Critical Ecosystem Restoration Plan (CERP)

of

Kamala North River System

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

Building A Resilient Churia Region in Nepal (BRCRN)

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

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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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Acronyms and Abbreviation

A	Adaptation
AF	Agro-Forestry
AFG	Agroforestry Group
AKC	Agriculture Knowledge Center
ANR	Assisted Natural Regeneration
CB-FFFG	Community Based Forest Fire Fighting Group
CBO	Community Based Organization
CERP	Critical Ecosystem Restoration Plan
CF	Community Forest
CFUGs	Community Forest Users Groups
CRLU	Climate Resilient Land Use
D & FD	Deforestation and Forest Degradation
DFO	District Forest Office
DRR	Disaster Risk Reduction
DoS	Department of Survey
FFS	Farmer Field Schools
FoP	Forest Operational Plan
FPIC	Free, Prior, and Informed Consent
GESI	Gender Equality and Social Inclusion
GIS	Geographic Information System
HHs	Households
ICIMOD	International Centre for Integrated Mountain Development
ICS	Improved Cooking Stove
IPs	Indigenous Peoples
IPacks	Intervention Packages
IPM	Integrated Pest Management
LFUGs	Local Forest Users Groups
LMC	Livestock Management Center
LPG	*Liquefied petroleum gas*

LRP	Local Resource Person
M	Mitigation
MCA	Multi-Criteria Analysis
MoU	Memorandum of Understanding
NARC	Nepal Agriculture Research Center
NDRRMA	National Disaster Risk Reduction and Management Authority
PPMU	Provincial Project Management Unit
RM	Rural Municipality
SCWs	Seepage Cutoff Walls
SDFOs	Sub-Division Forest Offices
SNRM	Sustainable Natural Resource Management
ToF	Training of Facilitators
WFG	Women Farmer Group

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 system. 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 Kamala North river system is made up of the major tributaries, including Bhalu, Madaha, Bhairung, Rani, Tamarni, Bichitra. These tributaries have their sources in Churiya hill on the left bank of the Kamala River, and they confluence with the Kamala River in various locations. 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 involvement of the local users and theory of change approach were adopted in the river system to assess and status of the ecosystems and determine potential solution-activities and measures. In addition to the assessment and identification of solution activities, a guidance document, The Critical Ecosystem Restoration Plan (CERP) Manual-2021 approved by Ministry of Forest and Environment (MoFE) was followed in the process.

The maps generated from spatial analysis were taken to problem and solution workshops that took place at the local level in two locations in the river system: Dandatole, Kamalamai Municipality-10 and Sirthauli, Dudhouli Municipality-5. 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 visited-verified in the field followed by discussions with the local communities. Additional two-day expert planning workshop in the river system discussed and validated the findings, focusing on identifying drivers and underlying causes of the two thematic problems. 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:
The identified major issues and drivers of the two thematic problems include:

Climate change mitigation:

a. Over the past 19 years (2000-2019), the river system is covered with forests has decreased by 0.108 percent per year, whereas built-up area have increased by 28.86 percent and grassland increased by 4.318 percent per year (Source: ICIMOD, 2000 and ICIMOD, 2019). However, the cumulative area in the river system where the forest loss has been detected in around the catchments of the tributaries in uphill, which is about 321 ha, has been identified in various places. Field observations show large area degradaded 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 and fuelwood collection, encroachment, climate induced hazards- (flash flood, landslide), and the development of physical infrastructure, (especially Madan-Bhandari Highway along the Kamala River in left bank and other rural networks both municipalities) are the main causes of forest loss within this river watershed.

b. About 98 Community/Local Forest User Groups (CFUGs/LFUGs) are available functional in the river system, which is a significant in terms of number of forest user groups. However, there is inadequate of 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 67 landslides (covering about 26 ha) and a number of gullies in 25 torrents in various locations in the Kamalamai Dudhouli Municipality-1, 2, 4, 5 & 13 and Kamalamai Municipality-1, 5, 10, 11 & 13 have contributed to the degradation of forest ecosystems (loss of soil and vegetation) in upstream areas of this river system

d. The riverbed materials (like sands, boulders, and pebbles) have been deposited on a total of 754 ha of riverside land, including a flood plain, agricultural land close to the Kamala river, and fan regions of the confluence of the tributaries with the river system. This results in degraded agricultural lands and lowers the fertility of the river system.

e. Due to the hasty construction of physical infrastructure and the extraction of natural resources, from several catchments along the Madan-Bhandari Highway in Kamala river system have further strain on the forest (raw
materials for building construction). Along with increasing erosion and landslides, road building from Maisthan to Ruchani has also caused more forest degradation (around 37.5 km of surrounding tree species destroyed).The Dalkebar High Transmission Line also caused damage to a number of hectares (around 26 ha) of forest in the river system in 2013 and 2014.

f. 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 crop insects, pests, and diseases, and inadequate support for improved livestock management practices are all examples of inadequate climate adaptation practices in the river system.

g. 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.

h. 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 Resilient Churiya Region in Nepal (BRCRN) priority

The following are some important Five-IPacks solution activities.
IPack 1: Restoration of degraded forest (reforestation) 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 4km);

          ➢ Sustainable forest management system through capacity buildings
       c. Mesh-wire fencing (23 km) in the riverside lands (754ha) plantation, including community land plantation (195 ha), demonstration plantation (17 ha), riparian plantation (36 ha), and woodlot plantation (506 ha).
       d. Supports for alternative energy sources, priority for women and marginalized communities
       e. Capacity-buildings for local government on monitoring for sustainable extraction of river bed materials and mines;

IPack 2: Soil and water conservation
    a. Landslide treatments-67 sites with bio-engineering and vegetative measures
    b. Stabilization of gully in the torrent (25 torrents)
    c. Construction of water conservation new ponds (13 ponds):
    d. Improvement of existing ponds (1 pond)
    e. Improvement of sloppy lands-terracing, (29 ha in several locations)
    f. Wetland protection (3 locations)
    g. Improvement of drinking water sources
    h. Improvement of irrigation services
    i. Construction of water harvesting structure
    j. Riverbank stabilization
    k. Capacity buildings in water and soil conservation practices Skill based trainings, orientation and demonstration visits, success stories collection and sharing)

IPack 3: Agroforestry

Adoption of Agroforestry system in the potential areas of the riverside (about 80 ha) and link with livestock promotion with establishment of agroforestry nursery-focus on the local fodder species and horticulture crops
    a. Providing supports for irrigation facilities
    b. Formulation of groups called Agroforestry Groups (AFGs), if no any agroforestry group existed currently
    c. Capacity building trainings on Agroforestry and institutional support

IPack 4: Climate resilient agriculture (CRA)

   a. Establishment of Farmer Field Schools (FFSs) 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 Climate Resilient Agriculture (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 (includes preparing a strategy with issues, objectives, actions/products)
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 to understand the allocation of gender-responsive activities, budgeting, and implementation concerning GESI-inclusive practice at local level.

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 BRCRN project documents, the interventions to be done in upstream area are expected to bring positive change in downstream ecosystem. The majority of the activities under IPack 1 (forest restoration and afforestation) and IPack 2 (soil and water conservation) in the case of the Kamala North River System are concentrated in the areas where forest loss, landslides, and gulley erosions have occurred in the upland, as well as on areas where significant degradation has occurred in the form of loss of forest and soil. Interventions to control the forest and soil loss in the upland of river system (upstream) will control the ecosystem degradation thus reducing sedimentation in the flood plain and agriculture lands lowland along Kamala river system (downstream regions). This will subsequently reduce the flooding and damage of fertile land, river reclaimed areas and old floodplains in mid and downstream areas. In this sense CERP IPack designs also consider the connectivity and upstream-downstream linkages for ecosystem restoration.

Chapter 1: 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. Bhabar (foot slope) is a unique ecological zone which recharges water for flat lands (Terai). Despite its significant importance, the fragile landscape of Churia region is degrading at an alarming rate due to increased human pressure (livestock grazing, timber smuggling, illegal tree felling, etc.). Consequently, these have accelerated the loss of soil and biodiversity, floods, riverbank cutting and decrease in farmland productivity and have left poverty and land degradation as a landmark.

With accumulation of negative impacts on ecosystems in recent years, approaches towards ecosystem restoration have grown astoundingly 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, erosion, wildfire, floods, to the point at which the ecosystem cannot recover its pre-disturbance state 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 CERP ensures that adaptation to Climate Change (CC) and Disaster Risk Reduction (DRR) has been integrated into provincial and local development planning and sustainable forest management in the river system. 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. The development of CERPs will contribute to the provision of climate-informed extension and advisory services. 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 CR-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 investment packages, and their success or failure will inform government reporting on climate change related international commitments and instruments. The reports on the cumulative impacts of the CERPs should be a part of the country's overall NDC reporting on land use change and greenhouse gas emissions at national scale.

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

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.
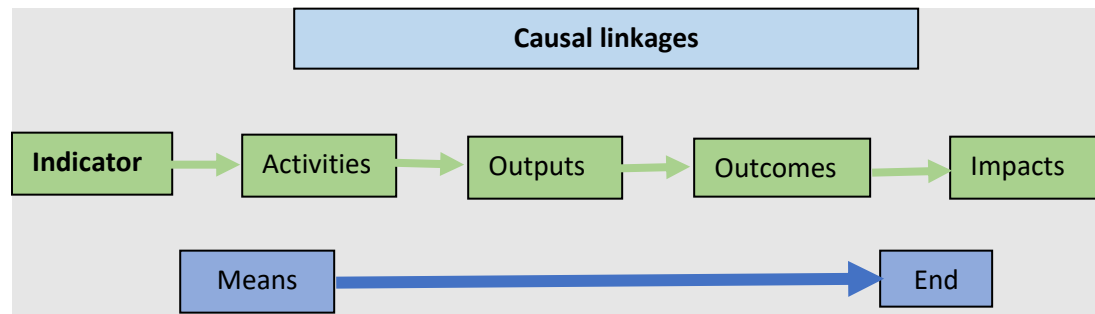
(Source: CERP Manual, 2021)

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 Churiya Master Plan (PTCMDB 2017). It is a part of watershed system that should ideally follow hydrological boundary, however river system delineation by president Churiya 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 Churiya river system can be divided into three zones based on the its landform and river geomorphic behaviors as shown in figure below. Upstream region which is the major source of sediment production acts as a sediment collection zone. Midstream region where meandering rivers transport sediment causing riverbank cutting and erosion. Downstream region where the sediment dispersal takes place forming river delta and rise of riverbed causing large flooding.
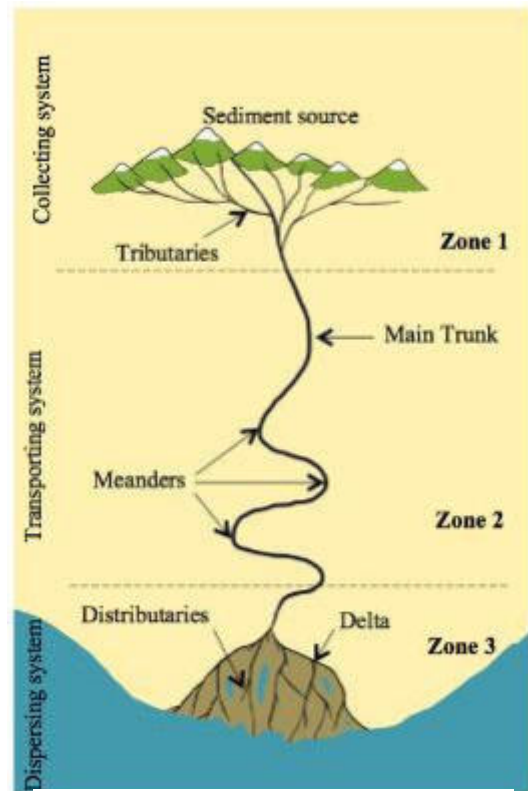
Figure 2: Upstream and downstream linkages in three distinct zones

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 of 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.

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). Three-day events, including

the problem analysis workshop (one-day), the solution analysis workshop (one day), field verification with local community consultation (one day), were adopted in the CERP development process in the river system. There were workshop events held in two locations: workshops at Dandatole, Kamalamai Municipality-10 and Sirthauli, Dudhouli Municipality-5 were held in the river system.

Preparatory Mapping - National level Secondary Data Collection - Remote Sensing Imagery Capture - Large scale base maps preparation for stakeholder consultation -	
Spatial Analysis - Multi-criteria Analysis - Hotspot Mapping **Participatory spatial planning** - Map based stakeholder planning	

Figure 3: Spatial Planning as a base for CERP

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 maps 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 MOFE approved CERP manual.
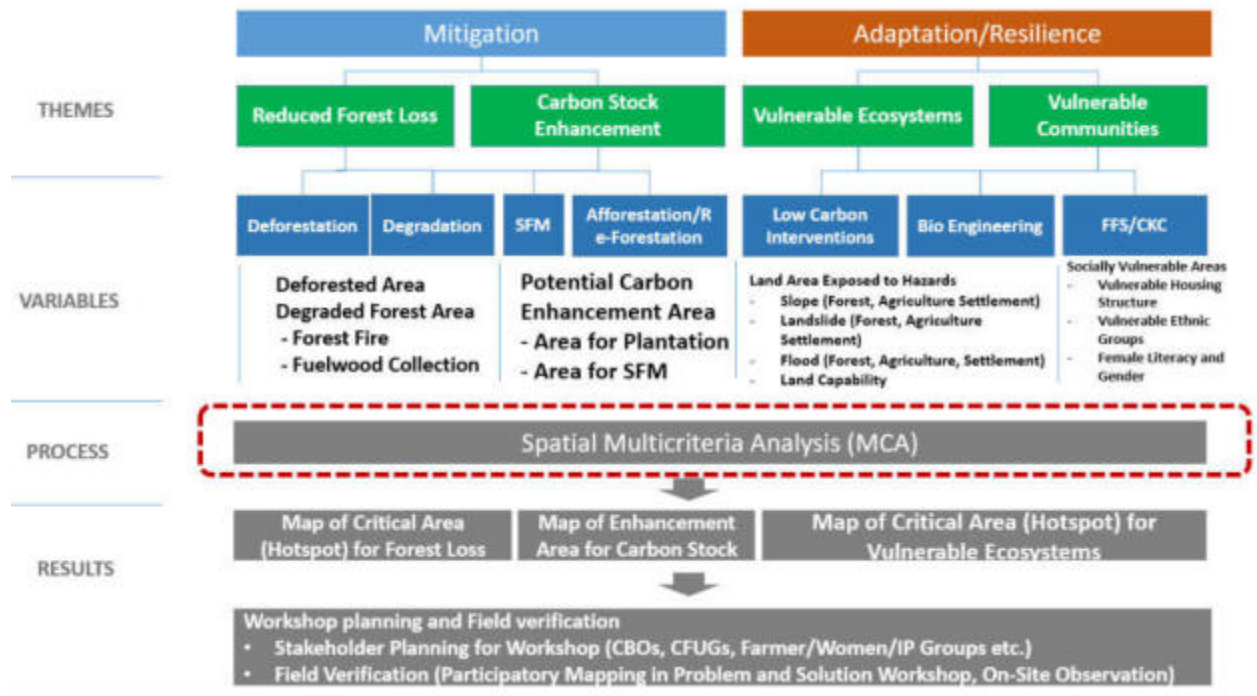
Figure 4: MCA process

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 1).

Table 1: 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	Polygon	PCTMCDMP (PCTMCDB, 2016)
			Abandoned cultivated land & Riverbed		DoS, 1996
2	Climate Change Adaptation	Agriculture land in slope area	Slopes in 3-classes: $<20^0$ $20-30^0$ $>30^0$	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 Kamala North River System

2.1 Physiography, Land Cover and Hydrology

The Kamala North River system consists of major tributaries, viz. Kamala, Bhalu, Ghatte, Lakhima, Rani, Bhairung, Kuluwa, Tamarni, Bichitra, Bangkha, Kulo, Range and Kher. Several thematic maps, including the river network of the river system is given in the report (Annex 1).

The River System (RS) covers two physiographic regions, namely Churiya 17034.5 ha (97.7%) and Middle Mountain, 406.1 (2.3%) (DoS, 1996). The total area of the river system is about 17440.6 ha within the project's river system (Figure 5). The total length of the Kamala River system within the project boundary of the river system is only about 55.49 km. The Kamala North River originates in the Churiya region near Kamalamai Municipality-8 KMM-8 at an elevation of 695.1 m .

The river system is dominant with tropical mixed hardwood forest-dominant species: Sal (*Shorea robusta*), Asna (*Terminalia tomentosa*), Barro (*Terminalia belerica*), Haro *(Terminalia chebula*), Karma *(Adina cordifolia)*, Jamun (*Syzygium cumini*) and sub-tropical mixed pine forest above 1000 m with dominant species of Khote sallo (Pinus roxburghii), Sal (*Shorea robusta)*, Dhataki *(Woodfordia fruticose)* and forest in low land: Sisau (*Dalbergiaa sissoo,* Khayer *(Acacia catechu*), Simal *(Bombax ceiba)*.
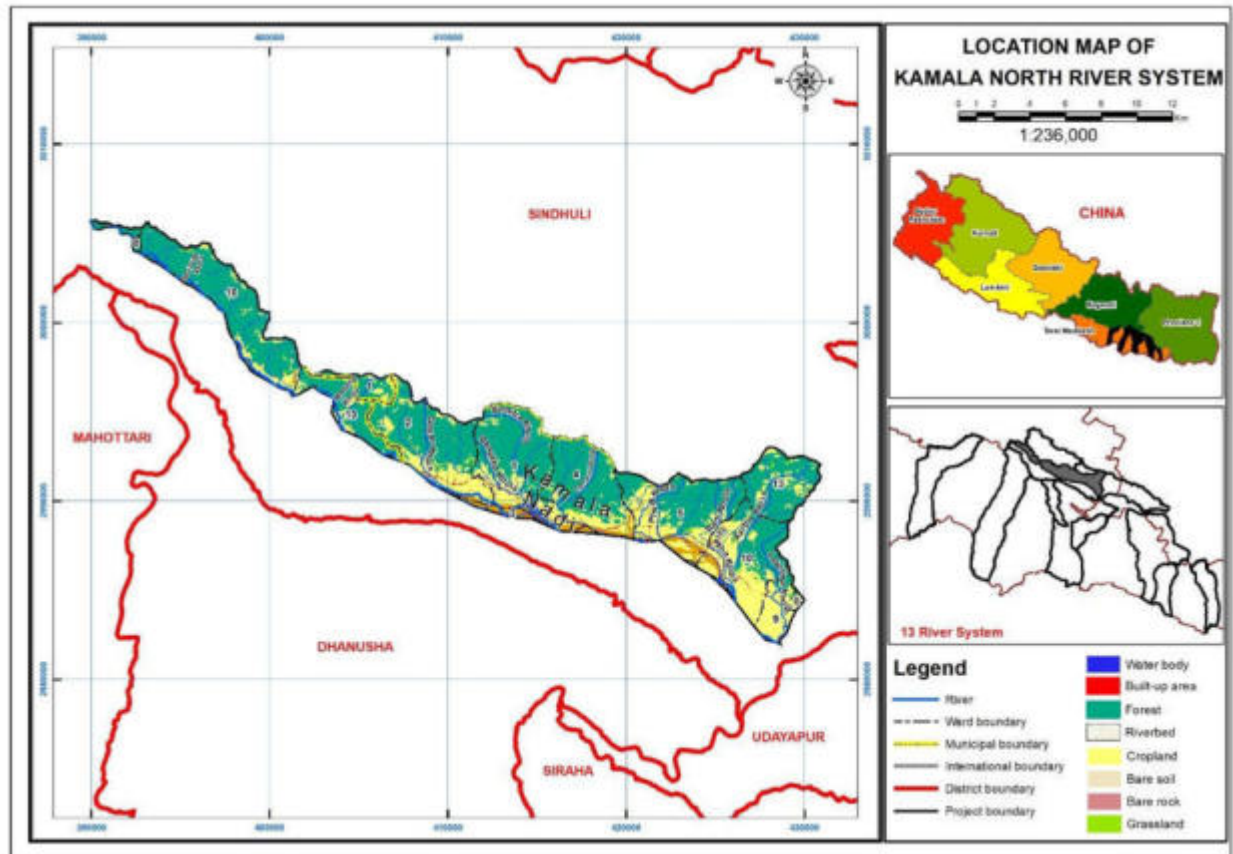
Figure 5: Location map of Kamala North river system

The hillslope is composed of Lower Siwaliks (LS) and Middle Siwaliks (MS) (DMG, 2007). The LS of 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. Sharp topography with high relief, steep slopes and escarpments are formed on the Middle Siwaliks, which is attributed to a higher proportion of beds of thick massive hard and resistant sandstones. The small portion of thrust and fault line are present in the river system (Figure 6).
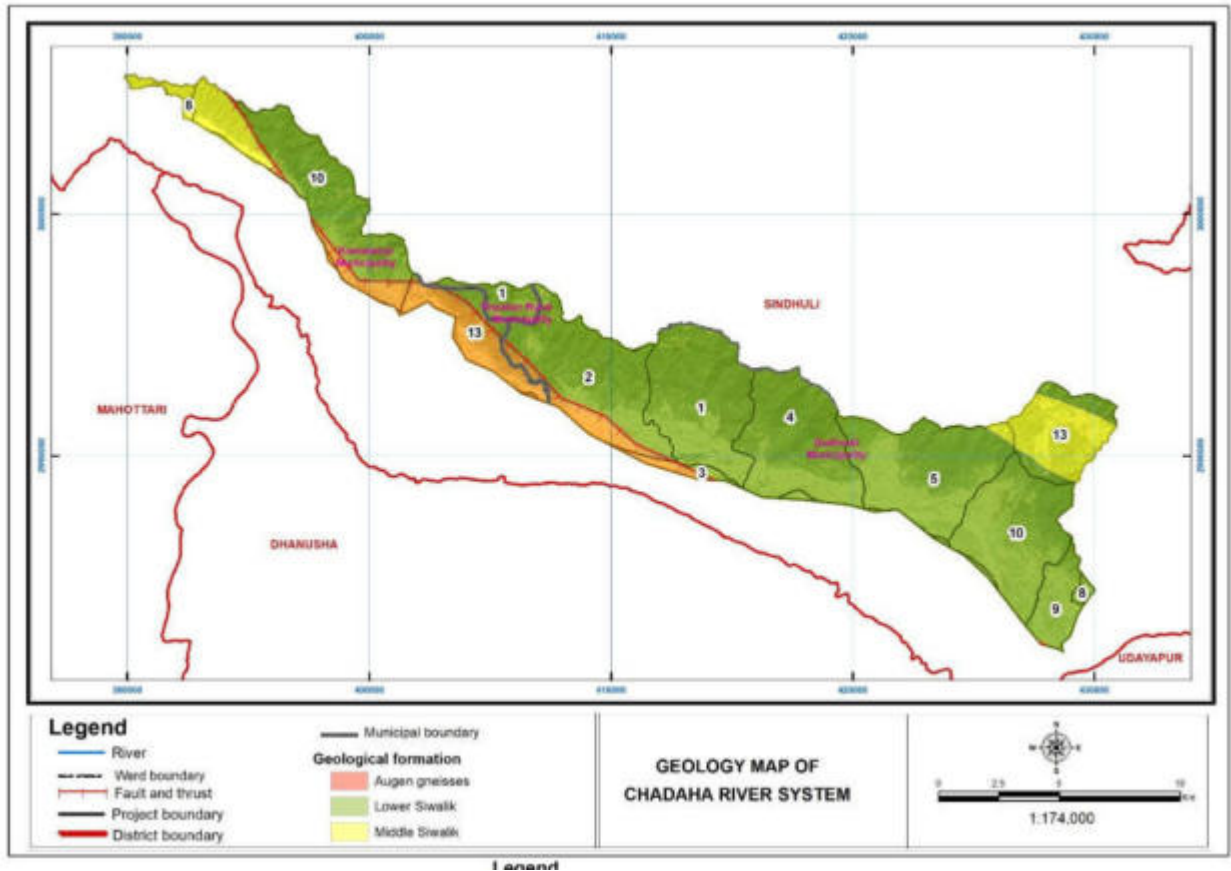
Figure 6: Geology of Kamala North river system

Forest is the dominant land cover of the river system, covering 63.31 percent of total area, which has been decreased at the rate of 0.108 percent per year in 19 years (2000-2019). RS is also facing urbanization with the built-up area expansion of 130.8 ha at the rate of 28.861 percent per year and the cultivation area has increased at the rate of 0.002 percent per year over the period (Table 2).

Table 2: Land cover change in Kamala North river system

Land cover	2000		2019		Change area (ha)	Rate of Change (% per yr)
	Area (ha)	Percentage (%)	Area (ha)	Percentage (%)		
Built-up	23.8	0.14	154.6	0.89	130.8	28.861
Cultivation	5072.0	29.08	5073.9	29.09	2.0	0.002
Forest	11272.3	64.63	11041.0	63.31	-231.3	-0.108
Grassland	94.7	0.54	172.3	0.99	77.7	4.318
Water bodies	34.8	0.20	61.7	0.35	26.9	4.064

Riverbed	793.5	4.55	734.0	4.21	-59.5	-0.395
Other wooded land	149.5	0.86	203.0	1.16	53.5	1.882

<div align="right">Source: ICIMOD, 2021</div>

2.2 Climatic Condition

The river system is located in the Sindhuli district and has a subtropical climate with significant monsoon influence (June-September), which received higher rainfall (1500-2000mm) (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 0.056 ° C/ year (DHM, 2017). Moreover, climate change scenario analysis performed for the National Adaptation Plan (NAP) process indicated that average annual mean temperature of Sindhuli district is likely to rise, Representative Concentration Pathway (RCP) 4.5 projected that the temperature would increase by 0.83^0C and 1.17^0C 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 (MoFE, 2019).

Table 3: Climate change scenario (MoFE, 2019)

	^{0}C		Change (^{0}C)			
Temperature	**RCP 4.5**				**RCP 8.5**	
	Reference Period (1981-2010)	Medium Term (2016-2045)	Long Term (2036-2065)	Medium Term (2016-2045)	Long Term (2036-2065)	
	19.7	0.83	1.17	1.04	1.75	
Precipitation	**mm**		Change (%)			
	RCP 4.5				**RCP 8.5**	
	Reference Period (1981-2010)	Medium Term (2016-2045)	Long Term (2036-2065)	Medium Term (2016-2045)	Long Term (2036-2065)	
	1768	4.63	7.53	6.06	11.87	

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 7.53 percent and 11.87 percent in the long period based on RCP 4.5 and RCP 8.5 respectively.

2.3 Socio-ecological process

There is a dominance of Indigenous Peoples (IPs) in the river system. The majority of people depend on daily wages laborers and local alcohol production for their livelihoods in the upstream of the river system. Whereas the majority of the people depends on livestock rearing, fuelwood collection, cultivation and fish farming for their livelihood. Even though IPs are in forest users' groups, they have inadequate capacity for forest management. Due to climate change, riverbank cutting and sediment deposition downstream has ultimately decreased agricultural production. The decreased agriculture production has decreased employment opportunity and livelihood of IPs downstream. The major market centers along the river system are Basniya, Bangka, Kurthauli, Dakaha, Kartha and Ratmate.

During local consultations, it was realized that more than 70 % of the population are dependent on forest products to support their livelihood. Road construction activity from Maisthan to Ruchani has increased erosion and landslides along with destruction of forest (around 37.5 km of surrounding tree species destroyed). Similarly, in 2013 and 2014, the Dalkebar high transmission line damaged several hectares (around 26 ha) of forest area in the river system. Land tenure issues in the RS has also increased the

vulnerability of the small holder farmers. Regular damaged of irrigation facilities due to climate induced disaster has reduced agriculture production in the RS.

2.4 Problem Analysis

Theme 1: 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 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). Forest fires, encroachment, free grazing, physical infrastructure development and illegal logging are the major drivers contributing to forest loss in the river system.

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

Drivers	Priority	Underlying causes
Multi hazard (River bank and torrent stream-cutting with gully erosion and landslide)	1	1. Natural causes (Fragile geology and intense and frequent rainfall) 2. Limited capacity of community for controlling riverbank, torrent streams, gullies erosion 3. Haphazard and excessive river materials extraction 4. Inadequate rules of river materials extraction
Forest fire	2	1. Inadequate management of fire lines and trails 2. Limited resources for the provision of forest watchers 3. Limited forest fire control tools and equipment with users 4. Lack of practices for the removal of dried leaves and branches 5. Unavailability of water sources in and around forests 6. Users' overconfidence in the emergence of new species 7. Lack of forest management and service training, skills, and knowledge specially for women. 8. Inadequate forest management training, skills, and knowledge among men and women. 9. Carelessness and unawareness of herders/users
Illegal logging	3	1. Weak forest management governance of user groups 2. Inadequate resources for the provisions of forest watchers 3. Inactiveness of Community Based Organization (CBOs) 4. Absence of concern from local governments and communities 5. Increase the demand for wood in buildings and the dependency on income generation 6. Lack of coordination among Community Forest Management User Groups (CFUGs) committee and the general users
Encroachment	4	1. Weak forest management governance of user groups 2. Inactiveness of CFUGs 3. Informally, political support contributes to encroachment. 4. Lack of sensitization and awareness
Open grazing	5	1. Lack of grazing land allocated 2. Inadequate fodder in farmland 3. Lack of commercial fodder practices

Physical infrastructure development	6	1. Lack of coordination with the local government in infrastructures development 2. Expansion of settlements

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

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

Multi hazard (flash floods, landslides, and erosion): According to the communities, sheet erosion was 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, thus expanding their area in the river system. Flooding, landslides, and soil erosion have all been exacerbated by the extreme rainfall. These hazardous events have degraded the forest area in the river system. Major landslides (for example, Ranibas landslide, Maderi Pakha landslide, Maisthan landslide, Sindure khola landslide, Sano Gaun landslide, Tangle kholsi landslide) and the rapid formation of gullies in the last 5 years have resulted in deteriorated forest in Dudhouli Municipality -1, 2, 4, & 5 and Tinpatan Rural Municipality-1, 2, 4, & 5 and Kamalamai Municipality-5, 10,11 & 13.

Forest fire: In the river system, every year (pre-monsoon and dry season from March to May), two to three fire events usually 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. Forest fire is one of the major drivers of forest loss. It especially occurs in different community forest regions in Kamalamai Municipality-10 & 13 in Kamala Parijat community forest, Maheshwor community forest, Tribeni community forest and Dudhauli Municipality -1, 2, 4, 5, 10 & 13.

Illegal logging: Logging is in practice due to weak institutional capacity of forest user groups, lack of livelihood and income-generating options for vulnerable communities, and interference of downstream communities in the river system. Similarly, the underlying causes are inadequate forest operation plan implementation; insufficient skilled human resources; insufficient coordination among committees, users, and Sub-Division Forest Offices (SDFOs); lack of awareness, carelessness; lack of income generation sources; high reliance on timber and wood; excessive fodder and fuelwood collection.

Encroachment: According to the local people, forest encroachment is noted in the Kamala North 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 a lack of sensitization and awareness.

Open grazing: Open grazing is another major driver in the river system. According to local stakeholders: about grazing of goats (300-500) daily in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-1, 2, 4, 5, & 10. 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.

Physical infrastructure development: Rapid modernization and city development along the Madan-Bhandari Highway have increased pressure on the forest by haphazard development of physical infrastructure and forest resource collection (wood for building construction). Road construction activity from Maisthan to Ruchani has increased erosion and landslides along with destruction of forest (around 37.5 km of surrounding tree species destroyed). Similarly, in 2013 and 2014.

Impacts

- Loss of forest products (timber & fodders)
- Decrease in forest quality
- Loss of native species
- Destruction of medicinal herbs
- Destruction of wildlife habitat

Problem

Deforestation & Forest Degradation (D & FD)

Direct drivers

- Multi hazards (River bank and torrent stream-cutting with gully erosion and landslide)
- Forest fire
- Illegal logging
- Encroachment
- Free grazing
- Physical infrastructure development

Underlying causes

- Natural causes (Fragile geology and intense and frequent rainfall)
- Limited capacity of community for controlling riverbank, torrent streams, gullies erosion
- Haphazard and excessive river materials extraction
- Inadequate rules of river materials

- Inefficient forest management governance of user groups
- Inadequate resources for the provisions of forest watchers
- Inactiveness of Community Based Organization (CBOs)
- Absence of concern from local governments and communities
- Increase the demand for wood in buildings and the dependency on income generation
- Lack of coordination among Community Forest Management User Groups (CFUGs) committee and the general users

- Lack of grazing land allocated
- Inadequate fodder in farmland
- Lack of commercial fodder

- Inadequate management of fire lines and trails
- 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
- Unavailability of water sources in and around forests
- Users' overconfidence in the emergence of new species
- Lack of forest management and service training, skills, and knowledge specially for women.
- Inadequate forest management training, skills, and knowledge among men and women.
- Carelessness and unawareness of herders/users

- Weak forest management governance of user groups
- Inactiveness of CFUGs
- Informally, political support contributes to encroachment.
- Lack of sensitization and awareness

- Lack of coordination with the local government in infrastructures development
- Expansion of settlements

Figure 7: Direct drivers and underlying causes of D & FD in Kamala North river system

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2.4.2 Hotspot for Forest Loss (Multi-criteria Analysis Result Map 1)

- The hotspot areas with respect to forest loss were identified using secondary information (forest fire, fuelwood consumption, deforested area, and degraded forest area) and Multi-Criteria Analysis (MCA) and Geographic Information System (GIS) tools (Figure 8);

- The forest covered area has been reduced by about 0.108% in the last 19 years (2000–2019), whereas built-up area have increased by 28.86% and grassland increased by 4.318% over the period in the river system (Source: ICIMOD, 2000, & ICIMOD, 2019). However, the primary information (grazing areas, encroachment areas, and illegal logging), the major forest loss has been concentrated in patches in the river system. In addition, the several drivers and underlying causes might have contributed to the **degraded forest areas (cumulative area 321 ha),** mainly in Dudhouli Municipality-1, 2, 4, 5, 10; and Kamalamai Municipality -10, 13.

- Deforestation and forest degradation are exacerbated by free grazing (300-500 daily in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-1, 2, 4, 5, & 10 encroachment, excessive river material extraction and illegal logging.

- A number of major landslides of an area about 26 ha (for examples: Ranibas landslide, Maderi pakha landslide, Maisthan landslide, Sindure khola landslide, Sano Gaun landslide, Tangle kholsi landslide) and the rapid formation of gullies with the widening torrent streams in the last 5 years have resulted in deteriorated forests in Dudhouli Municipality-1, 2, 4, 5, Tinpatan Rural Municipality-1, and Kamalamai Municipality-5, 10, 11, 13. Specifically, Kamala riverbank cutting, road construction in Arari Danda community forest, Kamala Parijat Community Forest, Kubinde, Kubinde Community Forest, and Triveni community forest cumulatively destroy the forests and lose native tree species (Khayar, Parijat, Gurjo, Kum-kum Dhup) in Kamalmai Municipality-10 & 13.

- Forest fire is one of the major drivers of forest loss. It especially occurs in different community forest regions in Kamalamai municipality-10 & 13 in Kamala Parijat community forest, Maheshwor community forest, Tribeni community forest and Dudhauli municipality -1, 2, 4, 5, 10 & 13.

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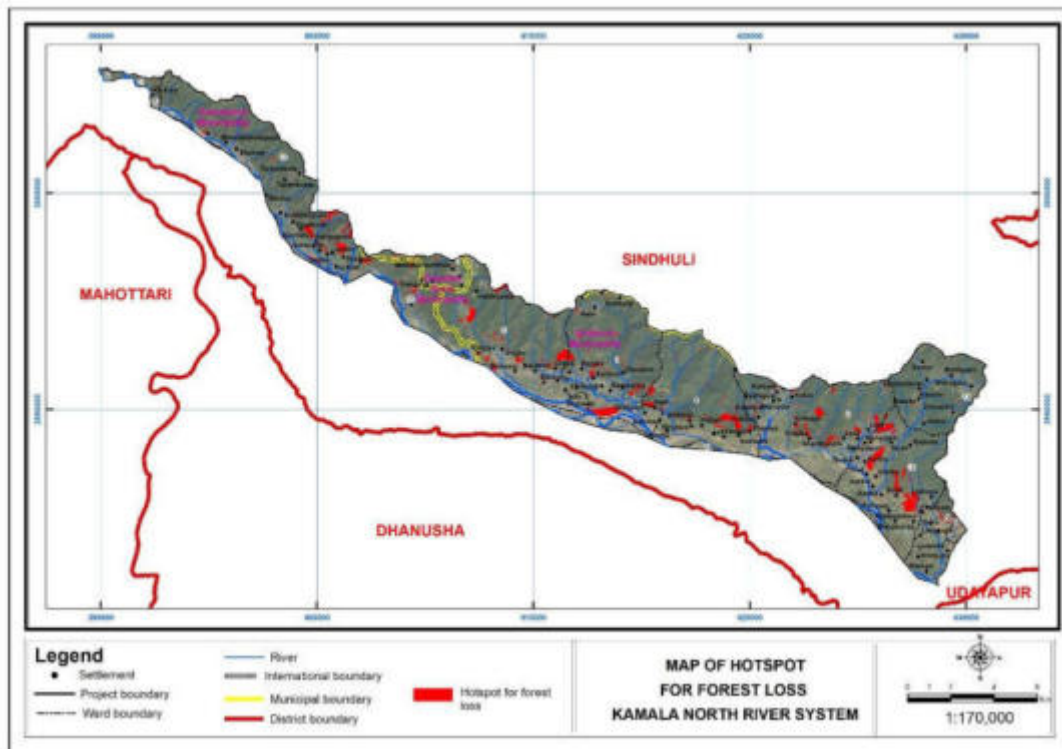
Figure 8: Map of Hotspot for Forest Loss in Kamala North River System

2.4.3 Enhancement Area for Carbon Stock -MCA Result Map 2

- Activities that are considered carbon stock enhancement include afforestation and reforestation to restore degraded forests (Figure 9);
- About **321 ha** of area are degraded forests that need to be reforested for carbon sequestration through forest regeneration activities in the Churia. The degraded forest is situated on different catchments, including Gogan, Bangkha, Bichitra, Rani, Lakhima in Dudhauli Municipality -1, 2, 4, 5 & 10 and Kamalamai Municipality-10 & 13. These torrents (*khola/khahare*) streams flow in several community forests regions, including Mangalpur, MahadevSthan, Sundereshwor, Ratomate CFUGs are responsible for managing and monitoring the forest area.
- The river side plantation (afforestation) could be done on approximately 754 ha in Kamalamai municipality-8, 9, 10 & 13 and Dudhauli municipality-1, 2, 5, 9 & 10. Furthermore, afforestation needs to be carried out with different aspects of plantation, including a) community land plantation (195 ha), demonstration plantation (17 ha), riparian plantation (36 ha), and woodlot plantation (506 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**.**
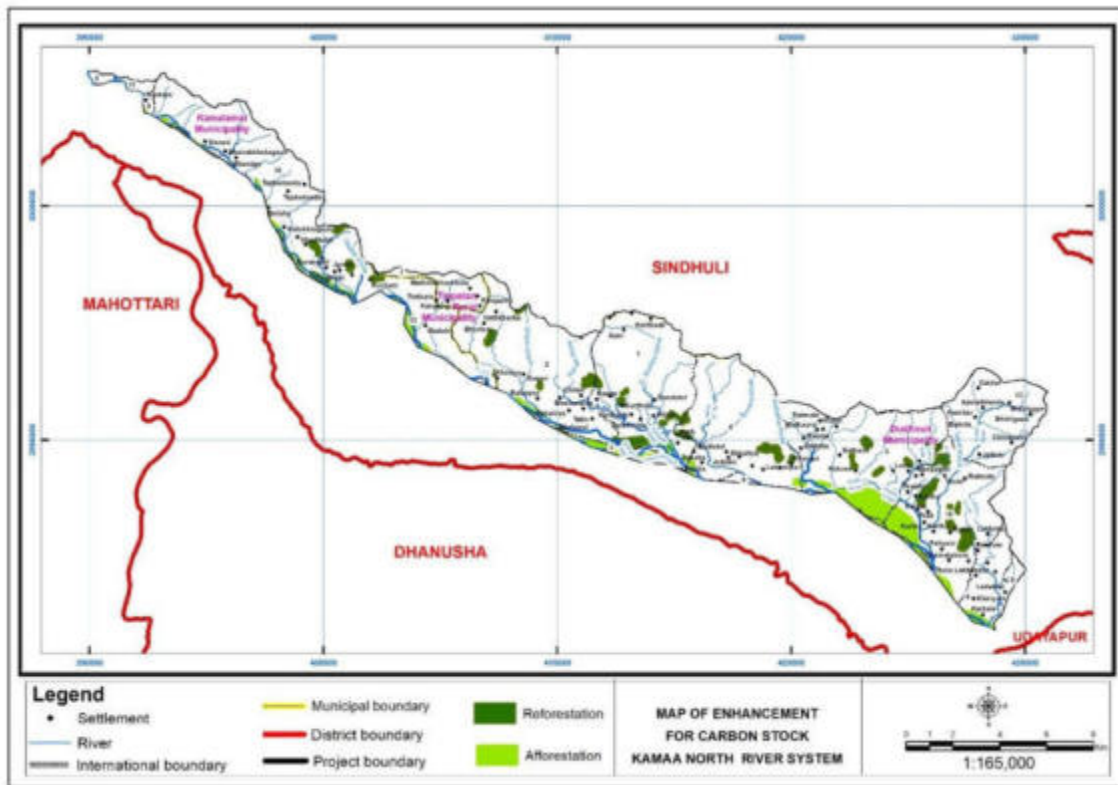
Figure 9:: Enhancement for forest carbon stock in Kamala North river system

Theme 2: Climate change adaptation and resilience

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 associated 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 Discussions (FGDs) 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 ecosystems and communities in Kamala North river system

Drivers	Priority	Underlying causes
Flash floods, erosion, landslides, and stream-riverbank cuttings threaten agricultural lands and settlements	1	1. Frequent and intense rainfall triggers 2. Fragile geology 3. Excavation of river-induced mining materials in a haphazard manner 4. Inadequate community capacity for flood and riverbank cutting control measures 5. Encroachment of river/stream site lands and forest lands for agriculture practices and settlements
Inadequate climate adaptation practices in the agriculture system, especially among women, IPs, Dalit and marginalized community	2	1. Not easy access to the climate services to support decision making in agriculture practices 2. Women farmers and marginalized farmer are not included in Sustainable Natural Resource Managmement (SNRM), technolodgy and practices. 3. Lack of availability of improved seeds 4. Inadequate skills and knowledge of compost manure, organic manure, and fertilizer formation 5. Lack of technologies and resources to improve soil moisture in riverbed farming systems. 6. Inadequate support and priority for crop seed production 7. Deterioration of soil nutrition in riverside and farmlands
Inefficient irrigation facilities	3	1. Decrease in rainfall in total 2. Water scarcity at the source and surface flow below the riverbed. 3. Lack of well-managed irrigation infrastructure; 4. Even a three-year flood hit irrigation headworks on a regular basis 5. Steep slopes upstream increase torrent runoff, threatening water sources 6. Women, Dalit and marginalized are not getting the access, information and support. 7. Inadequate access, information and support to women, IPs, Dalit and marginalized
Wild animal threats to agricultural production	4	1. Declining quality of wildlife habitats in the forests 2. Inadequate crop farming practices, which are usually not damaged by wildlife, 3. Lack of coping measures like fencings to protect agriculture crop from wildlife threats
Inadequate support for	5	1. Lack of training on livestock rearing and improved shed management

improved livestock management practices		2. Inadequate access to clinical services 3. Insufficient fodder availability. 4. Insufficient women's capacity in improved livestock management and rearing 5. It is hard to get waged laborers and increases input costs for agriculture practices
Inadequate practice with no access to the commercialization of agricultural production	6	1. Lack of agricultural production collection centers and storage 2. In access to the market center and information directly 3. Becoming expensive to use tools/machines in agriculture mechanization 4. Insufficient knowledge, agri-extension service/materials targeted to women and vulnerable groups.

Source: Problem tree analysis workshop,2022

The river system is characterized with multi-hazards (drought, riverbank cutting, flood and landslide) and the impacts are magnifying due to its topographic settings and inappropriate land use. These phenomena cause the degradation of land resulting in decreased agricultural production. So, the local communities are becoming more vulnerable in the river system. Specifically, the problem analysis workshop identified the major drivers and underlying causes of vulnerable ecosystem and associated communities and resulting into decreased adaptation capacity to climate change in the river system (Figure 10).

The agriculture ecosystem in the river system is vulnerable to riverbank 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. The riverbank cutting is mainly seen in different locations, particularly in the near Dudhouli Municipality-1, 3, 5, 6, and 10 and Kamalamai Municipality-13. The sediment deposition is on a 754-ha area in the river system.

Surface and sub-surface water are the main sources for irrigation in agriculture in the river system. However, the irrigation structures at the head are threatened regularly by floods in the monsoon season. For example: irrigation structures of Dudhouli Municipality-2 & 5 and Kamalamai Municipality-9, 10 & 13 are damaged by floods during monsoon. Similarly, drinking water sources of Dudhouli Municipality-4, 5 and 10 and Kamalamai Municipality-10 & 13 are also regularly damaged. About 600 HHs do not have access to safe and quality drinking water in monsoon seasons because communities have a lack of resources for maintaining heads of drinking water once torren rain and gully erosion hit the sources, especially in Jalkini Community Drinking Water, Khorkhola Community, Gaurutol Dobhantar Drinking Water, Ruchani Khanepani, Goganpani Adheri drinking water, and Madaha drinking water in Kamalmai Municipality (10 & 13).

Lack of training on livestock rearing and improved shed management, inadequate access to clinical services, and a lack of fodder have increased difficulties in livestock management practices especially in Dudhauli Municipality.

Cultivation practices in sloppy lands have caused erosion in the river system. Soil erosion with runoff in the sloppy lands has created several problems, especially the inefficiency of the irrigation system, less water holding capacity, and decreased cereal crop production in the river system. Dudhouli Municipality-2 is the area having highly cultivated practices on sloppy land and needs terrace improvement for better production.

Impact

- Damage of agricultural land
- Reduction of agricultural crops
- Unfertile soil
- Decrease in interest in farming
- Youth migrated for employment
- Import of hybrid and inorganic crops and food materials
- Unstable and unreliable market
- Increase risk to vulnerable communities

Problem

Vulnerable ecosystem and community

Direct drivers

- Flash floods, erosion, landslides, and stream-riverbank cuttings threaten agricultural lands and settlements
- Inadequate climate adaptation practices in the agriculture
- Inefficient irrigation facilities
- Wild animal threats to agricultural production
- Inadequate support for improved livestock management practices
- Inadequate knowledge with no access to the commercialization of agricultural production

Underlying causes

- Frequent and intense rainfall triggers
- Fragile geology
- Haphazard excavation of river-induced materials
- Inadequate community capacity for flood and riverbank cutting control measures
- Encroachment of riversite lands and forest lands for agriculture practices and settlements

- Decrease in rainfall in total
- Water scarcity at the source and surface flow below the riverbed.
- Lack of well-managed irrigation infrastructure;
- Three-year flood hit irrigation headworks on a regular basis
- Steep slopes upstream increase torrent runoff, threatening water sources
- Inadequate access, information and support to women, IPs, Dalit and marginalized

- Lack of training on livestock rearing and improved shed management
- Inadequate access to clinical services
- Insufficient fodder availability.
- Insufficient women's capacity in improved livestock management and rearing
- It is hard to get waged laborers and increases input costs for agriculture practices

- Not easy access to the climate services to support decision making
- Women farmers and marginalized farmer are not included in Sustainable Natural Resource Managmement (SNRM), technology and practices.
- Lack of availability of improved seeds
- Inadequate skills and knowledge of compost manure, organic manure, and fertilizer formation
- Lack of technologies and resources to improve soil moisture in riverbed farming systems.
- Inadequate support and priority for crop seed production
- Deterioration of soil nutrition in riverside and farmlands

- Declining quality of wildlife habitats in the forests
- Inadequate crop farming practices, which are usually not damaged by wildlife,
- Lack of coping measures like fencings to protect agriculture crop

- Lack of agricultural production collection centers and storage
- In access to the market center and information directly
- Becoming expensive to use tools/machines in agriculture mechanization
- Insufficient knowledge, agri-extension service/materials targeted to women and vulnerable groups.
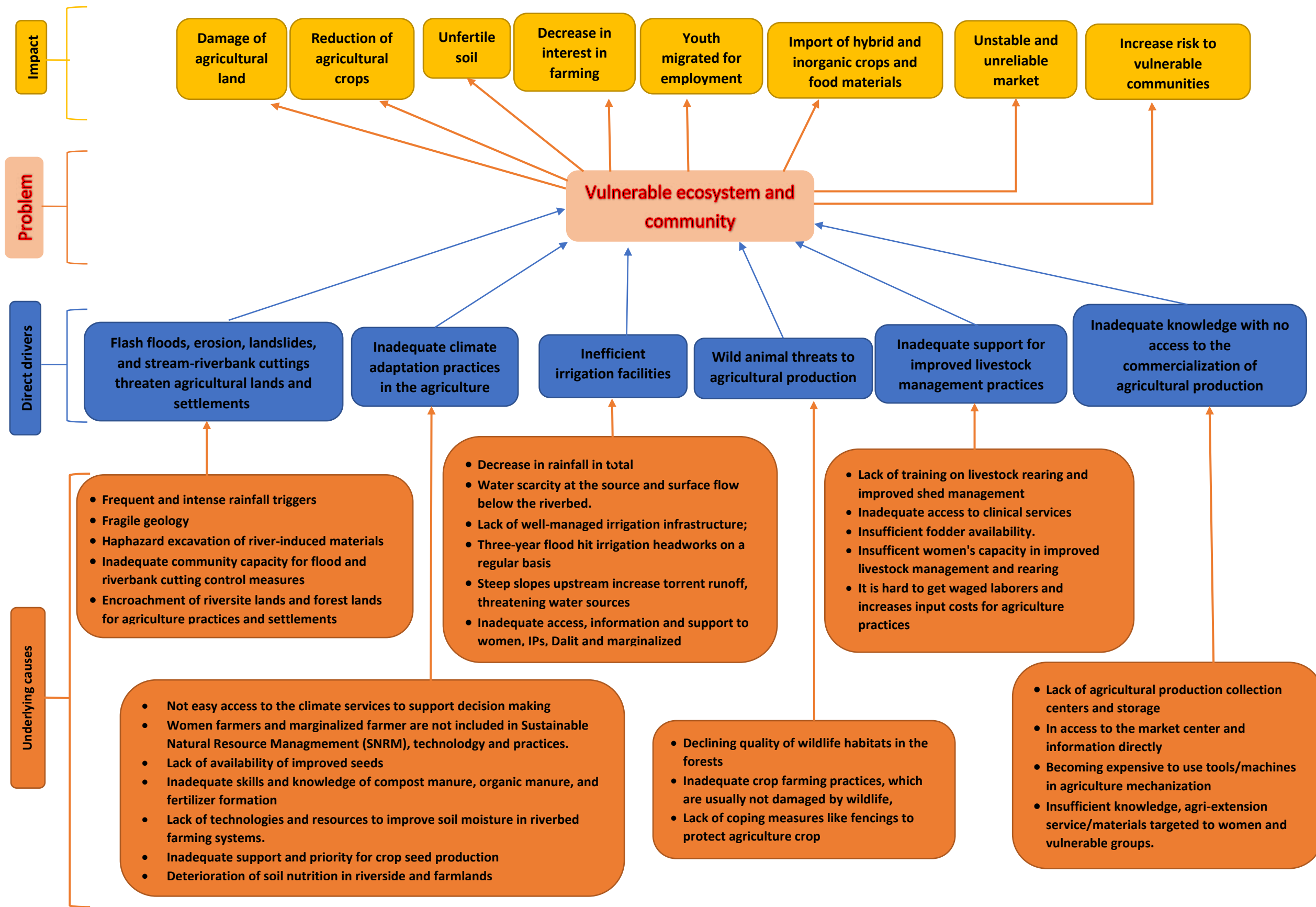
Figure 10: Direct drivers and underlying causes of vulnerable ecosystem and associated community in Kamala North river system

2.4.5 Hotspot for Vulnerable Ecosystems- MCA Result Map 3

- The hotspot areas with respect to vulnerable ecosystem were identified using secondary information (social vulnerability, physical vulnerability and exposure to hazards) and Multi-Criteria Analysis (MCA) and Geographic Information System (GIS) tools;
- Primary data mainly on sediment deposition area, river bank cutting zone, landslides were also integrated into the hotspot maps;
- The spatial pattern of the hotspot map showed the distribution of hotspot areas along gullies, the river banks with the most vulnerable settlements in the river system For example:
    - Most communities have spring drinking water sources located in the watershed of torrent streams where gulley erosion hits the sources regularly in every rainfall storm. springs in forest areas. About 600 HHs do not have access to safe and quality drinking water in monsoon seasons because communities have a lack of resources for maintaining heads of drinking water once torren rain and gully erosion hit the sources, especially in Jalkini Community Drinking Water, Khorkhola Community, Gaurutol Dobhantar Drinking Water, Ruchani Khanepani, Goganpani Adheri drinking water, and Madaha drinking water in Kamalmai Municipality -10&13.
    - Road construction activity from Maisthan to Ruchani has increased erosion and landslides along with destruction of forest (around 37.5 km of surrounding tree species destroyed).
    - The hill in the Sano Gaun area has formed cracks after the Gorkha Earthquake of 2015. The cracks are observed from the tip of the hills, which have further deepened due to intense rainfall and water percolation, resulting in 15-20 households being at risk of debris flow or landslide in Kamalamai municipality -10 & 13.
    - The agriculture lands in Kamalmai municipality-10&13 and Dudhauli municipality -2,4,5&11 have been low fertile and are exposed to flood risk. The total area of such lands is about 754 ha (public and private both) in the river system, where sedimentation is deposited.
    - The farmers in the river system in Kamalamai municipality and Dudhauli municipality engage in vegetable, cereal crops production, but the production and productivity have not been to the level of expectations due to low seed quality, decreasing soil fertility, and farmers not being able to provide input practices as changing weather events cause pest and diseases.
    - Sediment deposition has been identified in the agricultural lands covering 754 ha, mostly in Kamalamai Municipality-8, 9, 10 & 13 and Dudhauli Municipality- 1, 2, 4, 5, 9 & 10 of the river system;
    - 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).
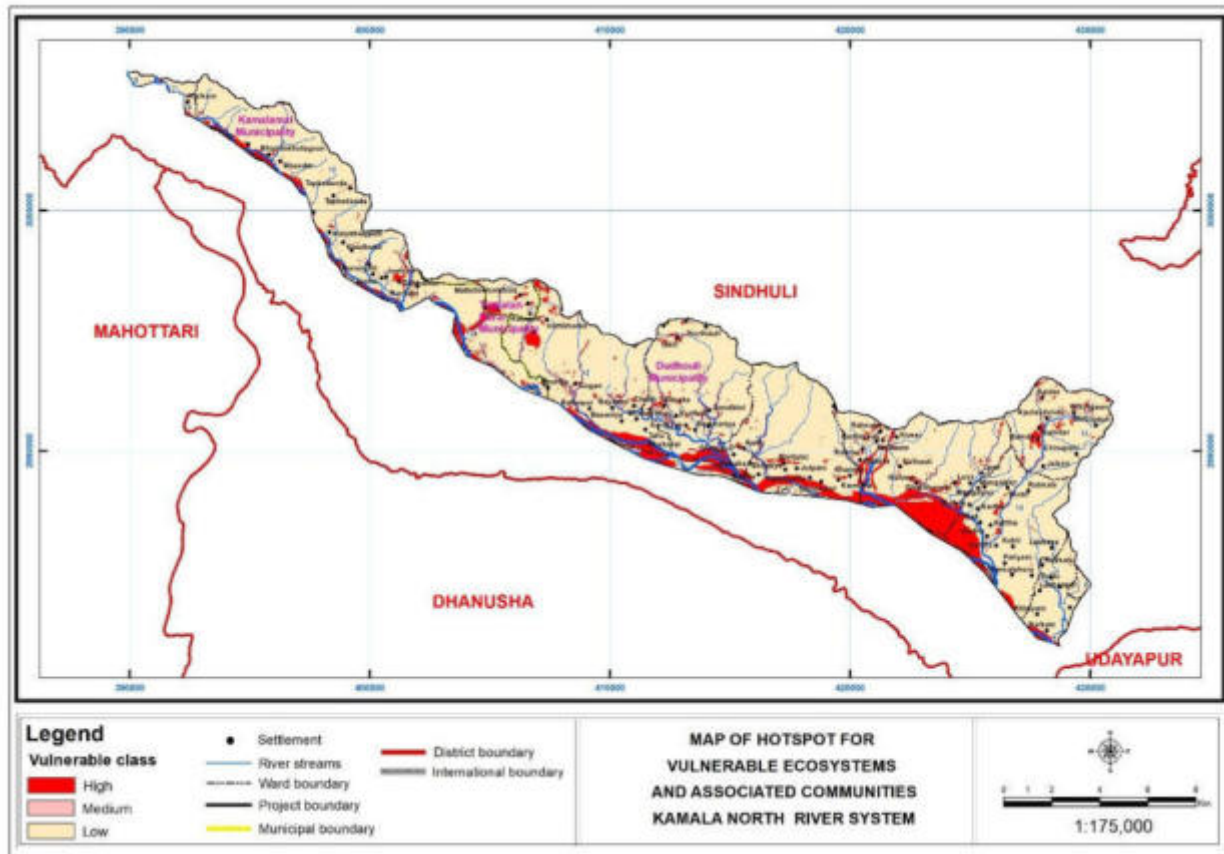
Figure 11: Map of Hotspot for Vulnerable Ecosystem and associated community in Kamala North River System

2.3 Linkage of GESI and IPs Issues to Forest Loss and Vulnerable Ecosystems

Mainstreaming of Gender Equality and Social Inclusion (GESI) and Indigenous Peoples (IPs) is 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 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's involvement in CFUGs committee is not significant, especially in the decision-making process in forest management activities and plantation.
- Involvement of women in conventional farming practices in sloppy lands exists in the river system with no effective and adequate farming knowledge and skills.
- Women from marginalized communities are disinterested in vegetable cultivation and agricultural practices in the river system due to a lack of knowledge about crop pest and disease management,

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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
  - Minimum role given to women in irrigation management
  - 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.
  - Torrent rains in the streams and gullies cause damage to irrigation heads in every rainstorm in the pre-monsoon and monsoon seasons. It limits marginalized women's engagement in agriculture practices. As a result, women have been compelled to change their income generation from agriculture to other activities like alcohol production and the collection and selling of fuelwood in both municipalities, including Kamalamai and Dudhauli.
  - Women and girls generally engage in fodder collection from the nearest forest, and they haphazardly cut tree species without considering growing stages and importance

2.5 Solution Analysis

2.5.1 Climate change mitigation: solution analysis of D&FD

Environmental impacts of D & FD include-damage and fragmentation of habitats, 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.
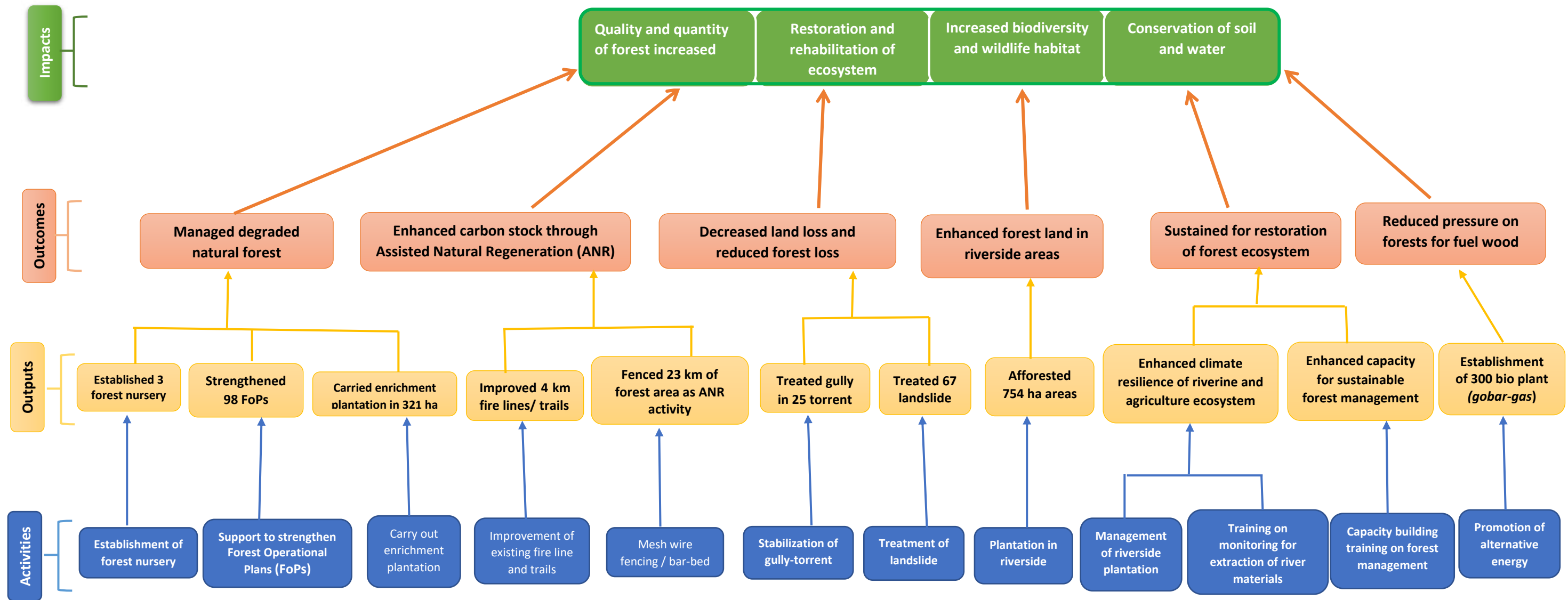
Figure 12: Solution tree analysis in Kamala North river system: Climate change mitigation

Activities, Outputs and outcomes for reducing degraded forest and enhancing forests
Several activities have been potentially 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 (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 sheet file-excel. 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 Kamala North river system

Sub-activities	Activities	Outputs	Outcomes
Forest nursery establishment and enrichment plantation in degraded forest			
Natural regeneration Management-Assisted Natural Regeneration (ANR) activities ➢ 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/bar-bed, ➢ Provisions for forest watcher, ➢ Minimize grazing with alternatives; ➢ Provisions for forest fire response toolkits (toolkit include gloves, boots, firest aid medicne, 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 sustainable natural resource management.	**Activity 1.1: Restoration of degraded natural forests**	Output 1: Natural forest ecosystems are better maintained and protected within the project area	➢ Degraded forest managed ➢ Enhanced climate resilient in forest ecosystem ➢ Enhanced carbon stock in natural forest region
Orientation sensitization on forest fire control and management for herders and forest users groups	Activity 1.2: Enhancement of capacity for		

Sub-activities	Activities	Outputs	Outcomes

Capacity buildings on forest management for:
    • users groups prioritizing women
    • governemnt entities
	sustainable forest management		Reduced barriers of sustainable forest management Sustained for restoration of forest ecosystem and services

Capacity-buildings for local government on monitoring for sustainable extraction of river induced materials and mines;		Output 2: Enhance Capacity for sustainable forest management	
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 side areas Post plantation management with irrigation facility and fencing	Activity 2.1: Enhancement of forest land in river side areas		➢ Enhanced forest cover and contributed in carbon stock (in 20-30 years from the plantation period)
Capacity buildings trainings for users on the management of plantation in new areas-river side areas			➢ Enhanced livelihood capacity of vulnerable community
		Output 2: Enhanced Forest land in river side areas	➢ Reduced human pressure on natural forest for woods, fodders and buildings materials ➢ Enhanced soil fertility of degraded lands in river site lands ➢ Enhanced climate resilience of riverine and agriculture ecosystem
Stabilization of the gullies in the torrent controls in the torrent through innovative	Activity 3.1 Conserved soil	Output 3: Local	

Sub-activities	Activities	Outputs	Outcomes
technology and local vegetative protective measures	and water source and Improved water retention	structures are enhancing resilience against climate change induced erosion, sedimentation and flooding risks	
Treating landslides with vegetative conservation measures (priority basis)			
Facilitation for 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

A solution tree has been prepared and analyzed by the participants in the solution tree analysis workshop to address the drivers and the underlying causes (Figure 13). The major solutions are mainly 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.
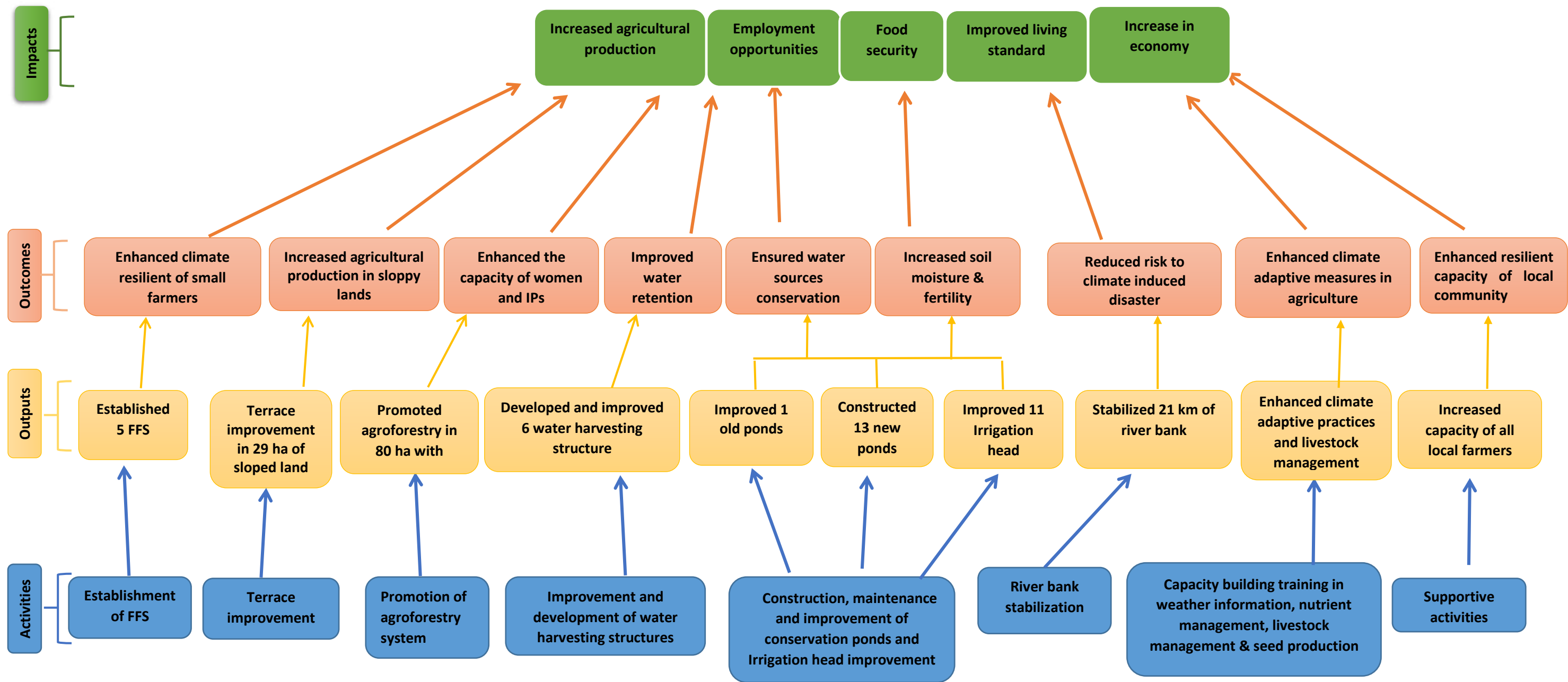
Figure 13: Solution tree analysis in Kamala North river system: Climate change adaptation

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 vulnerable communities in the river system. The details of activities are given in the Intervention Packages (IPacks) with their feasibility and safeguards (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 is presented in the table (Table 7).

Table 7: Activities, outputs and outcomes for reducing vulnerable ecosystem and communities in Kamala North river system

Sub-activities	Activities	Outputs	Outcomes
Construction of conservation ponds	4.1 Improve water retention and conserve water sources	Output4: 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 stream banks stabilization using local materials and bio-engineering	4.2 Reduce risk to water induced disasters and enhance coping capacity of vulnerable community		Increased soil fertility
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)			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	Improved soil and water conservation practices	
Establishing agroforestry system with mixed cropping in multi-year crop; fodder and grasses with horticulture plants	Establish agroforestry activities Capacitate farmer groups and government officers to	Farmers are skilled in using climate-resilient land use practices.	Enhanced climate resilient capacity of farmers Enhanced the capacity of

Sub-activities	Activities	Outputs	Outcomes
Institutional support for improved agroforestry groups Capacity buildings for Agroforestry Users Groups and government staffs	promote agroforestry system		women in agriculture system and livestock management Increased income capacity of women and IPs Ensured markets of the agricultural productions
Establishment of FFS on several crops addressing several pests and diseases and facilitation for soil testing Support to farmers for seed production in the FFS locations Promotion of riverbed farming practices in river side areas	Reduce risk to crop pests and diseases Increased agriculture production	Reduced risk to crop pests and diseases Increased agriculture production	Enhanced climate adaptive measures in agriculture
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	Utilized water sources and improved irrigation services	
Capacity-building training in the use of weather information and its application in agricultural practices; 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 improvement	Enhance climate agricultural adaptive practices and increased livestock management practices	Enhanced climate agricultural adaptive practices and increased livestock management practices	
support to farmers' sensitization to save agricultural practices and production from wildlife threats	Develop wildlife risk friendly agricultural practices	Developed wildlife risk friendly agricultural practices	

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Sub-activities	Activities	Outputs	Outcomes
Support to link farmers with the market centers and market information;	Enhance farmers capacity in commercialization of agricultural productions	Enhanced farmers capacity in commercialization of agricultural productions	Ensured income of small farmers through the agricultural production
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 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.	Support for Gender Inclusive governence	Promoted gender inclusive governence	• · Increase women's participation • · Share information about the latest news, update, notice, fund, plans and budget • · Time information about training and meetings • · Promote and engage leadership • Male engagement

2.5.3 Map of planned interventions MCA Result Map 4

The enhancement activities in the river system are divided into four 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 Kamala North river system (Figure 14).
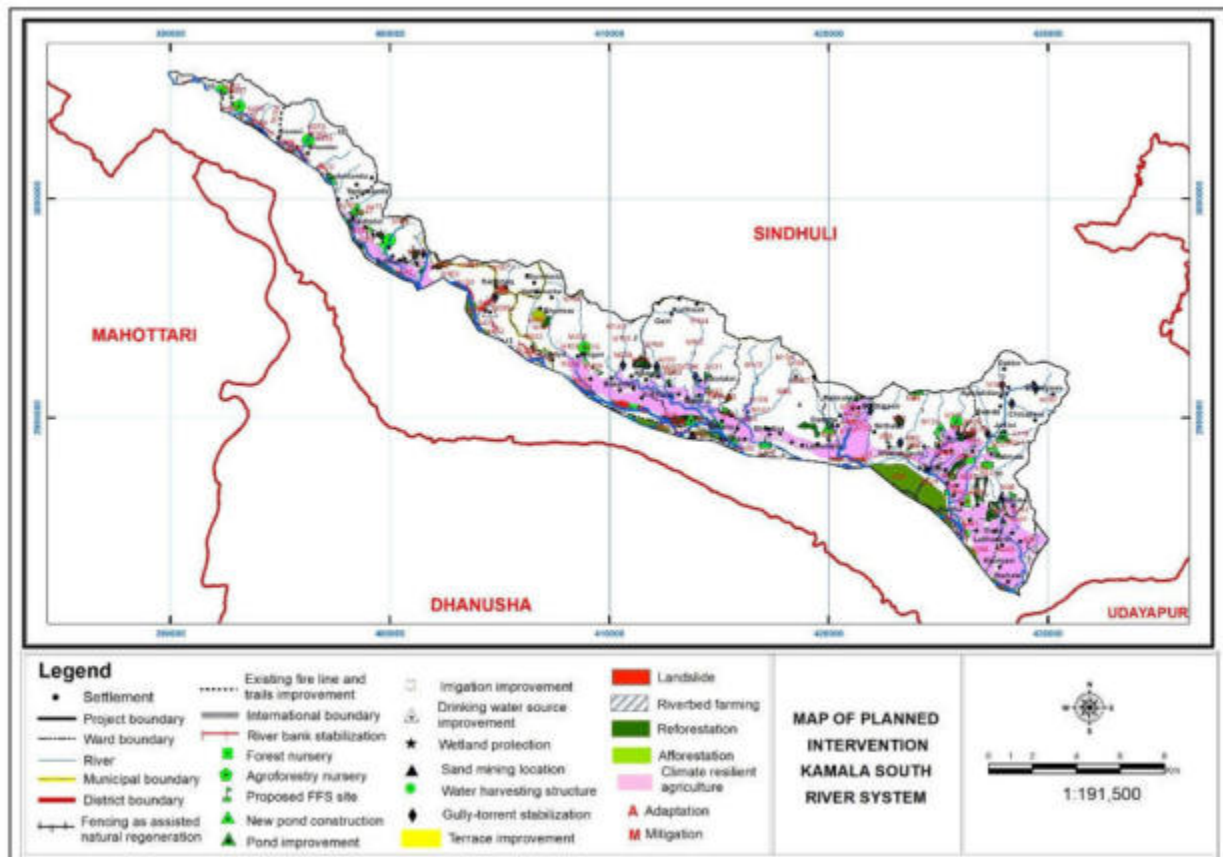
Figure 14:Map of Planned intervention (Mitigation and Adaptation) in Kamala North river system

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 madhesis, dalits, and forest-dependent marginalized communities.

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

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

- Increase financial investment in women's decision-making capacity buildings, especially in forestry activities and horticulture for Churia's region women groups.
- Increase financial investment in women's decision-making capacity buildings, especially in forestry activities and horticulture for Churia's 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 riverbank and gully stabilization.

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- Provide skill-building training to women for the promotion of afforestation in river reclaimed lands and the promotion of agroforestry and other opportunities Provide skill-building training to women for the promotion of afforestation in river reclaimed lands and the promotion of agroforestry and other opportunities (for example, the development of fruit orchards).
- Minimize women's workloads in the collection of fuelwoods: 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);
- Engage women in agroforestry groups (AFG), FFS, and also in intercropping practices to ensure their incomes and knowledge enhancement.

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
- **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 complains 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 observations related to climate change mitigation, vulnerable ecosystem identified in the Kamala North river system during the consultations and site verification are as follows:
- The major drivers of deforestation and forest degradation in the Kamala North river system are, forest fire, free grazing, development of physical infrastructure, encroachment, illegal logging, Climate induced-hazards impacts.
- Low involvement of forest users' committees and users' groups in reducing major drivers of deforestation and forest degradation (free grazing, encroachment, forest fire, illegal logging).
- 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) with enrichment plantation is needed to carry out the restoration of degraded forest in the natural forest region of the river system.

- Because of the lack of capacity of CFUGs' committees and their indirect engagement in political activities, they are unable to execute forest operational plans effectively. Hence, it needs to make them capacity-building through technical and financial support.
- Illegal logging in community managed forest regions is significant, especially in Dudhauli municipality. Due to access to road networks in the region, illegal logging, especially from the nearest districts, including Sindhuli, Dhanush, and Siraha downstream, is significant and causes degraded forests. Hence, strong coordination among forest divisions of Siraha, Sindhuli, and Dhanusa districts and the concerned stakeholders is needed to control illegal logging and for natural regeneration of forest in the region.
- The river side lands need to be assessed with respect to environmental and social aspects, as well as land tenure and demarcation related issues where afforestation is planned. The land might be under the plan of local government and local stakeholders at policy and programme levels. Therefore, all of these constraints for afforestation must first be identified in the river system.

Chapter 4: Intervention Packages (IPacks)
The identified solutions with intervention activities (solutions-activities) are grouped into six packages known as Intervention Packages (IPacks) for 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 analysis and their map demarcations are carefully reviewed against the underlying causes obtained in problem analysis. In next step, the activities are grouped based on adaptation and mitigation themes making sure it addresses the underlying causes and major problems (key drivers) identified during problem analysis. IPacks are formulated based on this grouping such that each IPacks address the major problems (drivers) and activities relate with solution analysis process. However, all activities identified in solution analysis are not reflected in IPack activities – as in reference to guidance from CERP manual Box 14 and section C1.2 based on which policy level interventions that are already reflected in REDD+ national strategy are not included in IPacks. IPacks geographic focus and coverage areas were also closely reviewed to make sure that the upstream-downstream linkage issues are addressed, although geographic focus are not considered as a primary criterion for activity grouping.

The Kamala North river system falls entirely in Churiya region. The river system has fragile geology throughout the river system and have similar problems and solution across the river system. The uphill region of the river system are the sources of boulders, pebbles and sand where the river is fan shaped during the merger with Kamala river. Five IPacks contain the activities that connect all the streams in the river system. In this sense CERP IPack designs also consider the connectivity for ecosystem restoration. The first two IPacks, IPack 1 (forest restoration and afforestation) and IPack 2 (soil and water conservation), primarily concentrate on the uphill region of the river system and forest degradation and torrents and gullies un-stabilization are primarily observed. Additionally, these two IPacks will definitely and primarily control soil and forest loss, restoring the degraded land and forest ecosystems, and reducing sediment deposition in the lower regions.

IPack 3 (Agroforestry system) concentrates on the lower regions (covered with agriculture lands and the river materials are deposited) that will improve the fertility of agricultural lands in riverside 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 lower region 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, a cross-cutting IPack 5 (Advocacy campaign: Gender-inclusive governance campaign) is suggested to address gender-related issues that support the restoration of the river system's degraded ecosystems.

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 1: Restoration of degraded forest (reforestation) and afforestation in riverside land

Why is this IPack needed?

Drivers and general descriptions: The natural forest loss is about 321 ha, mainly reported in Dudhauli Municipality -1, 2, 4, 5 & 10 and Kamalamai Municipality-10 & 13 in the river system (from 2015 to 2021); (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 side regions for restoration and afforestation in the river system.

- **Forest fire:** Forest fire is a predominant driver of deforestation and forest degradation in the river system. Due to several causes, including inadequate management of fire lines and trails, 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, unavailability of water sources in around forests, users' overconfidence in the emergence of new species following a forest fire, Lack of forest management and service training, skills, and knowledge, Inadequate forest management training, skills, and knowledge, carelessness and unawareness of herders/users. It especially occurs in different community forest regions in Kamalamai Municipality-10 & 13 in Kamala Parijat community forest, Maheshwor community forest, Tribeni community forest.
- **Free grazing:** inefficient grazing land management and weakness in understanding the importance of forests and their services to the forest management, users and locals are dependent on forest for livestock free grazing in the river system. According to local stakeholders: about grazing of goats (300-500) daily in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-1, 2, 4, 5, & 10.
- **Physical infrastructure development:** Rapid modernization and city development along the Madan-Bhandari Highway have increased pressure on the forest by haphazard development of physical infrastructure and forest resource collection (wood for building construction). Road construction activity from Maisthan to Ruchani has increased erosion and landslides along with destruction of forest (around 37.5 km of surrounding tree species destroyed). Similarly, in 2013 and 2014, the Dalkebar high transmission line damaged several hectares (around 26 ha) of forest area in the river system. Specifically, Kamala riverbank cutting, road construction in Arari Danda community forest, Kamala Parijat Community Forest, Kubinde , Kubinde Community Forest, and Triveni community forest cumulatively destroy the forests and lose native tree species (Khayar, Parijat, Gurjo, Kum-kum Dhup) in Kamalmai municipality (10 & 13).
- **Encroachment:** Weak Forest management governance of user groups, Inactiveness of Community Based Organization (CBOs), Informally, political support contributes to encroachment, Absence of concern from local governments and communities, Lack of sensitization and awareness, Political engagements of CFUG and less attention in controlling forest encroachment are underlying causes of the encroachment in the river system.
- **Illegal logging:** Weak governance on forest management, inadequate resources for the provisions of forest watchers, inactiveness of CFUGs on controlling illegal woods and forests, ineffectively engagement of local government to control illegal logging, inadequate coordination among CFUGs committee and the general users etc. are the major causes of the illegal logging.

- **Hazards (Flood, landslide and erosion, droughts):** floods, landslides, erosions and rainfall variability are the climate induced multi-hazards that cause forest loss in the river system. In addition, fragile geology, intense and frequent rainfall with highly variable with respect to location, limited technical and financial capacity of community for controlling torrent streams, gullies erosion are the key causes of multi-hazards risk to forest loss in the river system. These hazardous events have degraded the forest area in the river system. Major landslides (for example, Ranibas landslide, Maderi pakha landslide, Maisthan landslide, Sindure khola landslide, Sano Gaun landslide, Tangle kholsi landslide) and the rapid formation of gullies in the last 5 years have resulted in deteriorated forest in Dudhouli Municipality-1, 2, 4, & 5 and Tinpatan Rural Municipality-1, 2, 4, & 5 and Kamalamai Municipality -5, 10,11 & 13.

Key activities include:

a. Enrichment plantation in the degraded forest: the potential native tree species, includes

Bamboo (*Bambusa species*), Rai khanyu (*Ficus semicordata*) Kimbu (*Morus alba*), Tanki (*Bauhinia purpurea*), Badhar (*Artocarpus lacucha*), 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);*

b. Establishment of forest nursery is recommended nearest to the potential areas of plantation (approaches: private, community and promotion in forest sub-divisions): potential locations: Dudhouli Municipality-2, 10 and Kamalamai Municipality-10 area;

c. Natural regeneration management-ANR (Assisted Natural Regeneration) by promoting several actions such as;

  ➢ Reduction of forest fire hazards through cleanings and improvements (extraction of bushes, leaf litters and forest residues) (about 4 km);
  ➢ Fencing with mesh wire /bar-bed for protection of existing forest as priority ANR activity (23 km),
  ➢ Provisions for forest watcher,
  ➢ Minimizing grazing with alternatives;
  ➢ Provisions for forest fire response toolkits
  ➢ Adoption of new technology (for example: Forest Watcher mobile app-the dynamic online forest monitoring and alert systems) for fire controls,
  ➢ Strengthening and envisioning of forest management operation plans to reinforce the forest management system.
  ➢ Empower CFUGs on forest management and forest governance;

d. In addition, plantation area of **754 ha planned** including a) **Community land plantation (195 ha), Demonstration Plantation (17 ha), Riparian plantation (36 ha), woodlots establishment (506 ha).**

Objectives of the IPacks
- Improve forest cover through enrichment plantation;
- Improve forest quality through proper management;
- Build capacity of CFUGs/LFUGs to reduce forest fire hazard and risk;

- Reduce natural forest based fuelwood dependency;
- Increase forest cover in riverside 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 disribution of benefit of resource to the CF users especially, marginalized forest users;
- Incentives for women and economically marginalised community for their active enagement in nursary establishment and enrichment plantation;
- Incentives for alternative energy;
- Incentives for livestock sustianable management activities (promotion of profit making livestock farming, sheds improvement, fodder nursery- plantings of high quality fodder species).

Output and Activities

Outputs	Activity	Activities	Activity Code	Remarks
	1.1 Restore degraded natural forests	Forest nursery establishment/promotion-3 in	M42, M164, M214	

Output1: Natural forest ecosystems are better maintained and protected within the project area		Dudhouli Municipality-2 & 10 and Kamalamai Municipality-10		
		Natural forest regeneration management and Enrichment plantation in degraded forest lands **(321 ha) in** Dudhauli Municipality -1, 2, 4, 5 & 10 and Kamalamai Municipality-10 & 13.	M10, M105, M109, M113, M114, M116, M13, M141, M156, M165, M166, M171, M176, M182, M20, M22, M23, M26, M38, M42, M44, M47, M49, M50, M55, M61, M63, M68, M71, M72, M74, M75, M76, M77, M83, M85, M89, M90, M99	
		Natural regeneration management-ANR (Assisted Natural Regeneration): - Cleaning of existing fire line and existing trails **(4 km)** in Kamalamai Municipality-10 - Fencing around the natural forest lands **(23 km)** in Dudhouli Municipality -1, 2, 5 & 10 and Kamalamai Municipality-10 & 13 - Support on forest firefighting equipment/tools sets (49 sets-one set for each two groups) - Support for fodder nursery approach-seedlings for fodder trees **(300 HHs)**	M184, M196, M198 M11, M24, M27, M384, M385, M386, M387, M388, M389, M43, M9	toolkit for forest fire control in accordance with government packages (Trolly with Water Tank if possible at district level) the river system has 98 CFUGs/LFUGs and forest firefighting equipment is proposed for one package for each 2 CFUGs

		• Support on the provisions of forest watchman (at least one in each CFUGs/LFUGs **(98 persons)** • Linking with existing ICIMOD mobile apps (Forest fire App) for forest fire monitoring and forest management (1**)**		
	Activity 1.2 Enhance capacity for sustainable forest management	a. Development of Community Based Forest Fire Fighting Groups (CB-FFFG)- **98 events** b. Provide skill trainings on forest fire control and management **(98*3=294 person) for firefighter trainings**) c. Support for Forest Operational Plan (FOP) development and reviews **(98 plans)** d. **Coaching on forest operational plan for forest users (68 events)** e. Provide 1-day orientation trainings for herders/livestock farmers on forest management (**250 herders);** f. Provide skill trainings on compost preparation		• The total number of CFUGs/LFUGs in the river system is about 98 • 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

		using forest based resources-bushes and leaf litters- **5 days training** (one for each two CFUGs)		language/printings leaflets-pictorial contents for general forest users)
		g. Develop Training of Facilitators (ToF) in sustainable forest management (10 people in the river system);		• One coaching class events for each CFUGs/LFUGS
		h. Capacity building trainings on forest management for government staffs (DFOs/ SDFOs) **(1 event-**3 days residential)		
		i. Provide refresher trainings for CFUGs/LFUGs in forest management-3 days for each CFUGs/LFUGs **(98 events); each event include 20 persons/users**		
		j. **Celebration of Churiya Conservation day (5 events)**		
		k. Capacity-buildings trainings on monitoring of sustainable extraction of riverbed materials and mines (with site demonstration)-3days residential for local governments		

		l. Facilitation for School course programme on sustainable forest management (1 event) m. Production and dissemination of extension material on sustainable management of natural resources. Produce gender friendly materials. n. Facilitation support for alternative energy uses / biogas plants installation (300HHs)		
Output 2: Forests and tree cover are restored and maintained in the river system landscapes	**Activity 2.1: Enhance forest land in river side areas (afforestation)**	Plantation in river side area through sustainable management (754 ha) in Kamalamai Municipality - 8,10,13 and Dudhouli Municipality-1,2,4,5,9,10	A1, A122, A146, A149, A150, A159, A162, A170, A173, A174, A179, A18, A181, A185, A188, A194, A197, A30, A33, A396, A397, A398, A399, A4, A400, A401, A402, A403, A52, A67, A69, A7, A73, A94, A98	

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/Activity	Unit	Quantity	Rate	Amount	Remarks
Output1: Natural forest ecosystems are better maintained and protected within the project area					
Activity 1.1: Restore degraded natural forests					
1.1.1 Construction/promotion of forest Nursery	no.	3	1,000,000	3,000,000	The cost includes structure of nursery of each capacity 50,000 for Multi-year seedlings production
1.1.2 Seedling production in Nursery (Multi-years seedlings)	No.	150,000	40	6,000,000	The cost includes water supply, seedling bed preparation, nursery *Naike*, forest soil collection, sand collection, poly bag purchasing, nursery shading, soil filling in poly bag, preparation of germination bed)
1.1.3 Enrichment plantation and regeneration management in degraded forest	Ha	321	250,000	80,250,000	The cost includes survey and alignment, pitting, seedling transportation, and plantation

Clearance of leaf letter, bushes, dugout waterholes (30cm*30cm) and contour bund (for regeneration management).. |
1.1.4 Cleaning of existing fire line and existing trails	km	4	50,000	200,000	In collaboration with municipal government and DFO
1.1.5 Construction/improvements of fencings in natural forest lands	km	23	500,000	11,500,000	adopt mesh wire/ bar-bed
1.1.6 Support on forest firefighting equipment/tools (49 sets)	no.	49	500,000	24,500,000	Total CFUGs/LFUGs in the river system is only 98 groups. 1 set of firefighting equipment is for 2 groups. need to collaborate with others for

					firefighting water tanker-big and small size, the cost does not include bigger tanker cost.
1.1.7 support on provisions for forest watcher	pers ons	98	800,000	78,400,000	for 5 years salary with incentives
1.1.8 Support on fodder-seedlings for fodder trees promotion	hhs	300	5,000	1,500,000	focus for marginalized and livestock based livelihoods dependent community
1.1.9 Linking with existing mobile app system from ICIMOD for forest fire monitoring and forest management (1 event)	lump sum	1	200,000	200,000	
sub-total				**205,550,000**	
Activity 1.2: Enhance capacity of forest management stakeholders (government units, CFUGs, forest management CSOs, users)					
1.2.1 Development of Community Based Forest Fire Fighting Groups (CB-FFFG) and	no.	98	20,000	1,960,000	The cost includes coordination and communication and meetings for the development of CBFFFG
1.2.2Provide skilled-based training capacity for CBFFFGs on forest fighter trainings-forest fire control and management for (98*3)=294 persons-firefighter trainings) for CFUGs/LFUGs	pers ons	294	30,000	8,820,000	3 persons from each CFUGs/LFUGs at community level Participants also include from local government disaster management unit Collaborate with National Disaster Risk Reduction and Management Authority (NDRRMA) and Armed Police Force
1.2.3 Support on Forest Operational Plan (FoP) developments/reviews	no.	98	200,000	19,600,000	review 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...

1.2.4 Coaching on forest operational plan for forest users (98 events)	events	98	30000	2,940,000	Half day orientation on operational plan dissemination/sensitization to the users
1.2.5 Provide 1-day orientation trainings for Herders on importance of forest services and management (250 herders/livestock owners) ;	events	13	100,000	1,300,000	Coordination with cattle's' households' owner Collaboration with municipal government and Livestock Management Centers In 13 blocks events, 20 persons can adjust in each block/event
1.2.6 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 two CFUGs/LFUGs)	events	49	300,000	14,700,000	Collaboration with municipal government 2 CFUGs can adjust in one event with one machine
1.2.7 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
1.2.8 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
1.2.9 Provide refresher trainings for CFUGs/LFUGs in forest management-3 days for each CFUGs (non-residential) at local level	event	98	200,000	19,600,000	The training facilitator-from the ToF receiver One event from each CFUG/LFUGs and the training should be at river system level-non-residential
1.2.10 Celebration of Churia Conservation Day (**5 events**) at river system level	event	5	100,000	500,000	1event 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)

1.2.11 Capacity-buildings training on monitoring of sustainable extraction of riverbed materials and mines (with site demonstration)-3days 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
1.2.12 Facilitation on school course programme on sustainable forest management (1 event)	event	1	300,000	300,000	
1.2.13 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,…
1.2.14 Facilitation support for alternative energy uses / biogas plants installation(300 HHs)	no.	300	5,000	1,500,000	In coordination with the municipal government
sub total				**73,920,000**	
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					
2.1.1 Plantation in river side area (forestry plantation)	Ha	754	700,000	527,800,000	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 Priority for 4-categories plantation (riparian plantation, community plantation, demonstration

					plantation and woodlot plantation) 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) Collaboration approach with MoU/working guide notes with other government agencies/local government
2.1.2 Capacity building trainings for users on the management of plantation in river site areas	No.	5	700,000	3,500,000	One training event in every year (for 5 years); demonstration in the plantation regions-river site sites The ToF receivers should be the trainers in the river system
Sub total				**531,300,000**	
Total cost				**810,770,000**	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

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
Activity 1: Restore degraded forests				
Nursery estalishment	• Unavailability of : appropriate site, (water, slope, aspect, accessible to plantation site etc. • Uncertainty from wild animal attack-monkey • Intense rainfall decreases the growth of nursery plant • Infertility of soil resulting to low yield	• Ensure water availability through irrigation facilities and construction of ponds • Require site inspection with soil test and other aspect • Purchase seedling from private nursey. • Upgrade forest nursery under DFO • Provide shed for some days for protection from extreme heat and rainfall • Adopt multi-year nursery plants (2-year) • Adopt Indigenous knowledge, skills and customary practices for measures that are	• 150,000 seedlings purchased from private nursery • 2 DFO nursery upgraded	• No. of seedlings purchased • No. of DFO nursery upgraded

		viable at community level		
Seedlings production (multi-year seedlings)	• Unavailability of Multi-year seedlings for first year plantation • Desirable species of seedling may not produced	• Production of seedlings prior to implementation year/during planning phase • Carefully selection of species • devote well experience nursery *Naike*	• 150,000 seedlings produced in planning phase • Seedling species are selected as per site condition and users interests. • At least 2 nursery *Naike* are well experienced among 3 *Naike*	• No. of seedlings produced in planning phase • % of users demanded the seedlings for plantation. • No. of well experience nursery Naike devoted.
Carrying out plantation & regeneration in degraded forest	• Drought • Forest fire • Free grazing • Flash flood. • Less interest of CFUGs	• Selection of drought resistant species (Sal, Khayer) • Water hole • Clearance of bushes and leaf-litter. • Fencing • Adopt rotational grazing /stall-feedings • Make strong commitment of CFUG for the protection of the plant.	• 100% enrichment plantation species are drought resistant. • 80% of CFUG members participated in protection of the reforestation area	• % of drought resistant species in enrichment plantation. • km. of regenerated area fenced • % of CFUG members participated in protection of the reforestation area
Activity 2: Enhance capacity of forest management stakeholders for sustainable forest management				
	• Participants may not have interest to receive training • Training event may not match with leisure time of participant.	• Provide DSA and transportation allowances to the participant. • Training period selected as per the demand of	• 90% of targeted CFUG members actively involved in the training. • 50% women, 13% Dalit and 31% Indigenous people are	• % of targeted CFUG members actively involved in the training.

		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	included in the training • 100% of CFUGs able to know knowledge & skills for forest management	
• Venue may not easy accessible to participants especially for women and other vulnerable people				

Activity 3: Enhance forest lands in riverside area

Carrying out river side plantation (afforestation)	• 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	• 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;	• Post monsoon plantation in 754 ha of river site 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.	• 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.

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		sharing of products the community)		

Safeguard analysis

Outputs and activities/ tasks	Serious risks	Risk reduction measures	Risk reduction targets	Indicators
Nursery estalishment	• Labor hired from outsider that includes women, IPs, Dalits, and marginalized people. • Conflict in resources utilization (water, forest soil etc.) • Expansion of invasive species	• Labor hired from local users. • Agreement with corresponding user group	• 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	• No. of labor hired from local user. • Agreement document • No. focal desk developed in government entities
Carrying out river side plantation (afforestation)	• Exotic species may pose risk to local biodiversity. • Mass production of forest product may create problem in harvesting and marketing. • The plantation area itself act as social illegal site.	• Promote native species for plantation. • Regular thinning and pruning with market assessment. • Regular patrolling mechanism should be established.	• 100% of the plantation species is native. • One thinning and one pruning/year with market assessment or distribute to local users. • No illegal event recorded in the area.	• % of native species planted • Event of thinning and pruning/year • Amount earned/year from the product • No. of illegal event recorded from the area.

Carrying out plantation & regeneration in degraded forest land	• Exotic species may pose risk to local biodiversity. • Huge biomass forest product may create problem in harvesting and marketing. • Human wildlife conflict	• Promote native species for plantation. • Regular thinning and pruning with market assessment. • Compensation mechanism by CFUGs established.	• 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.	• % 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 managemennt.	• Right person (IPs, Dalits, marginalized groups). may be excluded in the training;	• Assure right person in training	• 80% of trained CFUG members involved in forest management.	• % of trained CFUG members involved in forest management.
Installation of biogas plants for marginalized poor communities.	• Elite capture • Actual beneficiaries may not receive the alternative energy (biogas plants).	• Assurance of beneficiaries highly dependent on fuelwood (IPs, Dalits, marginalized groups). • Require Proper analysis of actual beneficiaries.	• 300 HHs of actual beneficiaries receive alternative energy (biogas plants). • 90% of actual beneficiaries receive alternative energy (biogas plants).	• No. of actual beneficiaries receive alternative energy (biogas plants). • % of actual beneficiaries receive alternative energy (biogas plants).
Benefits	The focus of IPack on restoration of degraded forest and plantation in river side , 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	321 ha natural degraded forest restored and 754 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 is this IPack 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 Kama North 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 free grazing and haphazard development-road networks in fragile lands.
    - About 67 landslides covering about 26 ha in Dudhouli Municipality-1, 2, 4, 5 & 13 and Kamalamai Municipality-1, 5, 10, 11 & 13 are the major landslids in the river system. About 25 number of torrent streams is having a number of gullies that have led to degraded forest ecosystems; for example, mainly in Dudhouli Municipality-1, 2, 4, 5 , 10 & 13 and Kamalamai Municipality-10 & 13 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).
    - Free grazing at the rate of grazing of goats (300-500) daily in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-1, 2, 4, 5, &10 has increased the risk of erosion in upstream areas along the river and gully corridors;
- ➤ **Inadequate community capacity for flood and riverbank-cutting control measures and conventional agricultrue 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;
    - Conventional farming in sloppy lands of about 29 ha accelerates soil erosions and contributes to gully formation in Dudhouli Municipality-2;
    - Encroachment of river/stream site lands and forest lands for agriculture practices and income generating activities

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- There is tremendous problem of river cutting as about 21 km. of river surrounding land is abandoned..
- 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-67 sites with vegetative measures in collaboration with local governments, soil conservation offices, forest offices and the community (of these very strongly recommended for the treatmens (9 landslide), strongly recommended (4 landslide), and recommended (54 landslide)
b. Stabilization of gully in the torrent streams (25 torrent)
c. Construction of water conservation ponds (13 ponds): Kamalamai Municipality-10 and Dudhauli Municipality -1, 2, 4, 5, 10 & 13
d. Improvement of existing ponds (1 ponds) in Dudhouli Municipality-10
e. Improvement of sloppy lands-terracing, in 29 ha especially in Dudhouli Municipality (2)
f. Wetland protection (3 locations) in Dudhouli Municipality -4, 10 & 13
g. Improvement of drinking water sources
h. Improvement of irrigation services
i. Construction of water harvesting structure
j. Riverbank stabilization
k. Capacity buildings in water and soil conservation practices
    - Skill based training for local community CFUGs/LFUGs on landslide and gullies stabilization with locally available treatment measures **(33 events of 5 days)-combine 3 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 adaptatble and desirable vegetative species for soil cosnervation (for example, bamboo farming, Amrisho (Thysanolaena maxima), Amala (Phyllanthus emblica), Harro, Barro and linking these measures in income generation opportunities, particularly for women, dalit and IPs, Madhesi and othe margninalied 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 disribution of benefit of resource to the Community Forest (CF) users especially, marginalized forest users;
- Incentives for women and economically marginalised community for their active enagement in nursary establishment and enrichment plantation;
- Incentives for alternative energy;
- Incentives for livestock sustianable 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 and Activities:

Outputs/Activities	Activities	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 source and Improve water retention	3.1.1 Landslide risk reduction (treating 67 landslides)	Very strongly recommended for treatment (9)	M121, M130, M160, M175, M177, M39, M40, M57, M86
		Strongly recommended for treatment (4)	M132, M133, M169, M178
		Moderately recommended for treatment (54)	M482, M481, M102, M112, M115, M119, M120, M124, M125, M126, M129, M131, M134, M135, M136, M137, M138, M139, M140, M142, M144, M145, M151, M152, M154, M155, M157, M158, M163, M164, M167, M168, M189, M191, M192, M193, M199, M200, M201, M202, M203, M204, M205, M206, M207, M208, M209, M210, M87, M88, M91, M92, M93, M95

	3.1.2 Gully stabilization in torrent stream (25 torrents) in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-1, 2, 4, 5, 10 & 13	A447, M100, M114, M121, M124, M128, M135, M142, M157, M158, M162, M187, M189, M196, M207, M208, M224, M232, M289, M336, M375, M46, M47, M71, M92
	3.1.3 Terrace improvements (slope stabilization) (29 ha) in Dudhouli Municipality-2	A405
	3.1.4 Construction of water conservation ponds (13 ponds) in Kamalamai Municipality-10 and Dudhauli Municipality-1, 2, 4, 5, 10 & 13	A116, A130, A132, A200, A215, A41, A410, A411, A412, A413, A414, A415, A416
	3.1.5 Improvement of existing ponds (1pond) in Dudhouli Municipality-10	A454
	3.1.6 Drinking water source improvement(6 locations) -in Kamalamai Municipality-10 & 13 and Dudhauli Municipality-4, 5 & 10	A160, A198, A354, A428, A429, A78
	3.1.7 Improvement of irrigation services (11 location) in Kamalamai Municipality-9, 10 & 13 and Dudhauli Municipality-2 & 5	A193, A272, A349, A383, A448, A449, A450, A451, A452, A453, A80
	3.1.8 Wetland protection (3 locations) in Dudhouli Municipality-4, 10 & 13	A458, A459, A460
	3.1.9 Construction of water harvesting structure (Dam) (6 harvesting dams) in Kamalamai Municipality -10 & 11 and Dudhauli Municipality-2 & 5	A406, A407, A408, A455, A456, A457
	3.1.10Riverbank stabilization (21 km) in Kamalamai Municipality-8, 9, 10 & 13 and Dudhauli Municipality-1, 2, 3,4, 5, 6 & 10	A108, A118, A127, A147, A148, A161, A19, A21, A25, A28, A31, A32, A34, A37, A462, A463, A464, A465, A466, A467, A468, A469, A470, A471, A472, A473, A474, A475, A476, A477, A478, A479, A480, A5, A51, A53, A6, A8
Activity 3.2: Capacitated	3.2.1 Skill based training for local community CFUGs/LFUGs on	Skilled based training for local community (CFUGs/LFUGs and soil and water conservation groups)

stakeholders in water and soil conservation	landslide and gullies stabilization with locally available treatment measures **(33 events of 5 days)- combine 3 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);** 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)

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/sub-activities	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: Conserved soil and water source and Improved water retention

3.1.1 Landslide treatments	No.	67	2,000,000	134,000,000	The estimated cost is for each landslide, with the bio-engineering and structures for all three types of priorities.
3.1.2 Gulley stabilization in torrent	No.	25	2,000,000	50,000,000	25(torrent streams with gullies) (Bio-engineering, palisade, brushwood check dam, bamboo plantation, contour plantation,)
3.1.3 Terrace improvement (slope stabilization)	Ha	29	150,000	4,350,000	
3.1.4 Construction of conservation pond	No.	13	700,000	9,100,000	Size approximately: 20*20*2 m3
3.1.5 Improvement of existing pond	No.	1	500,000	500,000	Including cleaning and maintenance
3.1.6 Wetland protection	No.	3	1,500,000	4,500,000	Beautification with plantation and protection
3.1.7 Drinking water source improvement	No.	6	1,500,000	9,000,000	
3.1.8 Improvement of irrigation services	No.	11	1,000,000	11,000,000	
3.1.9 Construction of water harvesting structures (dams)	No.	6	1,000,000	6,000,000	
3.1.10 Riverbank stabilization	km	21	30,000,000	630,000,000	cost @ Rs. 30,000,000 per 100 meter Riverbank stabilization with engineering structures
Sub-total				**858,450,000**	

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	Events	33	250,000	8,250,000	• Total 98 CFUGs/LFUGs in the river system, Each event includes 3 CFUG/LFUGs • Each event for 5 days , including 1-day exposer visits
3.2.2 Orientation training on soil and water conservation measures for government officials	Events	5	600,000	3,000,000	• Government officers inlcude from agriculture knowledge centers, extensions, soil conservation offices, forest divisions/subdivisions, local governments, and other relavent 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	events	1	1,000,000	1,000,000	• For government officials, other stakeholders and users • National/neighberiong nations good practices (need to explore, if possible)
3.2.4 Sensitize on upstream and downstream linkages for well ecosystem services	events	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				**13,950,000**	
Total					The total estimated budget is to be varied once the detailed technical feasibility is completed in coordination, especially

		872,400,000	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 of IPack

Outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Activity 1: Conserved soil and water source and Improve water retention				
Gully treatment.	• Very low input/participation of users	• Needed to convince the importance of the gullies treatments • Incentive for local labor • Decrease the participation portion of local users	• 25 gullies treated	• No. of gullies treated
Landslides treatment	• Very complicated and time consuming procedures • Very low input/participation of users	• Cost/benefit analysis for the treatment • Decrease the participation portion of local users	• Identification of treatable landslides • 67 landslides treated	• No. of landslides treated
Terrace improvement (slope stabilization)	• Low interest of farmers	• Convincing to farmers with respect to benefits of terrace improvement	• Identifiacation of suitable slopes lands with details technical assessment	#ha of slope lands improved
Construction and improvement of Conservation pond	Appropriate site not available for desired size of pond.	Decrease the size of ponds. Make MoU with users to maintain the ponds	13 conservation ponds constructed 1 pond improved	No. of conservation ponds constructed and improved and maintain with conserving its catchment

	Pond may silt up in few years	Conservation of catchment of the pond	MoU with users on maintain the pond and conserve the catchment prepared	
Activity 2: Capacitate stakeholders and enhance water and soil conservations				
Carrying out training to CFUG members on soil and water conservation measures.	• 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 selected as per the demand of participants. • Selection of venue from consultation with participants • Residential training	• 250 targeted members actively involved in the training.	• No. of members actively involved in the training

Safeguard analysis

IPack outputs/activities	Serious risks	Risk reduction measures	Risk reduction targets	Indicators
Gully treatment.	• Vegetative species used in treatment pose no threat local biodiversity. • Insecurity from anthropogenic activities	• Use of locally available native species. • fencings	• 100% of the native vegetative species (Bamboo plantation/Amrisho) used in treatment. • 25 gullies treated	• % of the native vegetative species used in treatment. • Number of gullies treated
Construction of Conservation pond	• Children and small animal submerged in the pond.	• Fencing around the pond. • Develop animal friendly ramps	• No children and small animal submerged in the pond.	• No. of cases submerged in the pond.
Carrying out training to CFUG members on soil and water	• Right person may be excluded in the training.	• Assure right person in training by assessing the	• 80% of trained members involved in soil and water	• % of trained members involved in soil and water conservation measures.

conservation measures.		CFUGs institutions members	conservation measures.	
Production of booklets on soil and water conservation measure.	• The booklet may be used as other than informative document.	• Content of attractive decoration (pictorial) with short and clear language.	• The booklet is highly demanded by 80% of users.	• % of users demands the booklets.

Benefits   The focus of IPack is conserving soil and water and enhancing greenery in the river system

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 13 ponds and 2 existing ponds improvement 67 landslide treated as per the priority and 25 torrent-gully stabilized	No.of ponds constructed and improved #ha of landslide risk reduced and no.of torrent gullies stabilized

IPack 3: Agroforestry System
Why is this IPack needed?

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 riversite 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 the agroforestry system helps to enhance their capacity for income generation if planting for meeting the requirements of fuelwood and fodder is given high priority in the agroforestry system. Efficient agroforestry systems can reduce forest encroachment pressures and reduce forest degradation by increasing on-farm forest products. Dependency of marginalized communities on the forest for their livelihood and income generation. The Farmer Field School (FFS) approach is recommended for several kind of potential enterprises for learning riversite management and selecting species and other management practices . The formulation of Agroforestry Groups (AFGs) is advised to form in the agroforestry system.

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: Dudhouli Municipality-2 and Kamalamai Municipality-10
b. Adoption of Agroforestry system in the potential areas of the river site of about **80 ha**, mostly in Dudhouli Municipality-2 and Kamalamai Municipality-13.
c. Providing supports for irrigation supply in plantation period with active participation of women and IPs.
d. Formulation of groups called Agroforestry Forestry Groups (AFGs), it is advised as 2 groups (25-30 members in each group)
e. Providing Training on improved AF (Agro-Forestry) practices for 60 group members (30*2) 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 (from foresters, soil conservation officers, agriculture extension officers, local government planners, etc.) -3days (residential)

Strategies:
- Adopting 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.
- Assuring women's participation by proportional representation from the beginning of the agroforestry system establishment

- Establishing tree woodlots for firewood, timber, 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 of 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:

- <u>Fruit:</u> Mango, Citrus species-Lemon, Spices species: Tejpat (*Cinnamomum tamala)*, Timbur, Genger/turmeric, Chilly, Legume crops, Papaya, Banana, Oal, Sugarcane, Katahar (*Jackfruit*), Lichi (Lychee), Banana,
- <u>Fodder:</u> Neem (*Azadirachta indica*), Kimbu(*Morus alba*), Bakaino (*Melia azedarach*), Moringa (*Moringa oleifera*), Koiralo (*Bauhinia Variegata*),
- <u>Multipurpose:</u> Amala (*Phyllanthus emblica*), Jamun (*Syzygium cumini*), Khayar (*Acacia catechu*) Satisal (*Dalbergia latifolia*),

Objective:

- Diversify agricultural land production.
- 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.
- Facilitating the easy access to desirable forest species for plantation.
- Making provisions for providing incentives for ensure the participation of women, IPs and marginalised people in training activities.

Outputs and Activities:

Outputs/Activities	Sub-activities	Activity Area code
Output 4: Farmers are skilled in using climate-resilient land use practices.		

Activity 4.1: : Establish agroforestry activities through group systems (2 agroforestry group) agroforestry activities	4.1.1 Establishing Agroforestry Nursery -2 in Dudhouli Municipality-2 and Kamalamai Municipality-10	A393, A394
	4.1.2 Establishment of AF activities in the potential areas (80 ha. of river abandoned land) Dudhouli Municipality-2 and Kamalamai Municipality-13	A80, A404
	4.1.3 2 Agro-Forestry Group committee established	
	4.1.4:2 Agro-Forestry Group received institutional support and office equipment.	
	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	4.2.1Training for AFG members on administration and management (60 AFG members from 2 AFG)	
	4.2.2 Training on AF practices (60 AGF members)	
	4.2.3 Providing capacity building for government officers on the promotion of agroforestry system	
	4.2.4 Audio/video aids-dissemination of AF program	

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.

Activity	Unit	Quantity	Unit Costs	Budget (NPr)	Remarks
Output 1: : Established agroforestry activities					
4.1.1 Establishment of Agroforestry Fodder Nursery	No.	2	500,000	1,000,000	• Cost Include tunnel-protection measures
4.1.2 Purchasing seedlings of horticulture species for agro-	No.	20,000	200	4,000,000	Multiyear seedling nursery on horticulture

forestry focus on multiyear seedling production					
4.1.3 Support agroforestry activities in the potential lands	ha	80	500,000	40,000,000	• 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.	1	500,000	500,000	• 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.	1	30,000	30,000	
4.1.6 Institutional support and office equipment for women group	No.	1	200,000	200,000	
4.1.7 Coordination meetings (5 years)	No.	10	25,000	250,000	Two meetings/ year/per Group
Subtotal				**45,980,000**	
Activity 4.2: Capacitate communities'/farmer groups and government officers to promote agroforestry system (2 AFG)					
4.2.1 Training for agroforestry groups on sustainability, principle of administration and management-3 days residential	persons	60	30,000	1,800,000	60 person
4.2.2 Training on AF practices (promotion for small enterprises for the	persons	60	30,000	1,800,000	

production)-5 days residential					
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				5,600,000	
Total				51,580,000	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)	• Flash flood damages the AF activities. • Clearing land demarcation between private/public	• Needed river bank and gully stabilization (spur and embankment, bamboo plantation along the bank)	• 80 ha river abandoned land converted to AF activities adopting customary land practices for risk reduction approach.	• Hectares river side land converted to AF activities.

		• Approval of guideline from local unit to use river side land.		
	• Actual beneficiaries (IPS, dalit, marginalized groups) may exclude from AGF committee.	• Assurance of actual beneficiaries.	• 4 AFG committee established	• No. of AFG committee established
Train on cooperative principles, administration and management	• Participants may not have interest to receive training • Training event may not match with leisure of participant especially women with household duties (morning and evening).	• Provide DSA and transportation allowances to the participant. • Training period selected as per the demand of participants. • Selection of venue from consultation with participants • Residential training	• 60 AFG member trained on, administration and management	• No. of AFG members trained
Support institutional support and office equipment.	• Insufficient support and office equipment	• Assure sufficient support and quality equipment.	• 2 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.	• 60 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.	• 60 HHs consuming indigenous crop products 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. | • 60 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
Why is this IPack needed?

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 adaptive 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**:
- Total 2793 ha of agricultural land are planned for Climate Resilient Agriculture (CRA), representing with the codes.
- Out of 22 FFS, the potential four-FFS (with respect to hotspot to climate extremes, crop varieties with different problems, farmer willingness, and access) are listed to estimate the budget.

- o Sheath blight, borer, blast and foot rot in rice crop
- o Vegetable disease (bitter melon, cucumber and bottle gourd)
- o Gray leaf spot, army worms, blight and downy mildew in maize
- o Mealy bug, scooty mold and anthracnose in mango

- **Inefficient irrigation facilities :** Farmers suffer from irregualr 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 sytem.

- **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 4 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 sheath blight, blast and foot rot in rice crop in Dudhouli Municipality-9
   - FFS on vegetable disease (bitter melon, cucumber and bottle gourd) in Dudhouli Municipality-5
   - FFS on mealy bug, scooty mold and anthracnose in mango in Dudhouli Municipality-4
   - FFS on gray leaf spot, blight and downy mildew in maize in Dudhouli Municipality-2
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 for the conservation and utilization of water source by using local friendly techniques, for example: building of Seepage Cutoff Walls (SCWs) for tapping sub-surface water in irrigation sustainability in Kamalamai Municipality and Dudhauli Municipality
e. Support to farmers for seed production (improved seeds for climate induced disaster resilient varieties) in the location where the FFS approach is to be adopted in rice) in Dudhouli Municipality-9 (for 3 years)
f. Provide training to adopt and apply climate resilient land-use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure).

g. Support to farmers' sensitization to save agricultural practices and production from wildlife threats such as wild boar, monkey, blue bull and antelopes.

h. 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:

- Formalizing 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 agriculture 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
- Adopting 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 technologies and 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		Activity Area code
Output 5: Farmers are skilled in using climate-resilient land use practices.			
Activity 5.1: Establish four FFSs and increased farmers' ability in seed production **in** Dudhouli Municipality-2, 4, 5 & 9	5.1.1	Establish 4 FFSs on the crops listed above,	A13, A101, A104, A194
	5.1.2	Capacity building on livestock management practices	
	5.1.3	Support to farmers for seed production (improved seeds on rice) through FFS approach in rice crop (for 3-years)	

		5.1.4 Support for the conservation of water source and improvement of irrigation facilities using the technology of sub-surface water harvesting (SCWs) chambers	
Activity 5.2: Enhance farmers' capacity in climate resilient agriculture practices,		5.2.1 Capacity building trainings on using weather information and its application skills in farming practices; 5.2.2 Provide training to adopt and apply climate resilient land use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure, Sesbania manure); 5.2.3 Support to link farmers with the local market centers and market information;	
Activity 5.3: Increased coping strategies for wildlife threats in crops		5.3.1 Support to farmers' sensitization to save agricultural practices and production from wildlife threats	

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.

Introduction	Standard government price norms are adopted. Annual increase in costs by 15% to allow for inflation factored ; Implementation cost including monitoring				
Activity	**Unit**	**Quantity**	**Unit Costs**	**Budget (NPr)**	**Remarks**
Activity 5.1: Establish four FFSs and increased farmers' ability in seed production.					
Activity 5.1.1: Establish four FFSs and increased farmers' ability in seed production **in** Dudhouli Municipality-2, 4, 5 & 9	No.	4	350,000	1,400,000	• 4 locations (referred in the area code)
5.1.2 Capacity building on livestock management practices-sheds improvements crop depredation by wildlife	No.	4	200,000	800,000	• At 4 locations of FFS • In collaboration with municipal government and Livestock Management Center (LMC)

5.1.3Support to farmers for seed production (potato) through FFS approach	No.	I	600,000	600,000	• For 3-years for crops-rice in Dudhauli in collaboraion with AKC and municipal governemnt • In collaboration with municipal government and Agriculture Knowledge Center (AKC)
5.1.4Support for the conservation of water source and improvement of irrigation facilities using the technology of sub-surface water harvesting (SCWs) chambers	No.	4	2,000,000	8,000,000	• In collaboration with municipal governments
Sub-total				**10,800,000**	
Activity 5.2: Enhance farmers' capacity in climate resilient agriculture practices					
5.2.1Capacity building trainings on using weather information and its application skills in farming practices;	No.	4	200,000	800,000	In collaboration with Nepal Agriculture Research Center (NARC), AKC
5.2.2Provide training to adopt and apply climate resilient land use practices (for examples: compost manure preparation, mulching, water retention capacity, green manure,	Events	4	300,000	1,200,000	With demonstration for the FFS locations
5.2.3Support to link the farmers with the local market centers and know the market information;	No.	4	200,000	800,000	produce market linkage—link with municipal level AKC's Unit
Sub-total				2,800,000	
Activity5.3 : Increase coping strategies for wildlife threats in crops					
5.3.1 Sensitization orientation on wildlife threats and risk reduction in agriculture	No.	4	300,000	1,200,000	At Municipality levels in upstream and downstream for vulnerable farmers
Sub-total				**1,200,000**	
Total				**14,800,000**	

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
Activity 1: Establish four FFSs and increased farmers' ability in seed production				
Establish 4 FFSs	• Lack of priority about FFS in local government policy and programs • Pesticide toxicity results in reduction of chlorophyll and protein contents	• Continuous coordination with Palikas and promote them to incorporate FFS approach into their plans and programs • Use of Integrated Pest Management (IPM) practices	• Providing knowledge through FFS approach to farmers-directly to more than 100 (25*4=100) farmers in the river system by adopting basic aims of FFS (skill development, empowerment, will power and capacity of decision making)	• 4 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 1000 farmers=25X10X4) on how to deal with impacts of climate change and crop pests and diseases with weather conditions in crop growth and development	
Support in irrigation system to address the impacts of water stress and increase farmers interest in FFS approach	• Even though FFS is innovative approach, farmers interest is more focused on to have assured irrigation in wet and dry periods	• Ensure irrigation service regularly in both seasons in collaboration with local governments and make the FFS approach effective	• Supporting 50% of vulnerable farmers in FFS by providing support for 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 4 places where the FFS established) and ensuring the road networks to reach to the market by collaborating with local governments	#no of farmers linked with market information
Activity 2: Capacitat farmers in climate resilient agriculture practices				

IPack outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
Build coping capacity of marginalized farmers, including women in seed production	Poor accesses to quality and variety of 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 technology to 500 new women farmers (25 *10) for upscaling the seed production technology in Dudhauli Municipality	Number of women farmers trained for seed 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 1000 FFS (25*10*4) 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 compost manure preparation	• Weak willingness of farmers to pay 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	• Encourage women farmers and vulnerable farmers by providing technical and financial supports through the project in making compost in the field	• Providing trainings on preparation of compost manure for 100 persons, comprising women, Indigenous People (IPs), Dalit and other vulnerable and marginalized people	• Number of persons trained and become trainer or training (ToT)

IPack outputs/ activities	Risks or obstacles	Risk reduction measures	Risk reduction targets	Indicators
	problems-odors and dust			

Safeguard analysis

	Activities/Outputs	Social & Environmental risk	Risk reduction measures	Risk reduction targets	Indicators
Activity 1: Establish four FFSs and increased farmers' ability in seed production					
	Establish 4 FFSs	• 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	• 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 capacity building activities) • Mapping out groups working/involving in the	• 50 % women, 13 % Dalit and 31 % Indigenous Peoples are included in the group	• % of Dalit, Indigenous Peoples and women in the group

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			river system to enhance existing groups capacity	
	Support to link farmers with the market centers and market information	• Lack of sufficient market information and authentic data on market • Variation in market pricing of agriculture products	• Confirmed participation of local authorities (local government) in cooperation with local communities	• Identified all the possible market areas of the river system • Fixed pricing of the agriculture products	• Number of market centers

Activity 2: Capacitate farmers in climate resilient agriculture 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	yield increased	# yield increased

IPack 5: Gender-inclusive governance
Drivers

- Lack of gender integration in governance (planning and implementation)
- Social norms and values
- Women lack access and resources
- Lack of resources
- Gender is not a priority in governance.
- 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 resource conservation and management Increase women's participation in decision-making forums

Strategies

Build network among women and women-led organizations for an enabling environment.

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.

1. **General information of Intervention Package (Ipack)**

IPack 5: Advocacy campaign: Gender-inclusive governance for SNRM and Resilience	Lack of gender integration in SNRM, CCA, and DRR planning and implementation process	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. Increased influence of women in governance is important to identify and include gender-responsive program interventions to increase the adaptive capacity of vulnerable women.	• 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	• 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 environment.	• 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.

2. Outputs and activities

Intervention packages	Outputs	Activities and sub activities
IPack3: 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**	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) 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	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.

	contribute in SNRM and climate resilience	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

	Activities	Activities Risks and obstacles	Risk reduction measures	Indicators
Advocacy Campaign: Gender-inclusive governance for SNRM and Resilience				
Increased access of women to NRM/ CRLUP and management knowledge and information.	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) vi. Prepare and disseminate short videos on gender and governance, SNRM, and	Social norms and values restricting women to participate and give time for informal learning and sharing platforms. Women and youth lack access and resources about local level policies making them vulnerable.	Identification of social and structural barriers faced by women through sensitization measures Awareness and sharing of policies. Ensure availability of resources.	Social norms and barriers that prevent women's participation are identified. 3 videos developed. 3 dissemination activity in the river system. Event/ activity report

	climate resilience in the river system.	Lack of resources		At least 70% of target population participated. At least one report containing five best practices published and disseminated.
	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.		Raise awareness about long-term benefits of information dissemination.	50 radio programs in local language
	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.	Inadequate interest and motivation of concerned institutions.	Raise awareness about long-term benefits, social prestige.	Number of events between institutions and women groups/ CBOs. 3 drama and event conduct in the river system.
	ix. 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.	Less priority		4 events conduct in the river system. 50 % of male participation engaged.

				Frequency of male involvement in gender and women's issues and concerns.
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
Increased access of women to SNRM and increase resilience.	1. Developing and implementing awareness-raising sessions targeting government, civil society, grassroots organizations, and rural communities (includes preparing	• Social changes not acceptable by some men and women of the society and IPs not inclusive	• Promotion of women, IPs, Dalit and marginalized groups • Advocating GESI and women's issues among	• Informal learning and sharing platform benefited by grassroots level women, IPs, Dalits and marginalized groups • % of CBOs and women groups	• At least 30% of Grassroots level women, IPs, Dalits and marginalized empowered • Gender responsive

	a strategy with issues, objectives, actions/products) x. Prepare and disseminate short videos on gender and governance, SNRM, and climate resilience in the river system. 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. 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. 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, environment day, Indigenous people's day, Churia day, etc.		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	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	information and availability access made easy • Male involvement increased in advocacy of GESI and women's issues and minimized social disparities

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			• 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 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	• Change in gender roles not easily accepted posing threats to social norms and values	• Conduct GESI trainings and awareness campaigns and policy reviews to strengthen the GESI initiatives	• 50% men and women know about the GESI policy and integration strategies	• Province and local level policy reviewed
		3. Provide gender mainstreaming training/ workshops to local government and CBOs and	• Gendered governance restricting women to participate.	• Document of good and best practices in gendered	• Gendered governance best practices documented, and	• Best practices in gendered governance

	concerned stakeholders. The activity should be linked with project level activity: building capacity of project implementer, government staffs and other stakeholders.	• Women participation in NRM sectors can pose threat to social change	governance that has minimized social discrimination and women empowered reducing GBV as well	learning shared for social change	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.	Women not being empowered could hinder their participation. Leadership discrimination among women and elite captures GESI not prioritized. Inclusive transparency and practices limited and not prioritized	Rapid assessment on women's contribution and involvement in NRM/CRLUP and management to be conducted and shared for minimizing social barriers. Trainings to be provided to mainstream gender increasing the trend of preparing action plans as GESI priority. Regularly conduct GESI focused audits and public hearing to increase transparency and good governance	% of women's contribution and involvement analyzed and further plans developed % of understanding level and mainstreaming of GESI well adopted % Of local institutions practice GESI focused social audits and public hearing for social and strong governance practice	Rapid assessment conducted. GESI mainstreaming training and workshops raised awareness. GESI focused social audit and public hearing conducted regularly

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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

5.1.5 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/L1	Cost to implement L=3/M=2/H=1	Opportunity cost L=3/M=2/H=1	Incentive Measures H=3/M=2/L=1	Total score
Ipack 1	Output 1: Restored degraded forests	3	2	2	3	3	13
	Output 2: Enhanced sustainable forest management	3	3	3	3	2	14
	Output 3: increased forest lands in river site area	2	2	2	2	3	11
Ipack 2	Output 1: Conserved soil and water source and Improved water retention	2	2	2	3	3	12
	Output 2: Capacitated water and soil conservation	3	2	3	3	3	14
Ipack 3:	Output 1: : Established agroforestry	2	2	2	2	3	11
	Output 2: Capacitated farmer groups and government officers	3	3	3	3	2	14

Ipack 4	**Output 1: Established FFSs and capacitated climate resilient practices**	3	3	2	3	3	14
	Output 2: Established market information accesses and promoted organic farming practices	2	3	3	3	2	13
IPack 5: Advocacy campaing: gender inclusive governance	**Increased household food security by maximizing women's involvement in climate adaptive livelihood**	2	2	2	3	2	11

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 biomas: 295.95 ton/ha Other wooded land total biomass: 67.82 ton/ha	Forest density increased by 2%	Baseline and Endline survey report	This river system has 11059.8 ha of forest and 204.1 ha of other wooded land (baseline survey report 2022)
	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0 ha	320 ha of natural forest restored through ANR and enrichment plantation	PPMU/DFO records, Maps PMU/PPMU Reports	CBOs adopt climate resilient land use practices CBO profile report identified 321 ha of degraded land in community forest area.
	xx forestry user groups manage xx has of forest through updated forest management plan	0 forestry user groups manage 0 ha. of forest through updated forest management plan	98 forest user groups manage 11059.8 ha. of forest	DFO/Group/PPMU record PMU/PPMU report	Community based forestry groups implement renewed forest management operational plan
Output 2: Forests and tree cover are restored and maintained in the river system landscapes.	Xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	Area: 0 ha. Survival rate: NA	Area: 754 ha. Survival rate: 80%	Municipal /DFO/PPMU record Field verification Report	Local government 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	Cubic meter of soil volume per unit area: NA	25% in comparison to before constructing structures	In-person assessments at lower gabions. PMU/PPMU report	Other climate-resilient SNRM practices (including Activities on climate-resilient land use, sustainable management of forests and reforestation) are successfully implemented, further reducing potential for erosion and sedimentation
Output 4: Farmers are skilled in using climate-resilient land use practices.	Proportion of farmers trained by the project who begin to apply climate- resilient land use practices on their fields in the relevant season following their respective trainings.	0	At least 80% of the farmers involved in project trainings begun to apply project- promoted climate-resilient land use practices in the season following their training	Assessment report PMU/PPMU report	The final selection of practices to be promoted at each specific training site are highly relevant to targeted farmers' cropping systems and conditions, as well as the climate change challenges with which they must contend. Trainings are delivered in a form and manner that is accessible to, and relevant for, targeted farmers.
Output 5. Integrated gender and equity issues in governance practices in NRM/ CRLUP and management	% of women in leadership positions of CBO's executive committee	Out of 1015 leadership position inf CFUGs, 456 (44.9%) are female	At least 50% women in leadership position	DFO/PPMU/Group records	Proportional representation of all social groups ensured
	Access of women in Natural resources management,		At least 50% women participation in all events	Group record/PPMU records	Proportional representation of all social groups ensured

	CRLUP, knowledge and information				
	Integrate gender in local planning processes in NRM/ CRLUP and management		106 Gender sensitive forest management operational plan of forestry user groups	PPMU/DFO/Group records	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups This river system has 98 CFUGs and 8 LHFGs.

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

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

Annexes

Annex-1 Result Framework of Kamala South Critical Ecosystem Restoration Plan

Vision: Climate resilient and sustainably managed Natural Resources and communities in Kamala South 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 (proxi-indicator 2-5)*	Tonnes of carbon dioxide equivalent (tCO₂eq) reduced or avoided **Proxy indicator**: Area of (1) Deforestation rate: (2) Sustainable forest management area: (3) ANR area (4) Plantation area (5) Area of Climate Resilient Agriculture (CRA)	**Proxy indicator Baseline:** (1) Deforestation rate: - 0.108% (2) Sustainable forest management area: 0 (3) ANR area: 0 (4) Plantation area:0 (5) Area of Climate Resilient Agriculture (CRA):0 ha	**Proxy indicator target:** (1) Deforestation rate: 0 (2) Sustainable forest management area: 11059.8 ha (3) ANR area: 320 ha (4) Plantation area: 754 ha (5) Area of Climate Resilient Agriculture (CRA):2793 ha	PPMUs/PMU report/ project report GCF/BRCRN GHG mitigation calculation tool-based calculation sheet	Ther river system has 11264 ha forest including 11060 ha forest with <u>295.95 ton/ha</u> biomass and <u>204 ha other wooded land with 67.82 ton/ha biomass</u> (Baseline survey report 2022) Out of 20301ha, 98 forestry user groups are managing 11059.8 ha forest area (CBO profile report 2022) CERP land use data shows changes in forest area between 2000 and 2019 is -231.3 ha (-0.108% deforestation rate)
GCF core indicator (Adaptation)	Total number of direct and indirect beneficiaries (gender disaggregated)	0	Direct male: 36723, female: 38006	PMU/PPMU Periodic reports	CBOs adopt climate-resilient land use practices. CFUGs have 14170 HHs with 74729 members including 36723 male and 38006 female
Outcomes					
M9.0 Improved management of land or forest areas contributing to emissions reductions	M9.1 Hectares of land or forests under improved and effective management that contributes to CO₂ emission reductions		11059 ha of forest ecosystems sustainably managed 320 ha community-managed natural forests restored through assisted regeneration 754 ha of new planted forests established	Maps/remote sensing Project reports	Beneficiaries adopt climate- resilient land use practices
A8.0 Strengthened awareness of climate change threats and risk reduction processes	A8.1 Number of males and females made aware of climate threats and related appropriate responses	0 men 0 women 0 total	Male: 36723, female: 38006) 74749 total	Workshop/training Attendance sheets and materials	Beneficiaries are interested in adopting climate resilient land use practices. CFUGs have 14170 HHs with 74729 members including 36723 male and 38006 female
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.	<u>Forest land total biomas: 295.95 ton/ha</u> <u>Other wooded land total biomass: 67.82 ton/ha</u>	Forest density increased by 2%	~~Periodic assessment report (b~~Baseline and E~~ endline~~ survey report ~~)~~	This river system has 11059.8 ha of forest and 204.1 ha of other wooded land (baseline survey report 2022) ~~about 12079 ha of forest area~~

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	Area (in ha.) of natural forest restored through ANR and enrichment plantation	0	320 ha of natural forest restored through ANR and enrichment plantation	PPMU/DFO records Maps <u>PMU/PPMU</u> Reports	CBOs adopt climate resilient land use practices <u>CBO profile report identified 321 ha of degraded land in community forest area.</u> ~~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>through updated forest management plan</u>	98 forest user groups manage 11059 ha. of forest	DFO/Group/PPMU record <u>PMU/PPMU report</u>	Community based forestry groups implement renewed forest management operational plan ~~Improved density of forest~~
Output 2 Forests and tree cover are restored and maintained in the river system landscapes.	Xx ha of new plantation outside forest area; and their survival rate (public land forestry and private forestry)	Area: 0 ha. Survival rate: NA	Area: 754 ha. Survival rate: 80%	Municipal /DFO/PPMU record Field verification Report	Local government 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	Cubic meter of soil volume per unit area: NA	25% in comparison to before constructing structures	In-person assessments at lower gabions. <u>PMU/PPMU report</u>	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.	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 that they have begun to apply project-promoted climate-resilient land use practices in the season following their training	Assessment report <u>PMU/PPMU report</u>	The final selection of practices to be promoted at each specific training site are highly relevant to targeted farmers' cropping systems and conditions, as well as the climate change challenges with which they must contend. Trainings are delivered in a form and manner that is accessible to, and relevant for, targeted farmers.
Output 5. Integrated gender and equity issues in governance practices in NRM/ CRLUP and management	% of women in leadership positions of CBO's executive committee	<u>Out of 1015 leadership position inf CFUGs, 456 (44.9%) are female</u>	At least 50% women in ~~key~~ leadership position	DFO/<u>PPMU</u>/Group record<u>s</u>	Proportional representation of all social groups ensured
	Access of women in Natural resources management, CRLUP, knowledge and information		At least 50% women participation in all events	Group record/<u>PPMU records</u>	Proportional representation of all social groups ensured
	Integrate gender in local planning processes in NRM/ CRLUP and management		<u>106</u> Gender ~~sensitive plan~~<u>sensitive forest management operational plan of forestry user groups</u>	PPMU/DFO/Group records ~~Plan~~	Gender dimensions ensured in climate resilient plan including forest management operational plan of groups

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 Natual Regeneration	Dudhouli Municipality-10	26.99523	26.99523	M11	2.8	Length (Km)
2	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-10	26.99794	26.99794	M9	2.8	Length (Km)
3	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-10	27.00622	27.00622	M24	0.3	Length (Km)
4	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-10	27.01408	27.01408	M27	2.8	Length (Km)
5	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-5	27.02337	27.02337	M43	3.2	Length (Km)
6	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-1	27.02882	27.02882	M384	3.4	Length (Km)
7	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-5	27.03063	27.03063	M385	1.2	Length (Km)
8	Fencing as Assisted Natual Regeneration	Dudhouli Municipality-2	27.05283	27.05283	M386	2.2	Length (Km)
9	Fencing as Assisted Natual Regeneration	Kamalamai Municipality-13	27.09038	27.09038	M387	1.5	Length (Km)
10	Fencing as Assisted Natual Regeneration	Kamalamai Municipality-10	27.09506	27.09506	M388	1.3	Length (Km)
11	Fencing as Assisted Natual Regeneration	Kamalamai Municipality-10	27.10102	27.10102	M389	1.7	Length (Km)
12	Assisted Natural Regeneration	Dudhouli Municipality-2	27.05206	86.10738	M116	23.3	Area (Ha)
13	Assisted Natural Regeneration	Dudhouli Municipality-4	27.02523	86.18481	M61	26.5	Area (Ha)
14	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02903	86.22601	M72	11.2	Area (Ha)
15	Assisted Natural Regeneration	Dudhouli Municipality-2	27.07935	86.07639	M156	3.5	Area (Ha)
16	Assisted Natural Regeneration	Dudhouli Municipality-5	27.01793	86.23106	M38	4.7	Area (Ha)
17	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02743	86.25701	M68	2.8	Area (Ha)
18	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02255	86.25675	M50	19.2	Area (Ha)
19	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02590	86.25251	M63	6.7	Area (Ha)
20	Assisted Natural Regeneration	Dudhouli Municipality-4	27.02244	86.19368	M49	3.0	Area (Ha)
21	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02162	86.24398	M47	3.7	Area (Ha)
22	Assisted Natural Regeneration	Kamalamai Municipality-10	27.09121	85.98962	M165	8.2	Area (Ha)
23	Assisted Natural Regeneration	Dudhouli Municipality-2	27.02878	86.12497	M71	39.0	Area (Ha)
24	Assisted Natural Regeneration	Kamalamai Municipality-10	27.09589	86.00298	M171	9.9	Area (Ha)
25	Assisted Natural Regeneration	Kamalamai Municipality-10	27.10257	85.98752	M176	9.6	Area (Ha)
26	Assisted Natural Regeneration	Kamalamai Municipality-13	27.09166	86.01475	M166	10.6	Area (Ha)
27	Assisted Natural Regeneration	Dudhouli Municipality-10	26.99113	86.26868	M10	20.1	Area (Ha)
28	Assisted Natural Regeneration	Dudhouli Municipality-10	26.99407	86.27065	M13	7.7	Area (Ha)
29	Assisted Natural Regeneration	Dudhouli Municipality-10	27.00008	86.26247	M20	13.3	Area (Ha)
30	Assisted Natural Regeneration	Dudhouli Municipality-10	27.00407	86.26553	M22	3.0	Area (Ha)
31	Assisted Natural Regeneration	Dudhouli Municipality-10	27.02113	86.26044	M44	1.4	Area (Ha)
32	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02008	86.22066	M42	2.3	Area (Ha)
33	Assisted Natural Regeneration	Dudhouli Municipality-4	27.03171	86.14661	M77	1.8	Area (Ha)
34	Assisted Natural Regeneration	Dudhouli Municipality-4	27.03781	86.14746	M85	7.4	Area (Ha)
35	Assisted Natural Regeneration	Dudhouli Municipality-5	27.02288	86.21974	M55	2.1	Area (Ha)
36	Assisted Natural Regeneration	Dudhouli Municipality-4	27.03105	86.14772	M74	0.2	Area (Ha)
37	Assisted Natural Regeneration	Dudhouli Municipality-1	27.03897	86.14123	M90	2.1	Area (Ha)
38	Assisted Natural Regeneration	Dudhouli Municipality-1	27.03864	86.14399	M89	1.2	Area (Ha)
39	Assisted Natural Regeneration	Dudhouli Municipality-1	27.03621	86.13810	M83	1.7	Area (Ha)
40	Assisted Natural Regeneration	Dudhouli Municipality-1	27.04421	86.11987	M99	4.7	Area (Ha)
41	Assisted Natural Regeneration	Dudhouli Municipality-1	27.04788	86.12150	M105	2.4	Area (Ha)
42	Assisted Natural Regeneration	Dudhouli Municipality-2	27.05013	86.08486	M109	2.3	Area (Ha)
43	Assisted Natural Regeneration	Dudhouli Municipality-2	27.06840	86.06352	M141	14.0	Area (Ha)
44	Assisted Natural Regeneration	Kamalamai Municipality-10	27.11042	85.99848	M182	7.7	Area (Ha)
45	Assisted Natural Regeneration	Dudhouli Municipality-10	27.00997	86.25216	M26	27.1	Area (Ha)
46	Assisted Natural Regeneration	Dudhouli Municipality-2	27.05140	86.10528	M113	1.5	Area (Ha)
47	Assisted Natural Regeneration	Dudhouli Municipality-2	27.05140	86.10528	M114	1.5	Area (Ha)
48	Assisted Natural Regeneration	Dudhouli Municipality-4	27.03148	86.14705	M75	6.8	Area (Ha)
49	Assisted Natural Regeneration	Dudhouli Municipality-4	27.03148	86.14705	M76	6.8	Area (Ha)
50	Assisted Natural Regeneration	Dudhouli Municipality-10	27.00636	86.24906	M23	0.0	Area (Ha)
51	Policy advocacy and capacity buildings on monitoring Mechanism	Dudhouli Municipality-5	27.00967	86.23986	M390	1.0	Numbers

| 52	Policy advocacy and capacity buildings on monitoring Mechanism	Dudhouli Municipality-4	27.01522	86.19708	M391	1.0	Numbers
53	Policy advocacy and capacity buildings on monitoring Mechanism	Dudhouli Municipality-3	27.02205	86.13096	M392	1.0	Numbers
54	Policy advocacy and capacity buildings on monitoring Mechanism	Kamalamai Municipality-8	27.14393	85.93370	M395	1.0	Numbers
55	River bed farming	Kamalamai Municipality-10	27.12862	85.95922	A186	5.3	Area (Ha)
56	River bed farming	Kamalamai Municipality-10	27.13804	85.94546	A187	5.7	Area (Ha)
57	Establishment of forest nursery	Dudhouli Municipality-10	26.99578	86.25672	M42	1.0	Numbers
58	Establishment of forest nursery	Dudhouli Municipality-2	27.03631	86.10483	M164	1.0	Numbers
59	Establishment of forest nursery	Kamalamai Municipality-10	27.09801	85.98782	M214	1.0	Numbers
60	Establishment of FFS on Paddy	Dudhouli Municipality-9	26.97044	86.27839	A13	1.0	Numbers
61	Establishment of FFS	Dudhouli Municipality-5	27.02152	86.20983	A101	1.0	Numbers
62	Establishment of FFS	Dudhouli Municipality-4	27.02182	86.16511	A104	1.0	Numbers
63	Establishment of FFS	Dudhouli Municipality-2	27.04474	86.08696	A194	1.0	Numbers
64	Establishment of FFS	Kamalamai Municipality-10	27.08957	85.99667	A213	1.0	Numbers
65	Establishment of FFS	Dudhouli Municipality-10	27.01606	86.25922	A430	1.0	Numbers
66	Establishment of FFS	Dudhouli Municipality-1	27.04409	86.13694	A431	1.0	Numbers
67	Establishment of FFS	Dudhouli Municipality-1	27.04031	86.13283	A432	1.0	Numbers
68	Establishment of FFS	Dudhouli Municipality-1	27.02972	86.14539	A433	1.0	Numbers
69	Establishment of FFS	Dudhouli Municipality-4	27.02364	86.15178	A434	1.0	Numbers
70	Establishment of FFS	Dudhouli Municipality-5	27.03494	86.20622	A435	1.0	Numbers
71	Establishment of FFS	Dudhouli Municipality-5	27.01577	86.24318	A436	1.0	Numbers
72	Establishment of FFS	Dudhouli Municipality-10	27.01394	86.24865	A437	1.0	Numbers
73	Establishment of FFS	Dudhouli Municipality-10	27.01939	86.25154	A438	1.0	Numbers
74	Establishment of FFS	Dudhouli Municipality-10	27.01410	86.26710	A439	1.0	Numbers
75	Establishment of FFS	Dudhouli Municipality-10	27.00265	86.25007	A440	1.0	Numbers
76	Establishment of FFS	Dudhouli Municipality-10	26.99315	86.26263	A441	1.0	Numbers
77	Establishment of FFS	Dudhouli Municipality-10	26.98601	86.25996	A442	1.0	Numbers
78	Establishment of FFS	Dudhouli Municipality-9	26.98968	86.27461	A443	1.0	Numbers
79	Establishment of FFS	Dudhouli Municipality-10	26.99551	86.27731	A444	1.0	Numbers
80	Establishment of FFS	Dudhouli Municipality-9	26.97987	86.28320	A445	1.0	Numbers
81	Establishment of FFS	Kamalamai Municipality-10	27.10265	85.98144	A446	1.0	Numbers
82	Establishment of agroforestry nursery	Dudhouli Municipality-2	27.03591	86.10404	A393	1.0	Numbers
83	Establishment of agroforestry nursery	Kamalamai Municipality-10	27.11076	85.97280	A394	1.0	Numbers
84	Construction of conservation ponds	Dudhauli Muncipality 5 Ghari Thumsi	27.01319	86.23156	A41	1.0	Numbers
85	Construction of conservation ponds	Kamalamai Municipality 10 Dobhantar	27.09097	86.00591	A116	1.0	Numbers
86	Construction of conservation ponds	Dudhouli Municipality 2 Budhuna-Gagan	27.05825	86.06816	A130	1.0	Numbers
87	Construction of conservation ponds	Dudhouli Municipality 2 Ratanpur	27.04845	86.08782	A132	1.0	Numbers
88	Construction of conservation ponds	Dudhouli Municipality 2 Gagan catchment	27.04840	86.07405	A200	1.0	Numbers
89	Construction of conservation ponds	Dudhouli Municipality 1 Bangka	27.04857	86.11493	A215	1.0	Numbers
90	Water harvesting structure (Dam)	Kamalamai Municipality-10	27.15611	85.92161	A406	1.0	Numbers
91	Water harvesting structure (Dam)	Dudhouli Municipality-2	27.05798	86.08132	A407	1.0	Numbers
92	Water harvesting structure (Dam)	Dudhouli Municipality-5	27.02875	86.25223	A408	1.0	Numbers
93	Construction of conservation ponds	Dudhouli Municipality 4 Dudaha	27.02626	86.19369	A454	1.0	Numbers
94	Water harvesting structure (Dam)	Kamalamai Municipality-10	27.10166	85.99123	A455	1.0	Numbers
95	Water harvesting structure (Dam)	Kamalamai Municipality-10	27.14229	85.95337	A456	1.0	Numbers
96	Water harvesting structure (Dam)	Kamalamai Municipality-11	27.16235	85.91331	A457	1.0	Numbers
97	Wetland protection	Dudhouli Municipality-13	27.03683	86.27488	A460	1.0	Numbers
98	Wetland protection	Dudhouli Municipality-10	26.99928	86.25700	A458	1.0	Numbers
99	Wetland protection	Dudhouli Municipality-4	27.03079	86.15883	A459	1.0	Numbers
100	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-10	26.98462	86.25489	A5	1.3	Length (Km)
101	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-10	26.98815	86.25006	A6	0.7	Length (Km)
102	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-10	26.98841	86.24932	A8	0.2	Length (Km)
103	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-10	26.99946	86.25733	A19	0.1	Length (Km)
104	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-10	27.00009	86.24768	A21	1.4	Length (Km)
105	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-6	27.00900	86.20248	A25	0.1	Length (Km)
106	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-5	27.01070	86.23634	A28	0.4	Length (Km)
107	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-4	27.01179	86.20693	A462	0.8	Length (Km)

108	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-5	27.01222	86.21010	A31	0.1	Length (Km)
109	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-5	27.01263	86.23197	A32	0.4	Length (Km)
110	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-5	27.01399	86.21991	A34	2.1	Length (Km)
111	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-5	27.01694	86.24489	A37	0.2	Length (Km)
112	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-4	27.01956	86.15918	A463	0.3	Length (Km)
113	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-3	27.02257	86.12388	A51	0.2	Length (Km)
114	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-3	27.02266	86.12349	A53	0.2	Length (Km)
115	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-4	27.02651	86.15426	A464	0.2	Length (Km)
116	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-1	27.02775	86.13029	A465	2.9	Length (Km)
117	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-2	27.03956	86.08116	A466	1.0	Length (Km)
118	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-2	27.04659	86.07894	A467	0.2	Length (Km)
119	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-1	27.04899	86.11437	A108	0.3	Length (Km)
120	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-2	27.04920	86.07806	A468	0.1	Length (Km)
121	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-2	27.05077	86.07877	A469	0.1	Length (Km)
122	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.05397	86.06047	A470	0.9	Length (Km)
123	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.05402	86.05635	A118	0.8	Length (Km)
124	Riverbank stabilization with bio-engineering structures	Dudhouli Municipality-2	27.05409	86.06607	A471	0.1	Length (Km)
125	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.05632	86.05871	A472	0.3	Length (Km)
126	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.05674	86.04871	A473	0.4	Length (Km)
127	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.05746	86.05282	A127	0.6	Length (Km)
128	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.06603	86.03974	A474	0.2	Length (Km)
129	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.07318	86.02884	A147	0.1	Length (Km)
130	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.07451	86.02884	A148	1.1	Length (Km)
131	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.08036	86.02773	A475	0.8	Length (Km)
132	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-13	27.08389	86.01865	A161	0.0	Length (Km)
133	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-9	27.10916	85.97057	A476	0.2	Length (Km)
134	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-10	27.13059	85.96027	A477	0.5	Length (Km)
135	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-10	27.14065	85.94456	A478	0.7	Length (Km)
136	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-10	27.14708	85.93224	A479	1.3	Length (Km)
137	Riverbank stabilization with bio-engineering structures	Kamalamai Municipality-8	27.16579	85.90282	A480	0.0	Length (Km)
138	Community land plantation	Dudhouli Municipality-11	26.98215	86.25239	A4	2.5	Area (Ha)
139	Demonstration plantation	Dudhouli Municipality-2	27.04399	86.07620	A98	4.0	Area (Ha)
140	Community land plantation	Dudhouli Municipality-2	27.04065	86.08205	A94	16.2	Area (Ha)
141	Community land plantation	Kamalamai Municipality-13	27.05565	86.05003	A122	1.2	Area (Ha)
142	Community land plantation	Kamalamai Municipality-13	27.07461	86.03027	A149	8.7	Area (Ha)
143	Demonstration plantation	Kamalamai Municipality-9	27.08147	86.00406	A159	1.1	Area (Ha)
144	Community land plantation	Kamalamai Municipality-10	27.08790	85.99502	A162	30.5	Area (Ha)
145	Woodlot establishment in private land	Kamalamai Municipality-10	27.09345	85.98166	A170	1.7	Area (Ha)
146	Woodlot establishment in private land	Kamalamai Municipality-10	27.10049	85.97586	A174	10.6	Area (Ha)
147	Community land plantation	Kamalamai Municipality-10	27.12185	85.96473	A185	8.9	Area (Ha)
148	Community land plantation	Kamalamai Municipality-10	27.14194	85.93677	A188	5.6	Area (Ha)
149	Woodlot establishment in private land	Kamalamai Municipality-10	27.14787	85.92837	A194	7.8	Area (Ha)
150	Community land plantation	Kamalamai Municipality-10	27.15158	85.92246	A197	2.2	Area (Ha)
151	Woodlot establishment in private land	Kamalamai Municipality-10	27.09678	85.98122	A173	4.8	Area (Ha)
152	Woodlot establishment in private land	Dudhouli Municipality-2	27.02831	86.10722	A69	58.6	Area (Ha)
153	Promotion of agro-forestry system with riverbank stabilization	Dudhouli Municipality-2	27.03410	86.10252	A80	37.4	Area (Ha)

154	Demonstration plantation	Dudhouli Municipality-1	27.02945	86.13486	A73	11.3	Area (Ha)
155	Community land plantation	Dudhouli Municipality-1	27.02709	86.14018	A67	13.7	Area (Ha)
156	Woodlot establishment in private land	Dudhouli Municipality-1	27.02263	86.13739	A52	33.9	Area (Ha)
157	Riparian plantation	Dudhouli Municipality-9	26.96079	86.27469	A1	35.5	Area (Ha)
158	Community land plantation	Kamalamai Municipality-13	27.07318	86.02884	A146	0.0	Area (Ha)
159	Community land plantation	Kamalamai Municipality-9	27.10786	85.97176	A179	0.0	Area (Ha)
160	Woodlot establishment in private land	Dudhouli Municipality-10	26.98841	86.24932	A7	0.0	Area (Ha)
161	Community land plantation	Dudhouli Municipality-5	27.01222	86.21010	A30	0.0	Area (Ha)
162	Community land plantation	Kamalamai Municipality-13	27.07605	86.02553	A150	6.3	Area (Ha)
163	Community land plantation	Kamalamai Municipality-13	27.07605	86.02553	A150	17.5	Area (Ha)
164	Community land plantation	Kamalamai Municipality-13	27.07605	86.02553	A150	0.0	Area (Ha)
165	Community land plantation	Kamalamai Municipality-10	27.10921	85.97145	A181	10.3	Area (Ha)
166	Woodlot establishment in private land	Dudhouli Municipality-5	26.99934	86.23008	A18	388.8	Area (Ha)
167	Woodlot establishment in private land	Dudhouli Municipality-5	26.99934	86.23008	A18	0.2	Area (Ha)
168	Community land plantation	Dudhouli Municipality-5	27.01275	86.20691	A33	11.0	Area (Ha)
169	Community land plantation	Dudhouli Municipality-5	27.01275	86.20691	A33	0.1	Area (Ha)
170	Community land plantation	Dudhouli Municipality 4	27.01351	86.19723	A396	10.4	Area (Ha)
171	Community land plantation	Dudhouli Municipality 5	27.00904	86.23862	A397	6.9	Area (Ha)
172	Community land plantation	Dudhouli Municipality 10	26.97388	86.25983	A398	20.5	Area (Ha)
173	Community land plantation	Dudhouli Municipality 4	27.01637	86.14967	A399	3.8	Area (Ha)
174	Community land plantation	Dudhouli Municipality 4	27.01450	86.15189	A400	0.8	Area (Ha)
175	Community land plantation	Dudhouli Municipality 4	27.02110	86.14963	A401	6.5	Area (Ha)
176	Community land plantation	Kamalamai Municipality 13	27.06367	86.03496	A402	9.3	Area (Ha)
177	Community land plantation	Kamalamai Municipality-8	27.15486	85.91282	A403	2.1	Area (Ha)
178	Promotion of agro-forestry system with riverbank stabilization	Kamalamai Municipality 13	27.07877	86.03959	A404	42.5	Area (Ha)
179	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-10, Lakhima Khola	26.99762	86.27359	M46	1.0	Numbers
180	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-10, Kartha Khola	26.99771	86.25530	M47	1.0	Numbers
181	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-10, Badahariya Khola	27.01150	86.25042	M71	1.0	Numbers
182	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-5, Kuluwa Khola	27.01968	86.22660	M92	1.0	Numbers
183	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-10, Jhale Khola	27.02138	86.25695	M100	1.0	Numbers
184	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-13, Jalkini Khola	27.02273	86.27311	M114	1.0	Numbers
185	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-10, Tekan Khola	27.02367	86.26668	M121	1.0	Numbers
186	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-5, Talakha Khola	27.02431	86.24633	M124	1.0	Numbers
187	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-5, Dudadha Khola	27.02577	86.19522	M128	1.0	Numbers
188	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-5, Rani Khola	27.02693	86.25105	M135	1.0	Numbers
189	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-4, Tamarni Khola	27.02870	86.15632	M142	1.0	Numbers
190	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-5, Phedi Khola	27.03259	86.21262	M157	1.0	Numbers
191	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-4, Tamor Khola	27.03279	86.15559	M158	1.0	Numbers
192	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-13, Chisapani Khola	27.03604	86.27783	M162	1.0	Numbers
193	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-13, Hatti Khola	27.04220	86.28873	M187	1.0	Numbers
194	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-13, Kaijale Khola	27.04376	86.27337	M189	1.0	Numbers
195	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-1, Bichitra Khola	27.04631	86.13241	M196	1.0	Numbers
196	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-1, Bangkha Khola	27.05034	86.11444	M207	1.0	Numbers

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197	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-2, Range Khola	27.05080	86.09896	M208	1.0	Numbers
198	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Dudhouli Municipality-2, Gogan Khola	27.05582	86.08070	M224	1.0	Numbers
199	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Kamalamai Municipality-13, Kher Khola	27.05808	86.05781	M232	1.0	Numbers
200	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Kamalamai Municipality-13, Madaha Khola	27.07838	86.04012	M289	1.0	Numbers
201	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Kamalamai Municipality-10, Twakle Khola	27.09607	86.00708	M336	1.0	Numbers
202	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Kamalamai Municipality-10, Bhairung Khola	27.14368	85.95425	M375	1.0	Numbers
203	Torrent-Gully stabilization through check dams, contour planting, stone walls etc.	Kamalamai Municipality-10, Pipal Kholsi	27.11116	85.97344	A447	1.0	Numbers
204	Climate Resilient Agriculture		27.10457	85.97881	A482	110.6	Area (Ha)
205	Climate Resilient Agriculture		27.08881	86.00113	A483	125.4	Area (Ha)
206	Climate Resilient Agriculture		27.04231	86.13540	A484	27.0	Area (Ha)
207	Climate Resilient Agriculture		27.04239	86.10195	A485	533.9	Area (Ha)
208	Climate Resilient Agriculture		27.03913	86.12713	A486	108.1	Area (Ha)
209	Climate Resilient Agriculture		27.02893	86.14580	A487	69.7	Area (Ha)
210	Climate Resilient Agriculture		27.02589	86.15698	A488	105.1	Area (Ha)
211	Climate Resilient Agriculture		27.01900	86.18237	A489	158.8	Area (Ha)
212	Climate Resilient Agriculture		27.03222	86.20399	A490	78.9	Area (Ha)
213	Climate Resilient Agriculture		27.02273	86.20983	A491	261.8	Area (Ha)
214	Climate Resilient Agriculture		27.01466	86.26734	A492	18.5	Area (Ha)
215	Climate Resilient Agriculture		27.01820	86.25939	A493	45.3	Area (Ha)
216	Climate Resilient Agriculture		26.99349	86.27711	A494	40.5	Area (Ha)
217	Climate Resilient Agriculture		26.97807	86.28528	A495	137.1	Area (Ha)
218	Climate Resilient Agriculture		26.96959	86.27786	A496	210.2	Area (Ha)
219	Climate Resilient Agriculture		26.98543	86.27617	A497	93.8	Area (Ha)
220	Climate Resilient Agriculture		26.99094	86.26003	A498	82.2	Area (Ha)
221	Climate Resilient Agriculture		26.97823	86.26479	A499	213.4	Area (Ha)
222	Climate Resilient Agriculture		27.00394	86.25353	A500	148.7	Area (Ha)
223	Climate Resilient Agriculture		27.02083	86.24943	A501	80.8	Area (Ha)
224	Climate Resilient Agriculture		27.01282	86.24997	A502	66.3	Area (Ha)
225	Climate Resilient Agriculture		27.01328	86.23912	A503	76.8	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
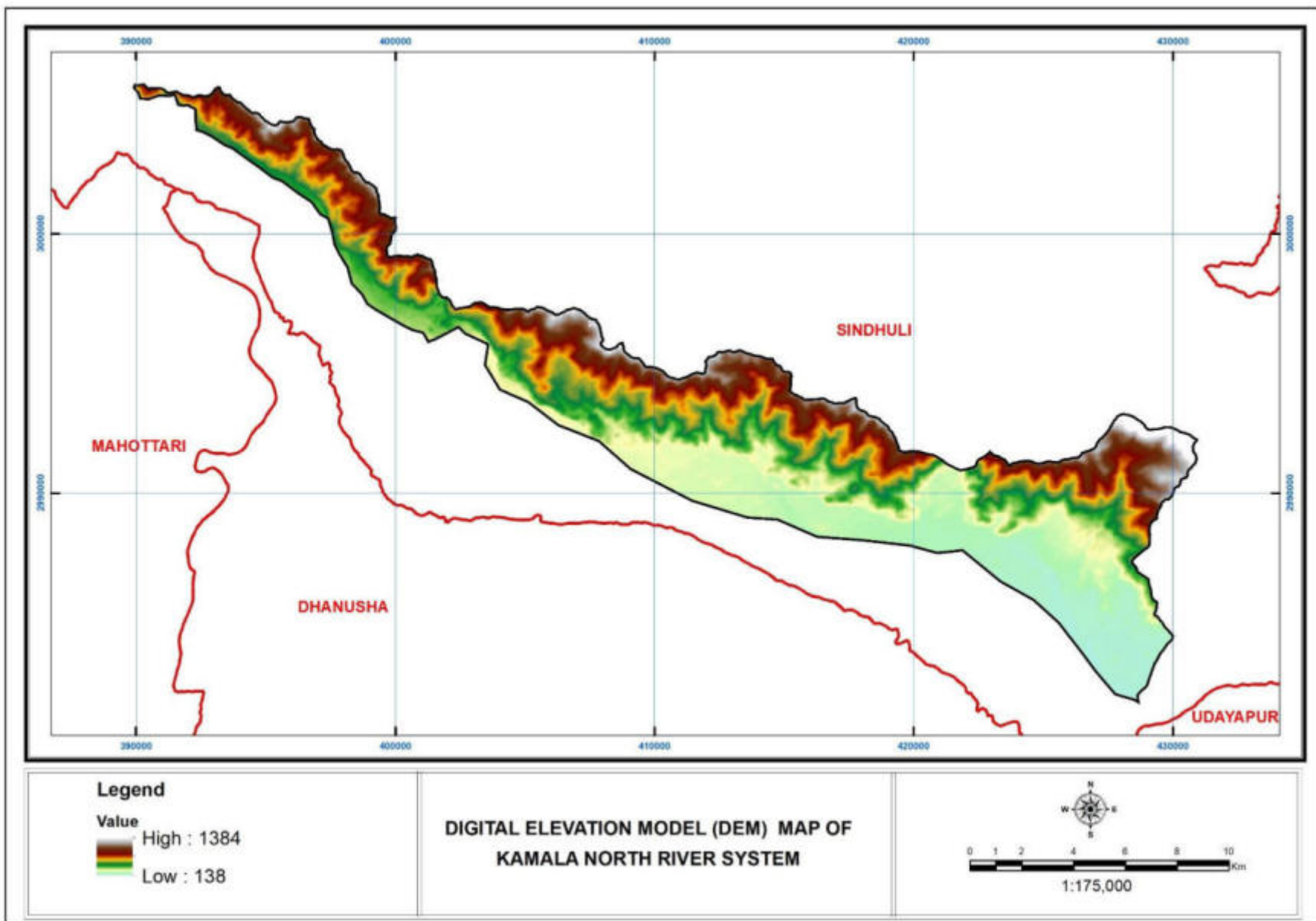
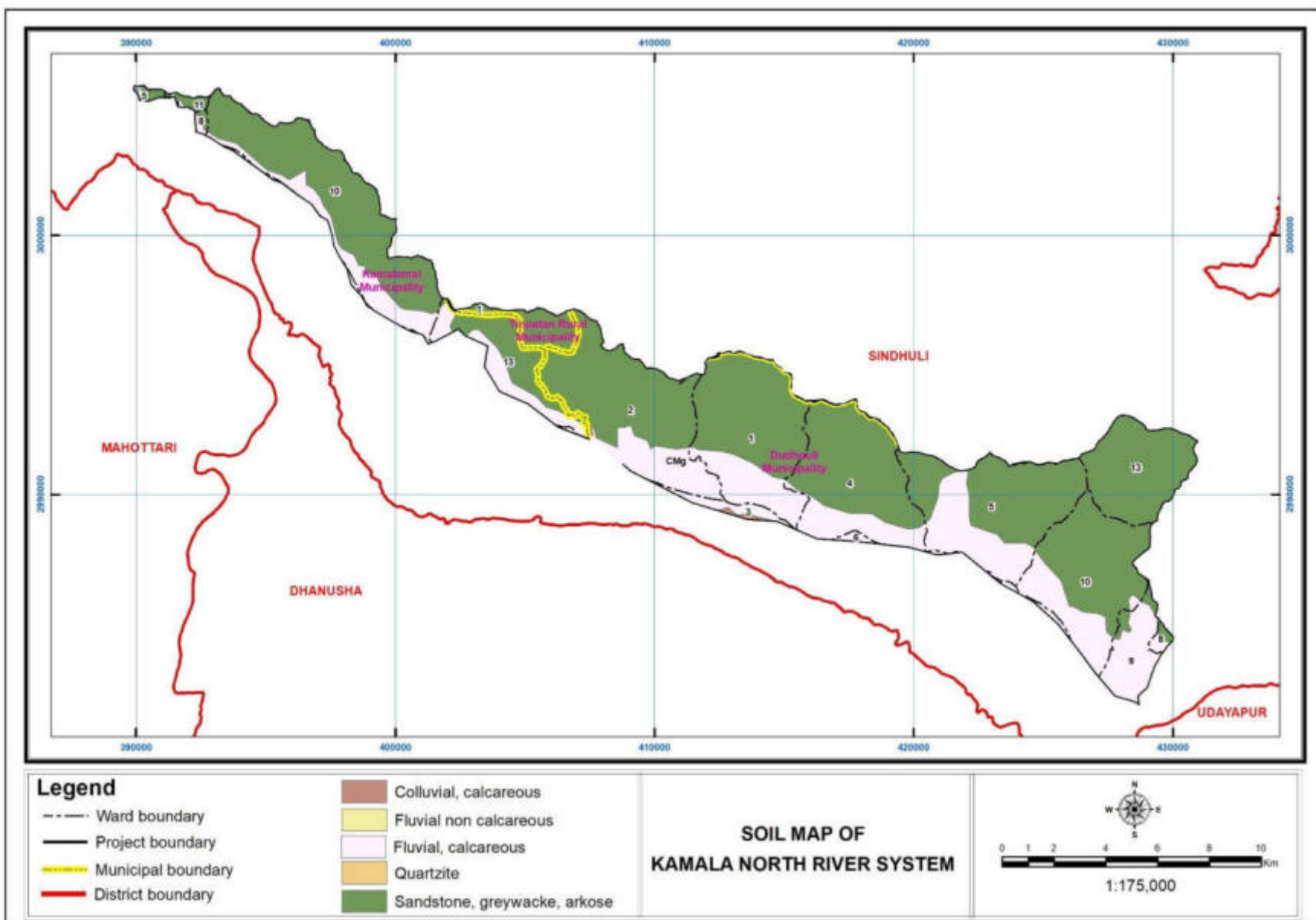Annex 2: Thematic Maps of the Kamala North river system
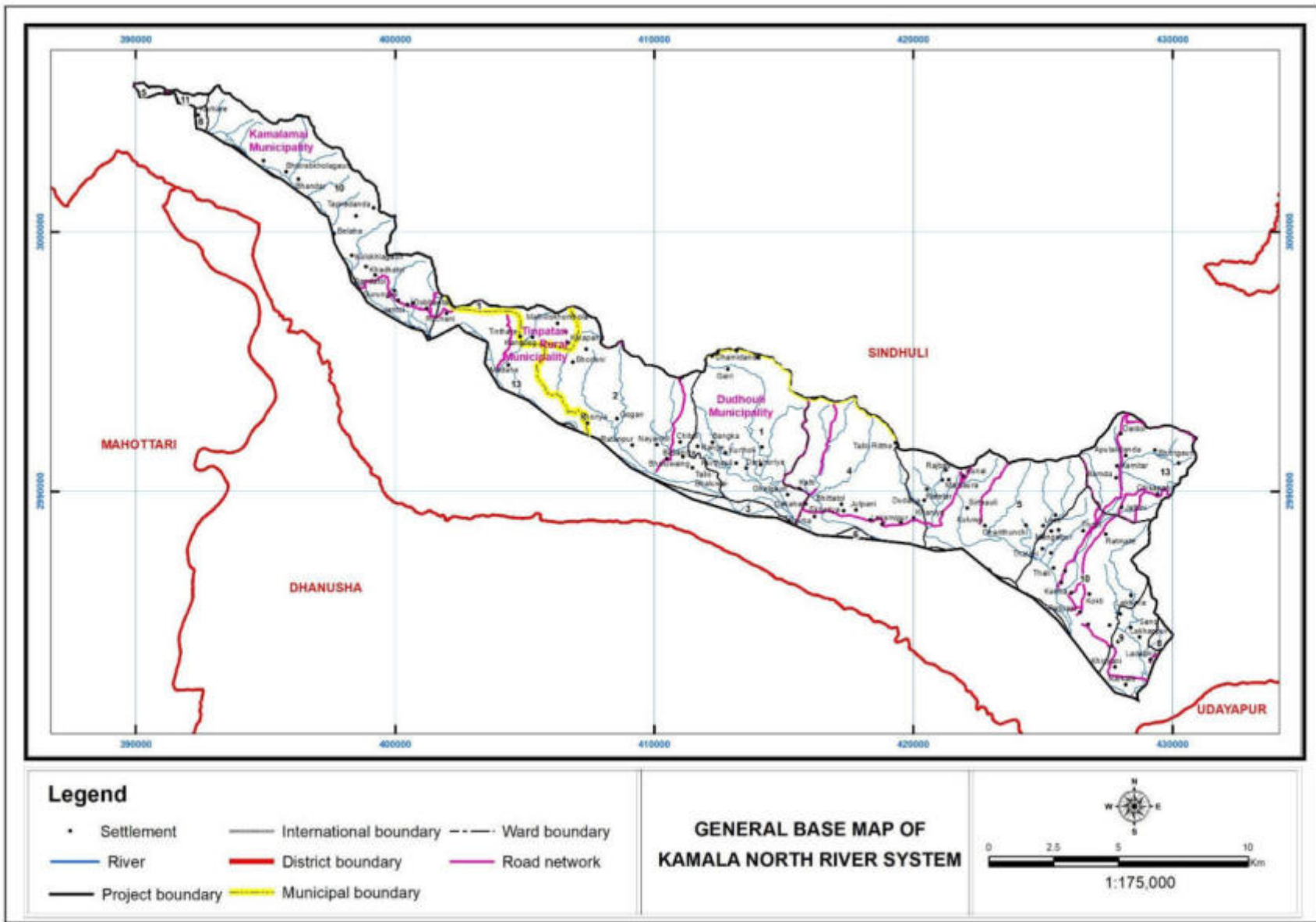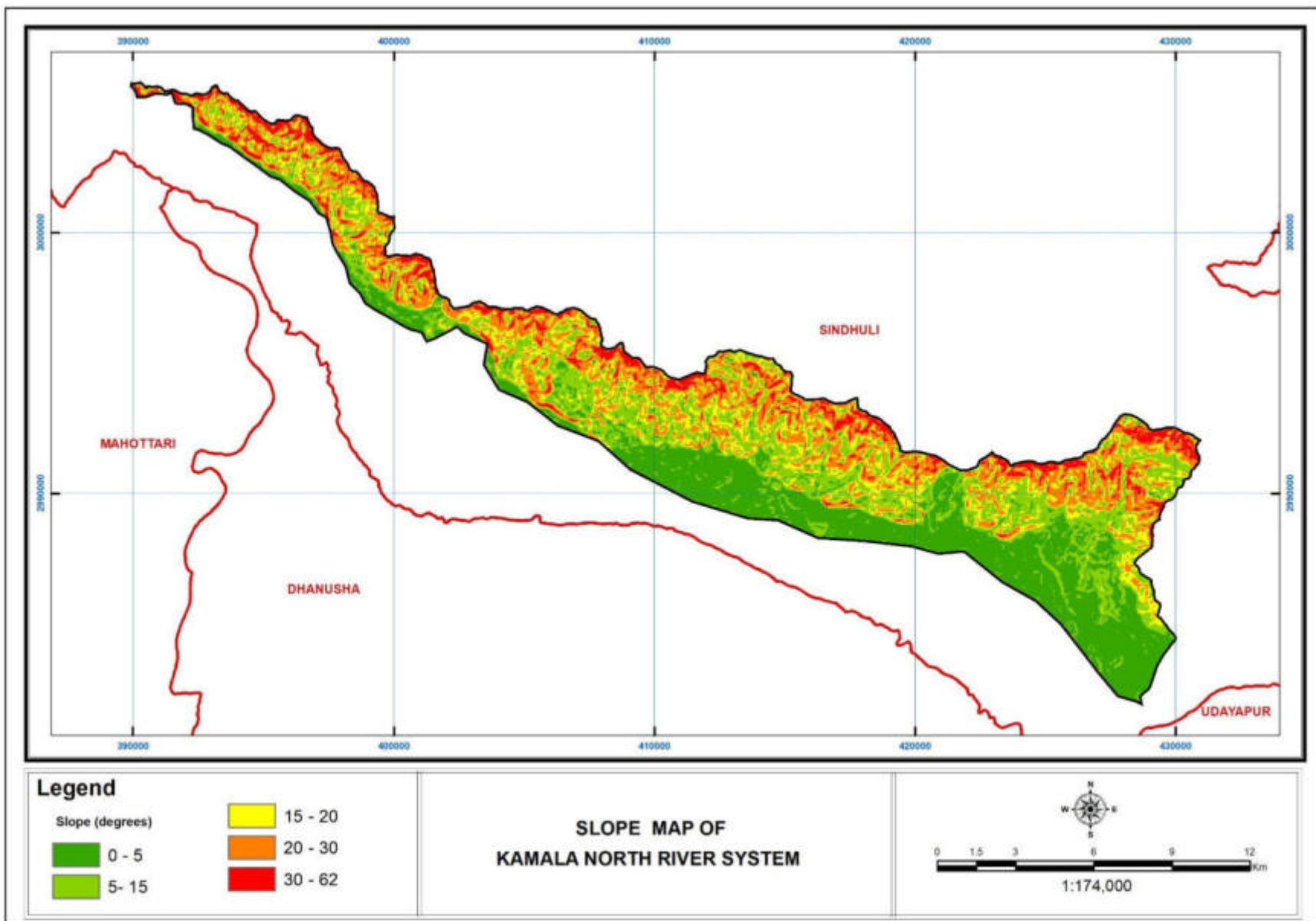

Base Map of Kamala North river system
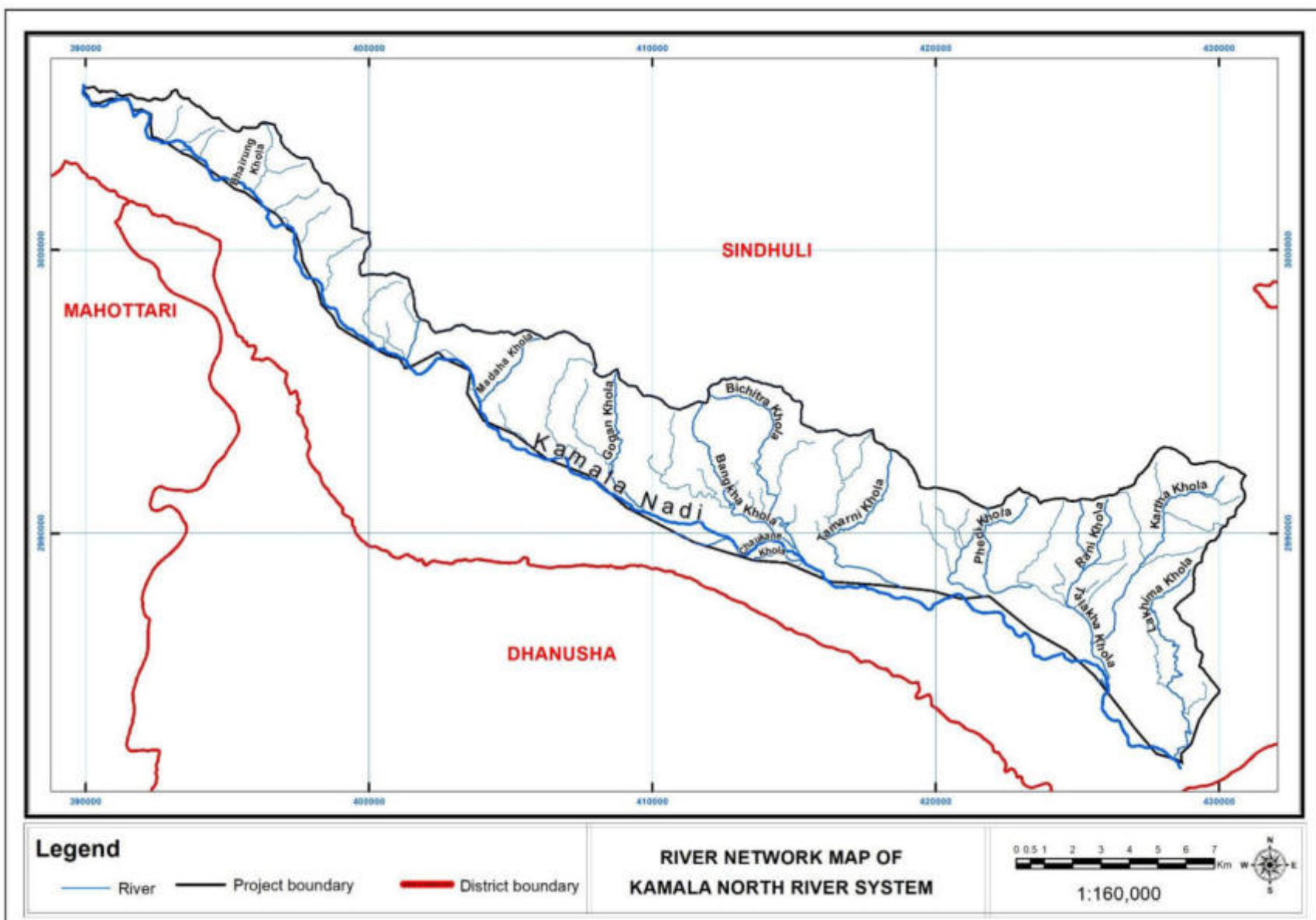
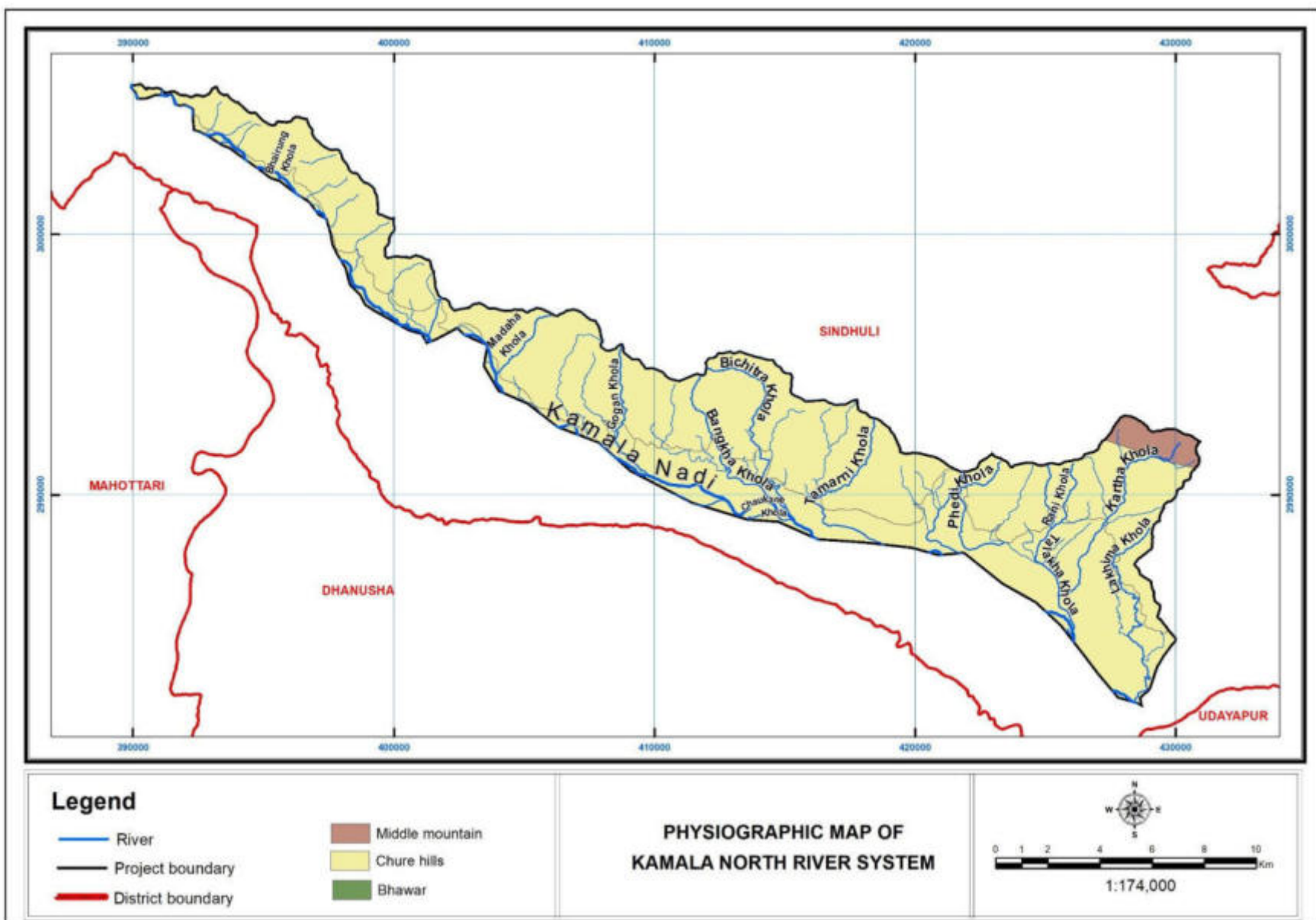River network of Kamala North river system

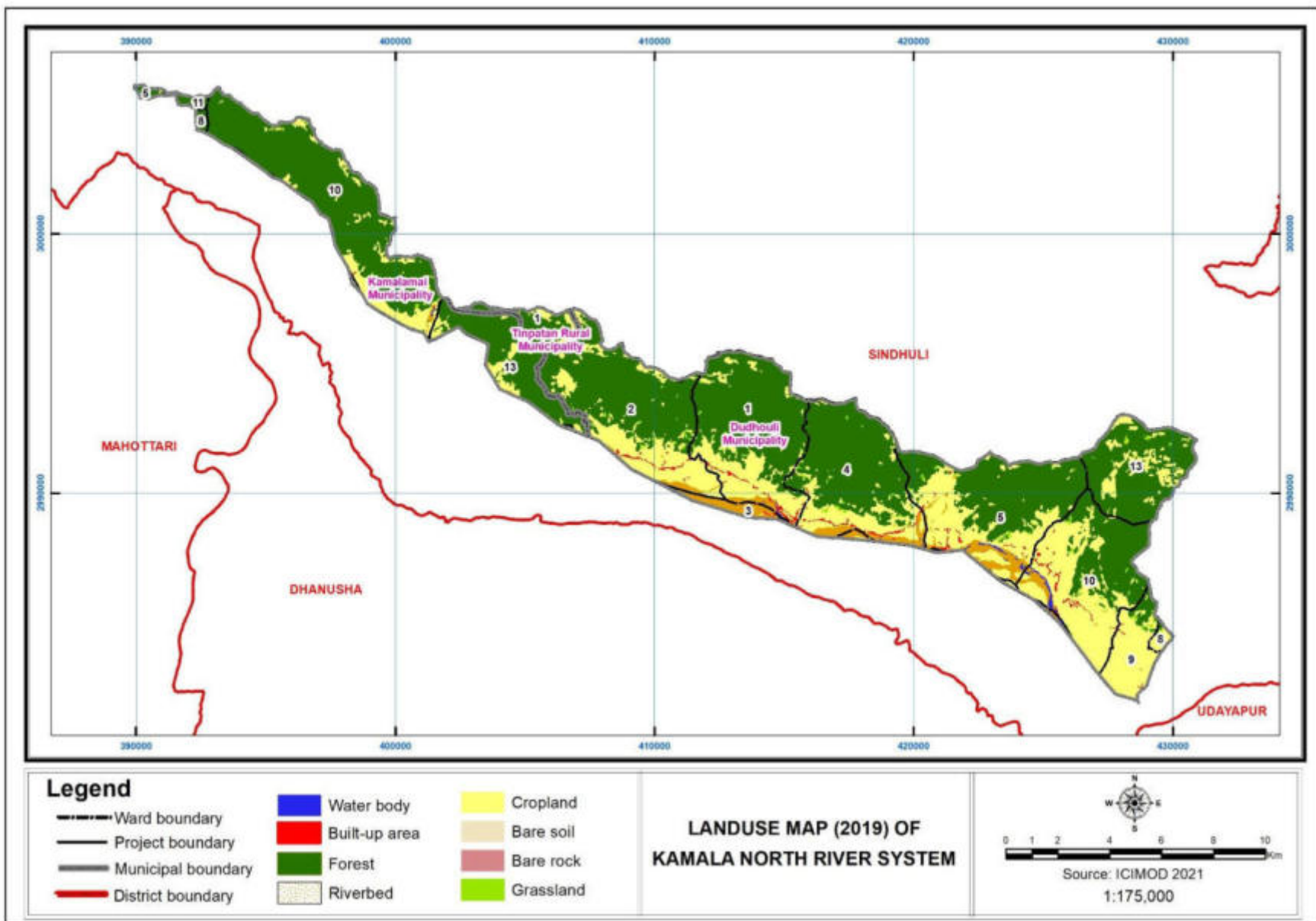Digital Elevation Map of the Kamala North river system

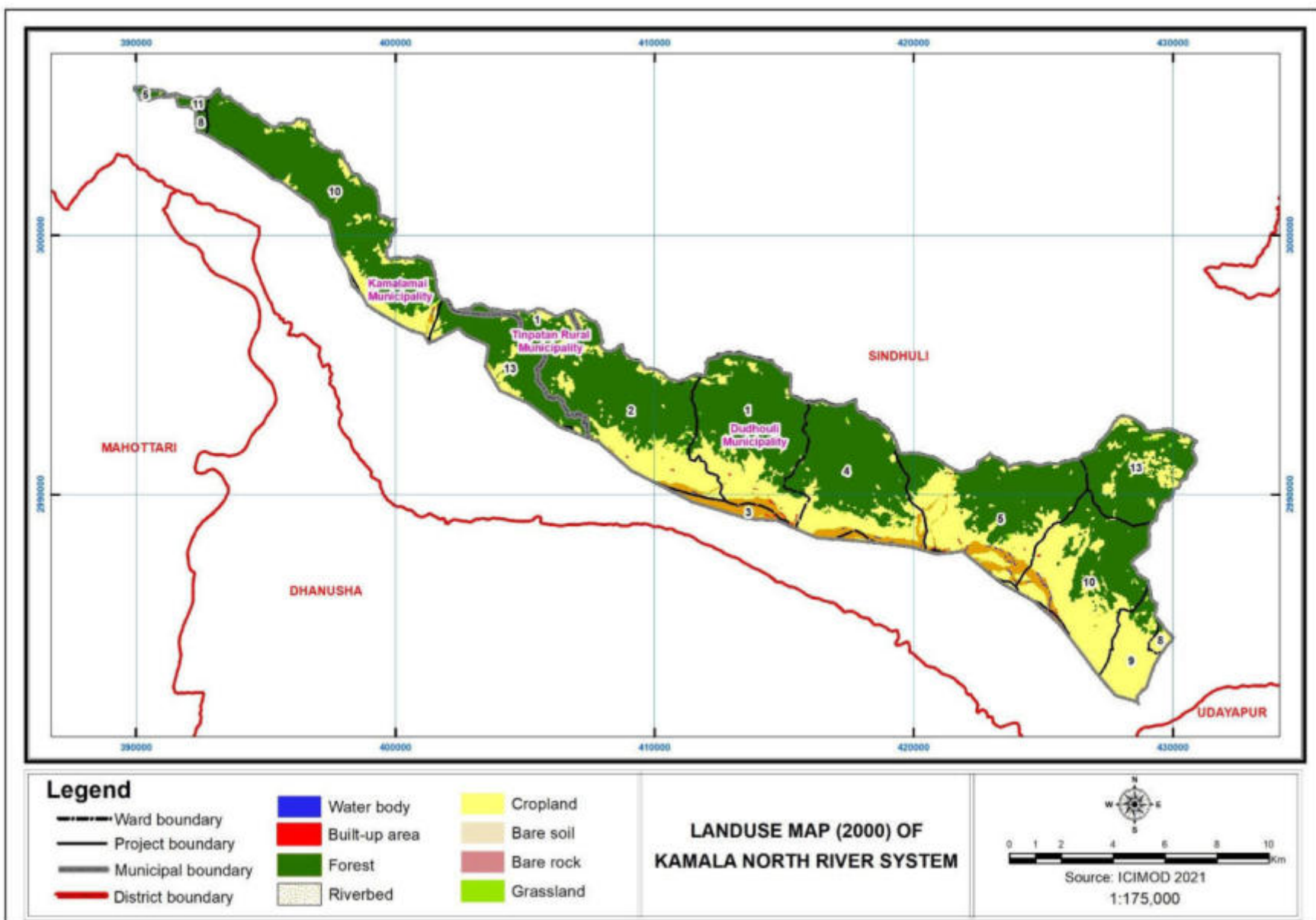
Soil map of the Kamala North river system

Slope map of the Kamala North river system

Physiographic map of the Kamala North river system

Landuse map of Kamala North river system (2019, ICIMOD)

Landuse map of Kamala North river system (2000, ICIMOD)

Glimpses of the events and site visits in Kamala North river system

Participants in workshops in Dadagau

Participants in the workshops in Sirthauli

Site inspection and interact with the locals in the hotspot (potential for plantation in Dudhauli

River site sediment deposition (possible for plantation) 27.022627/86.13739 Dudhouli -1 Forest Loss (26.991128/86.268677) Dudhouli Municipality-10

Landslide threats forests and community (27.018331/86.222547)   River bank unstabilization (27.010703/86.236343) Dudhouli Municipality-5

Forest loss (27.009965/86.252158) Dudhouli -10 Kamala riverbank cutting forests and forest soil, need for stabilization (26.999/86.257)

Expert Planning Workshop in Sindhuli: validation of CERP of Kamal North

Province Level Validation Workshop, Sindhuli Madhi