Government of Nepal

Ministry of Energy, Water Resources and Irrigation (MoEWRI)
and
Ministry of Agriculture and Livestock Development (MoALD)
Department of Water Resources and Irrigation/ Department of Agriculture

Modernization of Rani Jamara Kulariya Irrigation Project - Phase 3

Environmental and Social Scoping Report

February 2025

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1 Introduction

The aim of RJKIP III to expand access to irrigation services, increase farm productivity, enhance climate resilience, and boost rural incomes in Kailali district, Sudurpaschim Province through four components: (i) Component 1: Irrigation improvement and development in Patharaiya area by supporting a 13km extension of the Pathariya feeder canal, modernization of lower-order channels and related structures, and rehabilitation and construction of rural roads and bridges to improve rural connectivity; (ii) Component 2: Watershed management which includes the improvement and rehabilitation of existing lakes and wetlands to increase water storage capacity for irrigation purposes, construction of flood and erosion protection system in the command area, and watershed planning and management in the project area; (iii) Component 3: Agriculture services support, including the adoption of modern technologies for efficient production and better water resource management, market extension and outreach services and support to farmer organizations, cooperatives; and (iv) Component 4: Institutional Support and Project Management, including capacity building and institutional strengthening of water user associations (WUA), implementation support to the project implementation entity, design and construction supervision consulting services, environment, social and dam safety safeguards, as well as future project development and preparation. The project will align with Nepal's Green Resilient Inclusive Development (GRID) approach to ensure the sustainability and resilience of irrigation systems and rural livelihoods. The project is expected to come effective in 2025 and close in 2030.

1.1 Overview of the Project Components

1.1.1 Component 1: Irrigation Improvement and Development (US$100 million)

This component focuses on expanding and enhancing the irrigation network to distribute water from the existing intake at Chisapani. The main canal, with a capacity of 80 m^3/s, bifurcates into two branches: 40 m^3/s extending to the RJK area and 40 m^3/s to Lamki and Pathariya. The Government of Nepal (GoN) has completed the Lamki feeder canal and is developing its distribution networks (**Figure 1.1**). This component will extend the feeder canal westward from Lamki to Pathariya while constructing necessary distribution networks and channels to irrigate a net command area of 17,511 ha across five municipalities. Patharaiya currently includes a mix of existing irrigation systems (8,000 ha) and rain fed areas (7,500 ha). The existing systems are managed by Water User Committees (WUCs), but operations and maintenance (O&M) have been inadequate. After connecting these areas to the RJK system, significant rehabilitation and modernization will be required. With year-round irrigation, farmers will achieve cropping intensities of up to 226%. This component also includes improvements in rural roads, bridges, and operator housing.

1.1.2 Component 2: Watershed Management (US$20 million)

This component will finance watershed management activities to prevent soil erosion, conserve watershed areas, and mitigate the impacts of floods and droughts on agricultural productivity.

Activities will include riverbank protection, landslide and gully control, check dams, and afforestation. Natural lakes and wetlands in the project area, used by communities for irrigation, tourism, and fisheries, will be rehabilitated and augmented, with the development of new ponds where feasible. Given the seasonal variability of water availability, sustainable water storage solutions are critical. These measures, aligned with watershed management and conservation principles, will ensure the long-term sustainability of irrigation systems and agricultural command areas.

1.1.3 Component 3: Agriculture Support Services (US$20 million)

With year-round irrigation introduced during RJKIP Phase II, cropping intensity increased by 130% and crop diversification improved, particularly in the dry season. Phase III aims to further increase cropping intensity to 226% through targeted investments. While rice remains the dominant crop, there is a growing shift toward high-value crops such as wheat, pulses, oilseeds, maize, potatoes, and vegetables.

This component will finance interventions to:

1. Enhance agricultural productivity, efficiency, and resilience.
2. Improve farmers' capacity to adopt modern technologies and practices, particularly for better water resource management.
3. Promote value addition for agricultural products.

The component includes three subcomponents:

- **Subcomponent 3.1: Agricultural Modernization (US$15 million):**

  This will promote high-value agriculture and diversification, adoption of climate-smart technologies, improved crop varieties, and modern technologies for efficient production and water management. Demand-based extension services and linkages with ongoing initiatives will be strengthened. Producer-buyer alliances (PBAs) will be supported to enhance market access and financing, and digital technologies will be introduced in production and post-harvest processes.

- **Subcomponent 3.2: Farmer Capacity Development (US$3 million):**

  Hands-on training, on-farm demonstrations, and field seminars will be provided, tailored to local needs. This subcomponent will promote soil health and fertility, including low-methane rice cultivation and the use of bio or natural fertilizers. Demonstration sites will be established to showcase improved irrigation and drainage systems.

- **Subcomponent 3.3: Action Research and Knowledge Base (US$2 million):**

  Innovation grants will be offered to agricultural colleges, research organizations, cooperatives, and farmer organizations for activities such as fish farming, high-value crop trials, soil carbon sequestration studies, testing new grass varieties for feed, and analysis of interventions' cost-benefit. A framework for monitoring greenhouse gas (GHG) emissions will also be developed.

1.1.4 Component 4: Institutional Support and Project Management (US$10 million)

This component focuses on capacity building and institutional strengthening of Water User Associations (WUAs) and project management support. It includes two subcomponents:

- **Subcomponent 4.1: Institutional Support and Capacity Building of WUAs (US$3 million):**

  WUAs will receive training on the management, operation, and maintenance (MOM) of the modernized system, equitable water distribution, and water use efficiency. Modern technologies like remote sensing and water accounting will be introduced. Block-level WUAs will manage irrigation systems below the interface infrastructure, while a federated WUA will manage higher-level systems under a joint management model. A MOM plan will be developed, and the capacity of both WUAs and the Irrigation Agency will be enhanced.

- **Subcomponent 4.2: Project Management (US$7 million):**

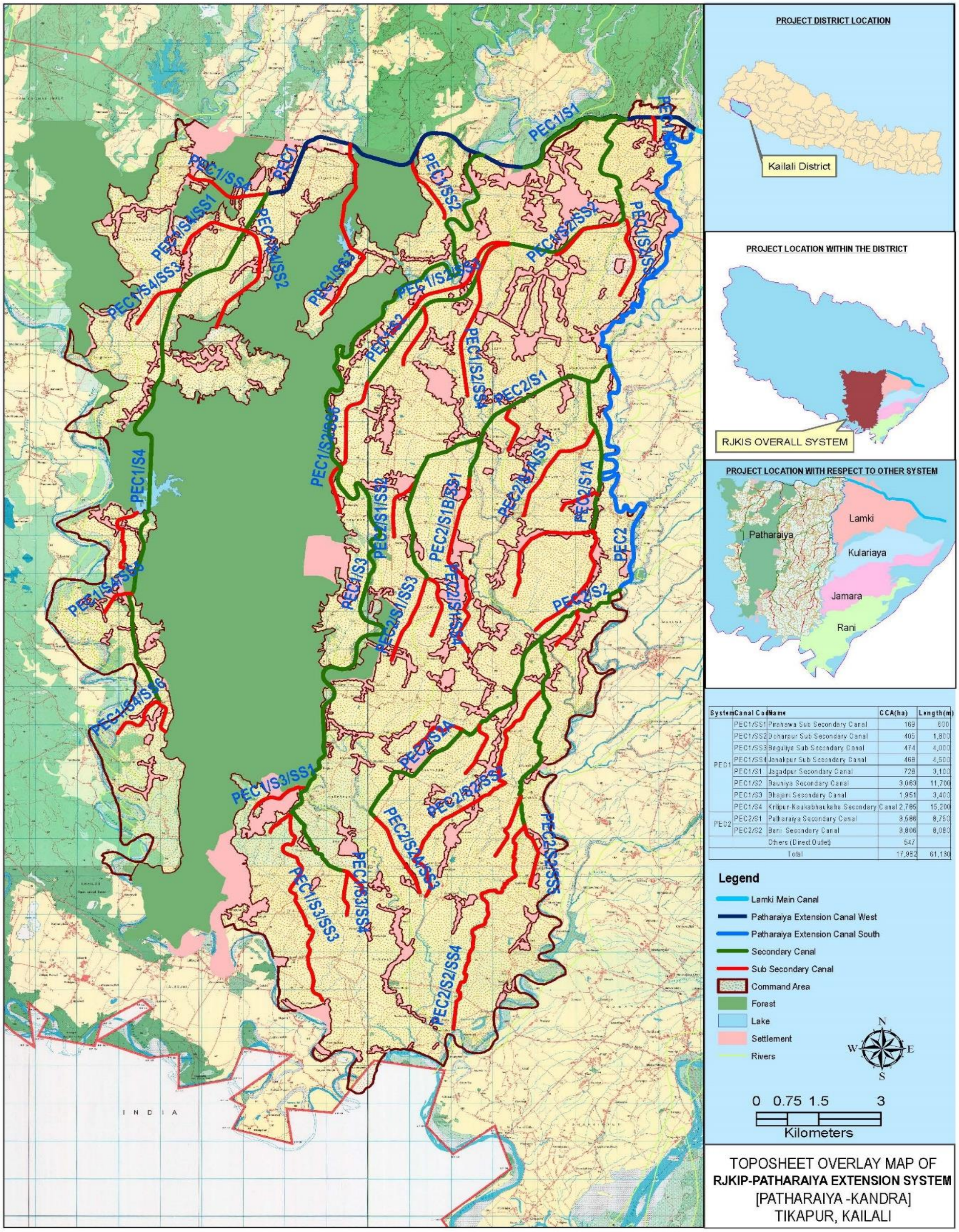
This includes engineering surveys, design, and construction supervision; strengthening management information systems (MIS); and enhancing capacities in environmental, social, and fiduciary management. It also supports feasibility studies, detailed project reports, and documents for future sectoral investments.

1.2 Objectives of the scoping study

The objective of the Environmental and Social Scoping Study is to assess the initial environmental and social risks associated with the Component 2 and Component 3 of the Project, and to define the necessary environmental due diligence for these components before individual investments can be implemented.

1.3 Rationale behind the Scoping Study

The Environmental and Social Scoping Study is crucial for identifying key risks and due diligence requirements for Component 2 and 3. Given the project's focus on watershed storage and irrigation, the study conducts scoping of dam safety, environmental and social risks, and cumulative impacts to ensure compliance with WB ESF and national regulations. It will also address downstream effects, biodiversity concerns, and water sustainability due to the multipurpose use of storages. The study also gives an overview of key risks associated with agricultural support services with focus on biodiversity impacts from land use change, management and use of agrochemicals, impacts associated with sexual exploitation and abuse, and integration of GESI in agricultural programs and outreach activities. The scoping will help define institutional arrangements, capacity-building needs, and stakeholder engagement strategies to ensure safe and sustainable project implementation.



System	Canal Code	Name	CCA(ha)	Length(m)
PEC1	PEC1/SS1	Pirahawa Sub Secondary Canal	169	800
	PEC1/SS2	Dcharpur Sub Secondary Canal	405	1,800
	PEC1/SS3	Bagahiya Sub Secondary Canal	474	4,000
	PEC1/SS4	Janakpur Sub Secondary Canal	468	4,500
	PEC1/S1	Jagadpur Secondary Canal	728	3,100
	PEC1/S2	Bauniya Secondary Canal	3,063	11,700
	PEC1/S3	Bhajani Secondary Canal	1,951	3,400
	PEC1/S4	Kripur-Kaukabhaukaha Secondary Canal	2,785	15,200
PEC2	PEC2/S1	Patharaiya Secondary Canal	3,586	8,750
	PEC2/S2	Bani Secondary Canal	3,806	8,080
Others (Direct Outlet)			547	
Total			17,982	61,130

Figure 1.1: Toposheet overlay map of RJKIP-PEP

2 Project Description

2.1 Detailed description of Component 2: Watershed Management

Component 2 will support efforts to control soil erosion, conserve watershed area, and reduce the impact of floods and droughts on agricultural productivity. It covers riverbank protection, landslide and gully control, check dams, and afforestation. The component aims to improve existing small multifunctional, water storage and create additional ponds to absorb monsoon precipitation. This is critical for water storage and irrigation system sustainability. The selection and number of reservoirs to be included in the project has not been finalized, so the scoping study is focusing on three proposed reservoirs (Bagaulia lake, Laukah Baukah lake and Koilahi Lake) that serve as example of potential investments and will serve to identify type of issues and environmental and social due diligence to support preparation of investments. The details of water storage investments and interventions by the project on these lakes is provided in Chapter 3.

2.2 Detailed description of Component 3: Agriculture Support Services

Component 3 intends to increase crop intensity and diversification, with a focus on horticulture and vegetable growing. It will cover both existing and new command areas covered by the RJK irrigation system. The component aims to improve agriculture production, efficiency, and resilience, as well as farmers' ability to adapt to current technologies and add value to their products. The initiative aims to promote high-value agriculture and diversification, implement climate-smart technology, and provide demand-based extension services. The initiative aims to develop producer-buyer collaborations and digital technologies during production and postproduction. Additionally, it aims to increase soil health and fertility by establishing demonstration sites for better irrigation systems and natural fertilizers.

2.2.1 Enhancing productivity, efficiency, and resilience of the agriculture sector

a) Crop support program e.g. cereal, vegetable
b) Seed production support program e.g. cereal, potato
c) Crop diversification: promotion of cash crops, off-seasonal vegetables, and fruits (pomegranate, dragon, etc.)
d) Promotion of climate-smart agriculture practices e.g. drought of flood tolerance species
e) Income-generating program support for small group-based farmers
f) Livestock support program: improved livestock breed, improving feeding practices, meat and milk product support program
g) Fish farming support program

2.2.2 Promotion of modern technologies and farming practices

a) Promotion of machine use i.e. tractor, power tiller, rotator, thresher, reaper, air drier, etc. for individual farmers or organization

2.2.3 Management of diseases, pest, and soil quality

b) Promotion of green fertilizer and bio-pesticides
c) Training on mitigating residual chemicals in agricultural product
d) Management of disease
e) Testing of soil quality
f) Development of Integrated Pest Management Plan

2.2.4 Promotion of agriculture extension program

a) Promotion of farmer field school
b) Collaboration with Agriculture Knowledge Center
c) Promotion of the banana fiber program and potato chips program
d) Promotion of climate-smart irrigation practices e.g. drip irrigation, etc.

2.2.5 Market, Branding, and supporting vulnerable group

a) Construction of cold storage
b) Support program women entrepreneurs
c) Support program for Mukta Kamaiya
d) Branding program of agriculture products
e) Exploration of markets

3 Watershed Storage Investments

3.1 Project Description

There are 197 reported lakes in the area that are currently being used for irrigation purposes or could potentially be used for irrigation, and the Borrower is currently identifying and shortlisting potential sites for this augmentation. The objective is to upgrade existing surface storage by either a) transferring flows from Pathariya irrigation scheme and augmenting water levels or b) capturing monsoon water storage to ensure the sustainability and resilience of irrigation schemes and livelihoods. Three of the lakes/ reservoirs currently considered for the study are Bagaulia lake, Laukah Baukah lake and Koilahi Lake.

3.1.1 Description of 3 Lakes proposed for intervention:

3.1.1.1 Koilahi Lake

The Koilahi Lake (Lat: 28.69041504°N; Lon:80.77163689°E) is located in Kailari Rural Municipality-9 of the Kailali district. The total area of the lake is 60.4 ha. The earth embankment that forms Koilahi Lake is around 800 m long and 3 to 4 m high and was constructed with the help of the local community about 30 years ago. The slopes forming the embankment are uneven and steep. Some undermining of the gabion baskets downstream of the outlet structure was observed. A gated reinforced concrete outlet has taken the place of an abandoned outlet structure. In the direction of the left abutment are two spillways constructed by the assistance from the army. The reservoir area is 10 ha with an average depth is 1.25 m. The source of water in the lake is rain and water is available year-round in the lake. The lake was built primarily for irrigation however currently serve for irrigation, fisheries, tourism, etc.

All outlets are blocked with netting to prevent the escape of fish. The dam breached shortly after the first impoundment without causing any casualties downstream and was immediately repaired. The current crest is about 3 – 4 m wide and is being used for access to various facilities including a temple and recreational area and a number of houses that use the crest for access as these have been built up against the embankment. The spillway crest is being artificially raised using sandbags in order to raise the level of the lake. This effectively reduces the freeboard and increases the risk of overtopping. The defunct outlet has been poorly abandoned and a high-water level during a flood could lead to leakage in this location. Some minor erosion was identified downstream of the main spillway structure. There are a number of embankments/dykes creating compartments within the lake. This is understood to be part of the activities linked to the fisheries.

3.1.1.2 Lauka Bhauka Lake

The Lauka Bhauka Lake (Lat:28.58792962°N; Lon:80.944807°E) is located in Bhajani Municipality-4 Bijuliya, Bhajani Municipality, Kailali district of Nepal. The total area of the lake is 46.1 ha. A tiny, uniform earth embankment, usually 3 to 5 m high, with a crest length of roughly 475 m and a crest width of 1.5 to 2.5 m, forms Laukah Baukah Lake and was

constructed by the local people many decades ago. It features two free overflow spillways that can be expanded over time, as well as an exit structure that feeds the irrigation canals and may be utilized to lower the water level if necessary. The reservoir area is 6 ha with an average depth of 0.6 m. The source of water in the lake is rain and water is available year-round in the lake. The lake was built primarily for irrigation however currently is used for multipurpose i.e. irrigation, fisheries, tourism, etc. The lake falls under Basanta corridor.

The dam breached in the last monsoon without causing any casualties downstream during the wet season. It apparently did not fail in overtopping, but the embankment failed under the increased load. The failed section was repaired using a mechanized plant and local material. The current crest varies from approximately 1.5m to 2.5m. The slopes forming the embankment are steep in places there is evidence of localized damage (origin uncertain) that has been repaired. The embankment was built around mature trees. These are now contained in the embankment. They looked healthy. Upstream vegetation appears to be trimmed down regularly. Some sections contain heavier vegetation, other sections appear to have reasonable grass cover on the downstream face. Some stone pitching is present on the upstream face. The repaired section has a low gabion basket retaining wall at the downstream toe. There is a large area of wet/ boggy ground this is suspected to be due to through and under seepage from the reservoir. Locals apparently add clay to the upstream face when they observe new seepages to reduce these. The bigger spillway structure formed of cement-faced masonry has some evidence of cracking and some leakage is entering the chute section. There are signs of loss of material within the embankment. All outlets are blocked with netting to prevent the escape of fish. There are a number of embankments/dykes creating compartments within the lake. This is understood to be part of the activities linked to the fisheries.

3.1.1.3 Bagaulia Lake

The lake **(**Latitude: 28.648735°N, Longitude: 80.993016°E) is located in Ghodaghodi Municipality in Kailali district. The area of the lake is 15.84 hectare (ha). A tiny, uniform earth wall that is roughly 3 to 4 meters high, 140 meters long, and 2 to 2.5 meters wide forms the lake. It was constructed by the locals several decades ago. It can discharge water to the downstream command area to a modest gated structure on the left side that consists of two vertical lift gates. When combined with the appropriate abutment, a low area at the interface serves as an unlined informal spillway. The lake features a tiny dyke with a gated structure that is thought to be utilized for lake fishing management. The local school is partially funded by the proceeds from the private fishing contract. The lake features a tiny dyke with a gated structure that is thought to be utilized for lake fishing management. Currently, it serves as a reservoir for both irrigation and fishing.

The dam has failed multiple times due to overtopping, last incident being the past monsoon. Incidents were described as caused by concentrated flows on low spots on the embankment crest leading to regressive erosion of the downstream face until formation of a full breach. Households were flooded downstream but no casualties were reported as flooding depth were described to be knee deep. Breaches are typically repaired using an excavator taking material

directly from the base of the lake. A village head explained that the structure had failed multiple times in overtopping incidents and was subsequently rebuilt each time. Downstream houses were flooded (up to knee height) but no casualties were reported. When the embankment was reconstructed post failure an excavator was mobilized and used material won locally from the reservoir itself. The embankment is understood to have been raised to allow an increase in the stored water volume in the past.

Surface is uneven, with many signs of desiccation cracking, downstream slope is heavily vegetated. Water accumulation towards the right-hand site of the dam suggesting a likely area of seepage through the foundation. The low spot located at the connection with the right abutment (heavily used footpath) which is likely to act as an informal spillway in periods of high flow. The lack of a formal spillway is a clear deficiency. There is poor vegetation management, mainly on the downstream face which increases the risk of failure in case of overtopping. The crest is narrow and both upstream and downstream slopes are steep and uneven. The material used to build the embankment appears to be a fine clay and is likely high plasticity as it is suffering from extensive shrinkage cracking. All outlets are blocked with netting to prevent the escape of fish. A large wet area apparently only dries up occasionally during dry years suggesting leakage or seepage is occurring in the dam foundation. The vegetation on the downstream face prevented the ability to assess whether seepage was occurring through the embankment itself. The outlet structure consists of two vertical lift gates, and a small informal footbridge is used to access the crest. It is constructed in cement faced brick masonry. Its overall condition is poor and there are signs of seepage around it occurring causing loss of embankment material

3.1.1.4 Proposed intervention for lakes

The primary aim is to enhance climate resilience, safety and improve agricultural productivity by utilizing these lakes as a sustainable water source for irrigation. The proposed interventions focus on the reconstruction, improvement, and management of water storage and distribution infrastructure to ensure efficient and reliable irrigation within the command area.

Proposed Intervention for Koilahi Lake (408-hectare command area)

The design report proposes a 5-meter-high earthen embankment dam with 6-meter-wide crest and a crest length of 1,840 meters will be constructed to regulate and store water. The intervention will reinforce the existing earthen embankment and there will be no new dam construction. At present, the Koilahi Lake is formed by a small homogeneous earth embankment approximately 4m high and 800m long. However, no augmentation from Pathraiya canal will be done. The dam will have a homogeneous fill design with 2H:1V slopes on both upstream and downstream sides for structural stability. The reservoir will have a total storage capacity of 2,825,686.79 m^3 at Full Supply Level (FSL) of 177 meters. A dead storage volume of 565,137.36 m^3 (20% of the total capacity) will be maintained to ensure sediment management and ecological balance. The project will utilize the existing outlet structure to regulate controlled water discharge. A freeboard of 1.5m has been proposed. The design report has proposed the dam and reservoir system designed to withstand a 50-year return period flood (16.7 m^3/s) while ensuring adequate water storage for dry-season irrigation. However, a

preliminary the dam safety analysis suggests the system to be designed for at least 100-year return flood period. Average annual rainfall in the project area is 1,883 mm, contributing to reservoir recharge. However, water losses due to evapotranspiration (4.01 mm/day, totaling ~1,685,935 m³/year) and seepage (141,284 m³/year) will be factored into the operational planning to maintain a sustainable water balance. A small toe/ short blanket drain is proposed. Considerations around material compatibility/ filter compatibility will be required during the design stage.

Proposed Interventions for Bagaulia Lake

The embankment height will remain unchanged, while water augmentation during the dry season only will be carried out using the Pathraiya sub-secondary canal. Additionally, the existing water release structures will either be repaired or enhanced as needed. The embankment requires crest widening and slope slackening, along with the installation of stone protection on the upstream face. A toe drain (French drain) will be installed to facilitate proper drainage downstream. Additionally, a formal spillway with adequate freeboard will be constructed, ideally as a free overflow-type structure. The crest path will be raised to maintain an even height along its full length. The existing gated structure will be refurbished, though reconstruction may be a more feasible option if integrating the spillway into the main channel. To address drying shrinkage cracks observed on the embankment, topsoil will be placed, and grass will be encouraged to establish itself for improved stability.

Proposed Interventions for Lauka Bhauka Lake (215 ha command area)

The embankment height will remain unchanged, while water augmentation not exceeding 200 l/s during the dry season only will be carried out using the Pathraiya sub-secondary canal. Additionally, the existing water release structures will either be repaired or replaced as needed. The embankment will have its crest widened and slopes slackened to improve stability. To minimize the risk of new leakages, a clay apron and foundation cut-off, or a similar measure, will be implemented. Vegetation management on both faces will continue, with heavily vegetated sections being cleared, while mature trees within the embankment will be preserved to prevent void formation over time. Drainage improvements would be beneficial, including the installation of a toe drain (French drain) to aid downstream drainage. The existing spillways will be rehabilitated, and the outlet gate will be maintained and tested over its full travel to ensure operability, with rehabilitation as needed. Additionally, spillway capacity and freeboard (currently about 0.75m) will be reviewed and confirmed as adequate.

3.1.2 Basic information of some potential watershed to be upgraded

Some of the potential lakes for the water storage to be upgraded has been presented below which is located in the RJKIP-3 project area of Kailali districts. An indicative list of reservoirs that could be upgraded is given in **Table 3.1**. The selection and number of reservoirs to be included in the project has not been finalized, so the scoping study is focusing on three proposed reservoirs (Koilahi, Lauka Bhauka and Bagaulaia lake) that serve as examples of potential investments and will serve to identify the type of issues and environmental and social due diligence to support the preparation of investments.

Table 3.1 List and basic information on potential watershed storages to be upgraded

SN	Name	Longitude (X)	Latitude (Y)	Location	Core Area (ha)	Existing Condition
1.	Bhairbhuwa Lake	28° 36' 17.066" N	80° 54' 16.217" E	Ghodaghodi Mun-12	19.8	Irrigation, Unmanaged, Degrading
2.	Chamraiya Tal	28° 40' 1.943" N	80° 49' 42.069" E	Gauriganga Mun-11	14.9	Dam by locals, Aquaculture, Irrigation, Degrading
3.	Chharra Tal	28°29' 46.209" N	80°55' 4.710" E	Bhajani Mun-9	3.3	Dam by locals, Aquaculture, Irrigation Degrading
4.	Dudhawa Tal	28° 27' 2.988" N	80° 58' 49.044" E	Bhajani Mun-5	4.41	Fish farming by locals, Degrading
5.	Ghod Tal	28° 35' 2.474" N	80° 54' 31.880" E	Bhajani Mun-9	36	Traditional cash crops farming, religious/ritual pond, degrading
6.	Godchittiya Tal	28° 43' 37.039" N	80° 46' 19.541" E	Gauriganga Mun-11	0.9	Rice field, fishery, degrading
7.	Korkotala Tal	28° 33' 9.452" N	80° 57' 6.616" E	Bhajani Mun-4	20.3	Dam by locals, Aquaculture, Irrigation Degrading
8.	Piparawa Tal	28° 26' 39.408" N	80° 58' 37.884" E	Bhajani Mun-5	40	Aquaculture, Degrading
9.	Rara Lake	28° 43' 59.323" N	80° 46' 18.919" E	Gauriganga Mun-4	2.1	Dam by locals, Aquaculture, Irrigation Degrading
10.	Soniya Tal	28° 34' 9.685" N	80° 54' 38.673" E	Bhajani Mun-9	24.1	Sayapatri Lake Management Community, surrounded by forest

(Source: Inventory of Lakes in Nepal, 2021)

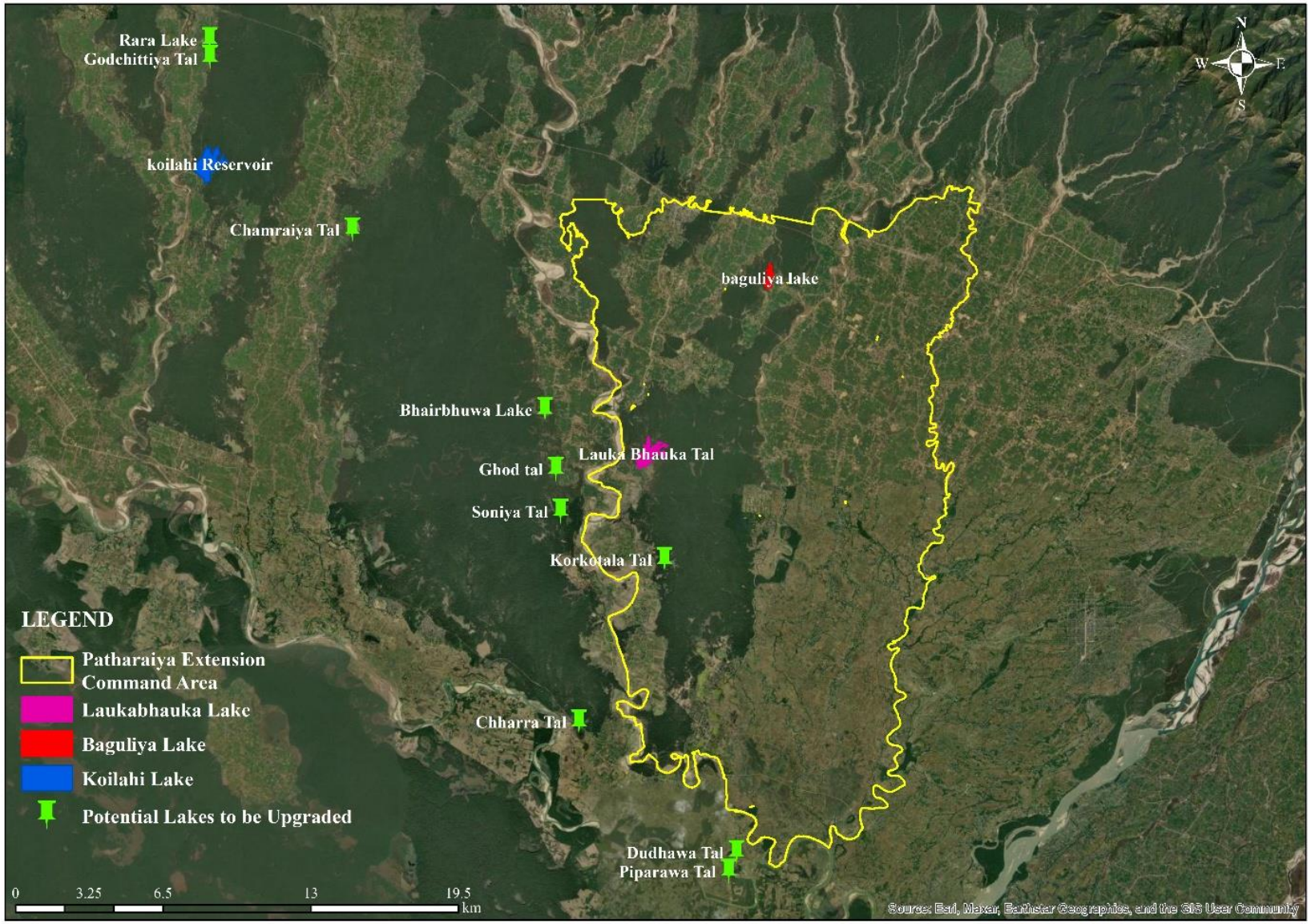


Figure 2 Map showing potential water storage to be upgraded near the PEP command area

3.1.3 Environmental baseline

The project area is located in the Terai towards south of the East-West highway enclosed by Patharaiya River to the east, the Kandra River to the west, and the Mohana River to the south. The project's command area has an average descending gradient of 1 in 700 towards the south, with elevations ranging from 100 to 200 m. The project area is in the subtropical type climate experiences winter from December to February, spring from March to May, summer from April to June, and fall from September to November. Approximately 90% of the total precipitation falls between June and September during the monsoon season. Thick alluvial deposits cover the plain, which is 200 meters above mean sea level. The primary components of the alluvial deposits are boulders, silt, sand, clay, and gravel. The texture of the soil profile varies from fine to coarse grains, including silt and clay in large quantities. The soil is sandy loam, with 77% sand, 17.3% silt, and 3.2% clay. Among the three lakes, Baguliya and Lauka Bhauka are located withing the Basanta Corridor which serves as animal crossing.

The environment baseline for the three reference lakes studied for scoping is given below.

Table 3.2:Environmental Baseline of the three reference lakes considered for scoping

Parameters	**Koilahi lake**	**Baguliya lake**	**Lauka bhauka lake**
Land Use	Forestland (94%); Agriculture (4%); Grassland (1%); Wetlands (1%) (from inventory report)	Surrounded by forests to the east, north, and west, while the south and southeast areas feature some settlements and arable land.	Forestland (99%); Grassland (1%) (from inventory report)
Topography	The altitude is around 190 m in the Terai Range. A Gauriganga river flows west of the area, and the lake downstream supplies irrigation water to five villages.	Alt: 190 masl; Terai Region (The pond's southeast embankment has a gentle slope where some cultivate). To the east, another pond exists, with a Suktikanda river flowing beside it. The arable land lies downstream.	The altitude is around 180 m, with forests surrounding it except to the south and southwest. The Kandra River flows to the west. The pond area is flat, with partitions made for aquaculture.

Parameters	**Koilahi lake**	**Baguliya lake**	**Lauka bhauka lake**
Climate and hydrology (drainage)	Tropical climate Gauriganga river	Tropical climate Hydrology (Thulo baguliya lake and Sano baguliya lake), Suktikanda river	Tropical climate Kandra river
Existing water quality and quantity data	Temp.:24ºC, pH:5.9; Transparency:0.5 m	NA	Temp:25°C, pH:6; Transparency:0.3 m
Major aquatic plants	*Nymphae sps* (Kama), *Utricularia australia* (Simgha); *Oryza rufipogon* (Jungalidha); *Phragmites sps* (Narkat); *Ceratophyllum demersem* (Pata); *Hydrilla sps* (Panijhyau)	NA	*Ludwigia adscendes(Jadelo);Utricularia Australia (Simghas); Oryzarufipogon (Jungalidhan)*
Major plants	*Senegalia catechu (Khayar); Dalbergia sisoo (Sisoo); Shorea robusta (Sal); Synzigium cumini (Jamun); Adena cordifolia (Haldo); Emblica officinalis (Amala); Oroxylum indicum (Tatelo); Bombax ceiba (Simal)*	NA	*Senegalia catechu (Khayar); Dalbergiasisoo (Sisoo); Shorea robusta (Sal); Synzigium cumini (Jamun); Adena cordifolia (Haldo); Emblica officinalis (Amala); Bombax ceiba (Simal); Butea monospermea (Palash); Terminalia chebula (Harro); Terminalia bellirica (Barro); Terminalia elliptica (Saaj)*
Fish	*Puntius sps (Sedari); Cetanoharyngodon idella (Carp); Hypophthalmichthys nobilis (Carp); Labeo rohita (Rohu;)*	NA	*Puntius sps (Sedari); Cetanoharyngodon idella (Carp); Hypophthalmichthys nobilis (Carp); Labeo rohita (Rohu)*
Herpeto fauna	*Euphlyctis cyanophlyctis (Tiktike); Buttaphrynus melanostictus (Kalokhasre); Calotes versicolor (Garden lizard); Varanus bengalensis (Monitor Lizard); Bungarus sps (Common Krait); Naja naja (Common Cobra)*	NA	*Bungarus sps Common Krait); Bufo melanostictus Schneider (Black- spined toad); Python morulus (Ajingar);* *Indotestudo elongate (Yellow/headed Tortoise)*

Parameters	Koilahi lake	Baguliya lake	Lauka bhauka lake
Birds	*Ardenola greyii (Sim Bakulla); Ardea alba (Bakulla); Eudynamyus scolopacea (Asian Koel); Psittacula sps (Parrot); Eupupa epops (Hoopoe); Francolinus francolinus (Black Francolin); Gallusgallus (Bankukhura)*	NA	*Coracias bengalensis (Indian Roller); Halcyon smyrnensis (Kingfisher); Leophronpercnopterus (Egyptianvulture); Casmerodius albus (Great Egret); Halcyon pileata (Yellow-cheeked Tit); Vanellus indicus (Red- watteled lapwing); Falco tinnunculus (Common Kestrel); Gallusgallus (Red Jungle fowl)*
Mammals	*Herpestes sps (Nyarimusa); Canis aurens (Syal); Felis bengalensis (Charibagh); Lutra lutra (Oont); Macaca mulatta (Bandar); Felis chaus (Ban Biralo)*	NA	*Herpestes sps (Mongoose); Canis aurens (Golden jackal); Felis bengalensis (Leopard Cat); Lutra lutra (Common Otter); Macaca mulatta (Rhesus Macaque); Felis chaus (Jungle Cat); Sus scrofa. (Eurasian wild Boar); Axisaxis (Spotted dear); Muntiac muntjac (Barking deer); Sus scrofa (Wild Boar)*
Invasive alien species	*Ipomoea carnea (Besara);Ageratina adenophora (Lahare banmara); Xanthium strumarium (Bhede kuro); Ageratum conyzoides (Nilo gande); Casia tora (Kose)*	NA	*Lantana camara (Tickberry); Eupatorium sps (LN: Ageratina adenophora (Crofton weed); Xanthium strumarium (Cockle bur sheep bar); Ageratum conyzoides (Cheek weed); Casia tora (Sickle pod)*

Inventory of Lakes in Nepal (2021)

The project area supports a diverse range of aquatic vegetation, tree species, fish, amphibians, reptiles, birds, and mammals. The presence of aquatic flora like *Ludwigia adscendes*, *Utricularia australia*, and *Oryza rufipogon* suggests a stable aquatic ecosystem. The *Shorea robusta* (Sal), *Dalbergia sisoo* (Sisoo), and *Senegalia catechu* (Khayar) forests are important in Nepal's Terai region for timber and non-timber forest products. Khayar, Simal, and Sal are banned for harvest, transportation and export for commercial purposes. However, watershed storage interventions do not envisage clearance of these trees.

The presence of native fish like *Puntius* spp. and *Labeo rohita* (Rohu) suggests that the water bodies support a natural fish population, though the presence of *Ctenopharyngodon idella* and *Hypophthalmichthys nobilis* (both Carp species) indicates aquaculture interventions. Wetland-

dependent birds such as *Casmerodius albus* (Great Egret), *Leophron percnopterus* (Egyptian Vulture), and *Coracias bengalensis* (Indian Roller) indicate that these lakes are also serve for migratory birds and nesting. These lakes are situated adjacent to tropical riverine forests of western Terai of Nepal. These forests occasionally host mammalian species like Nil Gai (*Boselaphus tragocamelus*), porcupine (*Hystrix indica*), Jackal (*Canis aureus*), rhesus monkey (*Macaca mulatta*), deer (*Lepus nigricollis*), wild boar (*Sus scrofa*), hare (*Lepus nigricollis*), spotted deer (*Axis axis*), tiger (*Panthera tigris),* leopard (*Panthera pardus*) etc. However, these lakes are located near settlements and agricultural fields and do not serve as habitats for these wild faunas.

The invasive species like *Lantana camara*, *Eupatorium* spp. (*Ageratina adenophora* - Crofton Weed), *Xanthium strumarium* (Cocklebur), *Ageratum conyzoides* (Cheek Weed), and *Cassia tora* (Sickle Pod), are spread through wind, water, livestock movement, and human activities such as road construction, agricultural expansion etc. Among them, *Lantana camara* and *Eupatorium* spp. are among the most threatening invasive plants in Nepal, known for displacing native vegetation.

The impact on biodiversity, however, will be minimal as the intervention involves upgrading of existing system only.

3.1.4 Social Baseline Data

A brief on social characteristics of the lake vicinity is presented table below and detailed description in the subsequent sections.

Table 3.3: A brief on social characteristics of the lake vicinity

Characteristic	Baguliya lake	Lauka bhauka lake	Koilahi lake
Demographic information (Ward wise)	1,429 Households (HHs), total population 6,767, Male: 3,103, Female: 3664 (NSO, 2021)	1,339 HHs, Total population 6,388, Male: 2,940, Female 3448 (NSO, 2021)	997 HHs, total population 5,017, Male:2,423, female: 2,594 (NSO, 2021)
Livelihoods and economic activities	Agriculture, fishing, and some households make clay pots to continue their traditional knowledge [1].		
Existing water usage activities	Commercial fish farming		
Activities in and around the water storage	Commercial fishing, grass, and fodder cutting in nearby fodder trees in embankment,	Tea stall at the viewpoint, grazing on the embankment, cultivation in the southwest, and commercial fishing in	Picnic spot, fishing, some tea stalls, grazing around lakes

[1] https://gorkhapatraonline.com/news/42435

Characteristic	Baguliya lake	Lauka bhauka lake	Koilahi lake
	Grazing around lakes	the lake and nearby lakes.	
Existing infrastructure and services	A dam (earthen embankment) built by locals in the south, with a headwork regulator for irrigation. A gravel road runs east, extending as an earthen road to the pond's entrance. A school is located in the southwest.	A concrete embankment is in the south near the settlement, with head regulators for irrigation. A road leads to the lake viewpoint.	A transportable road leads to the entrance and inside the lake, with infrastructures like a water tank, picnic spots, buildings, etc. made by the Chure project, a headwork regulator, an entrance gate, a church, a temple and an earthen dam.

3.1.4.1 Demographic information of the local communities including characteristics of Indigenous People

The project area falls on Bardagoriya Rural municipality ward number 1, 2, 4, 5 and 6, Ghodaghodi Municipality ward number 1, 2, 3, 5, 7 and 12, Bhajani Municipality 1, 2, 3, 4, 6, 8 and 9 and Joshipur Rural municipality ward number 1, 2, 3, 4, 5, 6 and 7.

The total estimated population of these municipalities is around 305,368 with Ghodaghodi being the largest urban center. The population distribution shows a 88.95 gender ratio, and the average household size is approximately 4.67 persons.

Ethnically, the region is dominated by the Tharu community (45%), followed by Chhetri/Brahmin (30%) and Dalit (15%). Tharu is the most spoken language (40%), with Nepali being spoken by 55% of the population. In terms of religion, Hinduism is the predominant faith (85%), followed by Islam (8%) and Christianity (5%). Includes Tharus as the dominant group (44 percent) followed by Chhetri (20.8 percent), Brahmin (10 percent), Dalit (8 percent), and others (12 percent).

Agriculture remains the primary occupation, engaging about 65% of the workforce, followed by wage labor (20%) and government/private sector jobs (10%). Remittances are a significant economic contributor, with about 25% of households relying on income from migrant workers. The unemployment rate is estimated at 4.5%, with youth facing higher challenges in securing jobs.

Migration trends indicate that 15% of the working-age population migrates to India and Gulf countries, while there is also internal migration from neighboring districts for agricultural work. Basic service accessibility varies between urban and rural areas. While Ghodaghodi has

95% electricity access, rural areas lag at 75%. Similarly, improved water supply and sanitation facilities are more widespread in urban centers compared to rural regions.

Health indicators reveal a vaccination rate of 88% in urban areas versus 72% in rural municipalities. The fertility rate stands at 2.3 children per woman, which is below the national average. Major health challenges include seasonal malaria and limited maternal healthcare services in rural regions.

Key developmental priorities include expanding rural electrification, improving education quality, and enhancing healthcare access. Ghodaghodi stands out with better infrastructure, while the rural municipalities require focused interventions. Tharu cultural traditions remain strong, with festivals like Maghi playing a significant role in local social life.

3.1.4.2 Cultural and historical sites in the project area

During the alignment finalization of the Rani Jamara Kulariya Irrigation Project - Phase III (RJKIP-III), special care was taken to avoid all cultural and historical sites during alignment mapping. The project ensured that no significant religious structures, heritage sites, or indigenous cultural landmarks were disturbed, maintaining the integrity of Tharu heritage and Hindu pilgrimage sites. Although there are cultural sites near the project area, such as Ghodaghodi Lak, a sacred Ramsar-listed wetland revered by the Tharu community, along with Urailee Temple, Bhawar Baba Temple, Shivalaya Dham, and Bardagoriya Temple, the project interventions will not affect them. Furthermore, the selection criteria (see Section 3.2) will exclude any cultural sites that would be directly impacted.

3.1.4.3 Community health and safety conditions

There are no health facilities within the immediate area, and residents rely on health posts and hospitals in Bauniya, Ghodaghodi, Joshipur and Sukhad. Common illnesses reported include diabetes, migraines, diarrhea, fever, and gastritis. In terms of drinking water, most households depend on taps and piped water, while sanitation conditions indicate that almost all households have toilets except for one. Waste management practices vary, with some households burning their waste, others composting it, and a few dumping it into the river.

Construction activities across all components will pose risks to community health and safety, including air pollution, water contamination, and accidents. In addition, the potential for conflict between local communities and labor forces working on the project should be addressed through stakeholder consultations and conflict resolution mechanisms.

For the three lakes considered, outlet structures, including outlets and surface spillways, are typically netted. This increases the risk of blockages forming at these structures, which is not beneficial from a dam safety perspective. Occasionally, the outlets are operated to create a flow that attracts fish toward them, facilitating easier catch. While this is not a direct dam safety issue, it alters overall water resource requirements, leading to a need for increased total storage

capacity at these structures. This, in turn, may have dam safety implications due to increased structure heights and stored volumes.

3.1.4.4 Existing infrastructure and services (e.g., roads, schools, healthcare)

The Rani Jamara Kulariya Irrigation Project (RJKIP) impact area is strategically located near the Mahendra Highway (East-West Highway), one of Nepal's most vital transportation corridors. This highway provides easy access to the project area, enabling smooth transportation of agricultural goods, facilitating trade, and improving connectivity for local communities. In addition to the highway, several local and rural roads link the Bardagoriya, Ghodaghodi, Bhajani, Joshipur, and Lamkichuha municipalities, ensuring that even remote villages within the irrigation project's reach remain well-connected. These road networks support economic activities, particularly agriculture, local businesses, and access to markets, allowing farmers and traders to transport their produce efficiently.

The educational infrastructure in the RJKIP impact area is relatively well-developed, with a sufficient number of primary and secondary schools serving local communities. These schools provide basic education, particularly in Ghodaghodi and Lamkichuha, where urban centers offer better schooling facilities. However, for higher education opportunities, students often need to move to nearby cities such as Dhangadhi, Tikapur, or even Kathmandu. This migration for education is common among students seeking university degrees, technical training, or specialized professional courses, reflecting the need for expanded higher education institutions within the region.

In the event of a dam breach in the proposed lake or an increase in water storage by introducing additional inflows, it is anticipated that breach flows will rapidly expand while their depth will quickly decrease, thereby reducing the risk to life and infrastructure damage. This assumption is supported by witness accounts of dam failures at the structures visited, which resulted in knee-deep flows and no casualties.

3.1.4.5 Landholding pattern

Landownership is a vital indicator of identity, money, power, and politics. However, it is believed that up to 25% of Nepal's population is landless or almost landless. The Kailali district project area's land-holding pattern is comparable to the national land-holding pattern. The largest portion is made up of 0.20 to 1 hectares of land, with only 3% being landless. The details of the land holding pattern are presented in **Table 3.4**.

Table 3.4: Land holding pattern of the project area

S.N.	Land Holding Type	HH Number	Percent
1	Holding without land	858	2.9
2	Holdings with land		
a	Less than 0.1 ha	3,522	11.91
b	0.10 to 0.5 ha	9,839	33.26
c	0.5 ha to 1.0 ha	7,937	26.83

S.N.	Land Holding Type	HH Number	Percent
d	1.0 ha to 2.0 ha	5,898	19.94
e	2.0 ha to 3.0 ha	1,136	3.84
f	3.0 ha to 4.0 ha	272	0.92
g	4.0 ha to 5.0 ha	83	0.28
h	5.0 ha to 10.0 ha	20	0.07
i	above 10 ha	16	0.05
Total		29,581	100

3.1.5 Marketing facility and labor situation

The Far Western Province's primary center for agricultural products is the Kailali district. Local markets are a convenient place to sell farm products. The local markets in the neighborhood of the project area are Sukhkhad, Lamki, and Chisapani, where it is easy to sell farm products. Nonetheless, Tikapur and Dhangadhi are where wholesale marketing is carried out. When harvesting was taking place, dealers used to pick the farm items straight from the farm.

3.2 Criteria for siting/selecting of water storage to be upgraded

3.2.1 Consideration of environmental and social factors in site selection

The three lakes were selected based on their vicinity to the project area which makes it possible for diverting excess water from the canal to the lakes with ease and not located to any critical habitats nor requiring large forest inundation. This also contributes to irrigation in the nearby lands and boost fishery to benefit the local communities

There are approximately 197 lakes in Kalai district that serve as irrigation sources during the dry season by storing rainwater from the wet season. Selection of the lakes will be prioritized based on the possible irrigation contribution to the scheme but also on the need for works to ensure community safety. The project has applied preliminary exclusion criteria based on ecological, environmental, and cultural significance, as well as community dependencies, and has identified specific areas where intervention will not take place. The potential lakes will be screened and excluded based on ecological, environmental, social and cultural criteria given below:

- *Lakes where the interventions can convert or degrade critical natural habitats.*
- *Lakes that are proposed to take place inside legally protected areas including National Parks, wilddlife reserve, and their buffer zones*
- *Lakes considered significant wetland sites.*
- *Lakes where the intervention can impact aquatic species of concern.*
- *Lakes requiring the interventions that cause dislocation, modification, or restriction of access to cultural heritage sites or pose adverse impacts on cultural and heritage sites.*
- *Lakes that require development of new dams*
- *Lakes that have high risk consequences in case of breach*

This will ensure that the proposed project will not cause significant harm to local ecosystem and cultural practices. **Table 3.5** lists the some of the lakes that are in the exclusion based on these criteria.

Table 3.5: Negative list of lakes and criteria for rejection

Lake Name	Criteria for Rejection
Ajuwa Lake	Cultural significance (local community dependence); *Python morulus* (wildlife)
Ghod Tal	Cultural significance (Siddha Baba temple); White stork (protected species)
Ghodaghodi Tal	Ramsar Site
Guldrahawa Tal	*Varanus flavescens* (wildlife)
Mahadeva Tal	Cultural significance (Bhed Baba site); Varanus flavescens (wildlife)
Mohana Oxbox Tal	Potential impact on biodiversity (wildlife concerns)
Nakror Lake	Cultural significance; Python morulus (wildlife); Varanus flavescens (wildlife)
Rara Lake	*Python morulus* (wildlife)

Further consultation with local stakeholders and environmental experts will be necessary for refining the decision-making process.

3.3 Preliminary assessment of potential Environmental and Social (E&S) risks of component 2

3.3.1 Identification of potential impacts on water quality and quantity

These lakes have long been used for irrigation by storing rainwater and are also utilized for commercial fish farming. The discharge of canal water into the lake can significantly alter the physical and chemical properties of the water, impacting the aquatic habitat. This change can affect aquatic life and potentially harm downstream users who rely on the water for irrigation. The introduction of canal water with different physical and chemical properties can disrupt the existing aquatic ecosystem, leading to changes in species composition and abundance. Additionally, the application of fertilizers and antibiotics for fish farming during dry season after augmentation of water in the lakes can contaminate the irrigation water, leading to negative impacts on soil quality and human health. The altered water properties can also affect the reproductive cycles and growth rates of aquatic organisms, further destabilizing the habitat. Moreover, the eroded banks of lakes during upgrading can lead to soil erosion and sedimentation, which can further degrade the aquatic environment and reduce water quality

3.3.2 Possible Impacts on Soil and Land Stability (Erosion, Sedimentation)

- Current Erosion of lake banks and possibly during upgrading can contribute to sedimentation and land instability.
- Upland farming can increase erosion and sedimentation.

3.3.3 Possible Effects on Local Biodiversity and Ecosystems Services

- By adding irrigation canal water physical and chemical parameters might impact water quality and hence may disrupt aquatic habitats but might also impact quality of water for irrigation. Variation in volume might also impact aquatic life.
- Due to its multipurpose use the current use of fertilizers and antibiotics from fish farming contaminate water, affecting aquatic biodiversity.
- Solid waste pollution during upgrading but also operation of lake can degrade water quality and harm aquatic species.

3.3.4 Possible Impacts on Local Communities (Displacement, Livelihood Changes, and Consequences of Potential Dam Failure)

- Excessive water use for fish farming reduces irrigation supply, affecting agriculture and livelihoods. It also impacts safety structures and mechanisms in the lakes.
- Dam failure risks may cause flooding, displacement, human loss and loss of agricultural land.
- Raising embankment height could pose additionally safety risks for nearby residents and animals in case of breach.

3.3.5 Possible Health and Safety Risks to Workers

- OHS risks such as heat stress from prolonged outdoor work in high temperatures, heavy machinery accidents, electrocution risks from temporary power lines, and exposure to dust.
- Wildlife encounters, including snakes and mosquitoes carrying vector-borne diseases,

3.3.6 Possible Impacts during Operation

- Changes in water availability due to storage and release cycles may impact both irrigation and biodiversity.
- Multipurpose use of lakes increases safety risk as fishery practices or using of lakes for recreation might impact safety structures and cause harm to human life.
- Water pollution from fish farming activities during dry season could persist and require ongoing management.

3.4 Instruments to be prepared for Component 2 sub projects

While this chapter tackles some of the basic safety features, more information on dam safety due diligence is provided in chapter 4.

3.4.1 Environmental and Social Management Plan

In the case of rehabilitation, modernization, or upgrading of existing storage reservoirs through watershed management does not fall under a specific threshold for Brief Environmental Study (BES), Initial Environmental Examination (IEE), or Environmental Impact Assessment (EIA)

as per the Environmental Protection Act (EPA) and Environmental Protection Rules (EPR) of the Government of Nepal. However, an Environmental and Social Management Plan (ESMP) of each lake should be prepared to ensure that potential environmental and social impacts are identified, mitigated, and managed effectively throughout the project. The ESMP will focus on key environmental, social risks including but not limited to occupational health and safety (OHS) risks, soil erosion, sedimentation, drainage management etc. The ESMP will propose measures for addressing OHS risks from construction, fit for purpose PPE provisions, worker training, water quality and agrochemical use monitoring etc. In addition, following will be part of ESMP

- Guidance for Emergency Preparedness Plan (EEP) for safety of downstream communities.
- Guidance for operation and maintenance plan of lakes during operation.

3.4.2 Biodiversity Assessment and Biodiversity Management Plan

The RJKIP 3 interventions: Pathraiya extension, water storage, and agricultural activities, are expected to have both direct and indirect impacts on natural habitats and biodiversity. To assess these impacts and determine appropriate mitigation measures, a Biodiversity Assessment (BA) should be conducted. If necessary, a Biodiversity Management Plan (BMP) should also be developed based on the proposed activities for construction and operation phase.

3.4.3 Operation and Maintenance (O&M) Manual for a multipurpose reservoir

Operation and Maintenance (O&M) Manual for a multipurpose reservoir and small dam, primarily used for irrigation but also serving recreational and fisheries purposes, is a comprehensive guide designed to ensure effective and safe operation and maintenance. This manual defines allowed activities to ensure the safe operation of the reservoir, taking into account relevant environmental and social studies such as the biodiversity management plan and dam safety assessment. It includes detailed operational guidelines for managing water levels, flow regulation, and usage for various purposes. Additionally, it outlines emergency procedures for handling extreme conditions such as floods or equipment failures and specifies routine maintenance activities, schedules, and procedures to maintain the structural integrity and functionality of the dam and reservoir. The manual also incorporates environmental and social protection measures to minimize impacts on water quality, habitats, and local communities, ensuring compliance with relevant regulations and standards, including the WB ESS4—Annex 1 on dam safety.

Furthermore, the manual describes dam safety features, monitoring systems, and emergency action plans for potential safety incidents. It includes documentation requirements, reporting procedures, and templates for record-keeping, ensuring thorough and organized management. Training programs and capacity-building initiatives for staff are outlined to ensure they are knowledgeable and skilled in implementing the manual. Regular updates to the O&M Manual are essential to reflect changes in operational practices, technological advancements, and

regulatory requirements, ensuring the long-term sustainability, safety, and efficiency of the multipurpose reservoir and small dam.

3.4.4 Measures to consider

When designing an Environmental and Social Management Plan, Biodiversity Assessment with BMP, and Operation and Maintenance Manual for a multipurpose reservoir and small dam, above identified impacts should be considered together with the following measures:

- Avoid grazing to prevent soil erosion and sedimentation.
- Implement water quality monitoring to ensure minimal contamination from fish farming and chemical pesticide and fertilizer use.
- Conduct solid waste management awareness programs to reduce pollution in lakes during construction and operation.
- Restrict upland cultivation to prevent further land degradation.
- Regularly maintain embankments, spillways, and outlets to prevent infrastructure failure.
- Periodically fill gaps around the outlet and raise low spots to help prevent localized overtopping.
- Remove sandbags and nets from the outlet to maximize spillway capacity and reduce blockage risks during floods.
- Prepare a dam safety plan and emergency preparedness plan (EPP).
- Conduct a basic hydrological study for each lake to advise the design, taking into account the quality and quantity of water filling the lakes.
- Implement afforestation with local species to stabilize soil and restore ecosystems.
- Use bioengineering with native species to prevent erosion and strengthen embankments.
- Apply an early flood warning system to minimize risks to communities.
- Develop sustainable fish farming guidelines to balance conservation and livelihoods.
- Develop an operation and maintenance plan for the lakes during the operation phase to ensure the safety of infrastructure and people by strictly managing recreational and farming use of the lakes.
- Establish compensation mechanisms for damages to fish farming and agricultural production caused by floods or dam failures.

4 Dam Safety Analysis

The preliminary Dam Safety Study (risk hazard assessment) conducted on Koilahi Lake, Bagauliya Lake, and Lauka Bhauka Lake indicates currently a high likelihood of dam failure across all three lakes. The study classifies the initial dam safety risk as substantial, considering structural integrity, failure potential, and associated consequences. The downstream area primarily consists of agricultural land and settlements, with houses typically constructed along roads. While downstream rivers act as natural boundaries for floodwaters, the flat terrain increases the risk of wide breach flow expansion. This could lead to reduced water depth but an extensive spread of floodwaters.

4.1 Overview of dam safety requirements as per ESF/ESS4 and national legislation:

For projects with potential emergency risks, the proponent must conduct a Risk Hazard Assessment (RHA) as part of the environmental and social assessment. Based on the RHA, the Borrower must prepare an Emergency Response Plan (ERP) in coordination with local authorities and the affected community. The ERP must cover alarm systems, evacuation procedures, training drills, and post-accident restoration measures. It must be regularly reviewed and updated to address evolving risks. The borrower will support affected communities, government agencies, and relevant parties through training and collaboration, along with project workers, to ensure effective emergency preparedness and response.

ESS4: Community health and safety requires compliance with national laws and international guidelines, ensuring community safety, design and approval by certified professionals, and incorporation of climate change considerations where appropriate. If a project's structure or components is in a high-risk area where failure could threaten community safety, the Borrower must engage independent experts to review the project at all stages and allocate sufficient resources to apply dam's safety requirements. The project proponent must implement measures to address emergency events, ensuring community safety and minimizing impacts from hazards like extreme weather, fires, spills, etc.

Annex 1 of ESS4 focuses on the safety of dams, establishes specific requirements for new dams, existing dams, and dams under construction. For new dam construction, the Borrower must engage experienced professionals to oversee the design, construction, and safety measures throughout the project. Dams are categorized as large (height of 15 meters or more from lowest foundation to crest (between 5 to 15 meters), with a capacity exceeding 3 million cubic meters or small, with specific safety requirements, including independent reviews, detailed plans, prequalification of bidders, and periodic safety inspections. An independent panel of experts will be appointed for large and certain small dams to review and advice on safety throughout the project's lifecycle.

For existing dams and those under construction, independent specialists must inspect and evaluate safety, review operation procedures, and recommend remedial measures. Projects relying on third-party-owned dams must ensure compliance agreements. If the dam's owner is not the Borrower, agreements must be made to ensure safety measures are implemented.

Additionally, the proponent may consult with the Bank to strengthen national dam safety regulations.

National Legislations on Dam Safety: Nepal does not have dam safety legislation and policies to enforce effective dam safety management program

4.2 Preliminary Dam Safety Assessment of potential investments

During project preparation a preliminary risk hazard assessment of Baguliya Lake, Lauka Bhauka Lake, and Koilahi Lake highlights a high likelihood of dam failure, primarily due to structural weaknesses, sedimentation, and past breaches. However, the downstream consequences are considered moderate due to the nature of the terrain, depth of lakes and the expected floodwater behavior.

4.2.1 Structural Integrity & Design Safety

Baguliya Lake

- **Earthen embankment**: Uneven surface, cracks, and a history of overtopping failures.
- **Seepage concerns**: Particularly at the gate outlet.
- **Sedimentation**: Partial obstruction affecting storage capacity.
- **Design Safety Measures**:
    - Open both gates during the rainy season (lack of spillway).
    - Periodic filling of gaps around the outlet.
    - Raising low spots to prevent localized overtopping.

Lauka Bhauka Lake

- **Winter drying**: The lake bed is exposed, leading to vegetation growth and grazing.
- **Past dam breach**: Failure due to increased load during the wet season.
- **Compartmentalization**: Multiple embankments/dykes create separate sections within the lake.
- **Vegetated island**: Submerges during the rainy season.
- **Design Safety Measures**:
    - Remove installed nets.
    - Repair spillway leakage.
    - Monitor embankment leakages regularly.

Koilahi Lake

- **Unstable earthen embankment**: History of breaches and high collapse risk.
- **Sedimentation issues**: Reduces storage efficiency.
- **Defunct outlet**: Leakage during floods.
- **Artificial water level adjustment**: Sandbags in the spillway and fishnets at the outlet.
- **Design Safety Measures**:
    - Remove sandbags to maximize spillway capacity.
    - Remove nets from the outlet to reduce blockage risks during floods.
    - Proposed embankment crest width of 6m and freeboard of 1.5m, exceeding Good International Industry Practice (GIIP) standards.

4.2.2 Risk assessment for potential hazards

The likelihood of dam failure is high across all three lakes. Downstream consequences are moderate due to the rapid expansion of breach flows, reducing depth and immediate danger. Strengthening embankment stability, spillway functionality, and regular monitoring is critical to mitigate risks.

From a capacity perspective, the following key points have been noted:

1. The construction and operation of these structures have primarily been carried out by the local population. While occasional support has been provided for the construction of outlets and spillway structures, as well as for major remedial works, these interventions have been limited.
2. Currently, the local irrigation board provides support; however, the frequency and scope of their visits remain unclear. It is understood that inspections are expected to take place before and after the wet season, but the extent to which this is followed is uncertain.
3. The Project Implementing Office (PIO) has no prior experience in implementing storage projects.
4. Some technical expertise exists within the central design team, which refers to recognized international guidelines, such as the *Design of Small Dams* by the United States Bureau of Reclamation (USBR), *Design of Small Hydraulic Structures*, and relevant Indian Standards. Additionally, the Mega Dang Valley Irrigation Development Project serves as a recent example of small to medium-scale dam construction for irrigation purposes in Nepal.
5. There is currently no regulatory framework for dam safety in the country, which further limits institutional capacity for oversight and risk management.

Given these factors, the PIO has limited capacity in storage project implementation and lacking experience in dam safety management. The absence of a regulatory framework further exacerbates these challenges. Consequently, the risk from a capacity perspective is considered high. It is crucial to provide additional technical support and mitigation measures to strengthen dam safety governance and implementation capacity.

4.2.3 Downstream risk and consequence assessment

Preliminary risk classification suggests **significant structural failure potential**.

- **Baguliya Lake**:
  - Downstream area: Irrigation command area and settlements.
  - Estimated households at risk: 50–60 (Population at risk (PAR): 250–300).
  - Low socio-economic & environmental risk (past breaches resulted in knee-deep flooding with no casualties).
- **Lauka Bhauka Lake**:
  - Downstream area: Irrigation command area and settlements.
  - Estimated households at risk: 8 (PAR: 400).

    - Low socio-economic & environmental risk.
- **Koilahi Lake**:
    - Downstream area: Irrigation command area and settlements.
    - Estimated households at risk: 100 (PAR: 500).
    - Low socio-economic & environmental risk.

4.3 Outline of Dam Safety Capacity Building Plan

Given the low capacity of the Borrower and the potential risks associated with dam safety, it is crucial to strengthen the technical, operational, and managerial capacity for effective dam safety management. The following capacity-building measures are recommended to ensure sustainable operation and safety of rehabilitated structures:

4.3.1 Technical Expertise and External Support

Independent Technical Experts: An independent technical expert will be hired to assess the proposed designs, studies, and dam safety reports during both the project preparation and implementation phases. This expert will ensure that the dam structures meet international standards and follow best practices in design and safety management.

4.3.2 Design Guides and Manuals

Develop Small Dam Design Guides and Manuals: To address the unique challenges faced by small dams in Nepal, a comprehensive Design Guide and Manual will be developed. This will be tailored to the local context and include clear guidance on dam construction, safety features, and operational protocols. The manuals will include a specific focus on hydrological safety, including guidelines for flood control and overflow management.

Training on Design Guides and Manuals: Training programs will be organized for the implementing agency as well as the agencies that will assume responsibility for the operation and maintenance of the rehabilitated structures. This will ensure that they understand the guidelines, standards, and best practices for dam safety.

4.3.3 Monitoring, Operation, and Maintenance Training

Training for Implementing Agencies: Staff from the implementing agency will be trained in monitoring techniques, periodic inspections, and how to perform maintenance activities on the rehabilitated dam structures. The training will cover both routine maintenance and emergency preparedness. Operation Manuals specifically for small dams will be prepared.

Community-based Training: Local communities, especially those living downstream of the dams, will be trained in emergency response processes and monitoring activities. This will empower them to be actively involved in the operation and maintenance of the dams, and to provide early warning signals if issues arise.

4.3.4 Emergency Response and Safety Protocols

Local Community Emergency Training: As part of capacity building, communities will be trained in **emergency response** procedures specific to dam safety. This includes evacuation

drills, how to identify potential dam failure indicators, and communication with local authorities during an emergency.

Simulation Drills: Regular simulation drills will be conducted to familiarize local communities, staff, and relevant stakeholders with emergency evacuation plans and how to respond to different types of dam failure scenarios.

4.3.5 Institutional Strengthening

Institutional Capacity for Dam Safety: Efforts will be made to strengthen institutions that will oversee the dam's safety and operations, such as Federal and Municipal governments and Water Users Associations (WUAs) by RJKIP. This will ensure that they are properly equipped to take responsibility for the maintenance and management of rehabilitated structures in the long term.

Regulatory Framework for Dam Safety: Given that there is currently no regulatory framework for dam safety in Nepal, RJKIP will consider institutional strengthening to support the development of regulations. This will include creating a dam safety registry for all structures in the project area, which will allow for systematic monitoring, assessment, and reporting on dam conditions.

4.3.6 Condition Assessment and Register

Dam Safety Register: A register will be established by RJKIP operation team in coordination with Department of irrigation in coordination with to track all the dams in the project area. This register will document the current condition, maintenance history, and inspection reports for each dam. It would serve as a useful tool for ongoing safety assessments and as a resource for future improvements.

Condition Assessment of Lakes: Regular assessments will be conducted to evaluate the structural integrity and safety risks associated with the lakes. This will help identify any areas requiring remedial action before they pose significant risks.

4.3.7 Coordination with Stakeholders

Multi-Stakeholder Coordination: Regular coordination will be established between the local authorities, federal agencies, and communities to ensure that the responsibilities for operation, maintenance, and emergency preparedness are clearly defined and shared.

Government Support for Local Communities: The RJKIP will work with local municipalities and WUAs to ensure that local communities are actively involved in the management and decision-making processes related to the dams' safety.

4.3.8 Documents to be prepared

For each of the dams, in addition of supporting design, following instruments will be prepared:

Operation and maintenance (O&M) plan – This plan will set out details of the organizational structure, staffing, technical expertise and training required; equipment and facilities needed to operate and maintain the dam.

Emergency preparedness plan - This plan will specify the roles of responsible parties when dam failure is considered imminent, or when expected operational flow release threatens downstream life, property, or economic operations that depend on river flow levels.

5 Key Environmental and Social Risks of Component 3

5.1 Identification of key risks for Component 3

5.1.1 Land use changes – biodiversity impact:

With irrigation facilities available, agriculture expansion leads to diminished natural habitat. Large-scale monocultures might replace diversified ecosystems, diminishing habitat complexity. Soil erosion, nitrogen depletion, and salinization are caused by intensive farming. Genetic diversity between species is decreased in isolated areas of natural habitat. In terms of biodiversity impact, invasive plant species that outcompete native flora are frequently made easier to spread when agricultural expansion occurs. Livestock grazing can introduce non-native grasses, changing local ecosystems. Loss of biodiversity affects ecosystem resilience to climate change. Additionally, global warming is exacerbated by the release of stored carbon due to intensive agricultural activities. There is the possibility of loss of genetic variety as a result of excessive usage of high-yield crop types and monoculture farming. Intensive farming leads to a decline in the soil microbial biodiversity which affects soil fertility and nutrient cycling. The loss of aquatic biodiversity is caused by agricultural runoff contaminating water bodies with sediments, fertilizers, and pesticides. Nitrogen leaching from agricultural activities leads to contaminating the water bodies. Besides, decrease in pollinators (birds, butterflies, and bees) as a result of flowering plant loss and pesticide use.

5.1.2 Agrochemical use and management:

Agrochemicals, i.e. fertilizers, pesticides, herbicides, and fungicides, play an important role in agriculture by improving crop yields and protecting plants from pests and diseases. However, misuse and poor management of these compounds can result in threats to human health, biodiversity loss, water contamination, and soil deterioration. In order to balance agricultural output with environmental and human health concerns, sustainable agrochemical management is essential. Communities nearby may be exposed to agrochemicals sprayed on fields since they can be carried by the wind. Excessive fertilizer uses causes greenhouse gas emissions, eutrophication of water bodies, and acidity of the soil. Herbicides, fungicides, and residual insecticides damage beneficial insects (like bees), contaminate groundwater, and have an adverse effect on human health. Rural people are impacted by drinking water pollution caused by nitrate leaching and pesticide discharge. Food residues cause bioaccumulation, which raises the dangers to consumers' health, particularly for young people. Prohibiting extremely harmful pesticides and encouraging the use of safer substitutes. Farm workers are required to wear protective gear and receive training. Farmers in high-exposure areas should undergo routine health checks. Awareness programs on integrated pest management and other sustainable farming practices will be conducted to educate consumers and farmers about healthy food choices and pesticide residues, by means of outreach programs in the form of workshops intended for agrochemical vendors and farmers or through farmers' field school (FFS) which will be detailed in integrated pest management plan, which shall be coordinated by Agricultural Component Implement Unit (ACIU). Component 3 is

heavily focused on good agricultural practices and the sustainable management of pesticides and chemicals, and supports knowledge transfer and training to minimize these potential impacts.

5.1.3 Socio-economic impacts on local communities and marginalized groups:

A crucial economic sector agriculture, promotes rural development, food security, and livelihoods. Agriculture supports rural economies and creates jobs, but it also disproportionately benefits vulnerable communities.

5.1.4 Labor and working conditions:

Exposure to pesticides and agrochemicals can result in cancer, neurological conditions, reproductive problems, and respiratory ailments. Machinery Accidents: Injuries and fatalities are caused by dangerous working conditions (machinery accidents) and inadequate training. As a result of climate change (extreme weather, heat stress), outdoor workers are at risk for heat stroke, dehydration, and UV exposure. Many agricultural workers especially women earn less than the minimum wage.

5.1.5 Sexual exploitation and abuse (SEA)/Sexual harassment (SH) risks and impacts:

The agriculture sector presents heightened risks of Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH), particularly for women, migrant workers, seasonal laborers, and marginalized groups. These risks undermine the overall resilience of agricultural communities and have profound psychological, economic, and social consequences for survivors. Women farm laborers, who are disproportionately represented in low-wage and precarious employment, face increased vulnerability to exploitation by male landowners and employers. The lack of accessible legal and support services further exacerbates these risks, creating barriers to seeking justice and redress.

5.1.6 Integrating GESI in agricultural outreach activities and agricultural programs:

Strengthening the representation of women and marginalized groups in agricultural decision-making bodies through targeted gender quotas and inclusive governance mechanisms is critical for fostering equitable rural development. Ensuring that vulnerable farmers, including women, Indigenous peoples, and other marginalized groups, have access to social protection programs—such as agricultural insurance and subsidy schemes—will enhance resilience and economic security.

A gender-responsive approach to agricultural extension and training is essential to reaching underserved populations effectively. This includes:

- Training and deploying female officers to better engage with and support women farmers.
- Developing culturally appropriate and accessible training materials for Indigenous and minority communities.
- Utilizing inclusive communication channels—such as visual aids, community radio, and mobile applications—to engage illiterate farmers and persons with disabilities.

Further, integrating youth networks, Indigenous organizations, and women's groups into program planning and decision-making processes will strengthen the impact and sustainability of interventions.

5.2 Instruments to be prepared for component 3 sub projects

5.2.1 IEE for construction of cold storage

For any cold storage facility exceeding the capacity of 1000 metric tonnes, an IEE will be required as per the Schedule 2, Agriculture Sector Clause 6 of EPR 2020 of Government of Nepal.

5.2.2 Environmental and Social Management Plan (ESMP)

A stand-alone ESMP needs to be prepared that will be executed to mitigate identified impacts for component 3 sub-projects. The activities proposed within the component includes: i) Enhancing agricultural productivity, efficiency, and resilience; ii) Improving farmers' capacity to adopt modern technologies and practices, particularly for better water resource management; and iii) Promoting value addition for agricultural products that is expected to have minimal level and that can be addressed through the implementation of ESMP. The ESMP will assess the key risks associated with agricultural support services with focus on biodiversity impacts from land use change and irrigation return flow, including both surface and subsurface water from RJKIP 3 command area, and management and use of agrochemicals. Additionally, the SEA/SH action plan will be included in the ESMP.

5.2.3 Environmental and Social Code of Practice (ESCoP)

For small investments, such as supporting seed storage buildings and small-scale infrastructure like fish ponds and livestock sheds, a screening checklist will be developed and used to assess the level of environmental and social (E&S) risk. If the initial screening determines the risk to be low, an Environmental and Social Code of Practice (ESCoP) will be prepared and implemented.

5.2.4 Integrated Pest Management Plan (IPMP)

Integrated Pest Management (IPM) is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks in order to minimize haphazard use of pesticides and to conserve the environment. As part of ESS 3- Resource Efficiency and Pollution Prevention and Management requirement for the implementation of component 3, an assessment will be carried out in the project command area to prepare an IPMP. This will include: (i) assessing the environmental issues and problems related to use of agro-chemicals, (ii) understanding the status of current use of agro-chemicals, (iii) assessing the level of awareness of farmers in handling and management of pesticides and the types of pesticides used, and (v) provide recommendations.

5.2.5 Environment and Social Commitment Plan

The proponent will require to include all the intervention proposed under component 3 in the ESCP to be prepared for overall project before project appraisal, in accordance with ESS 1.

5.2.6 Biodiversity Assessment

Although Component 3 heavily focuses on the management of pesticide and chemical use, the Biodiversity Assessment for Component 2 will also examine the impacts associated with Component 3, specifically focusing on land use changes and the effects of surface and subsurface runoff, and propose additional measures if needed. Among other aspects, the assessment will look into the impacts on downstream river dolphins and propose measures building on good practices from RJKIP Phase 2.

6 Preliminary analysis of cumulative impacts for the overall project

World Bank ESS 1 requires an Environmental and social assessment, to be carried out by the project proponent to assess the environmental and social risks and impacts of the project throughout the project life cycle. The assessment has to be proportionate to the potential risks and impacts of the project, and will assess, in an integrated way, all relevant direct, indirect and cumulative environmental and social risks and impacts throughout the project life cycle, including those specifically identified in ESSs 2–10.

Component 1- Patharaiya Extension Project (PEP) is the only component that requires forest and private land acquisition causing alteration in existing land use pattern. The existing forest and agricultural land will be converted into irrigation canal structures. Local communities of the project area rely on forests and lakes for various ecosystem services. Community forests of the project area provide resources like timber, fuelwood, and non-timber products while regulating climate, controlling floods, and supporting biodiversity. Furthermore, lakes supply water for, irrigation, and fishing, help regulate water flow and quality, and support aquatic life. Also, both forest and lakes offer recreational, cultural, and spiritual benefits, making their sustainable management crucial for local livelihoods and environmental health. These services can be partially disturbed during the construction of main and extension canals and rehabilitation of existing irrigation canal of Component 1- Patharaiya Extension Project (PEP). The placement of project structure, facilities and construction of access road may disturb local foot trails, pipes of drinking water supply etc.

Issues of community health and safety are likely from the construction of main and extension canals and rehabilitation of existing irrigation canal of Component 1- Patharaiya Extension Project (PEP). Furthermore, community health and safety issues are also expected from the riverbank protection, landslide and gully control, check dams, and afforestation activities planned under Component 2- Watershed management. Some of the issues that has the health and safety concerns for the community includes impacts from air, water, sound, and soil pollution from haulage movements, crusher plant operation, spoil management, waste discharge and haphazard waste disposal, disturbances in traffic movement, and conflict between the local community and laborers.

The preliminary cumulative impact of the three components of the project—irrigation improvement and development in the Patharaiya area, watershed management, and agriculture services support-requires a holistic assessment to understand how their combined effects will impact the environment and local communities over time. A preliminary analysis of the cumulative impacts on key valued environmental components (VECs) based on the activities in each component is presented below:

Water Resources: The cumulative impacts on water resources from all three components could result in both positive and negative consequences. Component 1 will increase the demand

for water for irrigation, which may lead to higher water extraction, potentially stressing existing water resources in the project area. However, Component 2's rehabilitation of lakes and wetlands is aimed at increasing water storage capacity, which will help offset some of the increased demand. Cumulative over-extraction could still occur if the water management strategies are not effectively implemented. Proper coordination across all components, such as integrated water resource management (IWRM), is crucial to ensure balanced water use.

Biodiversity and Habitat: The cumulative impact on biodiversity will depend on the balance between habitat destruction (from construction and land use changes) and habitat restoration (from wetland and watershed rehabilitation). It is crucial to integrate biodiversity considerations into the planning and implementation of all components to ensure the protection of local ecosystems.

Ecosystem Services: Wetland and lake rehabilitation under Component 2 can enhance ecosystem services, such as flood regulation, water filtration, and biodiversity support. However, changes in water flow and the introduction of new agricultural practices could strain these services if the project components are not well-coordinated.

Community Health and Safety: Construction activities across all components will pose risks to community health and safety, including air pollution, water contamination, and accidents. These risks can be mitigated through strict environmental management plans, regular monitoring, and community engagement. In addition, the potential for conflict between local communities and labor forces working on the project should be addressed through stakeholder consultations and conflict resolution mechanisms.

The current findings do not necessitate a CIA. However, considering all three interventions of RJKIP and their potential cumulative impact on the surrounding environment, a Rapid Cumulative Impact Assessment (RCIA) will be conducted in the first year of project implementation.

7 Stakeholder Engagement

7.1 Identification of key stakeholders including marginal and vulnerable communities

Possible Affected Parties
Key stakeholders for Component 2: Watershed Management
Primary Stakeholder • Local Community (Tharu and Ethnic groups) • Farmer and Grazing Land Users • Community Forest User Group (CFUGs) • Existing and New Water User Associations (WUAs) • Bhajani and Ghodaghodi Municipality, Bardagoriya and Joshipur Rural Municipality **Secondary Stakeholder** • Ministry of Forests and Environment (Forest and Watershed Division) • Watershed and River Basin Management Division – Watershed and Landslide Management Division (under the Department of Forests and Soil Conservation) • Non-Governmental Organisations (NGOs) • World Bank (Donor Agency) • Academic and Research Institutions **Tertiary Stakeholder** • Private Contractors and Suppliers • Disaster Risk Reduction (DRR) Organisation • Environmental Advocacy Group (Local Clubs) • Women's Groups
Key stakeholders for Component 3: Agriculture Support Services
Primary Stakeholders • Local Farmers and Farmer Groups • Water User Associations (WUAs) • Women's Groups and Marginalized Communities • Farmer-Led Cooperatives for Market Access **Secondary Stakeholders** • Bhajani and Ghodaghodi Municipality, Bardagoriya and Joshipur Rural Municipality • Agricultural Extension Offices • Ministry of Agriculture and Livestock Development (MoALD) • NGOs and Community-Based Organizations (CBOs)

- Academic and Research Institutions
- Private Sector (Agri-Businesses and Agro-Input Suppliers)

Tertiary Stakeholders

- Irrigation Department and PMU of RJKIP
- Financial Institutions
- World Bank and other donor agencies Disaster Risk Reduction (DRR) and Climate Adaptation Organizations

7.2 Effective outreach mediums for different stakeholders

Stakeholders	**Effective Outreach Mediums**
Affected Households/ Farmers	Community meetings, GRM desk, local radio, brochures, consultations, FGD, KII
Local Community and local leaders	Ward meetings, CBOs, social media, visual presentations
IP, Dalit Organizations, Women, Youths	FGDs, cultural activities, NGO partnerships, training
Farmer Cooperatives & Groups	Demonstration farms, SMS alerts, training sessions
Water User Associations (WUAs)	Monthly meetings, hotline, radio programs,
Division Forest Office (DFO), Sub-division Forest Offices	Meetings, CBOs, social media, visual presentations
Community Forest User Groups (CFUGs)	Awareness campaigns, joint meetings, compensation mechanisms
Affected Municipalities & Local Govt.	Coordination meetings, policy briefs, consultations, MoUs
Customary Institutions (Bhalmansa/ Badghar), Local Indigenous leader i.e. Badghars	Dialogues, local language materials, cultural engagement
Agricultural Colleges & Research Orgs.	Research partnerships, technical conferences, academic reports
Academic Institutions/Researchers (herpetologist and ornithologist), Schools / Colleges	Research partnerships, field visits
Private service providers such as agro-vets and other businesses	Brochures, consultations
Local Environment Monitoring Committee (LEMC)	Meetings
Non-Governmental Organizations (NGOs); BCN, WWF, Terai Arc Landscape	Meetings, CBOs, social media, visual presentations

Agriculture Knowledge Center, Kailali	Meetings,
District Coordination Committee	Meetings, Consultation
President Chure-Terai Madhesh Conservation Development Board office in Kailali	Meetings
Dolphin, Aquatic & Biodiversity Conservation Nepal, Kailali	Meetings
Soil and Watershed Management Office, Kailali	Meetings
Agricultural Service Centers	Coordination meeting, field visits
Agricultural Component Implementation Unit (ACIU)	Meetings

8 Institutional arrangements

8.1 Proposed set up for design

The Executing Agency for the Project is Department of Water Resources and Irrigation. The RJKIP is the Project Implementation Office (PIO). The Ministry of Energy, Water Resource and Irrigation (MoEWRI), on the recommendation of the DWRI approves the organizational structure of PIO, which is reviewed every fiscal year. Based on the approved structure, the DWRI deputes office personnel to the PIO. The agricultural activity of the project is being carried out through the Department of Agriculture. For this purpose, DOA has setup Agriculture Component Implementation Unit (ACIU) office at Tikapur.

At the Ministry Level, a high-level Project Steering Committee (PSC) chaired by the Secretary of the Ministry of Energy, Water Resource and Irrigation is mandated to coordinate with central level agencies like: National Planning Commission, Ministry of Finance, Ministry of Agriculture, DOA and the World Bank. It also makes policy related decisions and approves annual programs of the project. The agricultural component of the project is implemented through the Department of Agriculture (DOA). To implement agricultural activities of the project, the DOA has set up ACIU at Tikapur.

PIU shall have dedicated staffs or else augmented by team of consultants for:

- Technical leadership
- Procurement and financial management
- Environmental & social safeguards
- Monitoring & evaluation (M&E)
- Dam Safety Consultant

Water user groups (WUGs) shall be mandated as a principal stakeholder of the project in conducting participatory design at field level.

The PIO's procurement plan shall cover all technical designs and specifications which incorporates environmental & social requirements (e.g., mitigation measures as proposed in the ESMPs and related E&S plans (BMP, IPMP etc) with itemized cost of the mitigation measures included in the bill of quantities (BoQ) and Capacity-building and training proposed in the ESMPs.

8.2 Proposed set up for construction

The PIO will be responsible for oversight construction activities, including contract administration, safeguards compliance, and quality control.

Construction Management and Implementation

The PIO will be supported by a combination of dedicated technical expertise along with a Design Review, Construction Supervision and Management, E&S Monitoring Consultant to provide independent oversight, enhance technical quality assurance, and support contract management to ensure compliance with World Bank procurement, financial management, and safeguard policies. Key experts with functional areas will include:

- **Technical Team Leader/ Deputy Team Leader (Irrigation Engineer)**: Overseeing engineering design, construction supervision, contract management, and adherence to technical specifications.
- **Construction Supervision and Management and Quality Control Engineers**: Supervising and guiding construction activities, contract management, and adherence to technical specifications and quality control. They will be supported by sub-engineers and lab technicians.
- **Environmental and Social Safeguards Experts**: Implementing the Environmental and Social Management Plan (ESMP), enforcing Occupational Health and Safety (OHS) standards, and ensuring stakeholder engagement. Environmental and social risks will be mitigated through continuous monitoring, adaptive management approaches, and adherence to E&S risk management frameworks. The E&S experts will be supported by Environmental Technicians and Social Mobilizers.
- **Monitoring & Evaluation (M&E) Specialist**: Tracking construction progress, ensuring quality assurance, and facilitating results-based reporting to inform decision-making.
- **Dam Safety Specialist**: Conducting periodic risk assessments and ensuring design and implementation compliance with international dam safety standards.

Field-Level Implementation and Stakeholder Engagement

Water User Groups (WUGs) will be engaged as key stakeholders, ensuring participatory design and local ownership of infrastructure. WUGs will coordinate with the PIO for the smooth implementation of the construction activities, water management.

E&S Risk Mitigation

- A Grievance Redress Mechanism (GRM) will be established to address project-related concerns, ensuring transparency and accountability systematically.
- OHS risks will be managed through mandatory contractor safety requirements, worker training, and periodic compliance audits.

8.3 Proposed setup for operation

The Water User Committees (WUC) will be responsible for the Operation and Maintenance (O&M) of the developed infrastructures, including the implementation of an agricultural program during operation. During the initial phase of operation, the RJKIP Project Implementation Office (PIO) and ACIU will implement capacity-building activities for the O&M of the respective dams, including the development of an O&M manual and EPRP Plan.

9 Conclusion

The project necessitates a planned approach to mitigate risks associated with dam safety, particularly for downstream settlements. Implementing robust mitigation strategies before, during, and after construction will help sustain biodiversity, water quality, and livelihoods while enhancing the resilience of existing lakes. The scoping has defined the necessary environmental due diligence for the project components before individual investments can be implemented. According to the law of GoN, there is no need for an Environmental Assessment in the case of rehabilitation, modernization, or upgrading of existing storage reservoirs through watershed management. There are also no environmental and social national requirements for activities under component 3. However, an Environmental and Social Management Plan (ESMP) should be prepared to ensure that potential environmental and social impacts are identified, mitigated, and managed effectively throughout the project as per the requirements of the WB ESF. Specifically for the safety of the dams, the project will engage a dan safety expert to ensure quality of the design.

9.1 Negative list

Selection of the lakes will be prioritized based on the possible irrigation contribution to the scheme but also on the need for works to ensure community safety. Hazard Risk Assessment will be performed for each lake. The project will apply preliminary exclusion criteria based on ecological, environmental, and cultural significance, as well as community dependencies, and has identified specific areas where intervention will not take place. The potential lakes will be screened and excluded based on ecological, environmental, social and cultural criteria given below:

- Lakes where the interventions can convert or degrade critical natural habitats.
- Lakes that are proposed to take place inside legally protected areas including National Parks, wilddlife reserve, and their buffer zones
- Lakes considered significant wetland sites.
- Lakes where the intervention can impact aquatic species of concern.
- Lakes requiring the interventions that cause dislocation, modification, or restriction of access to cultural heritage sites or pose adverse impacts on cultural and heritage sites.
- Lakes that require development of new dams
- Lakes that have high risk consequences for settlements downstream in case of breach of dam

9.2 Recommendations for Project Design and Implementation

The design and implementation of interventions in lakes to combine wider use of lake and irrigation purposes could include the following:

1. Dam safety:

    - While the current design is prepared to sustain a 50 - year return flood, a preliminary the dam safety analysis suggests the system to be designed for at least 100-year return flood period.
    - Prepare hazard risk assessment for each lake / dam during selection period
2. Optimizing Water Use for Irrigation
    - Regulated Water Release System
        - Install controlled outlet gates to release water in staggered intervals based on irrigation demands.
        - Use diversion canals to channel lake water to fields while preventing over-extraction.
        - Monitor water levels to regulate outflow.
    - Retention Ponds for Dry-Season Water Supply
        - Construct small retention ponds at different sections of the lake to store excess monsoon water for later use in irrigation.
        - These ponds can act as fish nurseries during non-irrigation periods.
3. Bio-Engineering & Sediment Control
    - Install check dams upstream to trap sediments before entering the lakes, particularly in Bagaulia and Laukaha Bhaukaha lakes and other lakes where water will be augmented through perennial sources.
    - Use reeds and native grass or vetiver grass for embankment stability.
    - Design the system to withstand at least a 100-year return flood period.
4. Sustainable Fish Farming Practices and Multi-Use of Lakes
    - Establish acceptable use and practices around the lakes.
    - Implement zoning:
        - Central zones for deep-water fishes like carp.
        - Periphery zones for wetland vegetation and native fish breeding.
    - Regulate fertilizer and antibiotic use to prevent contamination.

Additional Studies for Component 2

- Environmental and Social Management Plan (ESMP)
    - Ensure that potential environmental and social impacts are identified, mitigated, and managed effectively throughout the project.
- Biodiversity Assessment (BA) and Biodiversity Management Plan (BMP)
    - Emphasize the plantation of local species, control of invasive species, and conservation of aquatic species, herpetofauna, and birds.
- Emergency Preparedness Plan (EPRP)
    - Prepare in coordination with local authorities and the affected community.
- Operation and Maintenance (O&M) Plan
    - Prepare during project implementation for each dam to ensure sustainable use of reservoirs and dam safety
- Small Dam Design Guides and Manuals
    - Improve Borrowers' capacity and ensure future interventions are based on good international practice.

Additional Studies for Component 3

- Environmental and Social Code of Practice
    - For small investments such as supporting seed storage buildings and small-scale projects.
- Stand-Alone ESMP
    - Mitigate identified impacts for component 3 sub-projects.
- Biodiversity Assessment (BA) and Biodiversity Management Plan (BMP)
    - Based on proposed activities and impacts from land use change and irrigation return flow.
- Integrated Pest Management Plan (IPMP)
    - Assess current cropping practices, pest, and disease issues in the project area and promote environment-friendly pest control methods.

For overall project:

- Rapid Cumulative Impact Assessment (RCIA)
    - In the first year of project implementation to determine whether a full Cumulative Impact Assessment (CIA) is necessary.

Reference:

RJKIP Phase 3 – Site Visit Findings – Dams/Lakes – DRAFT Thomas Bryant – Senior Dams Specialist – World Bank

NLCDC (2021). Inventory of Lakes in Nepal (Main Report). National Lake Conservation Development Committee (NLCDC)/Ministry of Forests and Environment/Government of Nepal. Kathmandu. Nepal. pp 145.

https://nsonepal.gov.np/

10 Annex

10.1 Annex 1: Terms of Reference (TORs) for Specific Assessments

10.1.1 Annex 1.1: Key issues to be covered in Integrated Pest Management Plan (IPMP)

Objective of the assignment

The main objective of the consulting service is as listed below

- To assess the current cropping practice, pest and disease in the project area.
- To promote environment-friendly pest control methods to enhance ecological and agricultural sustainability.
- To build the capacity of farmers and stakeholders on IPM techniques.
- To develop an IPM plan tailored to local farming practices and set the monitoring indicators for IPM plan implementation.
- To build on good practices introduced through the RJKIP Project phase 1 and 2.

Scope of Work

The RJKIP or the consultant/firm on their behalf shall undertake the following tasks:

Desk Study:

- Study of laws related to pesticide use like The Pesticides Act, 1991, Amendment on 2008, The Pesticide Regulation, 1993, Plant Protection Act, (1972), 2007, Plant Protection Regulation, (1974), 2010, National Agriculture Policy – 2004, List of registered pesticides and their consumption record 2024, Safe use, Storage and Disposal of Pesticides 2079 and so on. Study of latest scientific research and project related document to understand the past events in the project area. This will also work as a preparation for the interaction with farmers/key informants.

Consultations:

- Conduct systematic interviews with the farmers, agro-vets dealers, agriculture support officers, questionnaire survey, FGDs, and key informant interviews (KII) as major tools for the assessment.

Assessment:

- Conduct a baseline survey to identify key crops, pests, diseases, and existing pest management practices in the project area.
- Assess the status of current use of agro-chemicals, pesticides (banned Vs. recommended) in particular and trend in pesticides use, and possible adverse impacts

on human health and the local environment and the level of awareness of farmers and others in handling and management of pesticides
- Develop Criteria for Pesticide Selection: Guidelines for selecting appropriate pesticides, including considerations for human health, environmental impact, and efficacy.

Plan formulation

- Develop an IPM plan suggesting alternative options that includes preventive, biological, cultural, mechanical suitable for the project area based on the assessment and from lessons learnt or best practices from the first and second phases
- Devise a plan in relation to regulations related to pest and pesticide management in Nepal and Good International Industry Practices
- Develop indicators to monitor and evaluate the effectiveness of IPM interventions and recommend improvements.

Training:

- Awareness and training program for farmers in coordination with FFS, ACIU, Agriculture Learning Centre about IPM, selection of crops and timings, production and use of high-quality seeds, timing of irrigation and duration, crop rotation, mulching, bio-pesticides, well decomposed farmyard manure, disease/insect tolerant varieties, responsible use as well as balanced use of both chemical fertilizers and organic manures, proper use of pesticides, harvesting and collection timing, etc. targeting key crops of the project area.
- Organize training and workshops for farmers, extension workers, and project staff about Classification of Pesticides, environmental issues and problems in relation to the use of agro-chemicals and suggest mitigation measures for minimizing the adverse impacts, about IPM practices

Monitoring:

- Monitoring Plan: Establishment of a monitoring framework to track the implementation and effectiveness of the PMP, including indicators and data collection methods.
- Evaluation and Reporting: Regular evaluation of pest management activities and reporting on progress, challenges, and lessons learned.-

10.1.2 Annex 1.2: Key issues to be covered in Biodiversity Assessment and Biodiversity Management Plan (BMP)

Objective of the assignment

The main objective of the consulting service is as listed below:

- **Apply Mitigation Hierarchy and Precautionary Approach**: Implement these principles in the design and execution of projects impacting biodiversity.
- **Identify Sensitive Sites**: Identify sensitive sites before project activities to minimize environmental impact.
- **Stakeholder Coordination**: Identify and coordinate with stakeholders regarding project activities.
- **Evaluate Potential Impacts**: Assess the potential impacts of watershed management interventions on natural habitats and biodiversity, including direct (e.g., habitat loss due to construction) and indirect impacts (e.g., changes in water quality or flow).
- **Assess Land Use Changes**: Evaluate the impacts associated with land use changes and the effects of surface and subsurface runoff from the RJKIP 3 command area.

Scope of Work

The RJKIP or the consultant/firm on their behalf shall undertake the following tasks:

- **Desk Study:**
    - **Study Relevant Laws and Policies**: Review laws related to Forest and Biodiversity such as Forest Act, 2076, Forest Rules, 2077, Environment Protection Act, 2076, Environment Protection Rules, 2077, Plant Protection Act, 2029, Plant Protection Regulation 1974, Aquatic Animal Protection Act, 2017, CITES, 1973, Wetland Policy, 2069, CITES Act, Nepal Biodiversity Strategy, Wildlife Friendly Linear Infrastructure Guidelines 2077.
    - **Review Scientific Research and Project Documents**: Study the latest scientific research and project-related documents to understand past events in the project area, preparing for interactions with farmers/key informants.
- **Site Screening:**
    - **Avoid Sensitive Natural Habitats**: Conduct site screening to avoid sensitive natural habitats, identify CFUG, perform walk-through surveys of forest areas, identify trees to be cut, and examine trees for nesting birds or other animals.
    - **Conservation Activities**: Suggest activities designed to conserve biodiversity, consistent with existing conservation and management plans, considering biodiversity, wetlands, birds, herpetofauna, and aquatic organisms.
    - **Prevent Negative Impacts**: Assess project sites and activities, recommend alternatives to prevent forest fires, habitat fragmentation, land use modifications, tree felling, and schedule activities to protect biodiversity.
- **Identify Potential Risks and Impacts on Biodiversity:**
    - **Examine Project Locations**: Visit and examine locations proposed for various activities (e.g., workers' camp, quarries, crusher plant, waste disposal) for habitat and land-use conversion.

    - **Assess Agricultural Practices**: Evaluate unmanaged chemical pesticide and fertilizer use, agricultural runoff, use of non-native varieties, replacement of local varieties with hybrid or exotic species, and unsustainable harvesting of forest products.
    - **Water Augmentation Impacts**: Assess impacts of water augmentation to existing lakes (e.g., eutrophication, sedimentation).

- **Relocation Plan:**
    - **Transfer of Nest/Animals**: Identify tree species for the transfer of nests/animals from trees to be cut for project activities.
- **Compensatory Plantation:**

    - **Identify Land for Compensation**: Identify available land to compensate for forest area lost for the project in coordination with DFO and CFUGs.

- **Critically Endangered Species:**

    - **Assess Presence**: Assess the presence of critically endangered species in the project area or indirectly impacted like river dolphins, through literature review and consultation.

- **Stakeholder Consultation:**

    - **Conduct Consultations**: Hold consultations and group meetings with CFUGs, Division and Sub Division Forest officers, President Chure Terai Madesh Conservation Development Board, Terai Arc Landscape, Birds Conservation Nepal, and discuss project activities, working procedures, and required permits.

- **Community Capacity Building:**

    - **Orientation Programs**: Conduct orientation programs for workers, contractors, and locals about protected species and laws regarding the collection and use of these species, living or dead, as prohibited under GoN law.

- **Promotion of Native Species:**

    - **Plantation Activities**: Promote native tropical species of trees for plantation suitable for the project area

10.1.3 Templates for ESCoP

The ESCOPs should contain specific, detailed and tangible measures that would mitigate the potential impacts of each type of eligible subproject activity under the project. They shall be marked as relevant for the planning phase, the implementation phase, or the post-

implementation phase of activities. They shall be simple risk mitigation and management measures, readily usable.

ESCOPs for Agriculture Support to Farmers

Risk/Concern	Environmental Prevention/Mitigation Measures	Responsible Party
General		
	a) Use sustainable agricultural practices / approaches / technologies. (e.g., Agroforestry Practices, Polycultures and Crop rotation, Integrated Pest Management (encouraging the predators of crop-eating pest insects such as birds and bats), etc.) (Planning and implementation phases) b) Reduce top-soil losses from erosion and the reduction in soil fertility. (Cover Crops and Mulches (Establishing leguminous ground cover and applying plant residues), Grass Barriers (planting grass in strips along the contour lines), etc.) (Implementation phase) c) Induce conservation and efficient use of water. (Planning and implementation phases) d) Reduce misuse of agrochemicals, contributing to a reduction of toxic substances in soil and water. (Planning and implementation phases) e) Reduce usage of pesticides and promote integrated pest management approaches recommended by DOA. (Planning and implementation phases) f) Reduce, recycle and reuse the agricultural waste (natural, animal, plant waste). (Implementation phase)	

10.1.4 Templates for ESMP

Environmental and social risks and impacts are strongly linked to subproject location and scope of activities. This ESMP should be customized for each specific subproject location and activities.

1. Subproject Information

Subproject Title:	
Estimated Cost:	
Start/Completion Date:	

2. Site/Location Description

This section concisely describes the proposed location and its geographic, ecological, social and temporal context including any offsite investments that may be required (e.g., access roads, water supply, etc.). Please attach a map of the location to the ESMP.

3. Subproject Description and Activities

This section lists all the activities that will take place under the subproject, including any associated activities (such as building of access roads or transmission lines, or communication campaigns that accompany service provision).

4. ESMP Matrix: Risk and Impacts, Mitigation, Monitoring

This section should identify anticipated site-specific adverse environmental and social risks and impacts; describe mitigation measures to address these risks and impact; and list the monitoring measures necessary to ensure effective implementation of the mitigation measures. It may draw from the ESMF's pre-identification of potential risks/impacts and mitigation measures, as applicable, and drill down further to ensure relevance and comprehensiveness at the site-specific level. For subprojects involving construction, two sets of tables may be needed, for the construction phase and the operation phase.

Anticipated E&S Risks and Impacts	Risk Mitigation and Management Measures	Impact Mitigation		Impact/Mitigation Monitoring		
		Location/Timing/Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility

5. Capacity Development & Training

Based on the implementation arrangements and responsible parties proposed above, this section outlines any capacity building, training or new staffing that may be necessary for effective implementation.

6. Implementation Schedule and Cost Estimates

This section states the implementation timeline for the mitigation measures and capacity development measures described above, as well as a cost estimate for the implementation. The cost estimate can focus on the line items that will be covered by the project implementing agency, with costs of mitigation measures to be implemented by the contractor left to the contractor to calculate.

7. Attachments

IV. Review & Approval

<table>
<tr><td colspan="2">Prepared By: ……(Signature)
Position: …… Date ……</td></tr>
<tr><td>Reviewed By:
……(Signature)
Position: ……Date ……</td><td>Approved By:
……(Signature)
Position: …… Date ……</td></tr>
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11.1 Annex 2: Summary of Stakeholder consultations conducted

Date	Stakeholder	Issues of discussion	Key Issues raised/discussed
January 6, 2025	Bardagoriya Rural Municpality- Mr. Karna Bahadur Kunwar-Chairman Ganesh Raj Giri- Vice-Chairman Jagat Bahadur Sahi- Ward Chairman-Ward no. 4, Ramit Pandy- Journalist, Bimala Chaudhary, Laxmi Chaudhary, Dipak Bohora, Nandu Saud, Khagendra Bataula- project beneficiary,	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Key ESHS risks and issues related to the project	• The alignment of the canal is suggested to realign near the national highway in Bardgoriya Ward no. 3 area to the public land in the north to reduce social impacts from land acquisition and also to minimize the compensation amount • This realignment can maximize the benefits from irrigation facility covering additional area compared to proposed alignment • Project is suggested to realign the irrigation canal along the Kalika Secondary School playground upto Puraina Lake to enhance the benefits
January 9, 2025	Joshipur Rural Municipality, Chitra Bahadur Chaudhary-Chairman, Prakash Dhungana-Chief Administrative Officer, Dipesh Timilsina-Account Officer, Pramila Baidhya Chaudhary- Agriculture Technician, Prakash Bista, Kalpana Chaudhary- Farmer	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Key ESHS risks and issues related to the project	• Water outlet needs to be well provisioned in the construction of irrigation canal • Culverts in the irrigation canal should be provided for road crossing in the required sections • Lining in the edge of the irrigation canal should be provided
January 9, 2025	Piruwa Irrigation Water User Committee, Bardgoriya Municipality-Ward no. 2 Rajendra Bam-Secretary, Junga Bahadur Tharu, Shree Ram Chaudhary, Aman Dhangaura, Ajay Bam, Sanjib Kumar Chaudhary, Nawaraj Joshi-Beneficiaries	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Key ESHS risks and issues related to the project	• Project should provide additional water for irrigation as the irrigation is insufficient from existing Piruwa Irrigation Canal • Bars along the canals in and near the settlement areas needs to be installed to avoid possible accidents

January 6, 2025	DFO, Pahalmanpur Surendra Bahadur Kathayat, Forest Officer Dipendra K.C., Forest Officer Anita Bhattarai, Ranger	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Forest resources and biodiversity • Key ESHS risks and issues related to the project	• Project should coordinate for tree cutting with Division Forest Office • Project needs to provide adequate support for the conservation of protected species and biodiversity of the area • Project should provide wildlife crossing in the foreest segregated areas • Project should follow legal provisions of forest regualtions, 2024 (second amendments)
January 8, 2025	Koilahi Taal Community Forest User Group, Kailari, Kailali Dable Bahadur Salami Magar-Chairman Sihilal Chaudhary- Joint Secretary Ram Sundar Chaudhary-Member Man Bahadur Chaudhary- Member	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Forest resources and biodiversity • Key ESHS risks and issues related to the project	• Disagreement over the operation of Koilahi lake between local government and community forest user group
January 10, 2025	Pathariya Irrigation System Water User Committee, Joshipur Junga Bahadur Tharu, Chairman Om Raj Binadi-Vice Chairman Rekha Kumari Chaudhary-Treasurer Sabita Chaudhary-Secretary	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Key ESHS risks and issues related to the project	• Existing canal is narrow and in worn out state and therefore upgrading of the proposed irrigation canal should be constructed to accommodate additional water flow • Chemical fertilizers and pesticides are extensively used • The WUC is unaware of ESHS safeguards
January 7, 2025	Local Farmers, Bardgoria-2	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Key ESHS risks and issues related to the project	• Insufficient irrigation as farmer depends on rain, piruwa canal (very limited) and boring • Canal crossing must be constructed on every road crossing and other culturally- socially important place for the easy access
January 7, 2025	Budgars/Bhalmansa-Gaduwa Dangaura Tharu, Bardagoriya-2	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements	• Badghar is socially responsible in managing socials conflicts • Project should coordinate with Budghars during the project implementation

		• Key ESHS risks and issues related to the project	
January 10, 2025	Probable affected household at Main feeder canal chainage 0+001, 0+750, 2+850, 3+150, 5+090, 6+373, 11+810, 12+024	• Project concept, components, and objectives • Project sites and planned activities • Project implementation arrangements • Land use status • Key ESHS risks and issues related to the project	• Since all our land will be taken, the canal must be routed elsewhere. • Compensation at full replacement cost for land acquisition must be provided • As the proposed canal will be large, it should not pose a drowning risk to children •
January 10, 2025	Media	• Project information can be disseminated through official social media platforms of RJKIP PIU, municipality; FM, national/local television program and other media	• The project has used websites and FM- Jingle to disseminate project information.