A99, AI00, AI03, AI05, AI07,	

			AI09, AI10, AI18, AI12, AI21, AI30, AI34	
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Budget Plan (5 Years-Amount in NPR)

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.

Output/Activities/sub-Activity	Unit	Quantity	Rate	Amount	Remarks
Output I: Natural forest ecosystems are better maintained and protected within the project area					
Activity I.1 : Restore degraded natural forests					
I.1.1 Construction/promotion of forest Nursery	no.	2	1,000,000	2,000,000	The cost includes structure of nursery of each capacity 50,000 for Multi-year seedlings production
I.1.2 Seedling production in Nursery (Multi-years seedlings)	No.	100,000	40	4,000,000	The cost includes water supply, seedling bed preparation, nursery Naik, forest soil collection, sand collection, poly bag purchasing, nursery shading, soil filling in poly bag, preparation of germination bed)
I.1.3 Enrichment plantation and regeneration management in degraded forest	Ha	111	250,000	27,750,000	The cost includes survey and alignment, pitting, seedling transportation, and plantation Clearance of leaf litter, bushes, dugout waterholes (30cm*30cm) and contour bund (for

					regeneration management)..
I.1.4 Cleaning of existing fire line and existing trails	km	9	50,000	450,000	In collaboration with municipal government and DFO
I.1.5 Construction/improvements of fencings in natural forest lands	km	14	500,000	7,000,000	adopt mesh wire/ barbed
I.1.6 Support on forest firefighting equipment/tools (15 sets)	no.	15	500,000	7,500,000	Total CFUGs/LFUGs in the River System is only 15 groups. 1 set of firefighting equipment is for 1 groups. need to collaborate with others for firefighting water tanker-big and small size, the cost does not include bigger tanker cost.
I.1.7 support on provisions for forest watcher	persons	15	800,000	12,000,000	for 5 years salary with incentives
I.1.8 Support on fodder-seedlings for fodder trees promotion	HHs	400	5,000	2,000,000	focus for marginalized and livestock based livelihoods dependent community
I.1.9 Linking with existing mobile app System from ICIMOD for forest fire monitoring and forest management (1 event)	lump sum	1	200,000	200,000	
I.1.10 Development of Community Based Forest Fire Fighting Groups (CB-FFFG)	no.	15	20,000	300,000	The cost includes coordination and communication and meetings for the development of CBFFFG
I.1.11 Provide skilled-based training capacity for CBFFFGs on forest fighter trainings-forest fire control and	persons	45	30,000	1,350,000	3 persons from each CFUGs/LFUGs at community level

management for (15*3)=45 persons-firefighter trainings) for CFUGs/LFUGs					Participants also include from local government disaster management unit Collaborate with National Disaster Risk Reduction and Management Authority (NDRRMA) and Armed Police Force
I.1.12 Support on Forest Operational Plan (FoP) renewals/reviews	no.	15	200,000	3,000,000	Review with respect to climate change, regeneration management, enrichment plantation, forest fire, pests & diseases management, GESI integration, promotion of native species, proportional benefit sharing to marginalized users, respect to culture and social values of IPs and other ethnicity...
Sub-total				67,550,000	
Activity 1.2: Enhance capacity of forest management stakeholders (government units, CFUGs, forest management CSOs, users)					
I.2.1 Coaching on forest operational plan for forest users (15 events)	events	15	30000	450,000	Half day orientation on operational plan dissemination/sensitization to the users
I.2.2 Provide 1-day orientation trainings for Herders on importance of forest services and management (500 herders/livestock owners) ;	events	25	100,000	2,500,000	Coordination with cattle's' households' owner Collaboration with municipal government and Livestock Management Centers In 25 blocks events, 20 persons can adjust in each block/event

1.2.3 Provide skilled-based trainings to promote compost and green manure preparation using forest based resources-bushes and leaf-litters-3 days training (one event for each CFUGs/LFUGs)	events	15	300,000	4,500,000	Collaboration with municipal government 1 CFUGs can adjust in one event with one machine
1.2.4 Develop Training of Facilitator (ToF) on Forest Resource Management -7days (10 persons)	persons	10	100,000	1,000,000	Residential training for government staffs (DFO, Soil conservation Office, municipal government and forest management networks and stakeholders One event for 10 people
1.2.5 Capacity building trainings on forest management for government staffs (DFOs/ SDFOs) (1 event-3 days residential)	events	1	600,000	600,000	Participants from forest offices government and other related professional networks working in forest management in the River System Total participants 15-20 persons
1.2.6 Provide refresher trainings for CFUGs/LFUGs in forest management-3 days for each CFUGs (non-residential) at local level	event	15	200,000	3,000,000	The training facilitator-from the ToF receiver One event from each CFUG/LFUGs and the training should be at River System level-non-residential
1.2.7 Celebration of Churia Conservation Day (5 events) at River System level	event	5	100,000	500,000	1 event for each year of the project period at River System level in collaboration with all relevant entities (Government, Non-government, private sector and School unit)

1.2.8 Capacity-buildings training on monitoring of sustainable extraction of riverbed materials and mines (with site demonstration)-3 days residential for local governments	event	1	600,000	600,000	Participants from DFOs/ SDFOs/soil conservation office/Livestock service Expert Center/local government engineers/AKCs) Site demonstration needs to be incorporated in training schedules One event for each year of the project period 15-20 participants in each event in collaboration with the concerns (for examples: municipal government, province government and division forest offices, River mining industries private sectors, and other relevant stakeholders
1.2.9 Facilitation on school course programme on sustainable forest management (1 event)	event	1	300,000	300,000	
1.2.10 Production dissemination of sustainable management of natural resources	Lump sum	1	500,000	500,000	Through publications in local language/printings leaflets-pictorial contents for general forest users,...
1.2.11 Facilitation support for alternative energy uses / biogas plants installation(500 HHs)	no.	500	5,000	2,500,000	In coordination with the municipal government
sub total				16,450,000	
Output 2 Forests and tree cover are restored and maintained in the River System landscapes.					

Activity 2.1 Enhance forest land in River site areas

<p>2.1.1 Plantation in River site area (forestry plantation)</p>	<p>Ha</p>	<p>91</p>	<p>700,000</p>	<p>63,700,000</p>	<p>The cost includes survey and alignment, pitting, transportation of seedlings, filling of fertile soil (30cm*30 cm) or (40cm *40cm); 4-5 kg organic soil, (assumed 20% pits), plantation. The cost also includes watcher, water supply, fencing</p> <p>Priority for 4-categories plantation (riparian plantation, community plantation, demonstration plantation and woodlot plantation)</p> <p>The cost for River bank stabilization with structure measures is required to manage in collaboration (MoU) with municipal government, Janatako Tatbanda, and others , (the cost is estimated in IPack2)</p> <p>Collaboration approach with MoU/working guide notes with other government agencies/local government</p>
<p>2.1.2 Capacity building trainings for users on the management of plantation in River site areas</p>	<p>No.</p>	<p>5</p>	<p>700,000</p>	<p>3,500,000</p>	<p>One training event in every year (for 5 years); demonstration in the plantation regions-River site sites</p> <p>The ToF receivers should be the trainers in the River System</p>
<p>Sub total</p>				<p>67,200,000</p>	

Total cost				151,200,000	The total estimated budget is to be varied once the detailed technical feasibility is completed and the cost can be contributed by other government agencies, especially municipal governments. Thus, a strong collaboration (with a MoU) is needed with the concerned municipal government and soil conservation offices
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Note: Budget estimations are tentative and are subjected to change based on the changes in market situation as well as the field condition.

Feasibility Analysis of IPacks

Outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Output 1: Restore degraded forests				
Nursery establishment	<ul style="list-style-type: none"> • Unavailability of : appropriate site, (water, slope, aspect, accessible to plantation site etc. • Insecurity from wildlife-monkey • Intense rainfall triggers nursery plant • Infertility of soil resulting to unstable of plants 	<ul style="list-style-type: none"> • Ensure water availability • Require site inspection with soil test and other aspect • Purchase seedling from private nursey. • Upgrade forest nursery under DFO • Provide shed for some days. • Adopt multi-year nursery plants (2-year) 	<ul style="list-style-type: none"> • 100,000 seedlings purchased from private nursery • 2 DFO nursery upgraded • 2 Nurseries with shed 	<ul style="list-style-type: none"> • No. of seedlings purchased from private nursery • No. of DFO nursery upgraded • No. of nurseries with shed
Seedlings production (multi-year seedlings)	<ul style="list-style-type: none"> • Unavailability of Multi-year seedlings for first year plantation • Conflict due to the communities interest in species selection(which grows fast with high monetary 	<ul style="list-style-type: none"> • Production of seedlings should start from the first year of the implementation period to meet the demand of seedlings • Communities participation and consultation for the species selection 	<ul style="list-style-type: none"> • 100,000 seedlings produced in planning phase • Seedling species are selected as per the communities as 	<ul style="list-style-type: none"> • No. of seedlings produced in planning phase • Number of consultation for species selection

	value) and project priority on locally adapted species for biodiversity conservation	<ul style="list-style-type: none"> • Hire well experience nursery <i>Naik</i> 	<ul style="list-style-type: none"> well as project needs • At least 1 nursery <i>Naik</i> are well experienced among 2 <i>Naik</i> 	No. of well experience nursery <i>Naik</i> devoted.
Carrying out plantation & regeneration in degraded forest	<ul style="list-style-type: none"> • Drought • Forest fire • Free grazing • Flash flood. • Less interest of CFUGs 	<ul style="list-style-type: none"> • Selection of drought resistant species (sal, Khayer) • Construction of water hole • Contour plantation • Clearance of bushes and leaf-litter. • Fencing • Adopt rotational grazing /stall-feedings • MoU with CFUG/ LFUG for the protection of the plantation area 	<ul style="list-style-type: none"> • 80% enrichment plantation species are drought resistant. • 80% of seedlings protected 	<ul style="list-style-type: none"> • % drought resistant species in enrichment plantation • Number of planted area fenced • % of seedlings protected • Number of MoU with the CBOs
Output 2: Enhance capacity of forest management stakeholders for sustainable forest management				
	<ul style="list-style-type: none"> • Participants may not have interest to receive training • Training event may not match with leisure time of participant. • Venue may not easy accessible to participants especially for women and other vulnerable people 	<ul style="list-style-type: none"> • Provide DSA and transportation allowances to the participant. • Training period selected as per the demand of participants through Regular consultation with CFUG member in advance • Adopt seasonal calendar for training planning/schedule • Effective training through experimental exercise using related instruments • Selection of venue from consultation with participants • Residential training 	<ul style="list-style-type: none"> • 90% of targeted CFUG members actively involved in the training. • 50% women, 13% Dalit and 31% Indigenous people are included in the training • 100% of CFUGs able to know knowledge & skills for forest management 	<ul style="list-style-type: none"> • % of targeted CFUG members actively involved in the training.
	Marginalized beneficiaries may not receive the alternative energy	Require Proper analysis of marginalized beneficiaries.	<ul style="list-style-type: none"> • 90% of marginalized beneficiaries receive alternative energy 	<ul style="list-style-type: none"> • % of actual beneficiaries receive alternative energy

Output 3: Enhance forest lands in River side area				
Carrying out River side plantation (afforestation)	<ul style="list-style-type: none"> Flash flood damages the plantation Free grazing Obstacle in Land ownership. Social conflict between communities of two River banks No provision of government in post plantation management Unwillingness for controlling free grazing due to lack of fodder Mass production of forest product may create problem in harvesting and marketing. 	<ul style="list-style-type: none"> Post monsoon plantation. Prepare guideline on use of River side land. Vigorous consultation with user member Involvement of local government Enhance willingness of local community around public lands through several strategies (for examples: local community managed plantation in coordination with local government; sharing of products the community) Regular thinning and pruning with market assessment. 	<ul style="list-style-type: none"> Post monsoon plantation in 91 ha of River side land. 3 no. of consultation with local government to prepare guideline 90% of users agreed to carry out plantation 20% financial support from local government. One thinning and one pruning/year with market assessment or distribute to local users. 	<ul style="list-style-type: none"> Ha. of land (in post monsoon) planted. No. of consultation with local government to prepare guideline % of users agreed to carry out plantation % financial support from local government.

Safeguard analysis:

Outputs and activities/tasks	Serious risks	Risk reduction measures	Risk reduction targets	Indicators
Nursery establishment	<ul style="list-style-type: none"> Labor hired from outsider that includes women, IPs, Dalits, and marginalized people. Conflict in resources utilization (water, forest soil etc.) Expansion of invasive species 	<ul style="list-style-type: none"> Labor hired from local users. Agreement with corresponding user group for use of local seeds and other germplasms 	<ul style="list-style-type: none"> 80% of labors hired from local users Around 40% women and IPS/dalit/marginalized groups of labors hired from local users No conflict in resource utilization 	<ul style="list-style-type: none"> No. of labor hired from local user. Agreement document No. focal desk developed in government entities
Carrying out River side plantation (afforestation)	<ul style="list-style-type: none"> Exotic species may pose risk to local biodiversity. 	<ul style="list-style-type: none"> Promote native species for plantation. Regular thinning and pruning with 	<ul style="list-style-type: none"> 100% of the plantation species is native. One thinning and one pruning/year 	<ul style="list-style-type: none"> % of native species planted Event of thinning and pruning/year

	<ul style="list-style-type: none"> • Mass production of forest product may create problem in harvesting and marketing. • The plantation area itself act as social illegal site. 	<p>market assessment.</p> <ul style="list-style-type: none"> • Regular patrolling mechanism should be established. 	<p>with market assessment or distribute to local users.</p> <ul style="list-style-type: none"> • No illegal event recorded in the area. 	<ul style="list-style-type: none"> • Amount earned/year from the product • No. of illegal event recorded from the area.
Carrying out plantation & regeneration in degraded forest land	<ul style="list-style-type: none"> • Exotic species may pose risk to local biodiversity. • Huge biomass forest product may create problem in harvesting and marketing. • Human wildlife conflict 	<ul style="list-style-type: none"> • Promote native species for plantation. • Regular thinning and pruning with market assessment. • Compensation mechanism by CFUGs established. 	<ul style="list-style-type: none"> • 100% enrichment plantation species is native. • One thinning and one pruning/year with market assessment or distribute to local users. • 90% of the users received compensation on wildlife damages. 	<ul style="list-style-type: none"> • % of native species planted • Event of thinning and pruning/year • Amount of forest product harvested/year • % of the users received compensation on wildlife damages.
Carrying out training to CFUG members on sustainable forest management.	Right person (IPs, Dalits, marginalized groups). may be excluded in the training;	<ul style="list-style-type: none"> • Assure right person in training (organized as per CTNA) 	<ul style="list-style-type: none"> • 80% of trained CFUG members involved in forest management. 	<ul style="list-style-type: none"> • % of trained CFUG members involved in forest management.
Installation of alternative energy (biogas plants).for marginalized poor communities.	<ul style="list-style-type: none"> • Elite capture 	Assurance of beneficiaries highly dependent on fuelwood (IPs, Dalits, marginalized groups).	<ul style="list-style-type: none"> • 500 HHs of actual beneficiaries receive alternative energy (biogas plants). 	<ul style="list-style-type: none"> • No. of actual beneficiaries receive alternative energy (biogas plants).
Benefits	The focus of IPack on restoration of degraded forest and plantation in River site , capacity buildings, and promotion of alternative energy improve the ecosystem of the River			
Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators	Remarks
Clarity on sustainable forest management and increase in forest productivity	Establish strong forest management System	111 ha natural degraded forest restored and 91 ha River exposer lands covered with forest 50% of women and 31% IPs and 13% dalit benefited	% of degraded lands restored % of River site area covered with forest including woodlot % of vulnerable and marginalized communities benefited	

IPack 2: Soil and Water Conservation

Why this IPack is needed?

Drivers and general descriptions: This IPack is proposed to address the following key drivers and underlying causes for conserving soil and water and enhancing greenery in the River System:

- **Gully erosion, landslides, fragile geology, frequent and intense rainfall, droughts:**
 - Landslides are natural phenomena which occur under the favorable terrain conditions and are usually triggered by heavy rainfall, human activities, including open grazing and haphazard development-road networks in fragile lands.
 - About 23 landslides covering about 11 ha in Khadak Municipality-5 and Surunga Municipality-4 & 6 are the major landslides in the River System. About 11 number of torrents is having a number of gullies that have led to degraded forest ecosystems; for example, mainly in Khadak Municipality-4 & 5 and Surunga Municipality-6 are the major ones in the locations that need to be stabilized by using local and appropriate technologies (such as Bamboo and Amriso plantations, bio-engineering, checkdams, contour plantation, channel drainage or trenches).
 - Free and intensive grazing (for example: about 200-300 goats grazed daily in Chapin khola catchment in Khadak Municipality-5) has increased risk of erosion in upstream areas in forest region, riverbank corridor in upstream.
- **Inadequate community capacity for flood and riverbank-cutting control measures and conventional agricultural practices in sloppy lands**
 - Inadequate rainwater harvesting techniques and water sources get impacts from road construction and drying due to several factors, including degraded forest;
 - Encroachment of river/stream side lands and forest lands for agriculture practices and income generating activities
 - Haphazardly extraction of River materials-stones, pebbles
 - Inadequate resources to combat the flash flood risk and a lack of low cost conservation measures further intensified the problem in soil and water conservation.

The key activities include:

- a. Landslide treatments-23 sites with vegetative measures and engineering structures in collaboration with local governments, soil conservation offices, forest offices and the community (of these very strongly recommended for the treatments (6 landslides), strongly recommended (4 landslides), and recommended (13 landslides))
- b. Stabilization of gully in the torrent (11 torrents) in Khadak Municipality-4 & 5 and Surunga Municipality-6
- c. Construction of water conservation ponds (11 ponds): Khadak Municipality-3 & 5 and Surunga Municipality-4, 6 & 8
- d. Improvement of existing ponds (10 ponds) in Khadak Municipality-5 and Surunga Municipality-4, 6, 7 & 8
- e. Wetland Improvements (4 locations of cumulative area 3.5 ha) in Bode Barsain Municipality-7
- f. Construction of water harvesting structure (2 sites) in Khadak Municipality-4 & 5
- g. Improvement of irrigation facilities (10 sites) in Khadak Municipality- 1, 2, 3 & 4 and Surunga Municipality-5 & 6
- h. Riverbank stabilization (9 km) in Bode Barsain Municipality-1, 3, 5, 6 & 8; Khadak Municipality-1, 5 & 8 and Surunga Municipality-4 & 11
- i. Capacity building in water and soil conservation practices
 - Skill based training for local community CFUGs/LFUGs on landslide and gullies stabilization with locally available treatment measures **(15 events of 5 days)-1 CFUGs/LFUGs in one event**

- Orientation training on soil and water conservation measures for government officials (from agriculture knowledge centers, extensions, soil conservation offices, forest divisions/subdivisions, local governments, and other stakeholders **(5 events, each event for 3 days)**);
- Demonstration visits on soil and water conservation programme (5 events)
- Production and dissemination of success stories of water and soil conservation practices for possible replication

Objectives:

- Minimize soil erosion and protect degraded lands in upstream and downstream
- Conserve water sources and increase soil moisture
- Reduce landslide, erosion and flood risks and protect vulnerable community from possible disasters
- Promote and engage women, IPs, Dalit and marginalized communities in water and soil conservation enhance capacity of community in income generation
- Increase the soil moisture and productivity

Strategy:

- Increasing the accessibility and availability of locally adapted and desirable vegetative species for soil conservation (for example, bamboo farming, Amrishi (*Thysanolaena maxima*), Amala (*Phyllanthus emblica*), Harro, Barro and linking these measures in income generation opportunities, particularly for women, dalit and IPs, Madhesi and other marginalized community
- Stabilizing gullies and River banks through community participation, by empowering their capacity
- Coordinating with local government for gully stabilization and pond construction and improvements;

Incentives for participation & changing stakeholder practices:

- Fair and equitable distribution of benefit of resource to the Community Forest (CF) users especially, marginalized forest users;
- Incentives for women and economically marginalised community for their active engagement in nursery establishment and enrichment plantation;
- Incentives for alternative bio-energy;
- Incentives for livestock sustainable management activities (promotion of livestock farming, sheds improvement, fodder nursery- plantings of high quality fodder species,)
- Providing a subsidy for conservation measures on private land.

Output Activities and sub activities:

Activities	Sub-Activities	Sub-Activity Area code	
Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.			
Activity 3.1 Conserve soil and water	3.1.1.Landslide risk reduction (treating 23 landslides):	Very strongly recommended for treatment	M214, M163, M152, M154, M150, M149
		Strongly recommended for treatment	M228, M172, M174, M168

source and Improve water retention		Moderately recommended for treatment	M212, M235, M196, M171, M156, M182, M151, M176, M231, M180, M161, M204, M160
	3.1.2 Gully stabilization in torrent (11 torrents) Khadak Municipality-4 & 5 and Surunga Municipality-6		M159,M184,M179,M146,M191,M140,M147,M181,M223,M240,M239
	3.1.3 Construction of water conservation ponds (11 ponds) in Khadak Municipality-3 & 5 and Surunga Municipality-4, 6 & 8		A116,A120,M123,A135,A136,A142,A143,A145,A173,A209,A222
	3.1.4 Improvement of irrigation facilities (6 sites) in Khadak Municipality- 1, 2, 3 & 4 and Surunga Municipality-5 & 6		A359, A360, A361, A362, A363, A364
	3.1.5 Improvement of existing ponds (10 ponds) in Khadak Municipality-5 and Surunga Municipality-4, 6,7 & 8		A129,A131,A133,A138,A158,A164,A165,A175,A186,A200
	3.1.6 Wetland protection (4 locations of cumulative area 3.5 ha) in Bode Barsain Municipality-7		A342,A343,A344,A345
	3.1.7 Construction of water harvesting structure (Dam) (2 sites) in Khadak Municipality-4 & 5		A353, A354
	3.1.8 Riverbank stabilization (9 km) in Bode Barsain Municipality-1, 3, 5, 6 & 8; Khadak Municipality-1, 5 & 8 and Surunga Municipality-4 & 11		A101, A104, A108, A11, A111, A112, A115, A125, A127, A13, A16, A17, A18, A22, A23, A26, A27, A30, A31, A33, A35, A39, A44, A48, A58, A63, A65, A66, A71, A72, A73, A76, A77, A79, A84, A87, A89, A91, A92, A98
Activity 3.2 Capacitated stakeholders in water and soil conservation	3.2.1 Skill based training for local community CFUGs/LFUGs on landslide and gullies stabilization with locally available treatment measures (15 events of 5 days)- 1 CFUGs/LFUGs in one event 3.2.2 Orientation training on soil and water conservation measures for government officials (from agriculture knowledge centers, extensions, soil conservation offices, forest divisions/subdivisions, local governments, and other stakeholders (5 events, each event for 3 days);		Skilled based training for local community (CFUGs/LFUGs and soil and water conservation groups);

	3.2.3 Support on demonstration visits on soil and water conservation programme	
	3.2.4 Support on production and dissemination of success stories of water and soil conservation practices for possible replication	

Budget Plan (5 years)-in NPR

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-Activity	Unit	Quantity	Unit cost	Amount	Remarks
Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.					
Activity 3.1 : Conserve soil and water source and Improve water retention					
3.1.1 Landslide treatments	No.	23	2,000,000	46,000,000	The estimated cost is for each landslide, with the bio-engineering and structures for all three types of priorities.
3.1.2 Gully stabilization in torrent	No.	11	2,000,000	22,000,000	20 (torrent streams with gullies)
3.1.3 Construction of conservation pond	No.	11	700,000	4,900,000	Size approximately: 20*20*2 m ³
3.1.4 Improvement of existing pond	No.	10	500,000	500,000	Including cleaning and maintenance
3.1.5 Construction of water harvesting	No.	2	1,000,000	6,000,000	

structures (dams)					
3.1.6 Riverbank stabilization	km	9	30,000,000	450,000,000	cost @ Rs. 30,000,000 per 1 km Riverbank stabilization with engineering structures
3.1.7 Improvement of irrigation services	No.	10	6,000,000	6,000,000	
3.1.8 Wetland protection	Ha.	3.5	3,500,000	3,500,000	
Sub-total				538,900,000	

Activity 3.2 : Capacitate stakeholders and enhance water and soil conservations

3.2.1 Skill based training for local community CFUGs/LFUGs on landslide and gullies stabilization with locally available treatment measures (15 events);	Events	15	250,000	3,750,000	<ul style="list-style-type: none"> Total 15 CFUGs/LFUGs in the River System, Each event includes 1 CFUG/LFUGs Each event for 5 days , including 1-day exposers visits
3.2.2 Orientation training on soil and water conservation measures for government officials	Events	5	600,000	3,000,000	<ul style="list-style-type: none"> Government officers include from agriculture knowledge centers, extensions, soil conservation offices, forest divisions/subdivisions, local governments, and other relevant stakeholders – expected participants 10-15 persons Total 5 events, each event for 3 days, including 1 day exposure visits

3.2.3 Support on demonstration visits on soil and water conservation programme	event s	1	1,000,000	1,000,000	<ul style="list-style-type: none"> • For government officials, other stakeholders and users • National/neighboring nations good practices (need to explore, if possible)
3.2.4 Sensitize on upstream and downstream linkages for ecosystem services	event s	2	500,000	1,000,000	For users (women specific), government officials of the concerned municipalities of the River System (working on soil, water and natural resources management) in collaboration with the municipal government
3.2.5 Support on production and dissemination of success stories of water and soil conservation practices for possible replication	Lump sum	1	700,000	700,000	The cost is also propose on sensitization for school children competition on drawing/debates on soil and water conservation and linkages the upstream/downstream in natural resources management
Sub-total				9,450,000	
Total				548,350,000	The total estimated budget is to be varied once the detailed technical feasibility is completed in coordination, especially with municipal governments. Thus, a strong collaboration (with a MoU) is needed with the concerned municipal government and soil conservation offices.

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

Feasibility analysis:

Outputs/activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Output 1: Conserved soil and water source and Improved water retention				
Landslides treatment	Costly and time-consuming procedures Low participation of local users	Cost/benefit analysis for the treatment Incentive for local labor	<ul style="list-style-type: none"> • Identification of treatable landslides • 23 landslides treated 	<ul style="list-style-type: none"> • No. of landslides treated
Gully treatment.	Requires high input Low participation of local users	Needed to convince the importance of the gully's treatments Incentive for local labor	<ul style="list-style-type: none"> • 11 torrent streams with gullies treated 	<ul style="list-style-type: none"> • No. of gullies treated
Construction of Conservation pond	Site might not be available to construct the big sized ponds Siltation in the pond	Consult with communities on the size of the pond before implementation MoU with users for the management of the ponds Conservation of catchment of the pond	<ul style="list-style-type: none"> • 11 conservation ponds constructed • 10 ponds improved • 100% MoU with the user committee on the pond management 	<ul style="list-style-type: none"> • No. of conservation ponds constructed and maintain with conserving its catchment
Output 2: Capacitate stakeholders and enhance water and soil conservations				
Carrying out training to CFUG members on soil and water conservation measures.	<ul style="list-style-type: none"> • Participants may not have interest to receive training • Training event may not match with leisure of participant. • Venue may not easy accessible to participants 	Provide DSA and transportation allowances to the participant. Training period and venue selected as per the demand of participants. Residential training	<ul style="list-style-type: none"> • 200 targeted members actively involved in the training. 	<ul style="list-style-type: none"> • No. of members actively involved in the training

Safeguard analysis

IPack outputs/activities	Serious risks	Risk reduction measures	Risk reduction targets	Indicators
Landslide treatment.	<ul style="list-style-type: none"> • Risk of human casualty 	<ul style="list-style-type: none"> • Application of safety instrument. 	<ul style="list-style-type: none"> • No human casualty recorded in landslide treatment 	<ul style="list-style-type: none"> • No. of human casualty in landslide treatment.

Gully-torrent stabilization	<ul style="list-style-type: none"> Vegetative species used in treatment pose to threat local biodiversity. Labor hired from outsider 	<ul style="list-style-type: none"> Use of locally available native species. Labor hired from local users 	<ul style="list-style-type: none"> 100% of the native vegetative species used in treatment. 80% of labor hired from local user 	<ul style="list-style-type: none"> % of the native vegetative species used in treatment. %% of labor hired from local users
Construction and improvement of Conservation pond	<ul style="list-style-type: none"> Children and small animal submerged in the pond. Splash erosion occur when raindrop hit barren surface 	<ul style="list-style-type: none"> Fencing around the pond. Develop animal friendly ramps Paving by grasses Planting trees around the ponds 	<ul style="list-style-type: none"> No casualties recorded No erosion from the inclined inward lands and barren surface 	<ul style="list-style-type: none"> Number of casualties recorded Number of ponds with siltation problem
Carrying out training to CFUG members on soil and water conservation measures.	<ul style="list-style-type: none"> Marginalized groups may be excluded in the training. 	<ul style="list-style-type: none"> Assure right person in training by assessing the CFUGs institutions members 	<ul style="list-style-type: none"> 80% of trained members involved in soil and water conservation measures. 	<ul style="list-style-type: none"> % of trained members involved in soil and water conservation measures.
Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators	
Water pond for the recharging ground water	Water source for wildlife by planning recharge pond in the forest with minimum damage to the forest area Fire control and risk minimization Runoff water will be reduced, and it will reduce erosion Flash flood control	Construction of 11 ponds and 10 existing ponds improvement 23 landslide treated as per the priority and 11 torrent-gully stabilized	No.of ponds constructed and improved #ha of landslide risk reduced and no.of torrent gullies stabilized	

IPack 3: Agroforestry System

Drivers and general descriptions: This IPack is proposed to address the following key drivers and underlying causes for linking the agroforestry with the fodders and support for small marginalized farmers also linking to their livelihoods depending on the livestock.

- Unsustainable harvesting of forest resources (especially fodders, fuelwood) and river-induced resources:** In order to reduce the dependency of the community on fodder

and fuelwood, planting of fodder species on public and private lands is a priority through the agroforestry system.

- **Deterioration of soil nutrition in riverside lands:** The riverside areas are expected to be enriched with soil nutrition once the agricultural crops are intercropped in woodlot areas. The riverbank and stream banks are required to be stabilized with local resources and bamboo plantations along the riverbank.
- **Increasing women's engagement in fuelwood and fodder collection in forests:** Involving women and marginalized communities in agroforestry helps enhance their income generation capacity and secure household consumption. Efficient agroforestry Systems can reduce forest encroachment pressures and reduce forest degradation by increasing on-farm forest products. The Farmer Field School (FFS) approach is recommended for several potential enterprises to learn riverside management and select species and other management practices.

The key activities include:

- a. Establishment of Agroforestry nursery in the River System in different potential locations near to the agroforestry plantation areas. Some of the potential locations include: Balan Bihul Rural Municipality-1 & 5 and Khadak Municipality-5
- b. Adoption of Agroforestry System in the potential areas of the riverside of about 69 ha, mostly in the Balan Bihul Rural Municipality-6; Bode Barsain Municipality-1, 5, 6 & 8; Khadak Municipality-2 & 5 and Surunga Municipality-5, 6, 10 & 11
- c. Providing supports for irrigation facilities
- d. Formulation of groups called Agroforestry Groups (AFGs), it is advised as 3 groups (25-30 members in each group)
- e. Providing Training on AF (Agroforestry) practices for 90 group members (30*3) and providing learnings and techniques through FFS approach.
- f. Capacity building training on administration and management
- g. Providing institutional support and office equipment to make work easy for the groups.
- h. Providing capacity building for government officers on the promotion of agroforestry System (technical representative includes foresters, soil conservation officers, agriculture extension officers, local government planners, etc.) -3days (residential)

Strategies:

- Establishing Farmer Field School (FFS) for convincing the community, and learnings, particularly for the marginalized community dependent on River claimed land for seasonal livelihood activities
- Establishing agroforestry activities with agroforestry nursery
- Promoting the existing groups if available; otherwise, formulating farmer groups (Agricultural Forestry Groups for efficient operation) in the hotspots by promoting gender with a clear role of women as an integral part of the agroforestry System to obtain optimal benefits ensuing at different stages of agroforestry intervention.
- Assuring women's participation by 50% from the beginning of the agroforestry System establishment
- Establishing tree woodlots for firewood, fodder, building materials
- Linking the AF System with income generation of women and marginalized community
- Increase farmers' access to market information and commercialization of AF products
- Developing a strong coordination with the local governments to promote agroforestry in public land
- Assuring water availability
- Potential trees and agriculture species for agroforestry System in the River System are: Multi-year crops-mixed cropping, fodder and grass with trees
- Enhancement of soil fertility by planting nitrogen fixing species of forest and agriculture (multi-year crops-mixed cropping, fodders and grass with forest trees)
- Clearing land demarcation between private/public (ownership of the lands-private and public lands);

- Requiring feasibility assessment for the finalization of agroforestry Systems to be implemented in the hotspots once the baseline study report is ready.

The following species are potential in the River System:

- Fodder: Koiralo (*Bauhinia Variiegata*), Neem (*Azadirachta indica*), Kimbu(*Morus alba*), Bakaino (*Melia azedarach*), Moringa (*Moringa oleifera*), Tanki (*Bauhinia purpurea*), Badhar (*Artocarpus lacucha*), Nimaro (*Ficus auriculata*), Gutel (*Trewia nudiflora*)
- Fruit: Mango, Citrus species-Lemon, Spices species: Timbur, Ginger/turmeric, Chilly, Legume crops, Papaya, Banana, Oal, Sugarcane, Katahar (*Jackfruit*), Lichi (Lychee), Banana
- Multipurpose: Amala (*Phyllanthus emblica*), Jamun (*Syzygium cumini*), Khayar (*Acacia catechu*) Satisal (*Dalbergia latifolia*), Harro (*Terminalia chebula*), Barro (*Terminalia bellirica*)

Objective:

- Diversify agricultural land production for generating livelihoods.
- Enhance soil nutrition in river-claimed lands.
- Promote timber and fuel wood production from improved agroforestry Systems.
- Enhance the income-generating capacity of marginalized and vulnerable communities.

Incentives for participation & changing stakeholder practices:

- Developing a provision for the lease of lands to interested farmer groups in public lands where BRCRN work.
- Facilitating the easy access to desirable forest species for plantation.
- Making provisions for providing incentives ensuring the participation of women, IPs and marginalised people in training activities.

Outputs, Activities and sub-activities

Activities	Sub-Activities	Sub-Activity Area code
Output 4: Farmers are skilled in using climate-resilient land use practices.		
Activity 4.1 : Establish agroforestry activities through group Systems (3 agroforestry group) agroforestry activities	4.1.1 Establishing Agroforestry Nursery (3) in Balan Bihul Rural Municipality-1 & 5 and Khadak Municipality-5	A341, A346, A347
	4.1.2 Establishment of AF activities in the potential areas (69 ha. of River abandoned land) Balan Bihul Rural Municipality-6; Bode Barsain Municipality-1, 5, 6 & 8; Khadak Municipality-2 & 5 and Surunga Municipality-5, 6, 10 & 11	A9, A15, A21, A24, A25, A28, A37, A38, A51, A53, A54, A62, A93, A94, A95, A96, A102, A106, A114, A117, A122, A124, A126, A216, A220, A232, A233
	4.1.3 3 Agro-Forestry Group committee established	
	4.1.4 3 Agro-Forestry Group received institutional support and office equipment.	
	4.1.5 Coordination meeting as a part of 30 monitoring and evaluation (5 years)	

Activity 4.2: Capacitate communities'/farmer groups and government officers to promote agroforestry System	4.2.1 Training for AFG members on administration and management (90 AFG members from 3 AFG)	
	4.2.2 Training on AF practices (90 AGF members)	
	4.2.3 Providing capacity building for government officers on the promotion of agroforestry System	
	4.2.4 Audio/visual aids-dissemination of AF program	

Budget Plan (5-years) in NPR

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.

Activity	Unit	Quantity	Unit Costs	Budget (NPr)	Remarks
Output 4: Farmers are skilled in using climate-resilient land use practices.					
Activity 4.1 : Establish agroforestry activities					
4.1.1 Establishment of Agroforestry Fodder Nursery	No.	3	500,000	1,500,000	<ul style="list-style-type: none"> Cost Include tunnel-protection measures
4.1.2 Purchasing seedlings of horticulture species for agro-forestry focus on multiyear seedling production	No.	30,000	200	6,000,000	Multiyear seedling nursery on horticulture
4.1.3 Support agroforestry activities in the potential lands	ha	69	500,000	34,500,000	<ul style="list-style-type: none"> Transportation , fertilizer, support for matching fund, Focus on private land and link to government for government subsidy Public lands-coordination with local government

4.1.4 Irrigation facility (small irrigation facility)	No.	3	500,000	1,500,000	<ul style="list-style-type: none"> Shallow tubes/water harvesting dam-cutoff wall chamber /water boring/ improvement of water source in collaboration with municipal government
4.1.5 Formation of AFG focusing on women farmers	No.	3	30,000	90,000	
4.1.6 Institutional support and office equipment for women group	No.	3	200,000	600,000	
4.1.7 Coordination meetings (5 years)	No.	10	25,000	250,000	Two meetings/year/per Group
Subtotal				44,440,000	
Activity 4.2 Capacitate communities'/farmer groups and government officers to promote agroforestry System (3 AFG)					
4.2.1 Training for agroforestry groups on sustainability, principle of administration and management-3 days residential	persons	90	30,000	2,700,000	120 person
4.2.2 Training on improved AF practices (promotion for small enterprises for the production)-5 days residential	persons	90	30,000	2,700,000	
4.2.3 Providing capacity building for government officers on the promotion of agroforestry System-3days residential	events	3	500,000	1,500,000	For 5 years
4.2.4 Support on production and dissemination of success stories AF System replication	No.	1	500,000	500,000	Dissemination for 5 years

Subtotal				7,400,000	
Total				51,840,000	The total estimated budget is to be varied once the detailed technical feasibility is completed in coordination, especially with municipal governments. Thus, a strong collaboration (with a MoU) is needed with the concerned municipal government and soil conservation offices

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

Feasibility analysis:

Outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Establish Agroforestry Groups (AFG)	<ul style="list-style-type: none"> Flood damages the AF activities. Clearing land demarcation between private/public 	<ul style="list-style-type: none"> Needed River bank and gully stabilization (spur and embankment, bamboo plantation along the bank) Approval of guideline from local unit to use River side land. 	<ul style="list-style-type: none"> 69 ha River abandoned land converted to AF activities adopting customary land practices for risk reduction approach. 	<ul style="list-style-type: none"> Hectares River side land converted to AF activities.
	Actual beneficiaries (IPS, dalit, marginalized groups) may exclude from AGF committee.	Assurance of actual beneficiaries.	<ul style="list-style-type: none"> 3 AFG committee established 	No. of AFG committee established
Train on administration and management	<ul style="list-style-type: none"> Participants may not have interest to receive training Training event may not match with leisure of participant especially women with household 	<ul style="list-style-type: none"> Provide DSA and transportation allowances to the participant. Training period selected as per the demand of participants. Selection of venue from 	<ul style="list-style-type: none"> 90 AFG member trained on, administration and management 	<ul style="list-style-type: none"> No. of AFG members trained

	duties (morning and evening).	consultation with participants • Residential training		
Support institutional support and office equipment.	• Insufficient support and office equipment	• Assure sufficient support and quality equipment.	• 3 AFG received institutional support and office equipment.	• No. AFG received institutional support and office equipment.
Train AFG members trained on improved AF practices	Participants may not have interest to receive training	Provide DSA and transportation allowances to the participant.	• 90 AFG members trained on improved AF practices.	• No. of AFG members trained on improved practices.

Safeguard Analysis:

IPack outputs/activities	Serious risks	Risk reduction measures	Risk reduction targets	Indicators
Reduction in indigenous crops that are staple food of poor	• Implement multi-level AF practices with a focus on indigenous crops.	• 90 HHs consuming indigenous crops from AF Systems	% of total AF area under hybrid/exotic species cultivation	Reduction in indigenous crops that are staple food of poor
Elite capture of grants	• Establish a transparent grant approval with more engagement of vulnerable and marginalized communities • Strong Monitoring & reporting mechanism.	90 poor/marginalized HHs receiving grants	• No. of poor/marginalized HHs receiving AF grants	• Elite capture of grants
Biodiversity risk due to hybrid/exotic species replacing indigenous species	At least 50% of trees in AF extension/credit packages are indigenous species.	% of total AF area under hybrid/exotic species cultivation	Grants & input provision with at least 50% indigenous species	Biodiversity risk due to hybrid/exotic species replacing indigenous species
Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators	

Livestock based livelihood will be promoted	Fodder plantation	50 % of the fodder plants used	Proportion of the fodder plant used
Horticulture promotion	Linkages of private nursery for horticulture seedling. It will promote private forest	50 % of the linkages with private nursery	Proportion of the linkages of private nursery for horticulture seedlings

IPack 4: Climate resilient agriculture and land use practices

Drivers and general descriptions: This IPack is proposed to address the following key drivers and underlying causes for building climate resilience of small farmers by supporting climate resilient farming practices and adaptation measures in agriculture sector.

- **Climate induced multi-hazards (extreme temperature, frequent and intense rainfall, drought, floods, inundation) and Infestation of crop insects, pests, and diseases:**
- 10 FFS and 1552 ha of agricultural land are planned for Climate Resilient Agriculture (CRA), representing with the codes (A373, A374, A375, A376, A377, A378, A379, A380, A381, A382).
- Out of 10 FFS, the potential two-FFS (with respect to hotspot to climate extremes, crop varieties with different problems, farmer willingness, and access) are listed to estimate the budget.
 - *Phed daduwa*, yellowing, low growth, and bacterial disease called sheath blight on rice crops
 - Rhizome rot and bacterial wilt in turmeric and soft rot and leaf blight in ginger
- **Inefficient irrigation facilities:** Farmers suffer from irregular irrigation facility due to the depletion of water source and heavily riverbed raised causes impacts of irrigation heads and lacks of surface water flow in the River system.
- **Lack of improved seeds and fertilizers:** Farmers have a lack of knowledge and information about the availability of agricultural inputs, including quality seeds, agriculture production, and market and marketing costs of different commodities. As a result, the willingness of farmers in agriculture is becoming insufficient.
- **Inadequate climate agricultural adaptive practices :** Farmers suffer from having inadequate decision-making support on how to provide agricultural inputs in changing weather Systems and seasonal changes. Furthermore, the effective application of climate resilient agriculture technologies and practices on crops and the environment can improve vulnerable and marginalized farmers' coping and adaptation capacity, as well as increase crop and vegetable production and productivity through FFS approach.
- **Lack of support for livestock management practices:** Livestock management in the River System is inadequate .

The potential key activities include:

- a) Establishment of 2 FFS to provide skill, knowledge and improved agriculture practices to address following problems related to pest and diseases in different crops in the River System:
 - FFS on *Phed daduwa*, yellowing, low growth, and bacterial disease called sheath blight on rice crops in Bode Barsain Municipality-2;
 - FFS on Rhizome rot and bacterial wilt in turmeric and soft rot and leaf blight in ginger in Surunga Municipality-6

- b) Capacity-building training in the use of weather information and its application in agricultural practices;
- c) Capacity building on livestock management practices
- d) Support to farmers for seed production (improved seeds) in the location where the FFS approach is to be adopted in rice crop (for 3 years)- Bode Barsain Municipality.
- e) Provide training to adopt and apply climate resilient landuse practices (for examples: compost manure preparation, mulching, water retention capacity, green manure).
- f) Support to farmers' sensitization to save agricultural practices and production from wildlife threats
- g) Support to link farmers with the local market centers and market information

Objective

- Improve farmers' coping and adaptation capacity to adopt to weather stress, manage crop pest and disease
- Increase agricultural productivity and improve livestock management practices;
- Enhance local technology in irrigation improvements
- increase farmers' access to markets and enhance incomes of marginalized farmers;

Strategies:

- Working with at least 25 farmers in each group to establish FFS;
- Increasing the capacity of FFS members, including women and IPs, in group dynamics, FFS administration, demonstration of climate-resilient technology and practices, improved tools and equipment, and marketing-related aspects
- Establishing FFS to enhance and disseminate climate resilient farming technologies and practices and build farmers' capacities to be climate resilient;
- Enhancing FFS members' capacity to give site demonstrations of relevant technologies and practices to other farmers in their community, and
- Introducing climate-resilient varieties of crops (drought and flood-tolerant varieties)

Incentive for participation & changing stakeholder practices

- Farmers benefit directly from increased crop and vegetable production and productivity as a result of the use of climate-resilient farming practices.
- Increased access to quality inputs, particularly seeds and established linkage of the production System with the market;
- Enhanced participation of IPs, women, and poor and marginalized farmers in capacity-building activities on farms and fields

Output, Activities and sub-activities

Activities	Sub-Activities	Sub-Activity Area code
Output 4: Farmers are skilled in using climate-resilient land use practices.		
Activity 4.3 : Establish two FFSs and increase farmers' ability in seed production in Surunga Municipality-6 and Bode Barsain Municipality-2	4.3.1 Establish 2 FFSs on the crops listed above, 4.3.2 Capacity building on livestock management practices 4.3.3 Support to farmers for seed production (improved seeds) through FFS approach in rice crops (for 3-years)	
Activity 4.4 Enhance farmers' capacity in climate resilient farming practices,	4.4.1 Capacity building trainings on using weather information and its application skills in farming practices;	

	<p>4.4.2 Provide training to adopt and apply climate resilient land use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure, Sesbania manure);</p> <p>4.4.3 Support to link farmers with the local market centers and market information;</p>	
<p>Activity 4.5 : Increase coping strategies for wildlife depredation in crops</p>	<p>4.5.1 Support to farmers' sensitization to save agricultural practices and production from wildlife threats</p> <p>4.5.2 Sensitization programme on wildlife threats risk reduction in agriculture</p>	

Budget Plan (5 years)

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-Activity	Unit	Quantity	Unit Costs	Budget (NPr)	Remarks
Activity 4.3: Establish two FFSs and increase farmers' ability in seed production.					
4.3.1 Establish two FFSs	No.	2	350,000	700,000	<ul style="list-style-type: none"> 2 locations (referred in the area code)
4.3.2 Capacity building on livestock management practices-sheds improvements crop depredation by wildlife	No.	2	200,000	400,000	<ul style="list-style-type: none"> At 2 locations of FFS In collaboration with municipal government and Livestock Management Center (LMC)
4.3.3 Support to farmers for seed production (rice) through FFS approach	No.	1	600,000	600,000	<ul style="list-style-type: none"> For 3-years for crops-rice in Bode Barsain Municipality in collaboraion with AKC and municipal governeemt In collaboration with municipal government and Agriculture Knowledge Center (AKC)
Sub-total				1,700,000	
Activity 4.4 : Enhance farmers' capacity in climate resilient farming practices					
4.4.1 Capacity building trainings on using weather information and its application skills in farming practices;	No.	2	200,000	400,000	In collaboration with Nepal Agriculture Research Center (NARC), AKC
4.4.2 Provide training to adopt and apply climate resilient land use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure,	Events	2	300,000	600,000	With demonstration for the FFS locations

4.4.3 Support to link the farmers with the local market centers and know the market information;	No.	2	200,000	400,000	produce market linkage—link with municipal level AKC's Unit
Sub-total				1,400,000	
Activity 4.5 Increase coping strategies for wildlife threats in crops					
4.5.1 Sensitization orientation on wildlife threats and risk reduction in agriculture	No.	2	300,000	600,000	At Municipality levels in upstream and downstream for vulnerable farmers
Sub-total				600,000	
Total				3,700,000	

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

Feasibility analysis:

IPack outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Output 1: Established two FFSs and enhanced farmers' capacity in climate resilient agriculture				
Establish 2 FFSs on the listed crops, fruit, fish and vegetable	Lack of priority about FFS in local government policy and programs ;	Continuous coordination with Palikas and promote them to incorporate FFS approach into their plans and programs	Providing knowledge through FFS approach to farmers-directly to more than 50 (25*2=50) farmers in the River System by adopting basic aims of FFS (skill development, empowerment, will power and capacity of decision making)	Number of FFS for different crops in four locations in the River System established
Develop and use FFS manuals of respective crops to address the major drivers	Lack of crop focus guidelines/manuals of local governments to address the drivers and to function and sustain the FFSs	Adoption of available manual recommended by FAO System and other institutions in the local contexts	Developing decisions making capacity of marginalized HHs (indirectly 500 farmers=25X10X2) on how to deal with impacts of climate change and crop pests and diseases	Number of farmers capacitated
Support in irrigation System to address the	Even though FFS is innovative approach, farmers interest is more	Ensure irrigation service regularly in both seasons in collaboration	Supporting 50% of vulnerable farmers in FFS by providing	Number of vulnerable farmers supported for

IPack outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
impacts of water stress and increase farmers interest in FFS approach	focused on to have assured irrigation in wet and dry periods	with local governments and make the FFS approach effective	support for small irrigation structures	small irrigation structures
Support farmers to link with the market centers and obtain market information	Poor access to market information and limited financial resources for the development of market centers and road networks	Disseminate market and other information during FFS conduction and link farmers with local FM radio and local government information units	Placing display boards (at 2 places where the FFS established) and ensuring the road networks to reach to the market by collaborating with local governments	Number of display boards placed
Output 2: Capacitated farmers in climate resilient agriculture practices				
Build coping capacity of marginalized farmers, including women in seed production	Poor accesses to quality and variety of vegetable seeds Often priority is given only to elite farmers not to marginalized farmers in capacity building Lack of modern tools and knowledge with equipment for seed production	Promote seed production program to increase production productivity and enhance commercial vegetable production Increase labor productivity, reduce cost and labor on women through the adoption of modern tools and equipment	Starting with 25 women farmers in seed FFS and building their capacity so that they can further disseminate knowledge to 250 new women farmers (25*10) for upscaling the practices	Number of women farmers trained for quality production
Provide technical weather information and its application skills in farming practices	Lack of producing weather forecasts information at farm level, resulting to obstruct in its applications in decision making process	Adopt existing weekly agromet bulletin published by NARC and customize the advisory in local context	Building capacity of 500 FFS (25*10*2) farmers and 500 women seed producers and they are able to take decision making in agriculture practices and applications of technologies and skills and learnings to adopt to climate change and cope with insect pest and diseases problems	Number of farmers able to cope with climate change in agriculture
Provide training on improved	Weak willingness of farmers to pay	Encourage women farmers and	Providing trainings on preparation of	Number of persons

IPack outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
compost manure preparation	attention in the compost manure preparation (vermicomposting) due to lack of knowledge and skilled technical persons at local level. Lack of financial resources- for materials and equipment, complex in processes, environmental problems-odors and dust	vulnerable farmers by providing technical and financial supports through the project in making compost in the field	compost manure for 30 persons, comprising women, Indigenous People (IPs), Dalit and other vulnerable and marginalized people	trained and become trainer of facilitators (ToF)

Safeguard analysis:

Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
Activity 1: Establish two FFSs and increase farmers' skill in crop production				
Establish 2 FFSs on crops	<ul style="list-style-type: none"> • Low participation of women, Dalits and IPs during group formation • Change in agriculture practice might have negative impacts on some members • Inadequate options for women to participate in the programme • Pesticide toxicity 	<ul style="list-style-type: none"> • Maximum involvement through capacity building and awareness • Capacity building training to the marginalized groups and prioritizing the communities linking crop cycle and disease cycle • Need to integrate daily allowances to manage opportunity cost ; • Enhancement for women interest with their suitable time to participate in the programme (appropriate time is afternoon for women's involvement in the 	<ul style="list-style-type: none"> • 50 % women, 13 % Dalit and 31 % Indigenous Peoples are included in the group 	<ul style="list-style-type: none"> • % of Dalit, Indigenous Peoples and women in the group

		<p>capacity building activities)</p> <ul style="list-style-type: none"> • Mapping out groups working/involving in the River System to enhance existing groups capacity • Use of Integrated Pest Management (IPM) practices 		
Support to link farmers with the market centers and market information	<ul style="list-style-type: none"> • Lack of sufficient market information and authentic data on market • Variation in market pricing of agriculture products 	<ul style="list-style-type: none"> • Confirmed participation of local authorities (local government) in cooperation with local communities 	<ul style="list-style-type: none"> • Identified all the possible market areas of the River System • Fixed pricing of the agriculture products 	<ul style="list-style-type: none"> • Number of market centers

Activity 2: Capacitate farmers in climate resilient farming practices

Capacity building trainings on using weather information and its application skills in farming practices	Difficulty in understanding weather technical terminologies Women, indigenous peoples, and Dalits, may face obstacles	Ensure participation and active involvement	50 % women, 13 % Dalit and 31 % Indigenous Peoples are included in the group	% of Dalit, Indigenous Peoples and women in the group
Provide training to adopt and apply climate resilient landuse practices	•Women, indigenous peoples, and Dalits, may face obstacles	Ensure participation and active involvement	50 % women, 13 % Dalit and 31 % Indigenous Peoples are included in the group	% of Dalit, Indigenous Peoples and women in the group

Benefits	Benefit enhancement measures	Benefit enhancement targets	Indicators
Promote small farmers	Promotion of organic manure, Integrated Pest Management	Climate resilient agriculture practices promoted	# no of farmers benefits with climate resilient practices

Increased productivity	Enhanced soil fertility Reduced damage due to pest and disease infestation Increased decision making in climate informed agricultural practices	Increased in production and good livestock management practices improved	# yield increased No. of farmers capacitated with skills and technologies in livestock management
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IPack 5: Advocacy campaign: Gender-inclusive governance for SNRM

Drivers

- Lack of gender integration in governance (planning and implementation)
- Social norms and values
- Women lack access and resources
- Lack of resources
- Gender has to be top-priority in the governance of all structures
- Lack of transparency regarding gender and marginalized groups.
- Inadequate budget for gender related projects and activities.
- Exclusion of women and marginalized groups in governance.
- Inadequate interest and motivation of concerned institutions regarding gender.

General Description

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.

Potential key activities include:

- 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 learnings in gendered governance,
- Conduct rapid assessment on women's contribution and involvement in NRM/ CRLUP and management.
- Provide gender mainstreaming trainings/ workshops to local government and CBOs.
- Conduct GESI focused social audits and public hearing.
- 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.

Objectives

- Increase women's leadership in NRM, CCA, and DRR
- Building women's knowledge and skills in natural resource conservation and management
Increase women's participation in decision-making forums
- Increase the commitment of local stakeholders, decision managers, and local representatives/leaders to gender equality and women's empowerment.

Strategies

Build network among women and women-led organizations for an enabling environment. And increase male engagement in the advocacy campaign.

Incentive for participation

- 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.

I. General information of Intervention Package (Ipack)

<p>IPack 5: Advocacy campaign: Gender-inclusive governance for SNRM and Resilience</p>	<p>Lack of gender integration in SNRM, CCA, and DRR planning and implementation process</p>	<p>The underrepresentation of women in the decision-making process has resulted in the exclusion of women’s specific needs and capacities in SNRM, CCA, and DRR.</p> <p>Increased influence of women in governance is important to identify and include gender-responsive program interventions to increase the adaptive capacity of vulnerable women.</p>	<ul style="list-style-type: none"> • Increase awareness of gender equality and promote women’s empowerment. • Increase women’s leadership in SNRM, CCA, and DRR • Building women’s knowledge and skills in resource conservation and management Increase women’s participation in decision-making forums 	<ul style="list-style-type: none"> • Raise awareness about gender issues and the advantages on gender equality for sustainable socio-economic development that benefits not only women, but also whole societies. • Build a network of allies and supporters of gender equality aiming to create an enabling environment when gender equality and women’s rights can flourish • Build network among women and women-led organizations for an enabling 	<ul style="list-style-type: none"> • Increase women capacities, leadership and agency, • Include transformative gender activities at community level, community radio, flyers, training targeting men and women, etc • Consider women’s convenience while setting meeting agenda and venue. • Provide transportation costs for attending the trainings. • Ensure that women are aware of meeting or activities in an appropriate way. • Provide opportunity to participate in learning events /platforms for women leaders and women champions.
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2. Outputs and activities

Intervention packages	Outputs	Activities and sub activities
Advocacy Campaign: Gender-inclusive governance for SNRM and Resilience	Raise awareness campaign on gender issues for both men and women with a special focus on men to engage as allies	<ol style="list-style-type: none"> I. Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities (includes preparing a strategy with issues, objectives, actions/products) <ol style="list-style-type: none"> i. Prepare and disseminate short videos on gender and governance, SNRM, and climate resilience in the river system. ii. Prepare community radio programs and short messages, PSA (public service announcement), radio jingles on gender and governance, SNRM, and resilient by utilizing local radio. iii. Prepare drama and role play by involving local school/eco club in awareness-raising campaigns on SNRM, gender inclusive governance, and youth involvement for climate resilience. iv. Engage males, especially stakeholders of the river system, and involvement in advocating gender and women’s issues and concern through awareness-raising activities by eco-club. The activity should be conducted during the day celebration: women’s day, environment day, Indigenous people’s day, Churia day, etc. v. Create informal learning and sharing platforms for grassroots-level women by utilizing local schools, eco clubs, and youth associations.
	Integrated gender equality in local planning, implementation to contribute in SNRM and climate resilience	2. Collect local-level best practices for learning and policy influence to ensure gender responsiveness and women’s participation, access, control, and leadership. This should be linked with project level activity- collecting community and indigenous knowledge collection packages-compendium development.
		3. Provide gender mainstreaming training/ workshops to local government and CBOs and concerned stakeholders. The activity should be linked with project level activity: building capacity of project implementer, government staffs and other stakeholders.
		4. Conduct GESI-focused social audits and public hearings to understand the allocation of gender-responsive activities, budgeting, and implementation concerning GESI-inclusive practice at local level.

3. Feasibility analysis

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Activities	Activities Risks and obstacles	Risk reduction measures	Indicators	
<p>• Advocacy Campaign: Gender-inclusive governance for SNRM and Resilience</p>				
<p>Increased access of women to NRM/ CRLUP and management knowledge and information.</p>	<p>5. Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities (includes preparing a strategy with issues, objectives, actions/products)</p> <p>vi. Prepare and disseminate short videos on gender and governance, SNRM, and climate resilience in the river system.</p> <p>vii. Prepare community radio programs and short messages, PSA (public service announcement), radio jingles on gender and governance, SNRM, and resilient by utilizing local radio.</p> <p>viii. Prepare drama and role play by involving local school/eco club in awareness-raising campaigns on SNRM, gender inclusive governance, and youth involvement for climate resilience.</p> <p>ix. Engage males, especially stakeholders of the river system, and involvement in advocating gender and women's issues and concern through awareness-raising</p>	<p>Social norms and values restricting women to participate and give time for informal learning and sharing platforms.</p> <p>Women and youth lack access and resources about local level policies making them vulnerable. Lack of resources</p> <p>Inadequate interest and motivation of concerned institutions.</p> <p>Less priority</p>	<p>Identification of social and structural barriers faced by women through sensitization measures</p> <p>Awareness and sharing of policies. Ensure availability of resources.</p> <p>Raise awareness about long-term benefits of information dissemination.</p> <p>Raise awareness about long-term benefits, social prestige.</p>	<p>Social norms and barriers that prevent women's participation are identified.</p> <p>3 videos developed. 3 dissemination activity in the river system.</p> <p>Event/ activity report At least 70% of target population participated. At least one report containing five best practices published and disseminated.</p> <p>50 radio programs in local language</p> <p>Number of events between institutions and women groups/ CBOs.</p> <p>3 drama and event conduct in the river system.</p> <p>4 events conduct in the river system.</p> <p>50 % of male participation engaged.</p> <p>Frequency of male involvement in gender and women's issues and concerns.</p>

	activities by eco-club. The activity should be conducted during the day celebration: women's day, environment day, Indigenous people's day, Churia day, etc.			
Integrated gender in local planning processes in SNRM and climate resilience	2. Collect local-level best practices for learning and policy influence to ensure gender responsiveness and women's participation, access, control, and leadership. This should be linked with project level activity- collecting community and indigenous knowledge collection packages-compendium development.	Inadequate budget	Explore budget availability.	Assessment reports. 2 Best practices collected.
	3. Provide gender mainstreaming training/ workshops to local government and CBOs and concerned stakeholders. The activity should be linked with project level activity: building capacity of project implementer, government staffs and other stakeholders.	Gender is not a priority.	Raise awareness about long-term benefits after participating in gender workshops/ workshops.	1 trainings conducted.
	4. Conduct GESI-focused social audits and public hearings to understand the allocation of gender-responsive activities, budgeting, and implementation concerning GESI-inclusive practice at local level.	Lack of transparency. Inadequate budget. Exclusion of women and marginalized groups.	Increase practices for transparency through networking meetings, regular meetings. Policy guidance for ensuring intersectionality in social audits and public hearing. Adopt participatory tools for public hearing such as roleplays.	1 event conducted. Percentage of women including Dalits and Ips participation. Number of issues raised on intersectional issues.

5. Safeguard Analysis

Table 1: Safeguard analysis (risk)

Outputs	Activities	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
<p>Increased access of women to SNRM and increase resilience.</p>	<p>I. Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities (includes preparing a strategy with issues, objectives, actions/products)</p> <p>x. Prepare and disseminate short videos on gender and governance, SNRM, and climate resilience in the river system.</p> <p>xi. Prepare community radio programs and short messages, PSA (public service announcement), radio jingles on gender and governance, SNRM, and resilient by utilizing local radio.</p> <p>xii. Prepare drama and role play by involving local school/eco club in awareness-raising campaigns on SNRM, gender inclusive governance, and youth involvement for climate resilience.</p> <p>xiii. Engage males, especially stakeholders of the river system, and involvement in advocating gender and women's issues and concern through awareness-raising activities by eco-club. The activity should be conducted during the day celebration: women's day,</p>	<ul style="list-style-type: none"> • Social changes not acceptable by some men and women of the society and IPs not inclusive • Men not interested in social change and not supportive too • Women participation not ensured in SNRM/CRLUP and management. • Gender responsive awareness not shared or available as they 	<ul style="list-style-type: none"> • Promotion of women, IPs, Dalit and marginalized groups • Advocating GESI and women's issues among male and inform on transformative change and recognizing women's voice for change, reduce GBV • Awareness promotion on gender responsive information and ensure to make available to all 	<ul style="list-style-type: none"> • Informal learning and sharing platform benefited by grassroots level women, IPs, Dalits and marginalized groups • % of CBOs and women groups made aware on gender responsive information and access to resources increased • % of male engagement in GESI and women's issues help change the social norms and values 	<ul style="list-style-type: none"> • At least 30% of Grassroots level women, IPs, Dalits and marginalized empowered • Gender responsive information and availability access made easy • Male involvement increased in advocacy of GESI and women's issues and minimized social disparities

	environment day, Indigenous people's day, Churia day, etc.	are not prioritized			
	2. Collect local-level best practices for learning and policy influence to ensure gender responsiveness and women's participation, access, control, and leadership. This should be linked with project level activity-collecting community and indigenous knowledge collection packages-compendium development	<ul style="list-style-type: none"> Change in gender roles not easily accepted posing threats to social norms and values 	<ul style="list-style-type: none"> Conduct GESI trainings and awareness campaigns and policy reviews to strengthen the GESI initiatives 	<ul style="list-style-type: none"> 50% men and women know about the GESI policy and integration strategies 	<ul style="list-style-type: none"> Province and local level policy reviewed
	3. Provide gender mainstreaming training/ workshops to local government and CBOs and concerned stakeholders. The activity should be linked with project level activity: building capacity of project implementer, government staffs and other stakeholders.	<ul style="list-style-type: none"> Gendered governance restricting women to participate. Women participation in NRM sectors can pose threat to social change 	<ul style="list-style-type: none"> Document of good and best practices in gendered governance that has minimized social discrimination and women empowered reducing GBV as well 	<ul style="list-style-type: none"> Gendered governance best practices documented, and learning shared for social change 	<ul style="list-style-type: none"> Best practices in gendered governance documented and published
Integrated gender in local planning processes in SNRM and resilience.	4. Conduct GESI-focused social audits and public hearings to understand the allocation of gender-responsive activities, budgeting, and implementation concerning GESI-inclusive practice at local level.	<p>Women not being empowered could hinder their participation.</p> <p>Leadership discrimination among women and elite captures</p> <p>GESI not prioritized. Inclusive transparency and practices limited and not prioritized</p>	<p>Rapid assessment on women's contribution and involvement in NRM/CRLUP and management to be conducted and shared for minimizing social barriers.</p> <p>Trainings to be provided to mainstream gender increasing the trend of preparing action plans as GESI priority.</p> <p>Regularly conduct GESI focused audits and public hearing to</p>	<p>% of women's contribution and involvement analyzed and further plans developed</p> <p>% of understanding level and mainstreaming of GESI well adopted</p> <p>% Of local institutions practice GESI focused social audits and public hearing for social and strong governance practice</p>	<p>Rapid assessment conducted. GESI mainstreaming training and workshops raised awareness.</p> <p>GESI focused social audit and public hearing conducted regularly</p>

			increase transparency and good governance		
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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.

Output 5: Advocacy Campaign: Gender-inclusive governance for SNRM and Resilience				
Activity 5.1				
5.1.1 Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities (includes preparing a strategy with issues, objectives, actions/products)	Event/episode	Activity/episode/events	Amount	Total
5. Prepare and disseminate short videos on gender and governance, SNRM, and climate resilience in the river system.	Event	3	150,000	4,50,000
5.1.2 Prepare community radio programs and short messages, PSA (public service announcement), radio jingles on gender and governance, SNRM, and resilient by utilizing local radio.	Episode	50	10,000	500000
5.1.3 Prepare drama and role play by involving local school/eco club in awareness-raising campaigns on SNRM, gender inclusive governance, and youth involvement for climate resilience.	Event	3	50,000	150,000
5.1.4 Engage males, especially stakeholders of the river system, and involvement in advocating gender and women's issues and concern through awareness-raising activities by eco-club. The activity should be conducted during the day celebration: women's day, environment day, Indigenous people's day, Churia day, etc.	Event	4	100000	400000
5. Create informal learning and sharing platforms for grassroots-level women by utilizing local schools, eco clubs, and youth associations (number of event-.	Event	2	40,000	80,000

5.2 Collect local-level best practices for learning and policy influence to ensure gender responsiveness and women's participation, access, control, and leadership. This should be linked with project level activity- collecting community and indigenous knowledge collection packages-compendium development.	Event	3	20,000	60,000
5.3 Provide gender mainstreaming training/ workshops to local government and CBOs and concerned stakeholders. The activity should be linked with project level activity: building capacity of project implementer, government staffs and other stakeholders.	Event	1	150,000	150,000
5.4 Conduct GESI-focused social audits and public hearings to understand the allocation of gender-responsive activities, budgeting, and implementation concerning GESI-inclusive practice at local level.	Event	1	1,00000	1,00000
Total Budget (NRs)				18,90,000

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

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/L=1	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 I	Output I Natural forest ecosystems are better maintained and protected within the project area	3	2	2	3	3	13

	Output 2: Forests and tree cover are restored and maintained in the river system landscapes	2	2	3	2	2	11
IPack 2	Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks	2	2	2	3	3	12
IPack 3:	Output 4: Farmers are skilled in using climate-resilient land use practices.	3	3	3	2	3	14
IPack 4:	Output 4: Farmers are skilled in using climate-resilient land use practices.	3	3	3	2	3	14
IPack 5:	Advocacy campaign: Gender inclusive governance for SNRM	2	3	1	1	3	10

Monitoring and Reporting:

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

Expected Results	Objectively verifiable Indicator	Baseline	Target	Means of verification	Assumptions
Output 1: Natural forest ecosystems are better maintained and protected within the project area	Density of forest area in terms of biomass in the River Systems.	Forest land total biomass: 167.93 ton/ ha Other wooded land total biomass: 47.33 ton/ha (Baseline survey 2022)	Forest density increased by 2%	Baseline survey report Endline survey report	This River System has 643.5 ha of forest and 572 ha of other wooded land
	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0	At least 111 ha of natural forest restored through ANR and enrichment plantation	PPMU/DFO records Maps Reports	CBOs adopt climate resilient land use practices During baseline, degraded forest area/other wooded land is 572 ha.
	xx forestry user groups manage xx has of forest through updated forest management plan	0 forestry user groups manage 0 ha. of forest	At least 7 Community forest user groups manage 1026 ha. of forest through updated forest management plan	DFO/Group/PPMU record	Community based forestry groups implement renewed forest management operational plan
Output 2 Forests and tree cover are restored and maintained in the River	Xx ha of new plantation outside forest area; and their survival rate (public land	Area: 0 ha. Survival rate: NA	Area: At least 91 ha. Survival rate: 80%	Municipal /DFO/PPMU record Field verification Report	Local government supported and owned public land and private

System landscapes.	forestry and private forestry)				forestry initiatives under their own jurisdiction
Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.	Volume of sedimentation	Cubic meter of soil volume per unit area: 0	25% in comparison to before constructing structures	In-person assessments at lower gabions.	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 are skilled in using climate-resilient land use practices.	Ha. Of land under climate resilient agriculture	1552	NA	FFS record PPMU record	
	Proportion of farmers trained by the project who begin to apply climate-resilient land use practices on their fields in the relevant season following their respective trainings.	0	At least 80% of the farmers involved in project trainings by the end of PY4 report that they have begun to apply project-promoted climate-resilient land use practices in the season following their training	Assessment report PPMU record	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. Advocacy campaign: Gender-inclusive governance	% of women in leadership positions of CBO's executive committee	24 out of 55 (43.6%) womens are in leadership position	At least 50% women in leadership position	DFO/Group/PPMU record	Proportional representation of all social groups ensured
	Access of women in Natural resources management, CRLUP, knowledge and information	0	At least 50% women participation in all events	Group record	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in NRM/ CRLUP and management	0	No. of Gender sensitive forest management operational plan	PPMU record, PPMU record	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups

Outcome and impact level result assessment will be carried out based on result framework of CERP (Annex-I) 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.

Annexes:

Annex-I Result Framework of Bihul Critical Ecosystem Restoration Plan

Vision: Climate resilient and sustainably managed Natural Resources and communities in Bihul River System (by 2040)

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 (prox-indicator 2 to 5)	Tonnes of carbon dioxide equivalent (tCO ₂ eq) 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 indicator: Area of (1) Deforestation rate: 0.108% (2) Sustainable forest management area: (3) ANR area (4) Plantation area (5) Area of Climate Resilient Agriculture (CRA):0	Proxy indicator: Area of (1) Deforestation rate: 0 % (2) Sustainable forest management area: 1026 (3) ANR area: 111 ha. (4) Plantation area: 91 ha (5) Area of Climate Resilient Agriculture (CRA): 1552 ha.	PPMUs/PPMU report GCF/BR CRN GHG mitigation calculation tool-based calculation sheet	This River System has 1215.5 ha forest area (643.5 ha of forest and 572 ha of other wooded land) Out of 1215.5 ha forest, 1026 ha of forest managed by 7 CFUGs Deforested area between 2000 and 2019 is - 2420.5 ha and deforestation rate is 0.108%
GCF core indicator (Adaptation)	Total number of direct and indirect beneficiaries (gender disaggregated)	0	Direct: Male: 4338 , Female: 4311	Periodic reports PPMU record	1413 HHs associated with community forestry groups with 8649 population.
Outcomes					
M9.0 Improved management of land or forest areas	M9.1 Hectares of land or forests under improved and effective management that		Atleast 1086ha of forest ecosystems sustainably managed 111 ha community-	Project reports PPMU record	Beneficiaries adopt climate-resilient land use practices

contributing to emissions reductions	contributes to CO ₂ emission reductions		managed natural forests restored through assisted regeneration 91 ha of new planted forests established		
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	4338 men 4311 women 8649 total	Workshop/training Attendance sheets and materials	Beneficiaries are interested in adopting climate resilient land use practices. 1413 HHs associated with CFUGS with 8649 population
Outputs					
Output 1 natural forest ecosystems are better maintained and protected within the project area	Density of forest area in terms of biomass in the River Systems.	Forest land total biomass: 167.93 ton/ ha Other wooded land total biomass: 47.33 ton/ha (Baseline survey 2022)	Forest density increased by 2%	baseline survey report endline survey report	This River System has 643.5 ha of forest and 572 ha of other wooded land
	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0	At least 111 ha of natural forest restored through ANR and enrichment plantation	PPMU/DFO records Maps Reports	CBOs adopt climate resilient land use practices During baseline, degraded forest area is xx ha.
	xx forestry user groups manage xx has of forest through updated forest management plan	0 forestry user groups manage 0 ha. of forest	<u>At least 7 Community forest user groups manage 1026xx ha. of forest through updated forest management plan</u>	DFO/Group/PPMU record	Community based forestry groups implement renewed forest management operational plan
Output 2 Forests	Xx ha of new plantation outside	Area: 0 ha. Survival rate: NA	Area: Atleast 91 ha.	Municipal/DFO/PP	Local government

and tree cover are restored and maintained in the River System landscapes.	forest area; and their survival rate (public land forestry and private forestry)		Survival rate: 80%	MU record Field verification Report	supported and owned public land and private forestry initiatives under their own jurisdiction
Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.	Volume of sedimentation	0 cubic meter of soil volume per unit area	25% in comparison to before constructing structures	In-person assessments at lower gabions.	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 are skilled in using climate-resilient land use practices.	Ha. Of land under climate resilient agriculture	0	1552 ha	FFS record PPMU record	
	Proportion of farmers trained by the project who begin to apply climate-resilient land use practices on their fields in the relevant season following their respective trainings.	0	At least 80% of the farmers involved in project trainings by the end of PY4 report that they have begun to apply project-promoted climate-resilient land use practices in the season following their training	Assessment report PPMU record	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. Advocacy campaign: Gender-inclusive governance	% of women in leadership positions of CBO's executive committee	24 out of 55 (43.6%) women are in leadership position	At least 50% women in key leadership position	DFO/Group record/PPMU record	Proportional representation of all social groups ensured
	Access of women in Natural resources management, CRLUP, knowledge and information	0	At least 50% women participation in all events	Group record, PPMU record	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in NRM/CRLUP and management	0	7 no. of Gender sensitive forest management operational plan	plan PPMU record, PPMU record	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups

Activities:

Activities	Description	Sub-activities	Remarks
Output I natural forest ecosystems are better maintained and protected within the project area			
Activity 1.1: Restoration of degraded natural forests		1.1.1 Construction/promotion of forest Nursery 1.1.2 Seedling production in Nursery (Multi-years' seedlings) 1.1.3 Enrichment plantation and regeneration management in degraded forest 1.1.4 Cleaning of existing fire line and existing trails 1.1.5 Construction/improvements of fencings in natural forest lands 1.1.6 Support on forest firefighting equipment/tools (15 sets) 1.1.7 support on provisions for forest watcher 1. 1.8 Support on fodder-seedlings for fodder trees promotion 1.1.9 Linking with existing mobile app System from ICIMOD for forest fire monitoring and forest management (1 event) 1.10 Development of Community Based Forest Fire Fighting Groups (CB-FFFG) 1.11 Provide skilled-based training capacity for CBFFFGs on forest fighter trainings-forest fire control and management for (15*3) =45 persons-firefighter trainings) for CFUGs/LFUGs 1.12 Provide 1-day orientation trainings for Herders on importance of forest services and management (500 herders/livestock) 1.13 Provide skilled-based trainings to promote compost and green manure preparation using forest based resources-bushes and leaf-litters-3 days training (one event for each CFUGs/LFUGs)	
Activity 1.2: Enhance capacity of forest management stakeholders (government units, CFUGs, forest management CSOs, users)		1.2.1 Support on Forest Operational Plan (FoP) /reviews 1.13 Coaching on forest operational plan for forest users (15 events) 1.2.2 Develop Training of Facilitator (ToF) on Forest Resource Management -7days (10 persons) 1.2.3 Capacity building trainings on forest management for government staffs (DFOs/ SDFOs) (1 event-3 days residential)	

		<p>1.2.4 Provide refresher trainings for CFUGs/LFUGs in forest management-3 days for each CFUGs (non-residential) at local level</p> <p>1.2.5 Celebration of Churia Conservation Day (5 events) at River System level</p> <p>1.2.6 Facilitation on school course programme on sustainable forest management (1 event)</p> <p>1.2.7 Production dissemination of sustainable management of natural resources</p> <p>1.2.8 Facilitation support for alternative energy uses / biogas plants installation(500 HHs)</p>	
Output 2 Forests and tree cover are restored and maintained in the River System landscapes.			
Activity 2.1: Enhance forest land in River site areas (afforestation)		<p>2.1.1 Plantation in River side area (forestry plantation)</p> <p>2.1.2 Capacity building trainings for users on the management of plantation in River side areas</p>	
Output 3: Local structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks.			
Activity 3.1 Conserve soil and water source and Improved water retention		<p>3.1.1 Landslide treatments</p> <p>3.1.2 Gulley stabilization in torrent stream (11 torrents)</p> <p>3.1.3 Improvement of irrigation facilities</p> <p>3.1.4 Construction of conservation pond</p> <p>3.1.5 Improvement of existing pond</p> <p>3.1.6 Wetland improvement</p> <p>3.1.7 Construction of water harvesting structures (dams)</p> <p>3.1.8 Riverbank stabilization</p>	
Activity 3.2 Capacitate stakeholders and enhanced water and soil conservations		<p>3.2.1 Skill based training for local community CFUGs/LFUGs on landslide and gullies stabilization with locally available treatment measures (15 events);</p> <p>3.2.2 Orientation training on soil and water conservation measures for government officials</p> <p>3.2.3 Support on demonstration visits on soil and water conservation programme</p> <p>3.2.4 Sensitize on upstream and downstream linkages for ecosystem services</p> <p>3.2.5 Support on production and dissemination of success stories of water and soil conservation practices for possible replication</p>	

Output 4: Farmers are skilled in using climate-resilient land use practices.			
Activity 4.1: Establish agroforestry activities		4.1.1 Establishment of Agroforestry Fodder Nursery 4.1.2 Purchasing seedlings of horticulture species for agro-forestry focus on multiyear seedling production 4.1.3 Support agroforestry activities in the potential lands 4.1.4 Irrigation facility (small irrigation facility) 4.1.5 Formation of AFG focusing on women farmers 4.1.6 Institutional support and office equipment for women group 4.1.7 Coordination meetings (5 years)	
Activity 4.2: Capacitate communities'/farmer groups and government officers to promote agroforestry System (3 AFG)		4.2.1 Training for agroforestry groups on sustainability, principle of administration and management-3 days residential 4.2.2 Training on improved AF practices (promotion for small enterprises for the production)-5 days residential 4.2.3 Providing capacity building for government officers on the promotion of agroforestry System-3days residential 4.2.4 Support on production and dissemination of success stories AF System replication	
Activity 4.3 Establish 2 FFSs and increased farmers' ability in seed production.		4.3.1 Establish 2 FFSs 4.3.2 Capacity building on livestock management practices-sheds improvements crop depredation by wildlife 4.3.3 Support to farmers for seed production (rice) through FFS approach	
Activity 4.4: Enhance farmers' capacity in climate resilient practices		4.4.1 Capacity building trainings on using weather information and its application skills in farming practices; 4.4.2 Provide training to adopt and apply climate resilient land use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure, 4.4.3 Support to link the farmers with the local market centers and know the market information;	
Activity 4.5: Increase coping strategies for wildlife threats in crops		4.5.1 Sensitization orientation on wildlife threats and risk reduction in agriculture	
5. Advocacy campaign: Gender-inclusive governance			
5.1 Increase access of women to NRM/ CRLUP and		5.1.1 Create informal learning and sharing platforms for grassroots-level women	

<p>management knowledge and information.</p>		<p>5.1.2 Conduct local level policy to ensure gender responsiveness and women's participation, access, control and leadership. 5.1.3 Produce and publish best practices and learnings in governance</p>	
<p>5.2 Integrate gender in local planning processes in NRM/ CRLUP and management.</p>		<p>5.2.1 Conduct rapid assessment on women's contribution and involvement in NRM/ CRLUP and management. 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 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.</p>	

Annex-2: Planned Activities, Location and Description

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

SN	Activity	Location	Lat	Long	Code	Unit	Description
1	Fencing as Assisted Natural Regeneration	Surunga Municipality-4	26.66797	86.59649	M349	5.9	Length (Km)
2	Fencing as Assisted Natural Regeneration	Surunga Municipality-4	26.67218	86.57643	M350	0.7	Length (Km)
3	Fencing as Assisted Natural Regeneration	Surunga Municipality-4	26.67483	86.57116	M348	1.2	Length (Km)
4	Fencing as Assisted Natural Regeneration	Khadak Municipality-5	26.67570	86.60714	M351	2.0	Length (Km)
5	Fencing as Assisted Natural Regeneration	Khadak Municipality-5	26.68720	86.60889	M352	2.7	Length (Km)
6	Fencing as Assisted Natural Regeneration	Surunga Municipality-6	26.69083	86.56679	M139	0.7	Length (Km)
7	Fencing as Assisted Natural Regeneration	Surunga Municipality-6	26.69286	86.56572	M188	0.8	Length (Km)
8	Assisted Natural Regeneration	Khadak Municipality-5	26.67088	86.60041	M162	1.8	Area (Ha)
9	Assisted Natural Regeneration	Khadak Municipality-5	26.67638	86.60738	M185	8.1	Area (Ha)
10	Assisted Natural Regeneration	Khadak Municipality-5	26.68411	86.60850	M207	10.8	Area (Ha)
11	Assisted Natural Regeneration	Surunga Municipality-4	26.67428	86.56962	M177	6.1	Area (Ha)
12	Assisted Natural Regeneration	Surunga Municipality-4	26.67231	86.59902	M166	1.3	Area (Ha)
13	Assisted Natural Regeneration	Surunga Municipality-4	26.67284	86.57643	M169	2.5	Area (Ha)
14	Assisted Natural Regeneration	Surunga Municipality-6	26.67885	86.57714	M193	3.6	Area (Ha)
15	Assisted Natural Regeneration	Khadak Municipality-5	26.67048	86.60521	M157	4.2	Area (Ha)
16	Assisted Natural Regeneration	Surunga Municipality-4	26.67762	86.58465	M189	2.4	Area (Ha)
17	Assisted Natural Regeneration	Surunga Municipality-4	26.66809	86.58448	M144	63.8	Area (Ha)
18	Assisted Natural Regeneration	Surunga Municipality-6	26.69127	86.56588	M234	1.8	Area (Ha)
19	Assisted Natural Regeneration	Surunga Municipality-6	26.69264	86.56579	M238	2.5	Area (Ha)
20	Assisted Natural Regeneration	Surunga Municipality-4	26.68215	86.58224	M203	1.7	Area (Ha)
21	Establishment of forest nursery	Bode Barsain Municipality-8	26.53417	86.55438	M4	1.0	Number
22	Establishment of forest nursery	Khadak Municipality-5	26.66724	86.59431	M141	1.0	Number
23	Estabilishment of FFS on Paddy	Dakneshwori Municipality-3	26.50792	86.58579	A3	1.0	Number
24	Estabilishment of FFS on Paddy	Balan Bihul Rural Municipality-6	26.56057	86.52716	A41	1.0	Number

25	Establishment of FFS on Paddy	Bode Barsain Municipality-6	26.56602	86.56224	A45	1.0	Number
26	Establishment of FFS on Vegetable	Bode Barsain Municipality-2	26.59998	86.58429	A68	1.0	Number
27	Establishment of FFS on Vegetable	Surunga Municipality-4	26.65956	86.56203	A128	1.0	Number
28	Establishment of FFS on Maze	Surunga Municipality-4	26.66323	86.58440	A132	1.0	Number
29	Establishment of FFS on Mango	Surunga Municipality-4	26.67045	86.56654	A155	1.0	Number
30	Establishment of FFS on Vegetable	Surunga Municipality-6	26.68103	86.55884	A198	1.0	Number
31	Establishment of FFS on Ginger and Turmeric	Surunga Municipality-6	26.68354	86.56249	A206	1.0	Number
32	Establishment of FFS on Ginger and Turmeric	Surunga Municipality-5	26.68717	86.55098	A215	1.0	Number
33	Establishment of agroforestry nursery	Balan Bihul Rural Municipality-5	26.54711	86.54233	A341	1.0	Number
34	Establishment of agroforestry nursery	Balan Bihul Rural Municipality-1	26.57679	86.53736	A346	1.0	Number
35	Establishment of agroforestry nursery	Khadak Municipality-5	26.65547	86.59512	A347	1.0	Number
36	Construction of conservation ponds	Khadak Municipality-3	26.64261	86.58495	A116	1.0	Number
37	Construction of conservation ponds	Khadak Municipality-5	26.64889	86.59538	A120	1.0	Number
38	Construction of conservation ponds	Surunga Municipality-8	26.65641	86.53806	A123	1.0	Number
39	Pond Improvement	Surunga Municipality-4	26.66082	86.56345	A129	1.0	Number
40	Pond Improvement	Surunga Municipality-8	26.66300	86.55589	A131	1.0	Number
41	Pond Improvement	Surunga Municipality-8	26.66347	86.54697	A133	1.0	Number
42	Construction of conservation ponds	Khadak Municipality-5	26.66497	86.59971	A135	1.0	Number
43	Construction of conservation ponds	Surunga Municipality-4	26.66531	86.57122	A136	1.0	Number
44	Pond Improvement	Surunga Municipality-4	26.66643	86.57528	A138	1.0	Number
45	Construction of conservation ponds	Khadak Municipality-5	26.66730	86.59786	A142	1.0	Number
46	Construction of conservation ponds	Surunga Municipality-4	26.66803	86.57780	A143	1.0	Number
47	Construction of conservation ponds	Khadak Municipality-5	26.66844	86.61618	A145	1.0	Number
48	Pond Improvement	Khadak Municipality-5	26.67048	86.60458	A158	1.0	Number
49	Pond Improvement	Surunga Municipality-7	26.67129	86.52770	A164	1.0	Number
50	Pond Improvement	Surunga Municipality-7	26.67214	86.53517	A165	1.0	Number
51	Construction of conservation ponds	Surunga Municipality-4	26.67346	86.56865	A173	1.0	Number
52	Pond Improvement	Surunga Municipality-4	26.67388	86.56828	A175	1.0	Number
53	Pond Improvement	Surunga Municipality-7	26.67644	86.53510	A186	1.0	Number
54	Pond Improvement	Surunga Municipality-6	26.68150	86.55380	A200	1.0	Number
55	Construction of conservation ponds	Surunga Municipality-6	26.68463	86.56931	A209	1.0	Number
56	Construction of conservation ponds	Surunga Municipality-6	26.68876	86.56851	A222	1.0	Number

57	Water harvesting structure (Dam)	Khadak Municipality-5	26.67218	86.60812	A353	1.0	Number
58	Water harvesting structure (Dam)	Khadak Municipality-4	26.67912	86.59466	A354	1.0	Number
59	Wetland protection	Bode Barsain Municipality-7	26.55771	86.58013	A345	1.0	Number
60	Wetland protection	Bode Barsain Municipality-7	26.55541	86.57863	A343	1.0	Number
61	Wetland protection	Bode Barsain Municipality-7	26.55563	86.58218	A344	1.0	Number
62	Wetland protection	Bode Barsain Municipality-7	26.55380	86.58037	A342	1.0	Number
63	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.53117	86.55040	A11	0.1	Length (Km)
64	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.53374	86.54796	A13	0.4	Length (Km)
65	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-5	26.53529	86.54446	A17	0.3	Length (Km)
66	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.53544	86.54695	A16	0.4	Length (Km)
67	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.53687	86.54624	A18	0.1	Length (Km)
68	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.54081	86.54395	A22	0.3	Length (Km)
69	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.54427	86.54341	A23	0.2	Length (Km)
70	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.54739	86.54740	A26	0.3	Length (Km)
71	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-5	26.54809	86.54442	A27	0.2	Length (Km)
72	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.55022	86.54778	A31	0.3	Length (Km)
73	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.55071	86.54511	A30	0.3	Length (Km)
74	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.55329	86.54883	A33	0.2	Length (Km)
75	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.55631	86.55038	A35	0.3	Length (Km)
76	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-8	26.55869	86.54935	A39	0.3	Length (Km)
77	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-6	26.56498	86.54202	A44	0.4	Length (Km)
78	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-6	26.56890	86.54053	A48	0.3	Length (Km)
79	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.58901	86.53891	A58	0.1	Length (Km)
80	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-3	26.59660	86.54144	A63	0.2	Length (Km)
81	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.59891	86.54321	A65	0.1	Length (Km)
82	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.59983	86.54271	A66	0.1	Length (Km)
83	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.60178	86.53385	A72	0.1	Length (Km)

84	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.60180	86.54243	A71	0.2	Length (Km)
85	Riverbank stabilization with bio-engineering structures	Surunga Municipality-11	26.60221	86.53569	A73	0.1	Length (Km)
86	Riverbank stabilization with bio-engineering structures	Surunga Municipality-11	26.60331	86.53447	A76	0.1	Length (Km)
87	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.60345	86.54645	A77	0.3	Length (Km)
88	Riverbank stabilization with bio-engineering structures	Bode Barsain Municipality-1	26.60408	86.53213	A79	0.1	Length (Km)
89	Riverbank stabilization with bio-engineering structures	Khadak Municipality-1	26.60715	86.55976	A84	0.4	Length (Km)
90	Riverbank stabilization with bio-engineering structures	Khadak Municipality-1	26.61485	86.56545	A87	0.2	Length (Km)
91	Riverbank stabilization with bio-engineering structures	Khadak Municipality-1	26.61732	86.56603	A89	0.1	Length (Km)
92	Riverbank stabilization with bio-engineering structures	Khadak Municipality-1	26.61903	86.56533	A91	0.1	Length (Km)
93	Riverbank stabilization with bio-engineering structures	Khadak Municipality-1	26.61970	86.56630	A92	0.1	Length (Km)
94	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.62621	86.59138	A98	0.2	Length (Km)
95	Riverbank stabilization with bio-engineering structures	Khadak Municipality-8	26.62631	86.59443	A101	0.3	Length (Km)
96	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.63127	86.59216	A104	0.2	Length (Km)
97	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.63140	86.59532	A108	0.2	Length (Km)
98	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.63712	86.59279	A112	0.6	Length (Km)
99	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.63738	86.59720	A111	0.2	Length (Km)
100	Riverbank stabilization with bio-engineering structures	Khadak Municipality-5	26.64175	86.59388	A115	0.4	Length (Km)
101	Riverbank stabilization with bio-engineering structures	Surunga Municipality-4	26.65728	86.56604	A125	0.1	Length (Km)
102	Riverbank stabilization with bio-engineering structures	Surunga Municipality-4	26.65861	86.56641	A127	0.1	Length (Km)
103	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-7	26.64339	86.52498	A117	13.6	Area (Ha)
104	Woodlot establishment in private land	Balan Bihul Rural Municipality-6	26.56412	86.54180	A43	1.9	Area (Ha)
105	Community land plantation	Bode Barsain Municipality-6	26.56688	86.54009	A46	0.7	Area (Ha)
106	Community land plantation	Balan Bihul Rural Municipality-6	26.56831	86.53995	A47	0.3	Area (Ha)
107	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-5	26.54513	86.54284	A24	2.1	Area (Ha)
108	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-8	26.54650	86.54532	A25	4.2	Area (Ha)

109	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-5	26.54842	86.54546	A28	2.6	Area (Ha)
110	Demonstration plantation	Bode Barsain Municipality-8	26.55028	86.54575	A29	0.6	Area (Ha)
111	Woodlot establishment in private land	Bode Barsain Municipality-8	26.55434	86.54861	A34	1.5	Area (Ha)
112	Community land plantation	Bode Barsain Municipality-8	26.52928	86.55146	A10	2.6	Area (Ha)
113	Community land plantation	Bode Barsain Municipality-8	26.52432	86.55308	A7	1.3	Area (Ha)
114	Community land plantation	Bode Barsain Municipality-9	26.52246	86.55494	A6	2.2	Area (Ha)
115	Community land plantation	Bode Barsain Municipality-9	26.51930	86.55505	A5	3.3	Area (Ha)
116	Woodlot establishment in private land	Bode Barsain Municipality-9	26.49525	86.57756	A1	0.8	Area (Ha)
117	Woodlot establishment in private land	Bode Barsain Municipality-9	26.49953	86.56747	A2	4.4	Area (Ha)
118	Woodlot establishment in private land	Bode Barsain Municipality-8	26.53206	86.54878	A12	3.3	Area (Ha)
119	Community land plantation	Bode Barsain Municipality-8	26.52634	86.55129	A8	1.3	Area (Ha)
120	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-8	26.52890	86.55068	A9	3.9	Area (Ha)
121	Woodlot establishment in private land	Bode Barsain Municipality-8	26.53423	86.54936	A14	1.5	Area (Ha)
122	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-8	26.53452	86.54933	A15	0.8	Area (Ha)
123	Woodlot establishment in private land	Bode Barsain Municipality-8	26.53867	86.54563	A20	4.5	Area (Ha)
124	Woodlot establishment in private land	Bode Barsain Municipality-8	26.53705	86.54574	A19	0.3	Area (Ha)
125	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-8	26.53953	86.54590	A21	0.6	Area (Ha)
126	Woodlot establishment in private land	Bode Barsain Municipality-8	26.55692	86.55076	A36	1.3	Area (Ha)
127	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-5	26.55820	86.54694	A38	1.0	Area (Ha)
128	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-5	26.55716	86.54701	A37	0.4	Area (Ha)
129	Woodlot establishment in private land	Bode Barsain Municipality-5	26.56035	86.54566	A40	1.8	Area (Ha)
130	Woodlot establishment in private land	Bode Barsain Municipality-6	26.56217	86.54409	A42	1.0	Area (Ha)
131	Community land plantation	Bode Barsain Municipality-6	26.57310	86.53927	A50	1.8	Area (Ha)
132	Promotion of agro-forestry system with riverbank stabilization	Balan Bihul Rural Municipality-6	26.57356	86.53823	A51	0.7	Area (Ha)
133	Community land plantation	Balan Bihul Rural Municipality-6	26.57391	86.53898	A52	1.1	Area (Ha)
134	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-6	26.57683	86.53993	A54	1.6	Area (Ha)
135	Promotion of agro-forestry system with riverbank stabilization	Bode Barsain Municipality-1	26.57569	86.53870	A53	3.0	Area (Ha)

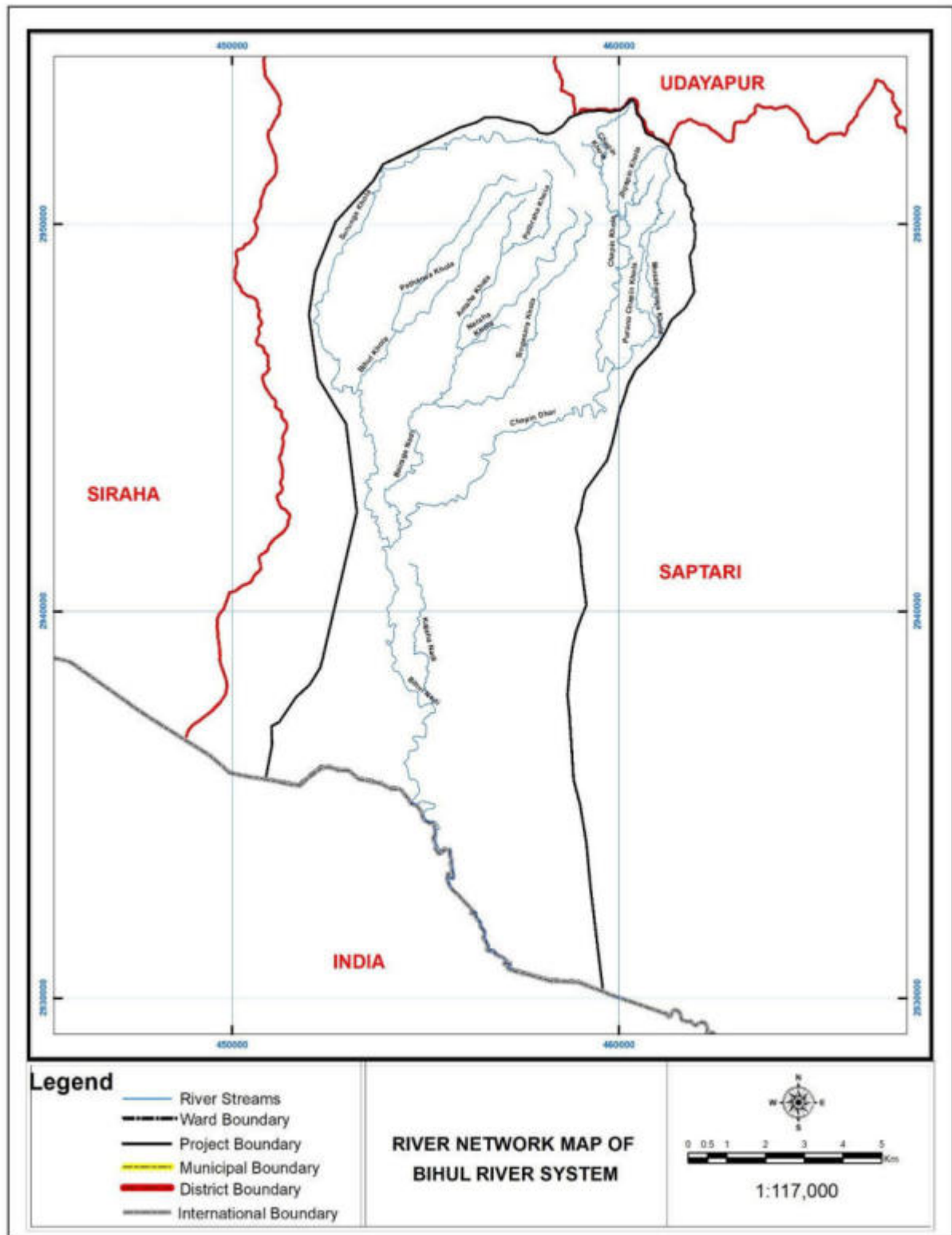
136	Community land plantation	Bode Barsain Municipality-1	26.58165	86.53849	A55	1.9	Area (Ha)
137	Woodlot establishment in private land	Bode Barsain Municipality-1	26.58655	86.54012	A57	4.1	Area (Ha)
138	Demonstration plantation	Bode Barsain Municipality-1	26.58987	86.53962	A59	2.5	Area (Ha)
139	Woodlot establishment in private land	Bode Barsain Municipality-1	26.59099	86.53826	A60	2.0	Area (Ha)
140	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-11	26.59612	86.53906	A62	1.8	Area (Ha)
141	Riparian plantation	Surunga Municipality-11	26.59530	86.53927	A61	0.7	Area (Ha)
142	Riparian plantation	Surunga Municipality-11	26.59722	86.54102	A64	0.6	Area (Ha)
143	Woodlot establishment in private land	Bode Barsain Municipality-1	26.59980	86.54326	A67	0.4	Area (Ha)
144	Demonstration plantation	Bode Barsain Municipality-1	26.60114	86.54380	A69	3.3	Area (Ha)
145	Community land plantation	Bode Barsain Municipality-1	26.60380	86.54562	A78	0.5	Area (Ha)
146	Community land plantation	Bode Barsain Municipality-1	26.60612	86.55569	A82	0.7	Area (Ha)
147	Woodlot establishment in private land	Khadak Municipality-1	26.60569	86.55751	A81	0.5	Area (Ha)
148	Community land plantation	Khadak Municipality-1	26.60726	86.55829	A83	1.6	Area (Ha)
149	Woodlot establishment in private land	Khadak Municipality-1	26.61099	86.56261	A85	1.7	Area (Ha)
150	Demonstration plantation	Khadak Municipality-1	26.61597	86.56374	A88	0.8	Area (Ha)
151	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-2	26.62254	86.56900	A94	0.5	Area (Ha)
152	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-2	26.62193	86.56948	A93	0.8	Area (Ha)
153	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-2	26.62346	86.57598	A95	1.1	Area (Ha)
154	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-2	26.62406	86.57739	A96	1.4	Area (Ha)
155	Woodlot establishment in private land	Khadak Municipality-5	26.62657	86.58459	A99	1.6	Area (Ha)
156	Community land plantation	Khadak Municipality-5	26.62661	86.58783	A100	5.0	Area (Ha)
157	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-5	26.62748	86.59218	A102	5.3	Area (Ha)
158	Community land plantation	Khadak Municipality-5	26.62980	86.59288	A103	2.2	Area (Ha)
159	Woodlot establishment in private land	Khadak Municipality-5	26.63713	86.59347	A110	1.5	Area (Ha)
160	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-5	26.64166	86.59326	A114	0.9	Area (Ha)
161	Riparian plantation	Khadak Municipality-5	26.64560	86.59329	A118	2.3	Area (Ha)
162	Demonstration plantation	Khadak Municipality-5	26.65047	86.59503	A121	1.0	Area (Ha)
163	Promotion of agro-forestry system with riverbank stabilization	Khadak Municipality-5	26.65680	86.59730	A124	8.4	Area (Ha)
164	Riparian plantation	Khadak Municipality-5	26.66117	86.60024	A130	2.0	Area (Ha)
165	Riparian plantation	Khadak Municipality-5	26.66494	86.59967	A134	1.0	Area (Ha)
166	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-5	26.68773	86.54983	A216	0.5	Area (Ha)

167	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-6	26.68837	86.55106	A220	0.6	Area (Ha)
168	Riparian plantation	Surunga Municipality-5	26.68790	86.55200	A217	0.4	Area (Ha)
169	Riparian plantation	Surunga Municipality-5	26.68794	86.55125	A218	0.4	Area (Ha)
170	Riparian plantation	Surunga Municipality-5	26.68814	86.55253	A219	0.3	Area (Ha)
171	Riparian plantation	Surunga Municipality-6	26.68842	86.55292	A221	0.6	Area (Ha)
172	Riparian plantation	Surunga Municipality-6	26.69005	86.55494	A227	0.4	Area (Ha)
173	Riparian plantation	Surunga Municipality-6	26.69036	86.55621	A229	0.6	Area (Ha)
174	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-6	26.69064	86.55613	A232	1.2	Area (Ha)
175	Riparian plantation	Surunga Municipality-6	26.69037	86.55964	A230	0.9	Area (Ha)
176	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-6	26.69074	86.56259	A233	1.1	Area (Ha)
177	Woodlot establishment in private land	Surunga Municipality-11	26.61833	86.53539	A90	1.6	Area (Ha)
178	Community land plantation	Surunga Municipality-11	26.62508	86.53207	A97	3.4	Area (Ha)
179	Community land plantation	Surunga Municipality-11	26.63114	86.53127	A105	0.4	Area (Ha)
180	Woodlot establishment in private land	Surunga Municipality-10	26.63147	86.53028	A107	0.2	Area (Ha)
181	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-10	26.63137	86.52936	A106	1.1	Area (Ha)
182	Riparian plantation	Surunga Municipality-10	26.63228	86.52849	A109	0.4	Area (Ha)
183	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-7	26.65742	86.52489	A126	6.6	Area (Ha)
184	Promotion of agro-forestry system with riverbank stabilization	Surunga Municipality-9	26.65336	86.52338	A122	2.9	Area (Ha)
185	Community land plantation	Surunga Municipality-11	26.60465	86.53347	A80	3.1	Area (Ha)
186	Woodlot establishment in private land	Bode Barsain Municipality-1	26.61264	86.53491	A86	1.8	Area (Ha)
187	Woodlot establishment in private land	Surunga Municipality-11	26.60232	86.53450	A74	0.6	Area (Ha)
188	Woodlot establishment in private land	Bode Barsain Municipality-1	26.60173	86.53518	A70	0.4	Area (Ha)
189	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Patharaha khola	26.66910	86.57959	M159	1.0	Number
190	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Chapin Khola	26.67265	86.59765	M184	1.0	Number
191	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Patharwa Khola	26.67284	86.56414	M179	1.0	Number
192	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Amaha khola	26.66966	86.56951	M146	1.0	Number
193	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Jhyapni khola	26.67551	86.60040	M191	1.0	Number
194	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, singesara khola	26.66813	86.58934	M140	1.0	Number

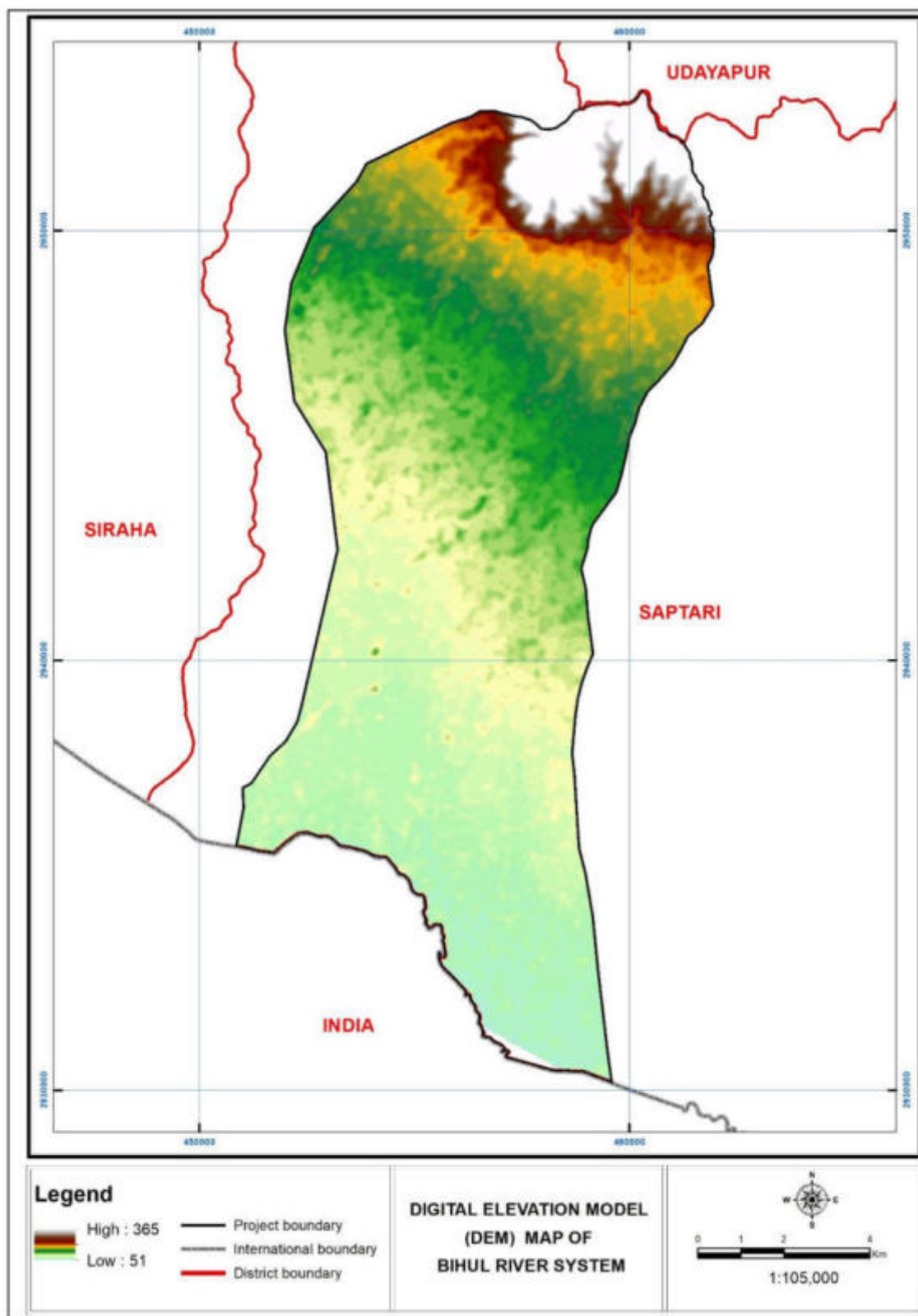
195	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-5, Musaharniya khola	26.66884	86.60793	M147	1.0	Number
196	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-5, Purano chapin khola	26.67078	86.60763	M181	1.0	Number
197	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Surunga Municipality-6, Surunga Khola	26.68959	86.56971	M223	1.0	Number
198	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Khadak Municipality-4, Neraha Khola	26.64248	86.55958	M240	1.0	Number
199	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Surunga Municipality-6, Patharwa Khola	26.67117	86.55874	M239	1.0	Number
200	Climate Resilient Agriculture		26.50402	86.58566	A365	273.0	Area (Ha)
201	Climate Resilient Agriculture		26.55559	86.52861	A366	423.9	Area (Ha)
202	Climate Resilient Agriculture		26.56584	86.56417	A367	380.2	Area (Ha)
203	Climate Resilient Agriculture		26.60106	86.58278	A368	105.8	Area (Ha)
204	Climate Resilient Agriculture		26.65882	86.55994	A369	86.3	Area (Ha)
205	Climate Resilient Agriculture		26.66863	86.56678	A370	57.8	Area (Ha)
206	Climate Resilient Agriculture		26.66172	86.58411	A371	114.5	Area (Ha)
207	Climate Resilient Agriculture		26.68497	86.55224	A372	37.3	Area (Ha)
208	Climate Resilient Agriculture		26.68349	86.56294	A373	17.7	Area (Ha)
209	Climate Resilient Agriculture		26.67752	86.55775	A374	55.7	Area (Ha)

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

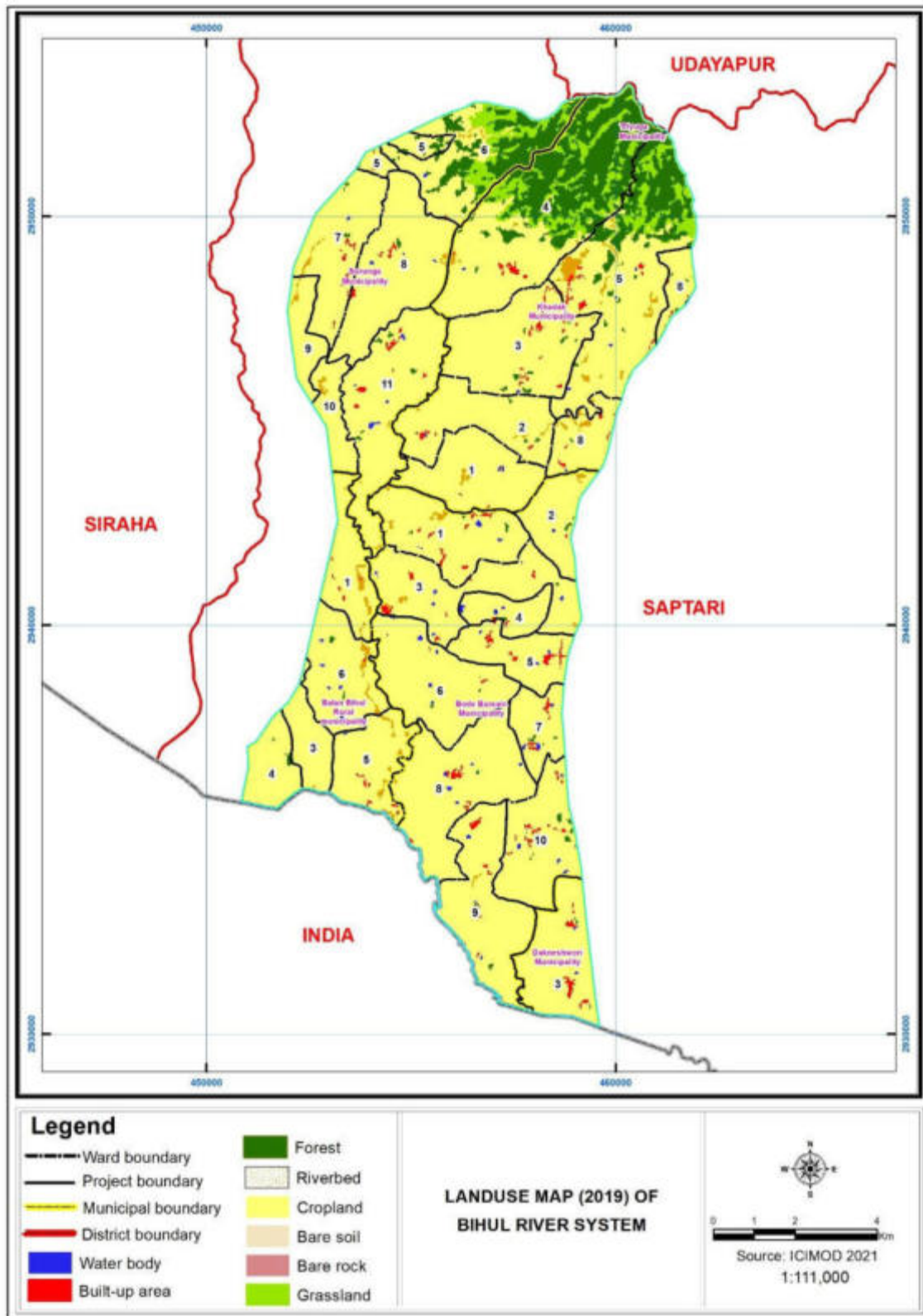
Annex 2: Thematic Maps of the Bihul River System



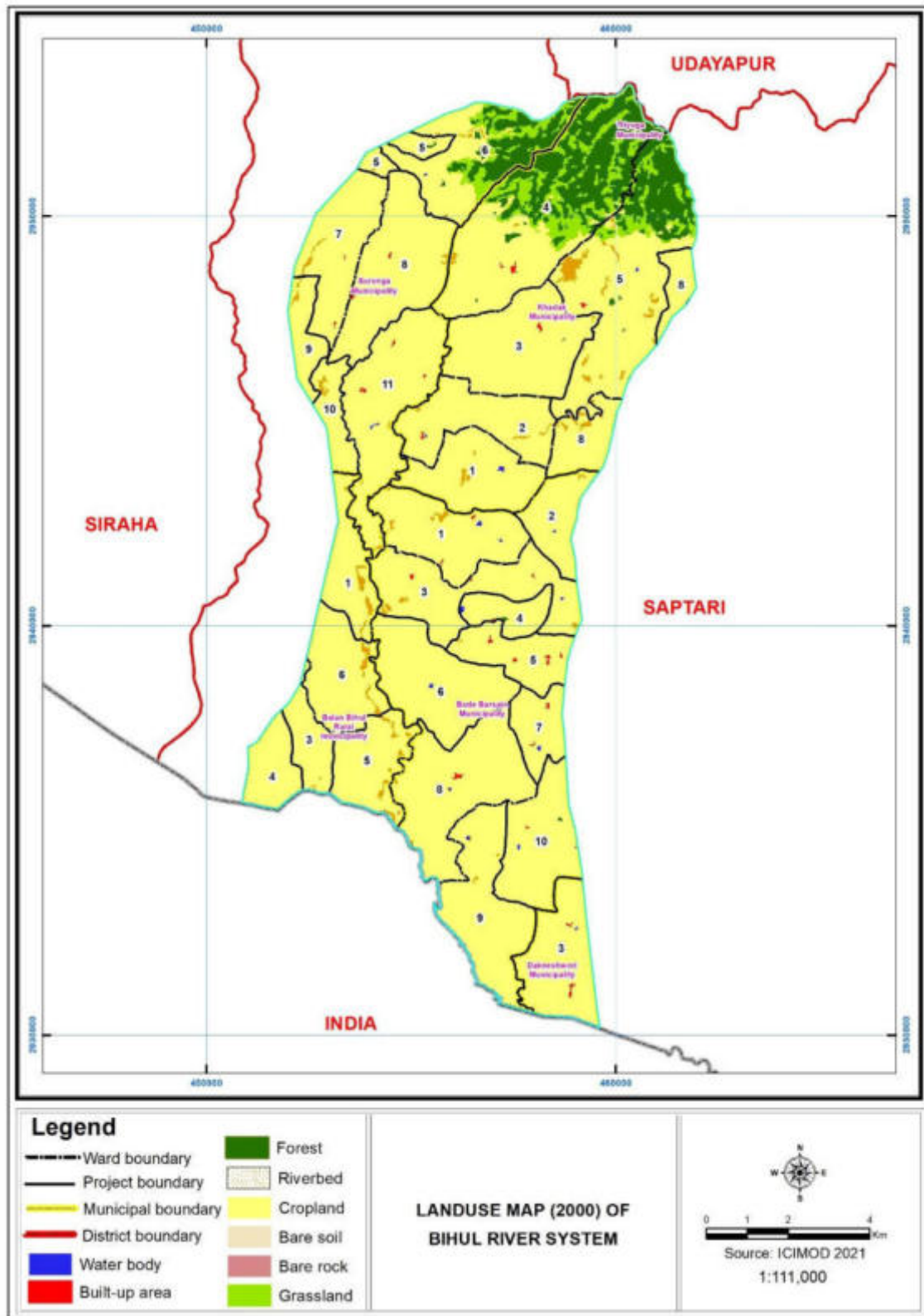
River Network of Bihul River System



Digital Elevation Map of the Bihul River System



Landuse map of Bihul River System (ICIMOD, 2019)



Landuse map of Bihul River System (ICIMOD, 2000)

Glimpses of the events and site visits in Bihul River System



Local stakeholders and facilitators actively engaged in problem tree and solution tree workshops held in Ranjitpur, Khadak Municipality-5, Saptari, Bihul River System



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Expert Planning Interaction Workshop-interaction on Bihul Rivers System-CERP-draft in Rajbiraj, Saptari



Possible plantation sites 26.604648/86.533474 Surunga Municipality-I I



River bank stabilization (26.657276/86.566036) Surunga Municipality-4



Possible location for construction of conservation ponds (26.673464/26.673464) Surunga Municipality-4



Forest Loss (26.674282/86.569618) Surunga Municipality-4



Potential for agroforestry with River bank stabilization (26.656799/86.597304) Khadak Municipality-5



River banks cutting through agriculture lands needed stabilization (26.641745/86.593877) Khadak Municipality-5



Site inspection and interaction with local community in Bihul River System



Expert Planning Interaction Workshop in Saptari