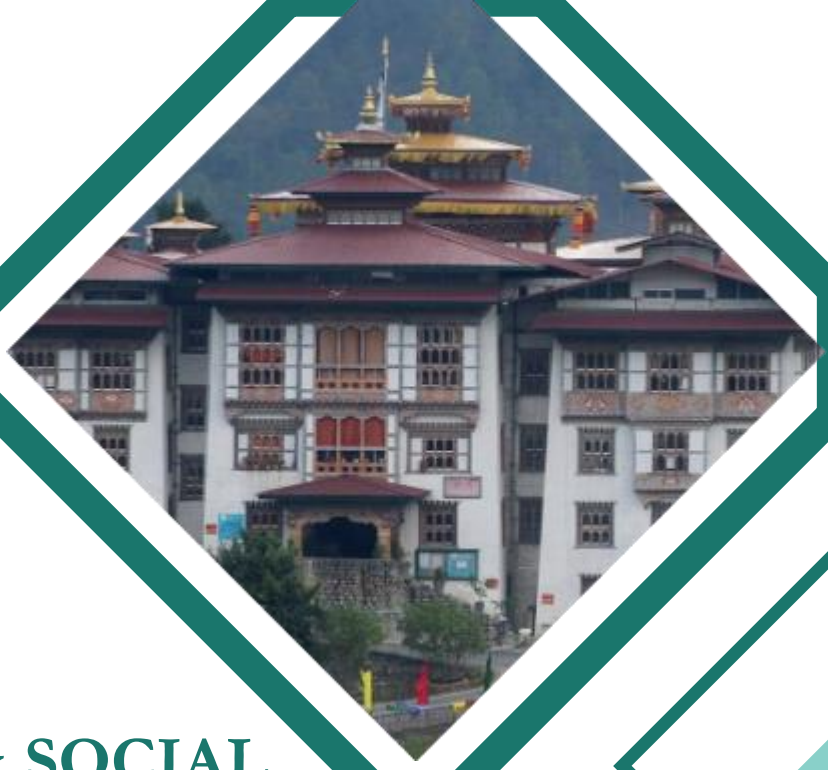
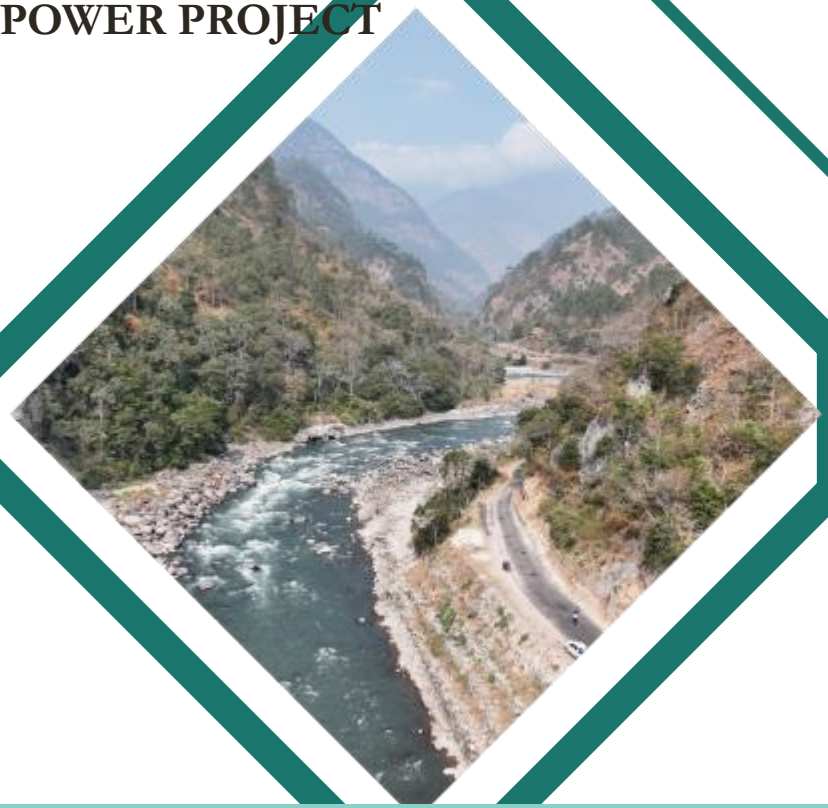


ENVIRONMENT & SOCIAL MANAGEMENT PLAN (ESMP)

DRAFT

1125 MW DORJILUNG HYROPOWER PROJECT
MONGAR AND LHUENTSE
BHUTAN



MARCH 2025

DRUK GREEN POWER CORPORATION LIMITED (DGPC)
THIMPHU, BHUTAN

Disclaimer:

This Environmental and Social Impact Assessment (ESIA) for the Dorjilung Hydro-electrical Power Project[1] was prepared by the Druk Green Power Corporation Limited, Royal Government of Bhutan (RGoB), and follows Good International Industry Practices (GIIP) and the Bank's Environmental and Social Framework (ESF).

The review of this ESIA is a key part of the Bank's due diligence process and is currently ongoing. This ESIA may still contain gaps to fully address all pertinent E&S issues in the project. Any gaps in this ESIA will be filled through supplemental studies, assessments, and/or plans that will be completed in a reasonable timeframe to ensure compliance with the ESF.

For the benefit of potentially project affected people (PAP) and other interested stakeholders, and in alignment with the Bank's Policy on Access to Information this ESIA is being disclosed as soon as it became available. The disclosure of this ESIA, however, should not be considered as a final clearance of the ESIA by the World Bank.

[1] Synonymously called "Dorjilung Hydropower Project (DHPP)"

CONTENTS

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List of Acronyms

IAS	Invasive Alien Species
BMP	Biodiversity Management Plan
BWS	Bumdeling Wildlife Sanctuary
CC	Construction Contractor
CCFs	Contractor Construction Facilities
C-ESMP	Contractor Environmental and Social Management Plan
CoC	Code of Conduct
DLGDM	Department of Local Governance and Disaster Management
DoCDD	Department of Culture and Dzongkha Development
DGPC	Druk Green Power Corporation Limited
DHPP	Dorjilung Hydropower Project
DoECC	Department of Environment and Climate Change
DOFPS	Department of Forests and Park Services
E&S	Environmental and Social
EE	Environmental Event
EFlow	Environmental Flow
EMF	Electro Magnetic Field
EPC	Engineering, Procurement, and Construction
EPR	Emergency Preparedness and Response
ESF	Environmental and Social Framework
ESHS	Environmental, Social, Health, and Safety
ESIA	Environmental and Social Impact Assessment
ESS	Environmental and Social Standards
GBV	Gender-based Violence
GRM	Grievance Redress Mechanism
GWh	Gigawatt hours
HIV	Human Immunodeficiency Virus
HRT	Headrace Tunnel
LALRP	Land Acquisition and Livelihood Restoration Plan
LMP	Labour Management Procedures
MDDL	Minimum Drawdown Level
Mg/L	Milligram per Litre
MDS	Muck Disposal site
MW	Megawatt
NC	Non-Conformance or Non-Compliance
NCR	Non-Conformance Report
OE	Owner's Engineer
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSIP	Occupational Health and Safety Implementation Plan
PCR	Physical Cultural Resources
PD	Project Director
PPE	Personal Protective Equipment
PMU	Project Management Unit
RAP	Resettlement Action Plan
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SEP	Stakeholder Engagement Plan
SON	Site Observation Notice
SP	Specific Action Plan
SSEP	site-specific environmental plans

1 INTRODUCTION

1.1 Objective of this Report

This document presents the Environmental and Social Management Plan (ESMP) of the Dorjilung Hydropower Project (the Project or DHPP). This ESMP is presented in two parts:

- **Part 1 covers the ESMP of construction-related** environmental, social, health and safety (ESHS) impacts and risks, which will be directly annexed to the bidding documents of the Contractors for their implementation.
- **Part 2 covers the ESMP of non-construction-related** and operational-phase-related ESHS impacts and risks, which will be implemented by Druk Green Power Corporation Limited (DGPC).

A brief introduction to the Project activities is described below in Chapter 1. The Project's institutional arrangements are described in Chapter 2. Part 1 on the ESMP of construction-related impacts is given in Chapters 3 and 4. Part 2 on the ESMP of non-construction-related impacts is given in Chapter 5. The budget for ESMP implementation during both the construction and operational stages is presented in Chapter 6.

1.2 A Brief Description of DHPP

The Project entails developing a 1,125 MW run-of-river hydropower facility designed to generate approximately 4,504 gigawatt hours (GWh) of electricity annually. The proposed project activities are categorized into the following categories to explain the project description:

- **Preparatory works** include access roads to the main construction facilities, realignment of existing roads that will be submerged in the proposed reservoir, and power supply for construction purposes.
- **Main Works** includes the following hydropower facilities and ancillary facilities.
    - **Hydropower facilities** include dam construction, head race, tail race tunnels, diversion/adit tunnels, underground powerhouse, and power transmission lines.
    - **Ancillary facilities** to support construction activities, such as contractors' facilities, including labor camps, storage yards, workshops, batching plants and muck disposal sites.

A location map showing all these facilities is given in **Figure 1-1**.

1.2.1 Preparatory Works

The preparatory works for the Project include the following activities to facilitate the construction of main hydropower facilities and will be carried out over 18 months:

- **Access Roads to the Main Construction Sites**: A total of 27.58 km of new access roads (at 10 locations) will be constructed to reach key project components, including the dam site, adit portals, headrace tunnel (HRT), surge shaft, and powerhouse, facilitating the transport of construction materials and equipment.
- **Highway Submergence and Realignment**: The project will submerge approximately 5.4 km of the Mongar to Lhuentse Highway near Autsho. The new Rewan to Autsho section of the highway will be

realigned to 10.60 km (up from the current 6.80 km). This realignment includes 8.45 km of new road and a 750-meter tunnel.

- **Temporary Power Supply:** The main construction activities will require approximately 15 MW of power during construction. This demand will be met by constructing a new 132/33 kV substation at Rewan. The substation will connect to the existing 132 kV Kilikhar-Tangmachhu transmission line, which will be upgraded (18 km long). This substation will distribute power to various construction sites, including the dam, tunnel adits, and powerhouse areas.
- **Existing Road Improvements:** Approximately 8.93 km of the road will be improved, including widening and other enhancements and the construction of 4 bridges to support construction activities.

1.2.2 Hydropower Facilities

The key facilities related to hydropower construction include the following, which will be carried out over 60 months.

- **Dam:** A 139.5-meter-high dam (85 m high above the riverbed) will be constructed. The dam will be made of random fill material with an impervious core and roller-compacted concrete cladding on the downstream face. The dam's crest length is 241 meters, and it features six spillway gates, each measuring 9.0 meters wide by 15.1 meters high, with a design discharge of 451 m^3/s. The project will operate with a gross head of 300.45 meters.
- **Coffer Dams and Diversion Tunnels**: Two coffer dams will be constructed—one upstream and one downstream of the main dam to facilitate water diversion. Two diversion tunnels, each 11 meters in diameter and 929.33 meters and 821.66 meters long, will be constructed to divert the water.
- **Headrace Tunnel (HRT**): A 14.97-km-long, 11-meter-diameter tunnel to convey water from the dam to the underground powerhouse.
- **Adit Tunnels**: Six adit tunnels, with a combined length of 4,698.35 meters, will be constructed to provide access to the HRT for construction and excavation purposes.
- **Underground Powerhouse**: The powerhouse will house six Francis turbines, each with a capacity of 187.5 MW, for a total installed capacity of 1,125 MW.
- **Tailrace Tunnels:** Two tailrace tunnels, 8 meters in diameter, will return water to the Kurichhu River, approximately 3.5 km upstream of the existing Kurichhu Hydropower Plant. Tunnel 1 is 350 meters long, and Tunnel 2 is 360 meters long.
- **Transmission Line**: Power generated by DHPP will be transmitted via a 400 kV line to the existing Durungri substation, located about 40 km south of the powerhouse. Two potential transmission corridors have been identified, with the final alignment to be confirmed through detailed surveys.

1.2.3 Ancillary Facilities

The proposed ancillary facilities will include the following.

- **Contractor Construction Facilities (CCFs):** Nine CCFs will be established at strategic locations near the construction sites, each equipped with Labor camps for worker accommodation, site offices for operational management, storage warehouses for materials, workshops for equipment maintenance, parking areas for heavy machinery, and Fabrication yards for material preparation. DGPC staff will

reside in existing accommodations near Autsho, Gyelpozhing, and Lingmethang, while most contracted workers (mainly foreign) will be housed within the CCFs.

- **Stockyards:** Four stockyards, covering about 21.46 acres, will be established near adits and the dam site to store construction materials.
- **Explosive Magazines:** Five explosive storage magazines, spanning 2.85 acres, will secure explosives needed for tunnelling and excavation.
- **Material Storage Areas:** At batching plants, dedicated areas will store cement, fly ash, and other bulk materials. Conveyors will facilitate efficient handling and transport.
- **Muck Disposal Sites (MDS):** Twelve muck disposal sites within an area of approximately 198.74 acres will manage waste from tunnelling, dam construction, and excavation.
- **Office Building:** A non-residential complex at the powerhouse will include offices, storage, and some recreational facilities, supporting administrative needs during the operation and maintenance phase.

1.3 Resource Requirements

Construction Material: The Project will require significant materials for its construction. These include:

- **Cement**: About 405,000 metric tons of cement will be needed for concrete production.
- **Steel**: About 65,000 metric tons of steel will be used for reinforcement in concrete structures and other applications.
- **Aggregates**: About 1,460,000 cubic meters of aggregates will be required, primarily sourced from nearby quarries.
- **Sand**: About 300,000 cubic meters of sand are anticipated to be used in concrete production and other construction activities.

Borrow and Quarry Areas: To meet the resource requirements, borrow and quarry areas have been identified near the project sites. The key locations include:

- **Quarries**: Two main quarry sites will be developed in Tsakaling and Saling Gewogs, providing the majority of aggregates and construction material.
- **Borrow Areas**: Sand and other minor aggregates will be sourced from Natural Resources Development Corporation Limited (NRDCL) sand mining operations near Gyelpozhing and Authso.

Construction Equipment: The Project will require extensive construction equipment, including excavators, bulldozers, dump trucks, concrete mixers, cranes, and drilling equipment. About 10 water tankers will be used for dust control and construction. To meet material demands, the following will be established:

- **Two crushing plants** will be established with 300 and 750 tons per hour capacity.
- **Five batching plants** will be installed with capacities ranging from 40 to 720 cubic meters per hour.

Manpower Requirements: The labour requirement for the Project will include direct workers and contracted works. The approximate manpower requirements of the Project are estimated below.

- **Construction Phase**: During the peak construction period, the project will require around 6,350 workers, approximately 90% of whom will be foreign labor. DGPC will mobilize an additional 466 Bhutanese workers for various activities.
- **Operational Phase**: Once the project becomes operational, a smaller workforce of approximately 219 workers will be required for operations and maintenance.

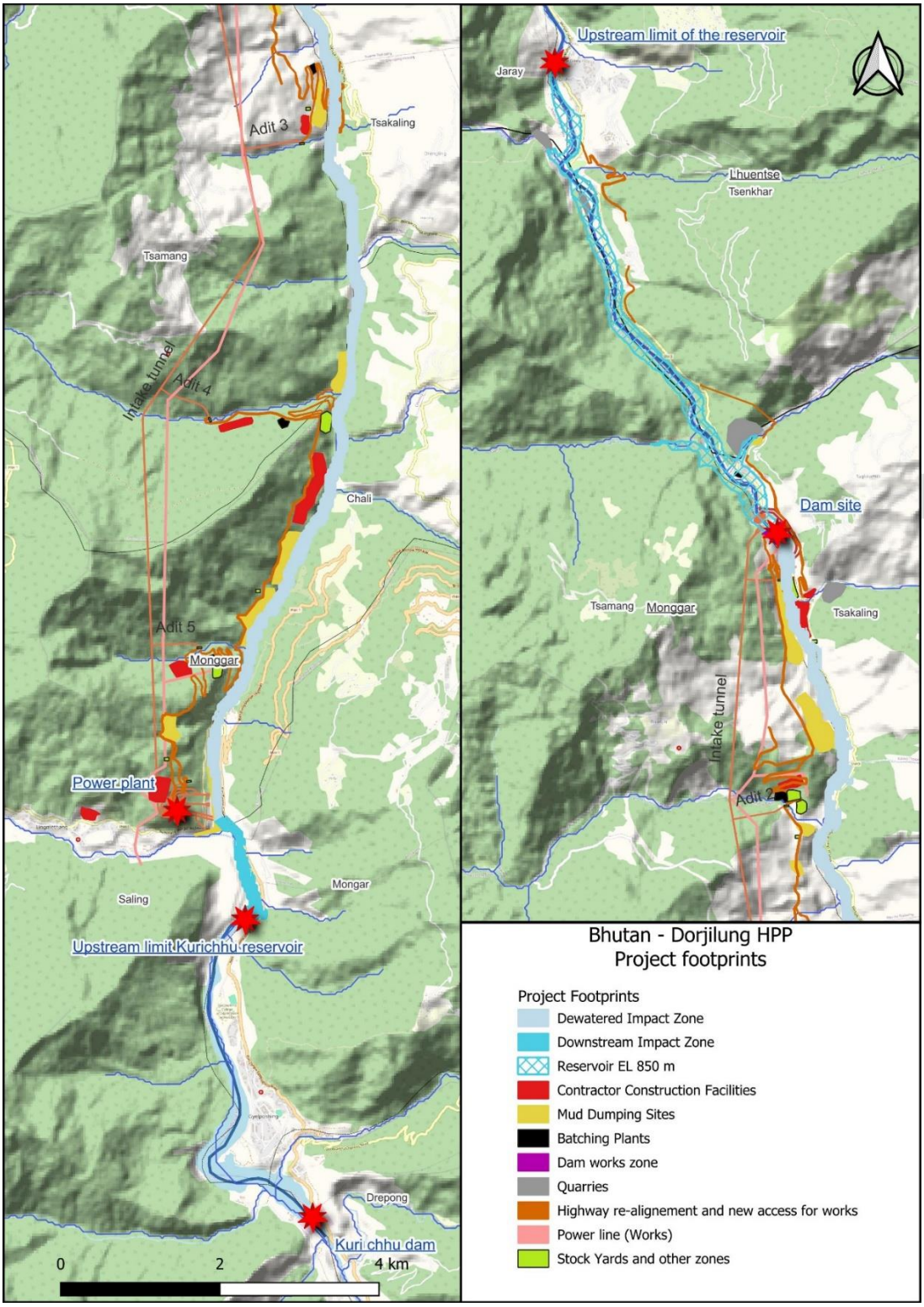
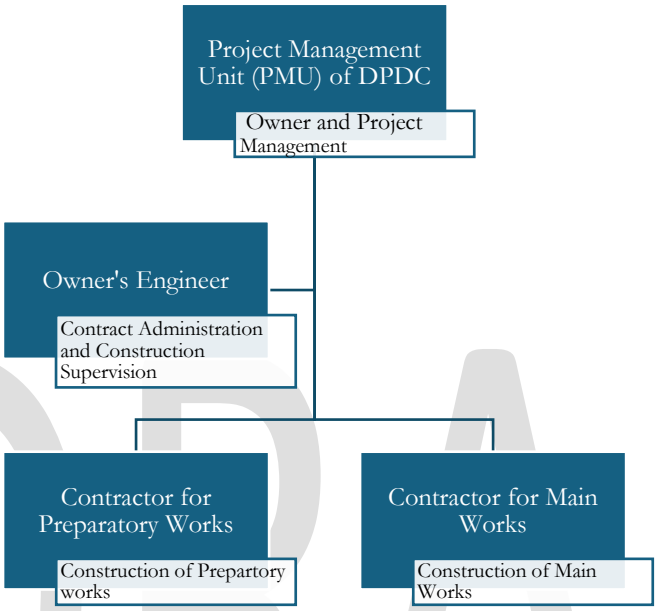


Figure 1-1: Locations of Project Facilities

2 INSTITUTIONAL ARRANGEMENTS

2.1 Organizational Structure

The proposed organizational structure of the Project implementation is shown in Figure 2.1, and a brief description of these organizations in terms of E&S management is described below.



- **Project Management Unit**. DGPC, as the Project Owner, will be responsible for overall implementation. DGPC will establish a Project Management Unit (PMU) tasked with procuring contractors, coordinating day-to-day activities, and implementing DHP activities on-site. The PMU will liaise closely with affected communities and collaborate with local authorities, reporting directly to the DGPC General Manager. PMU will oversee Environmental, Social, Health, and Safety (ESHS) management through a dedicated ESHS Section with four specialized units: an Environment Unit, a Social Unit, an Occupational Health and Safety (OHS) Unit and a Biodiversity Unit. The details of ESHS staffing in these units and their responsibilities are explained in the next section.

- **Owner's Engineer (OE):** The PMU will engage a construction supervision consulting firm to serve as the Owner's Engineer (OE), responsible for overseeing contract administration and ensuring quality control of the Contractor's work. The OE will form a dedicated ESHS Unit to monitor the project's ESHS performance and to regularly coordinate with the PMU ESHS team. The ESHS unit will include three specialized units—Environmental, Social, and OHS.

- **Contractor for Preparatory Works**: PMU will procure a contractor to construct preparatory works. The Contractor will have a small ESHS team to manage ESHS risks during the construction.

- **Contractor for Main Works**. PMU will procure an international Construction Contractor (the CC or Main Contractor) to construct the main works. The CC will most likely be engineering, procurement, and construction (EPC) contractors responsible for delivering turn-key projects. The EPC Contractor will handle all subcontractors' and suppliers' bidding, selection, and management. This contractor will also have a huge ESHS team, similar to PMU and OE's teams.

2.2 ESHS Staffing in PMU, OE and Contractors

The tentative ESHS staffing arrangements of the Project are proposed in **Table 2.1**. Each entity will have an ESHS manager to manage their ESHS team with adequate environmental, OHS, social and biodiversity staff.

Table 2-1: E&S Staffing in PMU, OE and Contractors

Project Entity	Environmental Unit	OHS Unit	Social Unit	Biodiversity Unit
PMU	1 ESHS Manager 2 Environmental Staff Plus Env. Panel of Experts -1	2 OHS staff	4 Social staff Plus Social Panel of Experts - 1	3 Biodiversity staff (Biodiversity – 1 Terrestrial - 1 Aquatic Ecologist-1)
Owners Engineer	1 ESHS Manager 6 Environmental Staff (Env. Specialists – 2 Env. Inspectors – 4)	10 OHS staff (OHS Specialists - 4 OHS Inspectors – 6)	4 Social staff (Social– 1 Resettlement – 1 Labour/GBV – 1 SEP/GRM – 1)	1 Biodiversity specialist
Contractor for Main Works	1 ESHS Manager 9 Environmental Staff (Env. Engineer - 1 Env. Specialists – 2 Env. Supervisors – 6)	20 OHS staff (OHS Specialists – 5 OHS Supervisors – 15)	4 Social staff (Human Resources - 1 Communication – 1 Labour – 1 Gender 1)	1 Biodiversity Specialist
	Medical Staff: 2 Doctors and 4 nurses			
Contractor for Preparatory Works	3 ESHS (ESHS Specialist – 1 & ESHS Supervisors – 2)			

2.3 Role and Responsibilities of ESHS Staff

2.3.1 PMU ESHS Staff

The PMU's ESHS Manager is key to ESHS matters throughout the project lifecycle. This includes ensuring compliance with the ESMP, associated plans (e.g., BMP, LALRP), and all ESHS obligations. The PMU ESHS team coordinate closely with the OE and CC ESHS teams, government authorities, the World Bank, and local communities to maintain consistent ESHS standards and transparency,

The key responsibilities of PMU ESHS staff include, but are not limited to:

- **Pre-Construction Phase**
    - Develop ESHS Specifications for tender documents.
    - Participate in tender evaluations and contractor negotiations, focusing on ESHS aspects.
    - Coordinate with government authorities and agencies on land acquisition, compensation, and necessary pre-construction approvals.
    - Obtain all required environmental permits and clearances.
- **Construction Phase**
    - Collaborate with the OE to ensure alignment of ESHS activities.
    - Participate in coordination meetings with OE and CC representatives to address ESHS issues.
    - Conduct site inspections, monitor compliance with ESHS requirements, and oversee corrective actions.
    - Prepare quarterly ESHS performance reports and update the PMU Project Director on ESHS progress.
    - Serve as the liaison to relevant government departments and support OE in resolving non-conformances and grievances.
- **Operating Phase**
    - Oversee the transition of ESHS management responsibilities to DHPP plant O&M departments.
    - Ensure the implementation of operational-phase ESMP measures.
    - Transfer all relevant E&S documents and data compiled during construction to O&M teams.
    - Confirm that all temporarily used sites are rehabilitated.

2.3.2 Owner's Engineer ESHS Staff

The OE ESHS team provides technical guidance and oversight, ensuring that the Contractor's work meets ESHS commitments. The OE ESHS staff are instrumental in capacity building, coordinating monitoring activities, verifying the Contractor's compliance, and reporting non-conformances. The key responsibilities are:

- Train and build capacity of PMU ESHS staff on ESIA findings, ESMP obligations, and construction-phase ESHS management.
- Develop baseline documentation (report templates, checklists, NCR forms) for ESHS monitoring.

- Support PMU in organizing daily inspection activities, registering and following up on non-conformances, and guiding corrective actions.
- Coordinate continuously with PMU E&S Units and keep them informed of ESHS performance.
- Review and approve the Contractor's ESMP (C-ESMP) and Occupational Health and Safety Implementation Plan (OHSIP) prior to construction commencement.
- Conduct or participate in weekly site inspections, ensuring the Contractor meets ESHS obligations, and escalate serious non-conformances to the OE Project Director.
- Oversee the Contractor's ESHS performance and prepare monthly ESHS monitoring reports, including recommendations for penalties if persistent non-conformance occurs.
- Enforce the suspension of works for significant ESHS violations until corrections are made.
- Implement compliance monitoring programs (water, air quality) and interpret results in monthly reports.
- Engage with local communities, address ESHS-related concerns, manage grievances, and handle unexpected environmental or social incidents.
- Maintain a comprehensive ESHS documentation database and assist PMU in resolving ESHS complaints and preparing for audits and inspections by lenders or independent panels of experts.

2.3.3 Role of the Construction Contractor ESHS Staff

The Contractor's ESHS team ensures that on-site construction activities comply with ESHS standards. The Contractor's ESHS Manager must be a high-ranking staff in the Contractor's organization and should have the authority to influence work methods and halt activities if critical ESHS issues arise.

The key responsibilities are:

- Develop and implement the C-ESMP and OHSIP.
- Design and manage wastewater treatment, muck disposal, landfill, and waste management facilities as required.
- Execute all mitigation measures and actions as outlined in the C-ESMP and OHSIP.
- Adjust construction methods and activities to remain compliant with ESHS obligations.
- Ensure all subcontractors and suppliers adhere to the same ESHS standards.
- Regularly inspect all construction sites, record observations, and promptly address non-conformances identified by OE or PMU.
- Submit weekly and monthly ESHS activity reports to the OE E&S Unit.
- Participate in weekly inspections and ESHS meetings with PMU and OE.
- Organize and deliver ESHS training for both management and workers.

- Engage and inform the local community about construction activities, ensuring transparent communication and resolving any related concerns.

2.3.4 Role of the E & S Panel of Experts

DGPC's Panel of Experts, comprising environmental and social specialists, provides independent guidance and recommendations throughout the project. The key responsibilities include:

- Review the organizational setup, technical capacity, and financial resources allocated to ESHS management.
- Assess progress against action plans (e.g., ESMP, LALRP, BMP) and verify compliance with schedules and quality standards.
- Identify obstacles, offer solutions, and evaluate the quality of reports submitted by the Contractor or service providers in ESHS-related fields.
- Provide DGPC with recommendations to enhance practices, resolve complex ESHS challenges, and improve overall project performance.
- Submit a report of recommendations within one month of each visit, and ensure these reports are publicly available on the DGPC website.

Part 1:
ESMP on Construction-Related E&S Impacts and Risks

3 ESMP ON CONSTRUCTION-RELATED IMPACTS AND RISKS

3.1 ESHS Conditions in Tender Documents

In order to make the Contractors fully aware of the implications of the ESMP and responsible for ensuring compliance, technical specifications in the tender documents will include compliance with mitigation measures proposed in ESMP. The Contractor will be made accountable through contract documents for the obligations regarding the environmental and social components of the project.

DGPC/PMU will include the following ESHS in the bidding documents:

- Past performance of the Contractor on ESHS aspects, including sexual exploitation and abuse and gender-based violence.
- ESHS Staff with the Contractor.
- Mitigation measures to address construction impacts.
- Code of conduct of Contractor's Personnel.
- Management Strategies and Implementation Plans (MSIP) to manage the ESHS Risks.

Each of the above conditions is elaborated in **Table 3.1**.

Table 3-1: ESHS Conditions in the Bidding Documents

(DGPC includes this table in the bidding documents)

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
1. Past performance of the Contractor on ESHS is one of the eligibility criteria for the shortlisting process	The Contractor's past ESHS performance indicates the Contractor's commitment and capability to implement the ESMP.	The Bidder shall "declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for reasons related to the non-compliance of any environmental, or social (including sexual exploitation and abuse (SEA) and gender-based violence (GBV) or health or safety requirements or safeguard in the past five years."	Bidder to make the Declaration	DGPC uses this information to seek further clarification when carrying out its due diligence.
2. Bank's SEA and/or SH Disqualification	Contractor's past performance	At the time of Contract Award, not subject to disqualification by the Bank for non-compliance with SEA/ SH obligations	Bidder to make the Declaration	DGPC uses this information to seek further information or clarifications

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
				when carrying out its due diligence.
3. (a) The Contractor for Main Works shall propose adequate E&S Specialists (environment, OHS, social and biodiversity) in their team	The Main Contractor's ESHS staff should include one environmental cum sanitation engineer, 3 environmental specialists, 4 OHS specialists, 4 social specialists and one biodiversity specialist – with adequate site supervisors - responsible for implementing all mitigation measures on E&S risks and compliance with ESMP.	The Bidder shall provide details of the proposed ESHS staff, including academic qualifications and work experience. The Environmental and OHS Specialists should have a minimum bachelor's degree in engineering or a master's degree in sciences related to environmental management. The social specialists should have relevant master's degrees. The manager-level specialist should have 10 years of experience, and the specialists should have 5 years of experience monitoring and managing E&S risks related to infrastructure projects.	The Bidder is to submit the CV of the proposed E&S staff	DGPC will review and approve
3 (b). The contractor for preparatory works shall propose adequate E&S specialists	The Contractor for Preparatory Works will have an ESHS specialist with two supervisors.	The ESHS specialist should have a minimum bachelor's degree in engineering or a master's degree in sciences related to environmental management. The Specialists should have 5 years of experience monitoring and managing E&S risks related to infrastructure projects.	Proposed E&S Staff	DGPC will review and approve
4. Implement Mitigation Measures to	The mitigation measures to address potential E&S risks	DGPC will ensure the ESMP in the General Specifications of the		DGPC will include this condition in the

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
Address Construction-Related Impacts given in ESMP	and impacts should be included in the bidding documents. The Contractor shall be responsible for implementing the mitigation measures according to the conditions in the contract.	Bidding Document, and the reference to this document will be provided in the Conditions of the Contract as follows: • The Contractor shall implement the mitigation and monitoring measures in the ESMP to address E&S risks associated with the construction works. The Consultant shall refer to the ESIA of the Project, which is available on the DGPC website, for further guidance. • The Contractor shall comply with the World Bank Group's General Environmental Health and Safety Guidelines and applicable sector-specific guidelines.		bidding document.
4. Code of Conduct for Contractor's Personnel	All workers hired by the Contractor should sign a code of conduct to ensure compliance with the E&S obligations of the Contract.	The Bidder shall submit the Code of Conduct that will apply to the Contractor's employees and subcontractors. The Code of Conduct will state that the workers will comply with the following E&S requirements: • Wearing Personal Protective Equipment (PPE) in the workplace at all times	The bidder shall submit a code of Conduct with the bid documents.	

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
		• Non-discrimination in dealing with the local community by race, ethnicity, gender, religion, disability, sexual orientation, gender identity, social or health status • Respectful attitude while interacting with the local community • Prohibit sexual harassment, particularly towards women and children • Prohibit violence, including sexual and/ or gender-based violence • Respecting reasonable work instructions • Protection and Bidder use of the property The suitability of the Code of Conduct can be assessed and discussed as part of the Bid/Proposal evaluation and negotiations. The successful Bidder is required to implement the agreed code of conduct upon contract award.		
6. Contractor's Management Strategies and Implementation Plans (MSIP) to manage the E&S Risks	The Contractor's proposal should include his understanding of the E&S requirements of the project and the proposed strategies	The Bidder shall submit Management Strategies and Implementation Plans (MSIP) to manage the following key E&S risks: • Pollution prevention (wastewater, air and	The Bidder will submit MSIP along with the Bid Documents.	

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
	to manage the E&S risks.	noise emissions) and management • A waste management strategy for proper collection and disposal of waste • Strategy to address labor influx impacts on the local communities • Gender-based violence and sexual exploitation and abuse prevention and response action plan • Emergency response plan and early warning system The Contractor shall be subsequently required to submit (before mobilization) the Contractor's Environment and Social Management Plan (C-ESMP) and OHS Implementation Plan (OHSIP) using the above strategies and Condition 4 of this Table.		
7 Budget for implementation of ESMP	The ESMP implementation budget will be included in the bidding documents as bills of quantities.	The bill of quantities (BOQs) for E&S implementation will include the following: • ESHS staffing • Implementation of Contractors ESMP (C-ESMP) and OHS Implementation Plan (OHSIP)	Cost estimates for BOQs	

Condition	The rationale for the inclusion of this Condition in the Contract	Specifications to be included in the Bidding Documents	Responsibility	
			Bidders	DGPC/PMU
		• ESHS Monitoring		
8. Penalty clauses for non-compliance	For most serious non-conformances with significant impacts on workers, community health and safety, and environmental degradation, there should be provisions for penalizing the contractors.	A 3% Contractor's monthly interim payment will be withheld as a penalty if any Level III (most serious) non-conformance remains unresolved beyond the suggested timeframe for corrective action.		DGPC will include this clause in the bidding documents

3.2 Pre-construction Stage Mitigation Plans

The pre-construction stage will mainly include the mobilization of the contractor and finalization of the following conditions/documentation by the Contractor:

- Contractor's ESMP (C-ESMP) with site-specific management plans and OHS Implementation Plan (OHSIP)
- Surveys and engineering designs for muck disposal, waste and wastewater treatment facilities
- Labour Management Procedures to be followed for hiring and management of labour.
- The mobilization of ESHS Staff

Each of the above conditions is elaborated in **Table 3.2**.

Table 3-2: E&S Conditions in the Pre-Construction Stage

Condition/ Document	The rationale for the inclusion of this Condition	Measures by the Contractors
1. Preparation of Contractor's Environmental and Social Management Plan (C-ESMP)	The Contractor shall submit site-specific management plans to address E&S risks following the ESMP requirements and MSIP proposed in the bid documents.	Prior to commencing any construction activities, the Contractor must prepare and submit a Contractor's Environmental and Social Management Plan (C-ESMP) for review and approval. No construction work will begin until the C-ESMP is approved. The Contractor shall review the C-ESMP every six months and update it as needed to reflect changes in project scope, site conditions, or regulatory requirements. The C-ESMP will include three parts: **Part 1: Master C-ESMP**

Condition/ Document	The rationale for the inclusion of this Condition	Measures by the Contractors
		Part 1 serves as the overarching framework for the Contractor's ESHS management approach, aligned with international industry best practices. It will: • The planning framework: identification and assessment of risks, applicable legal and regulatory framework, objectives and targets, and performance indicators retained. • The ESMP implementation framework: organization and distribution of responsibilities, awareness and training programs, communication processes, documentation and document control processes, operational control and emergency preparedness procedures. • Control and corrective actions: establish monitoring protocols, non-conformance detection and corrective action procedures, data management, and audit protocols. • Detail emergency preparedness and response measures **Part 2: Specific Action Plans.** Part 2 will complement the master document with more technical documentation, presented as Specific Actions Plans (SPs). Each SP will outline the methodologies, equipment, and resources the Contractor will use to manage identified risks or impacts. At a minimum, the following SPs are required: • SP1: Erosion and Sediment Control Plan • SP2: Muck Disposal Planning and Management Plan • SP3: Waste Management Plan • SP4: Hazardous Substances Management Plan • SP5: Explosive and Blasting Management Plan • SP6: Emergency Preparedness and Response Plan • SP7: Water Quality Monitoring Plan • SP 8: Wastewater Management Plan • SP9: Quarry Management Plan • SP10: Emissions, Dust and Noise Management Plan • SP11: Physical Cultural Resources Management • SP12: Vegetations Clearing Plan • SP13: Landscaping and Re-vegetation Plan • SP14: Biodiversity Protection Plan • SP15: ESHS Training for Construction Workers Plan • SP16: Road Traffic Management Plan • SP17: Construction Sites Access and Security

Condition/ Document	The rationale for the inclusion of this Condition	Measures by the Contractors
		• SP19: Workers Accommodation Plan (Camps) • SP19: Labour Recruitment Procedures • SP20: Communities Health and Safety Management Plan • SP21: Site Cleaning and Rehabilitation Management Plan • SP22: Reservoir First Impoundment Management Plan • SP23: Logistics Management Plan **Part 3: Site Specific Environmental Plans** The site-specific environmental plans (SSEPs) customize the general mitigation measures identified in Parts 1 and 2 to address each specific site or activity area's unique E&S conditions. The scale, sequencing, and technical adjustments of mitigation actions will depend on site characteristics, ensuring the measures are both practicable and effective. **Method Statements** The contractor will submit a method statement that outlines the detailed procedures, sequences, and safety controls to be followed when performing a specific construction task or set of activities for OE review and no-objection. This method statement should include a section on ESHS aspects with SSEPs. Each SSEP will consist of: • A baseline description of the site's initial conditions (e.g., land use, existing infrastructure, drainage patterns). • A map indicating the location of planned construction activities. • The specific action plans triggered by those activities. • The tailored mitigation measures, including the protection of environmental and cultural resources, as well as proposed site restoration measures for temporarily used sites, upon completion of the work.
2. Preparation of OHS Implementation Plan (OHSIP)	The Contractor shall submit OHS implementation plans to address OHS risks following the ESMP requirements, and MSIP proposed in	Prior to initiating any construction activities, the Contractor must prepare, submit for approval, and implement an Occupational Health and Safety Implementation Plan (OHSIP), also known as the health and safety manual. No construction work shall commence until the OHSIP has been reviewed and approved. The Contractor shall re-examine and update the OHSIP every six months or more frequently if changing conditions or new information warrant adjustments.

Condition/ Document	The rationale for the inclusion of this Condition	Measures by the Contractors
	the bid documents.	Minimum OHSIP Requirements are: • Safe Working Environment: Clear procedures for establishing and maintaining safe working conditions, ensuring that workplaces, machinery, equipment, and processes under the Contractor's control do not pose undue health risks. This includes measures to control chemical, physical, and biological hazards. • Applicable Guidelines and Standards: Reference and compliance with Bhutanese regulations, World Bank EHS Guidelines, and internationally recognized best practices (e.g., International Tunnel Association Guidelines, OSHA, ILO), ensuring that the Contractor's operations align with the highest available safety standards. • Training and Record-Keeping: A schedule and curriculum for worker training sessions encompassing hazard recognition, use of personal protective equipment (PPE), emergency procedures, and general health and safety measures. All training must be documented, with attendance, topics covered, and evaluation records maintained for auditing. • Emergency Preparedness and Response: Detailed procedures for preventing, preparing for, and responding to emergency situations, whether natural or man-made. These should cover fires, explosions, leaks, spills, and severe weather events, as well as protocols for prompt incident reporting, containment, evacuation, and communication with relevant authorities and stakeholders.
3. Preparation of Designs and Drawings of Environmental Facilities	The contractor should design muck disposal sites, wastewater treatment, and waste management facilities to ensure adequate environmental controls.	As part of the C-ESMP, the Contractor must submit engineering designs and drawings prepared under the guidance of a qualified Environmental/Sanitation Engineer. These designs must be reviewed every six months and updated if necessary. The facilities include: • Muck Disposal Sites with slope protection measures to prevent erosion and environmental damage. • Structures for In-Vessel Composters ensuring efficient and sanitary organic waste management. • Modular Sewage Treatment Plants (e.g., Sequencing Batch Reactors) at construction camps for proper wastewater treatment and disposal.

Condition/ Document	The rationale for the inclusion of this Condition	Measures by the Contractors
		• Sedimentation and pH Treatment Systems for treating wastewater from batching plants and tunnel discharges before release into the environment. • Landfill Sites for disposing of inert and construction wastes in a controlled and environmentally responsible manner. • Water supply systems are dedicated to dust control at the dam excavation site and crushing plants, reducing particulate matter and improving air quality.
4. Mobilization of E&S Staff	The E&S Staff should be mobilized during pre-construction to prepare the C-ESMP.	The Contractor shall submit the CVs of the E&S Specialists for DGPC/PMU review and approval and mobilize them. The E&S Staff should be present at the site throughout the construction period.
5. The hiring of Construction Labour	Hiring procedure for construction workers, including the signing of the code of conduct	Provisions in labour management procedures (LMP) will be followed (further elaborated in Table 3.3). The Procedures will include terms and conditions of employment, including hours of work, wages, overtime, compensation and benefits, holidays, leaves, and so on. The procedures will set out measures to prevent and address harassment, intimidation and/or exploitation. All workers shall sign the code of conduct and will be terminated if they do not comply.
6. Construction camp and construction yard	The contractor will need areas to set up the camp and construction yard.	The contractor shall set up camps and yards within sites approved by the DGPC/PMU.

3.3 Construction Stage Mitigation Plans

Detailed mitigation plans for construction stage impacts have been developed based on the comprehensive impact assessment conducted in the ESIA and are presented in Table 3.3. These plans are tailored to the project's requirements and, where feasible, address site-specific conditions. However, Contractors will be responsible for further elaborating key elements to create detailed site-specific management plans as part of their C-ESMP and OHSIP. These site-specific plans must be submitted to the OE for review and approval prior to implementation.

Table 3-3: E&S Impacts and Risks in Construction and Mitigation Measures

(Note: DGPC will include this Table in the Contract Specifications of the Bidding Documents under Employer's Requirements)

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
	Labour Employment		
1	Labour recruitment	Potential labour risks in the recruitment of workers	• Contractors will apply the following guidelines to ensure fair and equitable treatment of all workers during recruitment and throughout the employment relationship: • Non-Discrimination: Contractors shall uphold non-discrimination practices in all aspects of employment, ensuring that workers are treated equitably irrespective of their gender, age, ethnicity, religion, disability, or any other characteristic. This includes: o Recruitment and hiring, where all candidates are assessed solely based on their qualifications and job requirements. o Compensation, ensuring fair wages and benefits for all workers as per labor laws and contractual terms. o Equal access to training programs to enhance skills and career advancement opportunities. o Transparent and merit-based job assignments and promotion practices. o Fair termination or retirement policies that comply with legal and contractual requirements. o Non-discriminatory disciplinary practices that respect workers' rights and dignity • Harassment Prevention: Contractors must prevent and address any form of harassment, intimidation, or exploitation within the workplace to maintain a respectful and safe work environment. • Protection of Vulnerable Workers: Contractors shall provide special measures of protection and support for vulnerable workers, ensuring their rights and safety are upheld
2	Employment terms and conditions	Potential exploitation of work force	• The Contractor shall provide the Contractor's Personnel information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out their rights under relevant labor Laws applicable to the Contractor's Personnel (which will include any

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from any requirements in the Specification; and shall also include the Code of Conduct for Contractor's Personnel. The Contractor's Personnel shall be informed when any material changes to their terms or conditions of employment occur.
3	Child labour	Risk of child labour	• The minimum age to work on the Project is 18. The Contractor, including its Subcontractors, shall not employ or engage a person under the age of 18. • The contractors will conduct age verification of all workers.
4	Forced labour	Risk of forced labour	• The Contractor, including its Subcontractors and Suppliers, shall not employ or engage in forced labor. Forced labor consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty and includes any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labour-contracting arrangements. • No persons shall be employed or engaged who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harbouring or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.
5	Code of conduct for workers	Lack of awareness among project workers on prohibited activities in the project	• The Contractor shall have a Code of Conduct for the Contractor's Personnel. • The Contractor shall take all necessary measures to ensure that each Contractor's Personnel is made aware of the Code of Conduct, including specific prohibited behaviours, and understands the consequences of engaging in such prohibited behaviours. • These measures include providing instructions and documentation that can be understood by the Contractor's Personnel and seeking to obtain that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project-affected people. The posted Code of Conduct shall be provided in languages comprehensible to the Contractor's workers and the local community.
6	Grievance Mechanism	Lack of mechanism to address workers' risks	• The Contractor shall have a grievance mechanism for the Contractor's workers and, where relevant, the workers' organizations to raise workplace concerns (other than those relating to SEA and/or SH, which will be addressed separately). The grievance mechanism shall be proportionate to the nature, scale, risks and impacts of the Contract. The mechanism shall address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and shall operate in an independent and objective manner. • The Contractor's Personnel shall be informed of the grievance mechanism at the time of engagement for the Contract and the measures put in place to protect them against any reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all Contractor's Personnel. • The grievance mechanism shall not impede access to other judicial or administrative remedies that might be available or substitute for grievance mechanisms provided through collective agreements. • The grievance mechanism may utilize existing grievance mechanisms, providing that they are properly designed and implemented, address concerns promptly, and are readily accessible to such Contractor's Personnel. Existing grievance mechanisms may be supplemented as needed with Contract-specific arrangements.
	OHS Risks		
7	General OHS Risks	General risks associated with the construction works include electrical hazards.	• Conduct a 'job hazard analysis' at the new construction site to identify potential hazards that may arise from the proposed works or working conditions for the project workers and implement necessary control measures. The job hazard analysis should be part of the Contractor's method statements, which will be reviewed and approved

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
		- Falls and Trips Hazards. - Hazardous Materials. - Working at Height. - Confined Space. - Crane and moving heavy equipment. - Burn, cuts, ear, eye and respiratory damage when using electrical tools and welding. - Fire and Explosion Hazards.	by the OE. The OE specialists will also visit the construction sites before the start of construction to ensure that control measures are in place. • Regular site inspections and safety audits by the OE and PMU OHS specialists. Since the site engineers will always be present at the worksites, they will be trained by their OHS team on monitoring the safety aspects of the construction works. • Regular training programs for workers on ohs (monthly training and daily toolbox talks), code of conduct, and emergency response plan. Special attention will be focused on safety training for workers to prevent and restrict accidents and on the knowledge of how to deal with emergencies. • In order to protect all project personnel and visitors, the Contractor will provide personal protective equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, body harnesses, protective clothing, goggles, full face eye shields and ear protection. The Contractor will also train workers on how to use them, maintain them in a sanitary and reliable condition, and replace the damaged ones immediately with new ones. • Adequate water supply and mobile toilets, medical and first aid care facilities at the worksites • Contractors will have a dedicated and qualified OHS inspector/supervisor at each work site to ensure compliance with the OHSIP. • First aid facilities will be made available at the worksites and in the workers' residences. The contractors will engage qualified first aider(s). • Develop and implement a strict working permit system for working at height, working in confined spaces, welding, hot work permits, etc. Each worker must hold the relevant accreditation / have gone through the relevant training prior to undertaking these activities.
8	OHS Risks with confined spaces	Risks from Tunnel and underground powerhouse construction works.	• Signage and Safety Information: All hazardous and high-risk areas, emergency exits, and safety-related locations will be clearly marked with internationally recognized signs. These signs must be easily understood by workers, visitors, and the general public, using symbols and languages appropriate for the workforce and any authorized site visitors.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Blasting Controls and Permits: Blasting operations will require a formal "Permit to Work" issued by the OE and the Contractor's OHS team. Prior to each blast, specific warning signals and procedures will be followed to alert all personnel and third parties in the vicinity, ensuring that no one is exposed to undue risk. • Air Quality Monitoring: After every blast, air quality tests will be conducted before allowing workers and staff to re-enter the tunnel or powerhouse areas. Adequate time for ventilation and clearing of dust and fumes will be ensured to maintain safe working conditions. • Ventilation Systems: The workplace will be equipped with effective ventilation systems to control dust, fumes, and gases. Proper airflow will ensure that workers can perform their tasks safely and without compromising their respiratory health. • Methane Detection and Monitoring: Regular methane detection tests will be carried out to identify potential gas accumulations. Timely detection allows for prompt action to reduce explosion and fire risks. • Respiratory Protection: Appropriate respiratory PPE will be provided and strictly enforced when exposure to dust, smoke, or other airborne contaminants cannot be eliminated or sufficiently reduced by engineering controls. • Heat Stress Management: Conditions in tunnels and underground spaces will be monitored for elevated temperatures and humidity. Measures such as rest breaks, hydration stations, and ventilation enhancements will be implemented to prevent heat-related illnesses. • Fire Prevention and Control: Fire risks due to combustible materials will be minimized through consistent housekeeping and waste management. Firefighting facilities, including extinguishers, hoses, and alarms, will be installed and maintained throughout the tunnels. Workers, including casual labourers, will receive training in firefighting and emergency response procedures. • Lighting and Visibility: Adequate lighting arrangements will be installed and maintained throughout tunnels and underground worksites, ensuring that all operations are conducted with sufficient visibility to reduce the risk of accidents and errors.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Electrical Safety: Electrical systems and equipment will be properly installed, grounded, and regularly inspected. Appropriate barriers, insulation, and PPE will protect workers from electrical hazards and ensure a safe working environment underground.
9	Personal Protective Equipment (PPE)	The lack of relevant PPEs will increase the risk of worker's exposure to construction hazards.	PPE protects workers exposed to workplace hazards in conjunction with other facility controls and safety systems. These include • Eye and face protection: Flying particles, molten metal, liquid chemicals, gases or vapours, light radiation. • Head protection; Falling objects, inadequate height clearance, and overhead power cords. • Hearing protection; Noise, ultra-sound. • Foot protection: Falling or rolling objects, pointed objects. Corrosive or hot liquids. • Hand protection: Hazardous materials, cuts or lacerations, vibrations, extreme temperatures. Recommended measures for the use of PPE in the workplace include: • The selection of PPE should be based on the hazard and selected according to criteria on performance and testing established by recognized organizations. • Active use of PPE if alternative technologies, work plans, or procedures cannot eliminate or sufficiently reduce a hazard or exposure • Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors without incurring unnecessary inconvenience to the individual • Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. Proper use of PPE should be part of the recurrent training programs for employees.
10	Emergency Response procedures	Emergencies during construction, such as accidents and fire incidents	Contractors will develop and implement emergency response procedures (ERP) consisting of the following: • Fire Prevention and Control: Conduct routine inspections of electrical and gas systems, establish designated smoking areas with clear fire hazard signage, and maintain fire safety equipment with clear access to fire exits.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Natural Disaster Response: Develop specific disaster response plans, conduct regular disaster scenario drills, and reinforce structures to withstand natural disasters. • Drowning Risk Mitigation: Provide life jackets and flotation devices for workers near water, install safety barriers and warning signage near riverbanks, offer water safety and rescue training, and ensure standby rescue teams during river-related construction activities. • Emergency Response Team and Communication: Form a specialized Emergency Response Team, maintain efficient communication systems for rapid emergency response, and regularly update and test emergency communication plans. • Rescue Equipment and Evacuation Planning: Ensure the availability of rescue and first aid equipment, including water rescue gear, clearly mark evacuation routes and assembly points, and regularly maintain and check rescue equipment. • Monitoring and Improving: Consistently monitor and review emergency preparedness measures, document incidents in detail, and continuously improve safety measures based on incident analysis and feedback. • Records management. A records management system will be established to store and maintain easily retrievable records against loss or damage. It will include documenting and reporting occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits. • Safety communication. Ensure that occupational health and safety matters are given high publicity to all persons regularly or occasionally on each construction site. Posters will be displayed prominently in relevant areas of the site, and • Training. Conduct training and test drills on emergency response procedures.
	Workers Health and Wellbeing		
11	Workers' accommodation in camps	Inadequate facilities for workers are a risk in construction,	• The minimum standard accommodation to be provided to workers should include (Values based on IFC/EBRD Workers' Accommodation: process and standards - Guidance Note, 2009)

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
		which affects workers' health.	• Room: Facilities for men and women are in separate buildings. The minimum ceiling height is 2.20 m, the minimum area per worker is 5 m², and the maximum of 4 workers in a room. For light and aeration, each room will have a window, with a window area representing at least 5 to 10% of the floor area. The room benefits from easily cleanable flooring material. • Storage: Each worker shall be allocated a cupboard or big locker volume of no less than 0.5 m3 to store personal belongings. Separate storage shall be provided for work boots, other personal protection clothing, and equipment. • Bedding: The bed will be at least 0.80m x 2.00 m. Double-bed bunks shall not be allowed. The minimum space between beds cannot be less than 1.00 m. Each worker is provided with a comfortable mattress, at least 10 cm thick of medium density foam, pillow, cover, clean bedding and impregnated mosquito net. • Lighting: At least one ceiling bulb for a 5 m² floor area will be provided, as well as one electric plug per worker living in the room. • Water supply and sanitation facilities: These will be installed in separate buildings for men and women and are constructed in easily cleanable materials (tiling, wood is prohibited) with anti-slip hard washable materials. Sanitary buildings are not located more than 30 m from related dormitory buildings and are accessible at night with light and hard paths, avoiding mud or water. Sanitary and toilet facilities shall be (i) designed to provide workers with adequate privacy, including ceiling-to-floor (or at least 2 m high) partitions and lockable doors, and (ii) well-lit and well-ventilated. • The ratios are to be respected in terms of sanitation (number of toilets, showers, and sinks). ILO recommends 1 shower and sink for 6 to 10 workers in worker camps. The selected standard for DHPP will be one cleaning set for 6 workers and one toilet for 10 workers. On construction sites, portable chemical toilets (separate for men and women) will be installed with a ratio of one toilet for 15 workers. • The canteen facility shall provide at least an area of 1.5m²/worker and be fully furnished with tables and chairs. Floor and table surfaces shall be easily washable (wood prohibited).

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Regular cleaning of the sanitary facilities is provided, particularly toilets and septic tanks. • Regular monitoring of the potability of distributed water (in particular, testing for fecal coliforms). • Waste management and regular cleaning of trash cans. • Monitoring of hygiene conditions in canteens and at authorized businesses selling food to employees (staff hygiene, kitchen cleaning, storage of fresh products). • Quality of meal supplied: A dietetically balanced daily ration of not less than 5,000 Kcal/worker.
12	Common health issues	Lack of medical treatment and urgent care for the workers	• The Contractor will maintain well-equipped medical facilities within the workers' camps, staffed by qualified doctors and nurses. Sufficient stock of medicines and basic first aid supplies will be kept readily available to address routine health concerns and provide initial treatment for illnesses or minor injuries. • In addition to on-site care, the Contractor will establish formal partnerships with nearby medical services or the Mongar Regional Referral Hospital. This arrangement ensures that workers have access to specialized treatment, urgent care, and emergency medical support when necessary, thereby improving overall health outcomes and response times.
13	Safety of workers	Security risks to project workers due to the remote location, such as exposure to wildlife, extreme weather conditions, or hazardous terrain. Risks such as theft, vandalism, or other criminal acts within the camp potentially endanger personal safety and property.	• Develop and implement an ID/tag system for Project workers and vehicles. • The camps and mains installations should be fenced, with a double boom-gate / security system to manage entry. There needs to be an automatic floodlight system with the mentioned sensor in key Camp and Technical Installations areas. • A CCTV system should be installed to cover the main works areas and access (e.g., camp entry, office building entry, explosives warehouse, fuel farms, etc.). • Any illegal contraband, poaching, trafficking, or prostitution activity is strictly prohibited (zero tolerance policy). In addition to disciplinary measures and dismissal, offenders will be reported to the Royal Bhutan Police. • Engage a specialized company for security management. Guards are prohibited from wearing firearms and should refrain from violent actions in their work.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• The PMU PD and Security Manager will liaise regularly with the Royal Bhutan Police and other agencies to share information. • Develop and implement a Security Management Plan. All measures will need to abide by the Voluntary Principles on Security and Human Rights.
	Impact on Resources		
14	Construction material	Adverse environmental impacts due to illegal quarry sources	• Contractors will use approved quarries of the Natural Resource Development Corporation Ltd. (NRDCL), aggregate from private crushing plants and sand from the NRDCL quarry at Wangdue. • Contractors will submit the details of quarries for OE's approval before procurement. OE's environmental specialist will conduct due diligence on these facilities to ensure they are operated with the requirement of environmental compliance with the permits and good practices. • The project designs also include measures to reduce resource use and waste generation by reusing the excavated material as aggregates and reducing the use of cement by incorporating fly ash, an industrial by-product, into concrete mixtures. • The new quarry sites will be developed as per the World Bank EHS guidelines on Construction Material Extraction.
15	Surface Water	The use of water from local resources may affect other users	• The project will build a dedicated water supply system for the project works without affecting other water users. • Reuse treated water from the sedimentation ponds and wastewater treatment plants for construction activities and sprinkling for dust control.
16	Springs	Impacts on springs from tunnel excavations	• Arrest the seepage from tunnel excavations that are affecting the springs • Should any local springs be affected, the project will provide alternative water sources to the affected households. Where seepage is detected during excavation, grouting and installing reinforced concrete linings will be used to reduce or eliminate groundwater ingress into tunnels

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
17	Soils	Soil erosion and sedimentation from construction activities	• Erosion control measures will be applied to all land that is stripped or excavated, as well as all embankments and temporary or permanent deposits of materials, in order to minimize and control the resulting sediment loads before they reach the Kurichhu River or tributaries. This protection will involve, on the one hand, the implementation of methods for stabilizing slopes and, on the other, the collection of surface water runoff. • Erosion control will include methods that are incorporated into construction practices, including the provision of temporary protection of a mechanical nature (geotextile covering sheets, sediment barriers) or temporary revegetation of the areas concerned. • Drainage of the entire area of any construction operations will be provided prior to the start of any other activity. Drained water will be channelled towards one or several sedimentation basins, designed following accepted best practices and sized to contain the rainwater falling in 24 hours with a return period of two years. Sedimentation basins will be cleaned of the deposited materials as soon as their active volume is reduced to 50% of their total volume. • Particular attention will be given to the sedimentation basins associated with the tunnel adits. • The CC will present a Drainage, Erosion and Sedimentation Control Plan, which will set out the applicable principles and practices adopted for the Project. • For each site to be opened for construction activities, a detailed Site-Specific Plan presenting the drainage system and the proposed anti-erosion measures will be prepared by the CC and submitted to the OE-ESHS Manager for non-objection at least three weeks before starting works on the site. The drainage channel and sedimentation basins will be built as a priority before any other activity is carried out.
	Pollution Prevention		
18	All types of pollution	General Pollution from all construction activities	• The Contractor shall take all necessary measures to: o Protect the environment (both on and off the Site) and o Limit damage and nuisance to people and property resulting from pollution, noise and other

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			results of the Contractor's operations and/ or activities. • The Contractor shall ensure that emissions, surface discharges, effluent, and any other pollutants from the Contractor's activities exceed neither the values indicated in the Employer's Requirements nor those prescribed by applicable Laws. • In the event of damage to the environment, property and/or nuisance to people, on or off-site, as a result of the Contractor's operations, the Contractor shall agree with the Engineer the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Engineer.
19	Wastewater from construction camps	Pollution of surface water resources	• Design and install modular sewage treatment plants (e.g., Sequencing Batch Reactors) at each construction camp. These systems should be capable of producing an effluent suitable for reuse in gardening. • Ensure that the sludge generated by these plants is properly handled and transferred to in-vessel composters, converting waste into a beneficial soil amendment. • Regularly sample and test the treated wastewater to ensure it meets environmental standards. If deviations occur, adjust treatment processes to maintain compliance. • Employ staff for the operation of these facilities and provide them targeted training sessions to ensure proper operation and maintenance of treatment plants.
20	Wastewater from batching plants and tunnel discharges	Pollution of surface water resources due to high sediment loads and pH from the wastewater/ discharges	• Construct adequately sized sedimentation ponds to capture wastewater and reduce suspended solids. Include systems for pH adjustment to neutralize the water before discharge • Conduct routine cleaning and maintenance of sedimentation ponds to remove deposited sediment. • Transport removed sediment to designated muck disposal sites, ensuring it does not pollute water resources. • Test the outlet water from treatment systems to verify that sediment and pH levels meet environmental standards. Adjust operations as needed based on monitoring results.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
21	Wastewater from construction yards	Pollution of soil and surface water resources	• Construct sedimentation ponds equipped with oil-water separators to prevent the discharge of oily substances into the environment. • Regularly inspect and monitor sedimentation ponds to ensure they function effectively. Promptly address any issues, such as excessive sediment buildup or leaks, to maintain consistent environmental protection.
22	Hazardous Materials	The potential risk of soil and water pollution from the storage of fuels and other hazardous materials	• Implement strict protocols for storing and handling hazardous materials to prevent spills and leaks. • Storage of fuels and chemicals in contained facilities and taking appropriate measures to avoid and contain any spillage. They will be stored a minimum of 100 m away from water bodies. • Establishing spill response procedures, including immediate containment and cleanup measures. • Conducting regular inspections of storage areas and construction sites to ensure no leaks. • Provision of adequate spill kits for immediate cleanup of spills
23	Air pollution from construction	The emissions from vehicles and construction equipment will pollute the air, causing health and safety issues as well.	• Maintain construction machinery and vehicles in good working order to minimize emissions. Ensure compliance with applicable emission standards. • Conduct wet blasting and drilling to minimize dust emissions • Limit dust generation through regular water spraying and other dust suppression techniques. Adjust the frequency of watering according to weather conditions and site activities. • Locate batching and asphalt plants at least 500 meters away from residential and commercial areas. Equip these facilities with effective dust and emission control systems (e.g., wet scrubbers and enclosures). • Inform local communities about construction schedules, planned mitigation measures, and any potential temporary impacts on air quality. • Quarterly monitoring of ambient air quality in the project area • Operate a GRM to promptly address public complaints related to air pollution. Implement corrective actions as needed.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
24	Noise and vibration	Increase in ambient noise levels due to construction	• Regularly inspect and maintain construction machinery to ensure they operate at optimal noise levels. • Conduct noise and vibration monitoring at the start of operations in new areas (e.g., pile driving and hydraulic hammer use) to verify compliance with project noise limits. • Enclose fixed equipment such as generators and crushers in noise-reducing housings and provide mufflers or acoustic enclosures for high-noise machinery. • Schedule noisy activities outside sensitive periods (e.g., school hours, hospital rest times) and use quieter construction methods where feasible. • Inform nearby residents about upcoming noisy operations, their duration, and the type of noise to be expected. This fosters transparency and helps communities prepare for temporary disruptions.
25	Muck/spoils	Indiscriminate disposal of spoils/ muck will cause nuisance and pollution of soil and water,	• Design and establish the 12 identified muck disposal sites as per the C-ESMP. Each site must have an engineering design approved by the OE before muck disposal begins. • Minimize surplus muck and maximize its reuse for fill and aggregates, reducing the demand for additional land and resources. • Ensure that muck piles are stable, with heights, berms and slopes determined by engineering calculations. Provide slope protection, adequate drainage and anti-erosion measures. • Remove and store topsoil separately for later use in site rehabilitation, revegetation, and landscaping around the headrace, camp areas, and public spaces. • After placement of the muck, it should be compacted. • After disposal activities cease, cover muck deposits with topsoil and encourage rapid vegetative growth to stabilize slopes and blend with the surrounding environment.
26	Waste	Waste management plan	• Implement a comprehensive waste management program that is mandatory for contractors and subcontractors. • Optimize raw material use and avoid excess waste generation. • Separate wastes at source into categories (organic, recyclable, inert, hazardous) and treat them to reduce environmental impacts.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Train workers in proper waste segregation, handling, and disposal. Conduct regular awareness campaigns to encourage good practices. • Follow local regulations and international best practices for waste handling, transport, storage, treatment, and disposal.
27	Organic waste	Improper disposal of organic or food waste will be a significant health risk.	• Install in-vessel composters at each campsite to convert food and organic waste into nutrient-rich compost for landscaping and plantation development. • Provide sufficient, well-maintained containers for organic waste. Ensure timely collection and transport to composting facilities. • Engage with local waste management authorities and services to ensure sustainable and environmentally sound disposal methods.
28	Non-hazardous waste	Littering, soil and water pollution from improperly managed non-hazardous wastes.	• Construct a controlled landfill site meeting international standards (impermeable liner, leachate collection, and treatment) to safely dispose of non-recyclable household-type wastes. The site will be developed with a view to its long-term use so that it can serve the needs of the future operator village of the Dorjilung HPP facility. The location of the site will be discussed with local authorities, and RGOB approval will be received before implementation. • Collect and separate waste at the source—paper, plastics, metals, glass—using designated covered bins and containers in the workers' camps. • Ensure materials like metal, wood, cardboard, and plastics are recycled or reused where possible. Prohibit the burning of waste. • Conduct training to promote effective segregation and proper disposal. • Inspect landfill sites and project areas regularly to ensure cleanliness and proper waste management.
29	Hazardous waste	Adverse health impacts and pollution due to improper management of hazardous waste	• Secure Storage: Store used engine oil, hydraulic fluids, and other hazardous liquids in sealed drums, placed in a covered and bunded area that can contain at least 110% of the largest container's volume. • Recycling and Disposal Options: Identify approved recycling facilities or suitable industrial plants (e.g., cement factories) to safely treat or dispose of used oils and hazardous chemicals.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Chemical Management: Minimize the use of highly toxic substances. Store used chemicals in secure containers and return them to suppliers or authorized treatment facilities whenever possible. • Special Waste Streams: Separately store and handle items like batteries, oil filters, and printer cartridges. Seek OE approval for chosen disposal methods. • Medical Waste: Collect medical waste in secure, clearly labelled containers. Arrange for incineration at Mongar Regional Referral Hospital under a formal agreement. • Drum Disposal: Never give empty hazardous substance drums to local populations. If rinsed, treat the rinse water appropriately. Crush drums so they will no longer be useful to prevent unauthorized reuse and dispose of them in a controlled manner. • Contingency Solutions: If local treatment facilities are not available, consider repatriating hazardous waste to countries with appropriate treatment options (e.g., India). Otherwise, construct a secure, impervious hazardous waste pit for temporary storage until suitable treatment becomes available. This approach has already been successfully used for the Nam Theun 2 Project in Lao P.D.R. The location of the pit will be discussed with local authorities, and RGOB approval will be received before implementation. • Used Engine Oil Management: Identify opportunities to use recovered oil as an alternative fuel in suitable industries or to produce low-grade diesel, reducing environmental impact.
	Impacts on Communities		
30	Labour influx	Impacts from the influx of labor on the local community from the outside areas	• Preferential recruitment is given to members of the community in the Project area, members of the community in the Mongar and Lhuentse Dzongkhags, and Bhutanese nationals. Foreigners shall be permitted to work in occupations against which Bhutanese are either not available or not willing to work. • Structured recruitment: through recruitment centres established by the employers in the project area (Mongar and Lhuentse Dzongkhags). Recruitment at the gate (of the camp/construction sites) is prohibited.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Maintain Labour relations with local communities through a Code of Conduct (CoC). • The Code of Conduct must be signed by all categories of workers. Workers must be trained on the provisions of the CoC about refraining from unacceptable conduct toward local community members, specifically women and informed of the sanctions for non-compliance. Training must be conducted for all new workers, including sub-contractors. • The contractor should provide recreational facilities in the camp and closely monitor and control workers-communities interactions. • Specific requirements to manage risks associated with labour influx (Public health, gender-based violence, SEA/SH, unrest, disruption to tangible and intangible heritage, disruption of social links, etc.) will be managed through contractual requirements, code of conduct and training set out in the LMP and GSVAP.
31	Gender-based violence GBV/Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH)	Risk of gender-based violence GBV/Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH)	• The Project will have a zero-tolerance policy for any gender-based violence, sexual exploitation and abuse, as well as sexual harassment. In addition to disciplinary measures and dismissal, offenders will be reported to the Royal Bhutan Police. • The inclusion of a clause on GBV/SEA/SH behaviour obligations in the employment contracts of all employees and construction workers is aimed at strengthening measures to address and prevent SEA/SH in the workplace and construction areas. • Awareness training of workers, sub-contractors and service providers staff to sensitize them about SEA and SH and their responsibilities to prevent • Posting of CoC standards in public spaces at workers' residences, village information centers and public places of adjoining/neighbouring communities • Raising awareness that SEA/SH is prohibited • Awareness to explain suspicious situations and the signs of SEA/SH. • Provide information on the use of GRM to report cases of SEA/SH and Code of Conduct breaches and assist victims of SEA if signs of SEA are identified/a victim approaches them to complain about SEA.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Awareness to communities, particularly women and male and female children, to understand the risks of SEA and SH and the roles and responsibilities of parties involved in project implementation on SEA and SH prevention, processes for reporting incidents of project-related SEA/SH, and the corresponding accountability structures. • Strengthen the Contractors' obligations and capacity to public health and safety risks and ensure contractor supervision capacity to monitor the mitigation of these risks. • Proactive GBV/SEA prevention measures will be put in place, such as GBV/SEA-related training to sensitize workers and the local population along the project implementation area and ensure that GRM for the project will also take care of GBV-related issues, if any. • There will be adequate mechanisms in place to protect the local vulnerable population, especially women and minors, from risks associated with the influx of workers (harassment, underage sex). This mechanism will ensure the sensitization and enforcement of the code of conduct by the Contractor's employees, workers, and all other parties involved in the project implementation. • Additionally, the Contractor will employ their skilled staff and apply unskilled construction labor from the local population as far as possible to minimize an influx of outsiders into the communities.
32	Traffic Management	Traffic congestion around the construction sites and the risk of accidents	• Traffic and Transport Management Planning: Develop and implement a comprehensive Traffic and Transport Management Plan, including a Safe Driving Policy tailored to local conditions. Incorporate a Grievance Redress Mechanism to address complaints from local communities or other stakeholders about traffic issues, ensuring prompt and effective resolution of concerns. • Driver Qualification and Awareness: Ensure that all drivers (of both light and heavy vehicles) have valid driving licenses, undergo eyesight checks, and demonstrate the ability to operate vehicles safely. • Conduct regular training sessions emphasizing responsible driving practices, such as adhering to speed limits, avoiding driving under the influence of alcohol, drugs, or certain medications, and performing routine vehicle maintenance checks (e.g., monitoring tire wear and securing loads).

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Road Signage and Safety Infrastructure: Enhance Road signage in sensitive areas, including villages, schools, dusty stretches, sharp bends, and construction site entrances/exits. Install species-specific warning signs in critical biodiversity zones (e.g., wildlife corridors) to prevent vehicle-wildlife collisions. Implement temporary signage and safety measures in cases of partial road obstruction, vehicle breakdowns, or accidents, ensuring clear guidance for all road users. Provide designated parking areas separate from active roadways to minimize congestion and enhance safety. • Speed Control and Routing: Install effective speed bumps at village boundaries and other inhabited sections of roads to enforce reduced speeds. • Enforce strict speed limits, especially in inhabited areas and regions of ecological importance, to reduce the risk of collisions with pedestrians, animals, or other vulnerable road users. • Limit deviations from approved travel routes and establish defined itineraries for all project-related vehicles to maintain predictable traffic patterns. • Restrict the movement of heavy vehicles on public roads at night and during school commute times to minimize risks to pedestrians and local communities. • Vehicle Use Restrictions and Monitoring: Prohibit project vehicles from transporting local residents, unauthorized equipment, or goods not related to construction activities. • All trailers, skips, and haulage trucks are required to cover their loads to prevent material spillage and reduce dust emissions. • Conduct random driver inspections to verify proper licensing and compliance with DUI (Driving Under the Influence) policies.
33	Safety hazards from construction works	Community exposure to construction hazards	• Secure Perimeters and Signage: Fully fence all construction sites, including colonies and other contractor's facilities, from the start of work, strictly adhering to the allocated land boundaries. Post "No Trespassing" signs in at least Dzongkha and English at regular intervals along the fencing to deter unauthorized entry and clearly indicate restricted areas. • Access Control and Identification: Develop and implement an identification (ID/tag) system for both

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			project workers and vehicles. Clearly mark designated access points with appropriate signage. Control entry with a secure gate and maintain a 24/7 checkpoint to record incoming and outgoing vehicles. At this checkpoint, perform basic safety checks (e.g., tire condition, lighting) as needed. • Site Security Personnel: Assign guards at all site entry points (e.g., adits, colonies, office areas). All visitors are required to register at the entrance and state the reason for their visit. Implement a sign-in/sign-out procedure for official visitors that includes a brief safety induction and an escort during their visit. • Illumination and Storage Security: Provide adequate lighting at night for high-value storage areas and hazardous zones to enhance visibility and deter unauthorized access. Store valuable materials and equipment in secure, locked areas. • Worker Training and Awareness: Conduct regular security awareness training for workers. Topics should include proper adherence to access control procedures, reporting security incidents, following security protocols, and safely handling and storing equipment. • Explosives and Restricted Materials Management: Implement specialized security measures for explosive storage, following national regulations and best practices, often under the supervision or guidance of national security forces (e.g., police or army). • Surveillance and Enforcement: Install CCTV cameras in key locations, such as camp entries, office building entrances, explosive warehouses, and fuel storage areas, to monitor activities and deter theft, vandalism, or other unauthorized acts. • Zero Tolerance for Illegal Activities: Strictly prohibit and penalize any involvement in contraband, poaching, trafficking, or prostitution. Enforce a zero-tolerance policy by reporting offenders to the Royal Bhutan Police, in addition to applying internal disciplinary measures.
34	Blasting Management Plan	Safety risks associated with the storage and use of explosive material.	• Explosives Management Plan: The Contractor will prepare a dedicated Explosives Management Plan in accordance with national regulations and international standards. This plan will address all hazards related to explosives use and outline preventive and protective measures for:

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			○ Transporting explosives from storage sites to usage points. ○ Ensuring secure and compliant storage conditions. ○ Handling and detonating explosives in a manner that protects both workers and the local population. • Storage Requirements: ○ Location and Distance: Store explosives in closed containers or a secure building at least 500 m from the nearest occupied structure. ○ Separation of Explosives and Detonators: Keep these materials in separate storage areas or containers, at least 50 m apart, and separated by an earth bund at least 5 m high to prevent chain reactions. ○ Vegetation Clearance and Fire Safety: Remove vegetation around storage areas to reduce fire risk. Place fire extinguishers strategically. ○ Perimeter Security and Access Control: Fully fence the storage site and maintain 24/7 access control. Only authorized personnel may enter. • Qualified Supervision: A trained and competent Explosive Supervisor will oversee any activity requiring explosive handling. This individual ensures full compliance with safety procedures and immediate suspension of activities if storms, thunderstorms, or other imminent hazards arise. • Safety Blasting Operation Procedure: The CC will develop a comprehensive Safety Blasting Operation Procedure detailing: ○ Safety Perimeter for Surface Blasting: Define a minimum radius (typically 300 m) free of population. The exact radius will comply with regulations and correspond to the explosive load. ○ Population Relocation: Before blasting, transfer all individuals within the established radius to temporary shelters (e.g., reinforced containers) set up close to their residential areas. These shelters can be relocated as needed. ○ Blasting Alerts: Conduct systematic checks of each building to ensure complete evacuation of the hazard zone. Issue siren alerts before blasting to warn the public and after blasting to confirm

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			that all charges have detonated safely before allowing people to return. • Vibration Control and Monitoring: o Compliance with Vibration Limits: Adhere to Bhutan's legal limits (Mines and Minerals Management Regulations, 2002) on blast-induced ground vibration. If damage to private or cultural property occurs, the CC bears the cost of repairs. o Measurement and Predictive Analysis: Measure Peak Particle Velocity (PPV) and vibration frequency for each blast. Develop a predictor equation to anticipate vibration levels and adjust blasting practices accordingly. o Pre-Blast Survey: Before initiating blasting activities, survey buildings within 500 m of the blast site with a bailiff present. Document existing cracks or structural issues. Identify and compensate owners of weak buildings that cannot withstand permitted PPVs, then demolish these structures before blasting commences. o Monitoring Equipment Installation: Under OE supervision, install vibration recorders (3-4 units) in select residences near blasting areas. Record vibration levels for each blast and include results in the Monthly Progress Report. • Operating Hours and Weather Considerations: Conduct all explosive-related activities during daylight hours. Suspend blasting immediately if severe weather conditions (storms, thunderstorms) threaten safe operations.
35		Transport of explosive materials	• The itineraries used to transport explosives will be mapped out and communicated to the relevant regulatory agency. • Only accredited contractors with specialized vehicles will be used to transport explosives. By default, detonators and explosives are transported in separate vehicles.
36		Risk of landslides from blasting along slopes	• Optimized Blasting Techniques: Employ carefully planned blasting sequences and designs to minimize slope instability. • Monitoring and Protection: Implement a blast monitoring program and install rockfall protection measures as needed. • Early Warning Systems: Use early warning systems to detect signs of landslides or rockfalls.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• Emergency Planning: Integrate an Explosives and Blasting Management Plan and a Construction Emergency Management Plan, outlining communication strategies, evacuation procedures, and immediate response actions.
37	Dust from vehicular movement on local roads and excavation activities	Airborne dust affecting community health, visibility, and comfort	• Establish a water supply system with mobile lawn sprinklers for continuous watering at the dam and other major excavation sites. • Dust generation from construction sites will be restricted as much as possible, and water sprinkling will be carried out as appropriate, especially where earth-moving and excavation will occur. • Implement wet drilling and dust collection measures for crushing plants. • Excavated material will not be rolled along the hill slopes. All excavated material should be transported to the muck disposal sites. • Employ effective dust suppression techniques, such as using water sprays, dust control agents, or enclosing crushing equipment to minimize the generation of airborne dust and help channel the sediment in the management system. • Covering trucks and other vehicles transporting construction materials to minimize dust emission. • Limiting construction activities during peak hours in densely populated areas to reduce exposure. • Providing protective measures for workers, such as masks and respirators, to reduce health risks. • A GRM is in place to receive and address complaints from the public on various aspects of environmental issues, including dust pollution. Contact information on GRM will be placed around civil work sites.
	Impact on Biodiversity		
38	Removal of trees	Impact of vegetation removal from land clearing activities on the biodiversity	• Avoid the main period of bird breeding (March to May) for clearing operations. • Unnecessary clearing will be avoided, and areas to be cleared will be clearly indicated to limit additional clearing. The environmental expert will check that the work is properly done before the beginning of the clearing activities,

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			• A scaring campaign will be organized before every clearing activity in order to give an opportunity for the fauna to escape. These campaigns can be organized as sound or vibration emission campaigns for several minutes in the areas concerned. The main target of these campaigns are the small mammals and other small species (crawling species and slow-moving species) as big mammals will easily be seen and avoided and • Clearing activities must be structured and not lead anarchically. The most common method is centrifugal clearing, which avoids creating small islands of vegetation that can be considered as traps.
39	Fauna	Impact of construction activities on the fauna	• Control all the water crossings to ensure hydraulic continuity of the tributaries and allow fish movements. • Avoid basting March to May, anticipating aggregate needs to preserve the breeding period of the Dark-rumped swift. • Avoid crushing activities in the vicinity of the cliffs from March to May to preserve the breeding period of the Dark-rumped swift. • Reduce the night work period for specific sites and operations to avoid fauna behavioural disturbance. • Install directional lighting for activity areas, security lighting and colony lighting. • For lighting other than that necessary for safety, limit the lighting duration to what is strictly necessary. • Signage at large wildlife crossing points, reporting of collisions or injured animals. • Raising awareness of biodiversity protection among construction companies and subcontractors • Code of conduct in case of interaction with wildlife such as primates, snakes, feline and other big fauna • Removal of the temporary road, which will not be used for project maintenance
40	Wildlife	Poaching and illegal natural resources collection	• The Project will have a Zero Tolerance Policy for illegal poaching and illegal natural resource collection. • The consumption of bush meat is strictly prohibited for Project workers. • The PMU will liaise regularly with the Royal Bhutan Police and other agencies to share information.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
41	Invasive Alien Species (IAS)	Adverse impacts due to the introduction of IAS on biodiversity	• Use the designated roads to access the construction sites. Avoid using the forest roads and passing through the forests using construction equipment, vehicles, and labour. • Native tree species will be used for the plantation activities • Construction sites will be rehabilitated at the earliest opportunities, and rehabilitation plans will be made with invasive species control measures appropriate to the invasive species risk prevailing in the project area. • Construction vehicles will be brought to the site in an 'as-clean-as-new' condition to ensure that invasive plant material and seed-bearing soil are not introduced. • All vehicles will be cleaned on a regular basis to prevent the unintentional spread of IAS within the project area. • IAS will be regularly controlled in construction vehicle parking and operational areas, including construction sites.
42	Fauna in the reservoir area	Wildlife may become trapped or otherwise impacted during the first reservoir impoundment.	• Coordinate reservoir impoundment with the recommended environmental flow (E-Flow) strategy. Initiate filling during the high-flow season (June–September) to minimize abrupt habitat changes and leverage natural rainfall to smooth the transition. • Implement a controlled, slow-filling process to allow wildlife time to relocate, reducing the likelihood of animals becoming trapped by rising water levels. • Plan and conduct a wildlife rescue operation during the first filling period. Specialized teams will be available to identify, capture, and safely relocate trapped or at-risk fauna. • Establish protocols to prevent wildlife injury or mortality due to construction activities. This may include restricting access to hazardous areas, reducing noise levels, and implementing safe driving practices. • Develop clear procedures to handle trapped or injured animals found during construction or impoundment, including instructions for contacting wildlife specialists and providing immediate care. • Conduct routine inspections of areas posing risks to wildlife (e.g., electrical installations, steep embankments, roadways) and promptly implement corrective actions as needed. Train site personnel to identify potential hazards, report wildlife sightings or incidents, and understand proper rescue protocols.

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
	Cultural Heritage		
43	Cultural heritage sites	Access restrictions to these sites during the construction	• Plan construction activities to minimize disruption to access routes and implement signage and information dissemination about alternative access routes. • Implement dust suppression and noise reduction measures during construction to minimize impacts on the sites. • Engage with local communities, cultural authorities, and visitors to inform them about the construction activities and mitigation measures. • Monitor the condition of the cultural heritage sites regularly during construction and report any issues immediately for prompt action. • Include awareness about the importance of cultural heritage and values as part of the site induction.
44	Chance finds during construction.	Chance finds procedures	Implement the following procedures in case of chance finds of any physical cultural resources (PCR). **Upon Discovery:** • Immediate Halt: Construction activities must cease immediately near the discovered PCR to prevent any potential damage. • Secure the Area: The site supervisor or engineer should secure the area to prevent access and potential looting or damage to the PCR. • Notification: The site engineer or representative should promptly notify the Department of Culture and Dzongkha Development (DoCDD) about the discovery. • Documentation: Document the find with photographs and, if possible, mark the exact GPS coordinates for the record. **Assessment:** • Initial Assessment: The site supervisor should make a preliminary assessment to determine if the find appears to be of potential significance. • Expert Evaluation: If deemed potentially significant, an expert from the DoCDD or a designated cultural heritage specialist should be invited to conduct a thorough evaluation. • Action Plan: Based on the expert's assessment, decide whether to adjust project plans to accommodate the

#	E&S Aspect	Impacts	Mitigation Measures by Contractors
			preservation of the PCR or to proceed with an approved mitigation strategy, such as careful excavation or reburial. **Reporting** • Chance Find Report: Prepare a detailed report outlining the nature of the find, the actions taken upon discovery, and the outcomes of the expert assessment. This report should include photographs, GPS coordinates, and other relevant documentation. • Submission: Submit the Chance Find Report to the PIU, who will forward it to the DoCDD for official records. • Inclusion in Monitoring Reports: Include a summary of the chance find and the subsequent actions taken in the quarterly environmental monitoring reports submitted to oversight bodies, such as the World Bank or other funding agencies. • Workers Training. Contractors are mandated to train workers, particularly those involved in excavation, to recognize potential artifacts. The training, supported technically by the DoCDD and other relevant authorities, will inform workers about the importance of such findings and the required steps to take if they are encountered.

3.4 Construction Stage Monitoring Plans

The proposed monitoring plan to be carried out during the construction stage of the Project to ensure contractors are complying with the mitigation measures is given in Table 3.4, along with the monitoring indicators and frequency. The Contractor will be responsible for the implementation of the plan and submit the results in their monthly reports. The Owners Engineer will supervise the implementation.

Table 3-4: Monitoring Plan During Construction

(Note: DGPC will include this Table in the Contract Specifications of the Bidding Documents)

#	E&S components	Monitoring Parameters	Frequency of Monitoring
1	Labour/OHS	Lost Time Injury Frequency Rate, Total Recordable Incident Rate and accident rates, Training Fire Safety measures on site Permit to Work Records Labour Records Labour Insurances Vehicle Log Books	Daily during the construction stage

#	E&S components	Monitoring Parameters	Frequency of Monitoring
		Grievances – Labour Camp cleanliness and sanitation	
2	Dust	Visual observation at the construction sites	Daily at all work sites
3	Air quality	Ambient air quality for PM10, PM 2.5, NOx, SO2 and CO	Pre-construction monitoring at 6 locations. Every 3 months during the construction at the above locations
4	Wastewater discharges	Turbidity, conductivity, and pH will be assessed at the site with the help of portable kits.	Weekly basis
5	Water quality of rivers and wastewater	pH, conductivity, DO, TDS, TSS, BOD, COD, Fecal coliform, Total Coliform, Chloride, Turbidity, and oil and grease. Silica and methane in confined spaces.	Pre-construction monitoring at 6 locations. Every 3 months during the construction at the above locations (including the wastewater discharges from the batching plant and other construction sites
6	Obstruction of drainage	Roadside drainage discharge, water impounding area during rain, waterlogging	Daily during the construction stage
7	Waste	Waste inventory for both hazardous and non-hazardous waste, Waste Labeling, storage and disposal records	Weekly at yards and campsites
8	Noise	Noise quality monitoring	Pre-construction monitoring at 6 locations. Every 3 months during the construction at the above locations
9	Number of felled trees	Statistics of removed and planted trees, nurseries and plantations	During the time of tree felling on a daily basis
10	Wildlife	Visual inspection of the site area is needed to check for death or injury of any higher faunal species and habitat disturbances due to project activities.	Daily during the construction stage
11	Control of Invasive Alien Species (IAS)	Risk assessments are conducted prior to species introductions, regular equipment and vehicle cleaning and control of IAS.	Daily during and after the construction stage
12	Fire-hazard	Project management checklists, site monitoring, fire extinguishers in offices and work sites	Daily during the construction stage

#	E&S components	Monitoring Parameters	Frequency of Monitoring
13	Community Health and safety	Nuisance to adjoining communities from the construction-related works, grievances due to annoyance from the construction-related works.	Daily during the construction stage
14	Road safety	Traffic Signals, no horn signs, road signals and markings, speed control and GPS-tracking, traffic-related incidents	Daily during the construction stage
15	Grievance Redressal	Management of Grievance Redress Mechanism	During the construction stage
16	Traffic Management	Compliance with the Traffic Management Plan	Daily during the construction stage
17	Gender-based violence	Review and address grievances	Daily during the construction stage
18	Stakeholder engagement	Compliance with SEP	During the preconstruction and construction stage

4 PROCEDURES FOR E&S MANAGEMENT IN CONSTRUCTION

4.1 Establishing Communication Channels

4.1.1 Internal Communication within PMU, OE and CC

Clear, efficient, and well-structured communication channels are fundamental to ensuring successful ESHS management during the construction phase. Before initiating any work, each party involved (PMU, OE and CC) must understand their roles, responsibilities, and points of contact.

This protocol defines who reports to whom, at what frequency, and on what issues. For example, the OE's Project Director (OE-PD) may provide weekly updates to the OE-ESHS Manager on upcoming construction activities, while the OE-ESHS Manager, in turn, delivers weekly ESHS event reports to the OE-PD. Communication lines must also be agile enough to handle urgent or unforeseen incidents. In cases of significant ESHS events (Level II or III incidents), immediate and direct communication with the PMU-ESHS Manager and the OE-PD is mandatory. This ensures that decision-makers are promptly informed and can respond effectively. Table 4.1 presents the key links regarding internal communication among the stakeholders during construction.

By implementing these measures, the Project ensures that ESHS concerns are quickly identified, responsibly managed and thoroughly communicated to maintain trust, safety, and compliance throughout construction.

Table 4-1: Main Steps of Internal Communication (Reporting)

Origin	Recipient	Frequency	Subject
OE-PD	OE-ESHS Manager	Weekly	Updating the construction programme, specific construction activities in the coming period and their location.
OE-PD	PMU-ESHS Manager, OE-ESHS Manager	Ad hoc	Additional needs for land or notification of a change in construction techniques
OE-ESHS Manager	OE-PD	Weekly	Weekly report on ESHS events detected and their treatment; programme of activity of the OE-ESHS staff for the coming week.
OE-ESHS Manager	OE-PD	Ad hoc	Communication of ESHS events of levels II or III
OE-ESHS Manager	OE-PD	Monthly	Monthly report on activity and results of monitoring for review and approval before forwarding to PMU-ESHS
OE-ESHS Manager	OE-Inspectors	Weekly	Updating the construction programme, specific construction activities in the coming period, and particular directives
OE-Inspectors	OE-ESHS Manager	Weekly	Weekly activity report, list of observed ESHS events level I
OE-Inspectors	OE-ESHS Manager	Immediate (same day)	Observed ESHS events of levels II & III; particular problem requiring technical assistance; observation of construction activities outside specified areas
CC-ESHS Manager	OE-ESHS Manager	Monthly	List of training modules followed in the past month and the personnel concerned (list of attendance)

Origin	Recipient	Frequency	Subject
CC-ESHS Manager	OE-ESHS Manager	Fortnightly	Updating of new activity zones for the coming 2 weeks and operations presenting a particular risk for the environment; results of monitoring of the previous 2 weeks.
OE-PD	PMU-ESHS Manager	Immediate (same day)	Memo to inform on any observed non-compliance of level III; proposal to suspend the works on the incriminated site if justified
OE-PD	PMU-ESHS Manager	Monthly	Transmission of the monthly activity report, including ESHS activities as prepared by the OE-ESHS Manager
OE-ESHS Manager	OE-PD	Quarterly	Summary report on significant environmental events (Levels II and III) observed, on the decisions taken, and on the measures implemented; proposal, if necessary, to modify certain mandatory thresholds or obligations of the Contractor.
OE-PD	PMU-ESHS Manager	Quarterly	As above.
E&S Panel of Experts	Lenders, DGPC and DGPC PMU	As required	Mission report
CC -ESHS Manager	OE-PD and ESHS Manager	Six-monthly	Updated C-ESMP and OHSIP for OE review and approval

4.1.2 External Communication with Stakeholders

In addition to the internal communication described in the previous section, communication extends beyond the internal project team. Channels must be established with local communities, affected stakeholders, and government authorities as per the Project's Stakeholder Engagement Plan (SEP). This may include scheduled community meetings, consultations with local leaders, and regular updates to regulatory agencies. Effective communication also involves transparent documentation and the use of clear and accessible language. While English is the primary language for documentation, using Dzongkha or other local languages can foster better understanding among the workforce and local communities.

4.2 Site Inspection Procedures

The OE, through its ESHS Manager and supporting team, is responsible for ensuring that CC meets all ESHS obligations. Because the OE also certifies payment to the CC, the OE can leverage this authority to negotiate the allocation of resources—such as equipment or labor—toward ESHS measures when necessary.

To oversee the CC's compliance, the OE-ESHS Manager will implement a structured monitoring process. This process includes the following key components:

- **ESHS Supervision of the Contractor**: Regular site inspections to verify that the CC correctly applies all ESHS measures outlined in the Contractor's ESHS Specifications and in the C-ESMP action plans.

- **Environmental Quality Monitoring**: Periodic assessments of environmental parameters to evaluate the effectiveness of mitigation measures and adjustments to thresholds or methods if required.
- **Environmental Compliance Monitoring**: Confirmation that all project discharges comply with Bhutanese environmental regulations and requirements. This monitoring also validates the accuracy of weekly information provided by the CC. Only key pollution indicators will be analyzed to ensure efficient, targeted evaluations.

Inspection Activities: The CC's ESHS personnel conduct routine site inspections to ensure that mitigation measures are implemented effectively and consistently. They identify and address non-compliances at the source, maintain proper housekeeping, manage waste responsibly, store hazardous materials safely, safeguard worker health and safety, and adhere to approved construction techniques. The site inspections by the OE's ESHS team will include the following:

- **Daily Oversight Monitoring:** OE-ESHS Inspectors, supported as needed by OE-ESHS Managers or PMU-ESHS staff, conduct daily oversight to check if construction activities align with ESMP requirements. This helps identify whether ESHS measures are working effectively or need adjustments.
- **Weekly Site Inspections:** The OE-ESHS Manager and staff review issues identified during daily inspections. These inspections may include PMU ESHS representatives, and decisions are made regarding any additional mitigation actions required.
- **Monthly Joint Site Inspections:** ESHS Managers from the OE, PMU, and CC conduct monthly joint inspections. The scope of these inspections is agreed upon beforehand by PMU and the CC. After each joint inspection, a Joint Inspection Report is prepared, including descriptions of issues or non-compliances and photographic evidence. Any required corrective actions are recorded in a register and tracked until resolved.

Environmental Events (EE): During inspections, each identified environmental event (EE) is recorded on a standard form by the OE-ESHS Inspector and submitted to the OE-ESHS Manager for follow-up. The OE-ESHS Manager reviews and forwards the form to the CC-ESHS Manager, who documents the corrective measures implemented. The EE is considered closed once the OE-ESHS Manager confirms that the corrective actions have been effectively completed.

Coordination Meetings: Monthly coordination meetings between the CC-ESHS team and the OE-ESHS team provide an opportunity to review ongoing EEs, discuss remedial measures, and address any other relevant issues, including progress updates on Action Plans proposed by the CC-ESHS Manager. These meetings ensure continuous communication, timely resolutions, and ongoing improvement in ESHS performance.

4.3 Procedure for Handling ESHS Non-Conformances

Non-compliance with ESHS standards can arise even under a well-designed system. A clear, tiered mechanism for identifying, classifying, reporting, and resolving these issues is therefore critical. The Project uses a four-level classification system: Site Observation Notices (SON) for minor, easily correctable issues, and three Non-Conformance (NC) levels—NC1 (minor incidents), NC2 (moderate incidents), and NC3 (major incidents).

- **Site Observation Notice (SON):** A SON is issued when a minor non-conformance is detected on site. In such cases, the issue is immediately communicated to the Contractor's

representative for prompt correction. The SON is then recorded in a dedicated register to ensure proper follow-up and verification that the necessary remedial actions have been implemented. Because SONs are intended for minor issues that can be quickly resolved, they do not trigger a Non- Conformance Report (NCR). However, if a SON is not resolved within the agreed timeframe, it is escalated to the NC1 level.

- **Level I (Minor Incident):** Level I non-conformances are generally addressed through routine site visits and regular coordination meetings. Corrective measures are discussed directly with the relevant construction teams, promoting immediate and practical resolutions at the field level. Any Level I non-conformance is documented through a formal NCR prepared by the OE ESHS staff. This report is then evaluated by the OE-ESHS Manager and officially communicated to the Contractor's team. If a Level I non-compliance (NCR1) remains unresolved beyond the agreed correction deadline, it is escalated to Level II.
- **Level II (Moderate Incident):** Moderate incidents require a more urgent and formal communication channel. Upon observing a Level II event, the OE-ESHS Manager notifies the OE's Resident Engineer and Project Director and the Contractor's Site Supervisor on the same day. Within three days, the PMU-ESHS Manager will also be informed. The PMU-ESHS Manager then notifies the PMU Project Director, providing details of the required corrective actions to ensure swift implementation. Any unresolved Level II non-conformance report (NCR2) after the correction deadline is elevated to Level III.
- **Level III (Major Incident):** Major incidents, representing the most serious non-conformances, require immediate attention at the highest management level. On the day such an event is identified, both the OE Project Director and the PMU Project Director must be informed. Corrective measures must be applied within three days. In cases where more time is needed or if an imminent risk to the environment, workers, or the public is identified, the OE-PD has the authority to order the suspension of the affected work until conditions are restored to a safe and compliant state.

Examples of typical non-conformances for Level I, Level II and Level III are provided in the following table.

Table 4-2: Examples of Non-Conformances

Level I	Level II	Level III
Environmental:	***Environmental:***	***Environmental:***
Small-volume hydrocarbon or chemical spills	Large-volume hydrocarbon or chemical spills	Hydrocarbon/chemical spills requiring large-scale remediation
Small volume sediment run-off or pollution into local waterways	Large-volume or long-term sediment runoff or pollution into waterways	Sediment runoff or pollution causing permanent damage to waterways
Small volume of spoil disposal in undesignated areas		Large volume of spoil disposal in un-designated areas
Illegal hunting of wildlife (non-endangered)	Poaching of threatened or endangered species	Poaching or hunting and trafficking of threatened or endangered species

Level I	Level II	Level III
Poor quality or delayed site restoration and revegetation	Lack of implementation of an agreed restoration program	A large volume of illegal dumping of solid waste
Minor off-site disposal of solid waste from the project	Significant but non-persistent exceedance of monitoring threshold	Significant or persistent breach of monitoring threshold (e.g., NEQS, dust, or noise pollution)
Non-significant & non-persistent exceedance of monitoring threshold		
Social:	***Social:***	***Social:***
Small-scale crop damage or livestock deaths	Widespread crop damage or livestock deaths	Widespread and persistent crop damage or livestock deaths
Minor impacts on cultural sites/areas	Significant impacts on protected physical cultural resources	
Minor social conflict related to or affecting the project.	Significant and repeated community impacts from project vehicles/construction activities	Mistreatment of communities by project workers, including incidents of Gender-Based Violence
Workers:	***Workers:***	***Workers:***
Chronic underuse of personal PPE by Works Contractor	Numerous injuries requiring off-site medical attention	The contractor is unresponsive regarding ongoing worksite risks of bodily injury.
Lack of understandable warning or traffic control signage	Multiple "slip and trip" hazards throughout the site	Forced labor by Works Contractor
A local increase in the occurrence of communicable disease	Instances of serious communicable diseases among the workforce	An outbreak of life-threatening communicable disease

Figure 4-1 below illustrates the principles of this NC procedure and shows how the approach favours direct resolution on site of the less serious NC (Level I) by direct communication with the construction staff and how the senior levels of responsibility are progressively involved in the processes to solve the more serious NC (Levels II and III). The full arrows denote the decision processes, while the dotted arrows denote the reporting and information processes.

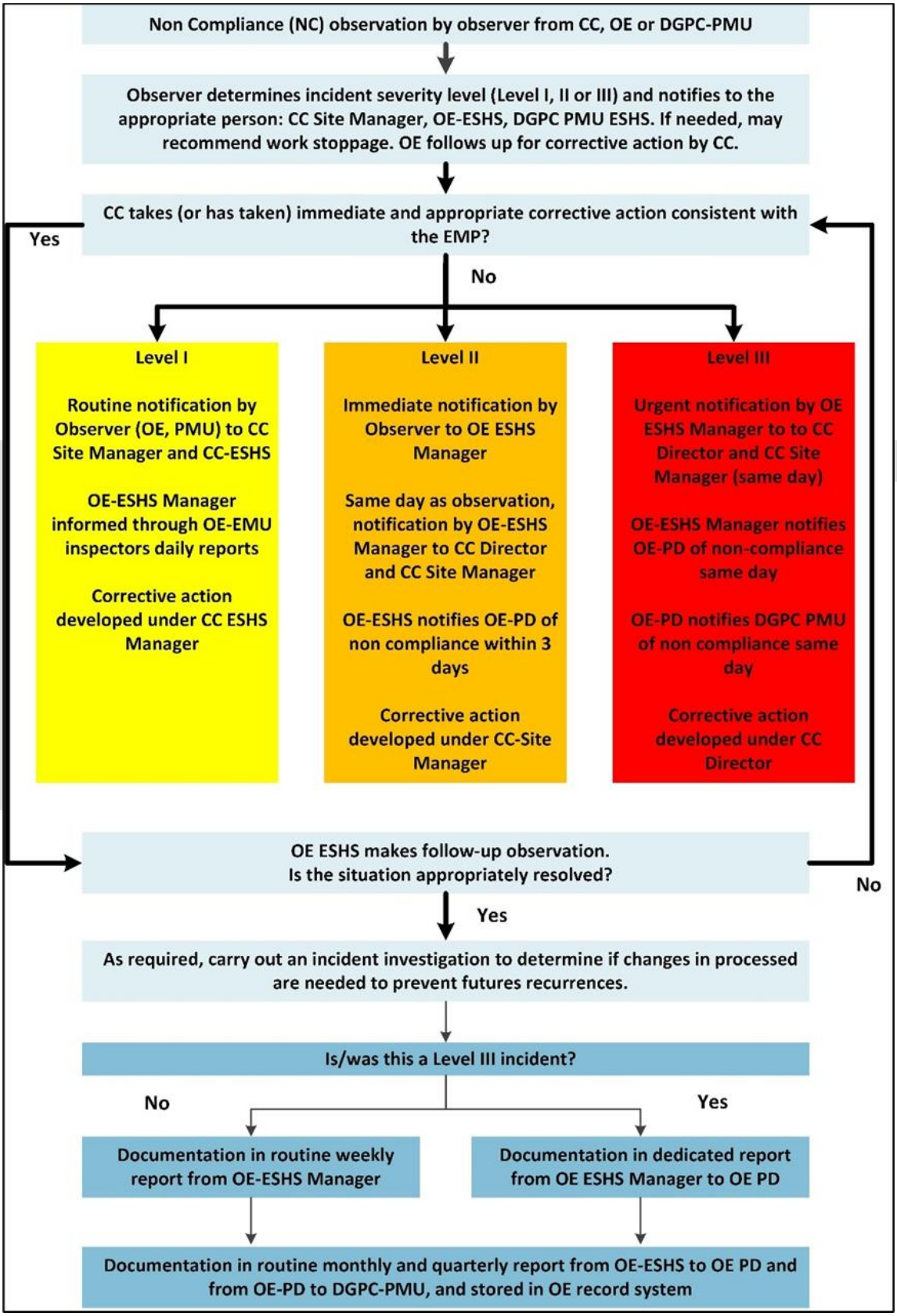

Non Compliance (NC) observation by observer from CC, OE or DGPC-PMU
Observer determines incident severity level (Level I, II or III) and notifies to the appropriate person: CC Site Manager, OE-ESHS, DGPC PMU ESHS. If needed, may recommend work stoppage. OE follows up for corrective action by CC.
CC takes (or has taken) immediate and appropriate corrective action consistent with the EMP?
Yes
No
Level I
Routine notification by Observer (OE, PMU) to CC Site Manager and CC-ESHS
OE-ESHS Manager informed through OE-EMU inspectors daily reports
Corrective action developed under CC ESHS Manager
Level II
Immediate notification by Observer to OE ESHS Manager
Same day as observation, notification by OE-ESHS Manager to CC Director and CC Site Manager
OE-ESHS notifies OE-PD of non compliance within 3 days
Corrective action developed under CC-Site Manager
Level III
Urgent notification by OE ESHS Manager to to CC Director and CC Site Manager (same day)
OE-ESHS Manager notifies OE-PD of non-compliance same day
OE-PD notifies DGPC PMU of non compliance same day
Corrective action developed under CC Director
OE ESHS makes follow-up observation.
Is the situation appropriately resolved?
No
Yes
As required, carry out an incident investigation to determine if changes in processed are needed to prevent futures recurrences.
Is/was this a Level III incident?
No
Yes
Documentation in routine weekly report from OE-ESHS Manager
Documentation in dedicated report from OE ESHS Manager to OE PD
Documentation in routine monthly and quarterly report from OE-ESHS to OE PD and from OE-PD to DGPC-PMU, and stored in OE record system

Figure 4-1: Procedure for Non-Conformance Resolution

This tiered system encourages prompt attention to minor issues before they become severe. It also ensures that significant non-compliances receive immediate, high-level attention and can be rapidly addressed to protect communities, workers, and the environment. Additionally, this system provides feedback loops—such as the possibility of revising procedures or training—to prevent recurrence and promote continuous improvement in ESHS management.

4.4 Contractor Penalty Procedures

In the event of recurring or unresolved ESHS non-compliances, the Project will implement a penalty mechanism designed to encourage prompt corrective action and maintain high ESHS standards. The following penalty mechanism will be followed.

Triggering Conditions:

- The penalty may be applied when the Contractor fails to address NC events within agreed-upon deadlines.
- Any incident escalated to Level III due to delayed or inadequate corrective measures qualifies as grounds for applying the penalty.
- Consistent failure to provide requested documentation (e.g., updated C-ESMP and OHSIP, monitoring reports), persistent non-implementation of agreed-upon corrective actions, or repeated NC events of Level I and II that remain unresolved may also trigger a penalty.

Penalty Application and Calculation:

- For each month in which significant unresolved NCs persist, the Owner's Engineer (OE), in consultation with the PMU, will formally notify the Contractor of pending corrective actions and set a final compliance deadline.
- If the Contractor does not achieve satisfactory resolution of the identified issues by the stipulated deadline, a penalty of 3% will be deducted from the Contractor's subsequent monthly interim payment.
- The penalty deduction will be clearly documented in the Contractor's payment certificate, including references to the relevant ESHS inspection reports, NCRs, and any correspondence detailing the unresolved issues.

Communication and Appeals Process:

- The OE-ESHS Manager will issue a written notification to the Contractor outlining the specific violations, the actions required, and the timeframe for compliance.
- The Contractor may submit a written explanation or request an extension under exceptional circumstances. Any extension or reconsideration of the penalty will require formal written approval by the PMU.
- If the Contractor rectifies the NCR to the satisfaction of the OE-ESHS Manager and PMU before the final compliance deadline, no penalty will be applied, and the Contractor's payment will be processed in full.

Monitoring and Continuous Improvement:

- The penalty mechanism is intended as an incentive for the Contractor to promptly address ESHS shortcomings.
- Regular coordination meetings and joint inspections will continue to provide the Contractor with guidance and support to prevent non-compliance and ensure continuous improvement in ESHS performance.
- Repeated penalization for the same or similar issues may result in further contractual actions as deemed appropriate by the PMU and in accordance with the Contract Documents.

4.5 ESMP Auditing and Updating

The PMU will organize regular audits of ESHS in order (i) to ensure compliance with the ESMP, (ii) to propose corrective solutions to observed non-compliances, and (iii) to propose modifications to the terms and obligations of the ESMP when justified. Three levels of audit are considered:

- **CC Internal Auditing**: Internal daily/weekly/ monthly construction site inspections carried out by the OE-ESHS team and the CC-ESHS team. An indicative internal CC E&S audit program is summarized in Table 4.43
- **Semi-annual Aduit by PMU**. The PMU will conduct a comprehensive ESHS audit at least twice a year. The audit will evaluate not only the CC ESHS performance but also PMU's own ESHS performance and consider aspects such as biodiversity offsets, resettlement, Gender, SEA/SH, Vulnerability and livelihood restoration. The audit outcomes are documented in the six-monthly E&S Reports shared with the World Bank.
- The third level of audit will be the yearly independent ESHS audit organized by DGPC if required by the World Bank.

Table 4-3: Outline of E&S Audits

Type	Scope	Frequency	Responsibility	Results submitted to
Worksite Inspections	Compliance checklists for site activities	Weekly	CC	Internal CC E&S Staff
Worksites Environmental Management compliance and implementation	Effectiveness of environmental management and level of compliance with ESMP	Monthly	CC	CC project manager and OE (monthly ESHS Report)
Work Procedures Audit	Compliance with conditions of planning approval Adequacy and implementation of environmental controls within work procedures	As scheduled	CC	CC Project Manager, OE for Information

Type	Scope	Frequency	Responsibility	Results submitted to
Management Systems Review	Adequacy and implementation of the ESMP	6 monthly (plus Inception Audit 2 months after CD)	CC	CC Project Manager, OE for Information
Annual Management Review	Adequacy of ESMP organization and working procedures and proposals for improvement	Annual	CC-E&S team	CC Project Manager, OE, PMU

4.6 Senior Management ESHS Commitment

Senior management and involvement of PMU, OE and CC are critical to ensuring that ESHS requirements are integrated into strategic decision-making. Every six months, the project's top-level management from PMU, OE, and EE reviews ESHS performance, evaluates progress against established targets, and addresses emerging challenges. This review draws on data from inspections, audits, incident reports, stakeholder feedback, and regulatory changes. By examining key indicators—such as the frequency and severity of non-compliance, the effectiveness of corrective measures, worker training needs, and trends in community grievances—management gains insights into the overall health of the ESHS system.

The review's primary outcome is continuous improvement. Management may decide to revise environmental objectives, adjust resource allocations, or introduce new training programs. They may also update policies, refine non-compliance procedures, or incorporate lessons from incidents into future work plans. This ensures that the organization remains proactive, rather than reactive, in addressing potential environmental or social issues.

In addition, senior management endorsement reinforces the importance of ESHS performance at all organizational levels. By communicating these priorities to staff, contractors, and stakeholders, management sets a tone of accountability and responsibility. Through ongoing commitment and openness to refinement, the Project maintains a culture of continuous improvement, ensuring that the construction phase proceeds in an environmentally responsible, socially inclusive, and health- and safety-conscious manner.

4.7 Training and Capacity Building

Training and capacity building ensures that every individual involved in the Project—PMU staff, OE personnel, and Contractor's workers—understands the ESHS standards, responsibilities, and procedures.

4.7.1 Training of PMU Staff

The primary objectives of the Training Program for PMU ESHS staff are as follows: (i) Provide induction training for all PMU staff, focusing on identifying and managing environmental and social risks during construction. This includes an overview of ESHS measures and good OHS practices; and (ii) Deliver specialized, operational-level training for PMU ESHS personnel, enabling them to effectively implement and oversee ESMP-related activities. OE will conduct this training in the initial stages of bidding. If the mobilization of OE is delayed, a qualified consultant will be appointed to facilitate early-stage capacity building for the PMU

ESHS staff. All training will be conducted at DGPC offices and carefully documented for future reference and audit purposes.

Some of the E&S training needs for DGPC have been determined through an E&S Borrower Capacity Assessment, which includes:

- **Review of DHPP ESIA**: An in-depth examination of the ESIA, focusing on applicable laws and regulatory frameworks, a detailed understanding of project components and construction scheduling, as well as methodologies for impact identification, analysis, and the development of corresponding mitigation measures to ensure that the PMU ESHS staff can anticipate potential issues and proactively manage environmental and social challenges throughout the project's lifecycle.

- **ESMP Programs of Action:** A detailed exploration of the ESMP action plans, including construction-phase ESHS risk identification and management strategies, clear procedures for reservoir first impoundment to minimize ecological disturbances, frameworks for adaptive management based on monitoring results, and guidelines for revising approaches as needed, ensuring that PMU ESHS staff can confidently align on-site practices with the project's planned environmental and social performance standards.

- **ESHS Management and Organization**: A structured training session covering the organizational aspects of implementing ESMP measures, including techniques for effective scheduling and execution of construction site inspections, best practices for systematic monitoring of ESHS aspects, methods for maintaining productive relationships with local communities and project staff, and approaches for ensuring transparent communication and coordination among different project entities to foster a cohesive and proactive ESHS management culture.

- **Inspection and Compliance Protocols:** Comprehensive guidance on designing and conducting site inspections with clear objectives, frequency, and standardized checklists; training on recognizing, documenting, and reporting non-compliances; and step-by-step procedures for initiating corrective actions, tracking improvements, and escalating issues when necessary, enabling the PMU ESHS staff to maintain continuous oversight and respond effectively to any deviations from established ESHS standards.

- **GBV, SEA/SH, Child and Forced Labor**: An extensive briefing on identifying, preventing, and managing Gender-Based Violence (GBV), Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), child labor, and forced labor, including understanding their underlying causes, relevant reporting mechanisms, support services for affected persons, legal implications, and integration of these principles into day-to-day operations, ensuring that the PMU ESHS team is fully equipped to uphold human rights and promote a safe, respectful, and equitable work environment.

- **Labour Management Procedures**: A focused session on project-specific Labour Management Procedures, covering compliance with local and international labor standards, fair employment practices, transparent worker grievance mechanisms, obligations for worker welfare and housing conditions, and periodic reviews of labour-related performance

indicators, ensuring that PMU ESHS personnel can oversee a workforce environment that respects dignity, fairness, and worker rights throughout the construction period.

- **Contractor ESHS Specifications and Good Practices**: A detailed examination of Contractor ESHS specifications, relevant industry standards, and international best practices, including how to interpret technical requirements, ensure contractor adherence through compliance checks and non-compliance procedures, foster contractor capacity building, and continuously improve site operations and environmental performance, resulting in alignment between the PMU and Contractor's ESHS teams for consistent and measurable progress.
- **Data Management and Reporting**: A thorough explanation of the data management systems and reporting structures, including methods for organizing, archiving, and retrieving environmental and social data, handling photographic and documentary evidence, updating non-compliance registers, and preparing and reviewing weekly, monthly, and semi-annual reports that synthesize site findings and mitigation results, thus enabling the PMU ESHS team to maintain robust records and evidence-based decision-making at all stages of the project.
- **Community Engagement and Labor Influx Management**: A targeted training module on best practices for engaging with local communities, managing stakeholder expectations, providing timely and transparent information, addressing community grievances, and implementing strategies to effectively handle large labor influx, including proactive measures to mitigate social tensions, cultural misunderstandings, and potential conflicts, thereby strengthening community relations.

All evidence of the capacity-building activities—such as training attendance sheets, evaluation forms, training materials, and meeting notes—will be carefully documented and stored on-site for future audits and verification, ensuring full traceability and continuous improvement of the ESHS training program.

4.7.2 Training of Contractors' Workers

The CC will implement a structured, tiered training program to ensure that all its workers, including subcontractors, acquire the necessary ESHS awareness and competencies.

Three levels of training will be implemented for Contractor's Workers.

- General Environmental Awareness program for all workers employed by the CC or its subcontractors, raising environmental issues related to general issues such as environmental conservation, waste management, health, hygiene and safety, social behaviour in camps, and cultural resources protection. Understanding of GBV, SEA/SH, Child labour and Forced Labour risks and management. Awareness training will also propose a session dedicated to the presentation of individual work contract content, employment conditions defined by the Human Resource management of the CC and an introduction to the Worker Code of Conduct.
- Health and Safety Awareness, including AIDS/HIV and other STIs awareness programs on prostitution, human trafficking and sexual harassment; Basic health: fight malaria and water diseases, improve sanitation; emergency response and evacuation.
- Targeted training, including job-specific environmental training of workers affected by particularly sensitive environmental activities: tasks requiring a work permit; first aid and transportation of injured people; handling of fuel and dangerous materials; firefighting, etc.

Each new recruit must participate in the awareness-raising programme within 10 days following his recruitment. Each employee in charge of sensitive activities will follow a catch-up session every 6 months.

Training will be delivered by the CC-ESHS Manager and staff or by a specialized consultant appointed by the CC. All personnel will be trained in the most appropriate language (Dzongkha, English or other). The sessions will be recorded in a register where the names of all participants will be noted.

The training program will comprise:

- An induction training program is to be delivered to all personnel and tailored to the specific needs of the construction staff (own personnel and subcontractor staff) and site visitors.
- ESHS training.
- General orientation and job/task-specific training are needed for the performance of the duties to which the person (CC and subcontractor staff) is assigned.
- External/statutory training is required according to regulatory provisions.
- Refresher training, including toolbox discussions.

A tentative list of training programs is provided in Table 4.4

Table 4-4: List of Training for Contracted Workers

Name of training	Training Topics
Site Induction Training	• Introduce the site for new participants; • Scope of work; • Program overview and hazards addressed - specific Project and Plant; • Construction organization; • Protective clothing, minimum size requirements and mandatory requirements; • Emergency alarms, evacuation procedures and assembly sites; • Smoking on site; • Accident report; • First aid facility; • Prevention and prevention of fire and explosion; • Cleaning of equipment (including management and maintenance of overhead cranes and cables); • Noise/vibration at work; • Self-audit and self-assessment of OH&S at work and place of activities; • PPE requirement; • Electrical and related equipment; • Work at night; • Cooperation with employers; • Drug and Alcohol Policy;

Name of training	Training Topics
	• Confined space; • Prohibited items.
General Environmental Awareness for Construction Workers	• Introduction to environmental impacts related to construction activities and the need to protect the environment. • Areas/issues of particular environmental sensitivity in or in the vicinity of the construction area. • Description of obligations/responsibilities of individual workers in terms of general environmental protection. • Roles and responsibilities of Contractor and construction supervisors, as well as lines of reporting in relation to environmental issues. • Prohibitions on hunting, explosive and chemical fishing, logging, collection of non-timber forestry products, purchasing or trading in wildlife or wildlife meat, and gathering and harvesting medicinal or valued plants or trees. • Prohibition of possessing guns, snares, traps, and other hunting equipment. • Waste management practices in camps and on construction sites. • Pollution control measures on construction sites. • Vegetation clearing procedures. • Cultural property issues, including chance-finding procedures). • Penalties for violation of rules and regulations.
General Health and Safety Awareness for Construction Workers	• Introduction to health and safety issues in construction camps and on construction sites, including main areas of risk to workers and others. • Education on basic hygiene practices to minimize the spread of typical tropical diseases. • HIV/AIDS and STD awareness, including information on methods of transmission and protection measures. • GBV/SEA/SH awareness • Covid-19 awareness. • Prohibition of drugs. • Prohibition of alcohol on construction sites. • Procedures for seeking medical assistance in emergency or non-emergency situations and procedures for seeking other health-related assistance (e.g. STD testing or counselling). • OH&S awareness, including basic procedures for: • Traffic and road safety. • Electricity hazards. • Explosives hazards. • Fire and fire protection. • Pesticide and chemical use.

Name of training	Training Topics
	• Hazardous materials management. • Use of Personal Protection Equipment (PPE) and processes for obtaining relevant PPE. • Penalties for violation of rules and regulations.
Working in an enclosed Space	• Working in enclosed space training in accordance with local and international accreditation.
First aid	• First Aid training in accordance with local and international accreditation.
Emergency response	• Knowledge of hazardous materials located on-site. • Potential for spills and releases. • Environmental and human effects of spills/releases. • Emergency response procedures, including priorities of responses. • Location and use of spill response equipment. • Communication and reporting measures.
Electrical safety	• Working with electrical equipment training in accordance with local and international accreditation.
Working on the water	• Working on or near the water training in accordance with local and international accreditation.
Hand tools	• Safe use of hand tools training in accordance with local and international accreditation.
Food safety	• Food hygiene training in accordance with local and international accreditation.
Fire and explosion prevention	• Causes of fire. • Fire prevention measures. • Firefighting equipment use and maintenance. • Firefighting procedures and emergency response procedures • Emergency assistance contacts • Requirements for waste burning on-site • Methods to train other workers in fire protection methods
Working with hazardous chemicals/substances	• Correct handling and storage procedures, including procedures in storage areas in terms of registering materials • Correct use procedures, including refuelling procedures, calculating amounts to be used and ensuring effective equipment operation • Disposal of used storage containers • Hazardous waste storage procedures • Non-hazardous waste management • Medical issues associated with exposure to substances • Emergency response procedures

Training needed and delivered for each role is identified and tracked by means of a training and competency/skills matrix covering the training required for each role. All training sessions delivered will be

documented, and records will be filed. Information on the training activities planned and completed will be included in the monthly report. Records of all training provided and the associated attendees should be maintained.

Staff will complete and sign an attendance sheet for all courses attended, including the toolbox talks training. Staff will also be asked to complete a course evaluation sheet at the end of each course to assess the effectiveness of the training delivered. A training register will be maintained and will contain details of the name of the training session, the date of the training session, a list of attendees and signatures, and the name of the trainer.

4.8 ESHS Documentation and Reporting

4.8.1 Environmental Database

Robust documentation and reporting systems enable all parties—PMU, OE, and CC—to track ESHS performance, identify issues early, and ensure accountability. The central objective is maintaining comprehensive, easily retrievable, and up-to-date records of all environmental and social activities, site inspections, non-compliances, training sessions, stakeholder consultations, and incident reports throughout the construction phase.

A dedicated ESHS database will be established and managed primarily by the OE with support from the PMU. This database will store the following information:

- The site description sheet includes the initial condition of the site and the construction activities that were developed.
- Results from routine monitoring by the Contractor and OE-ESHS.
- ESHS Permitting register.
- Site inspection sheets.
- Non-compliance detected and corrective measures (Non-compliance level, type, date detected, date corrected, corrective measure types).
- Related maps and drawings.
- Photographic archives.
- Site closing sheet and related documentation on-site restoration.
- All other relevant E&S documentation.

The database must be capable of generating detailed information by filtering categories such as date, location, type of non-compliance, or monitoring parameter. Proper version control will ensure that updated documents, such as revised ESMP procedures or newly issued permits, are immediately reflected.

4.8.2 Photographic Records

Photographic records of progress on site and an ad-hoc record of all incidents or events on site will be kept. These records can be used, where applicable, in case of disputes regarding E&S matters and for the review process after completion of construction. Photos will be taken with digital equipment and systematically stored as electronic files in the database. The contractor will be requested to take pictures of all construction sites prior to starting works as a reference for eventual site rehabilitation.

4.8.3 Permit Register

A permit register, including all permits required for the execution of the Project in line with national regulations, will need to be developed and maintained by the CC. The up-to-date permit register is appended to the weekly and monthly progress reports to DGPC. This allows information and discussion on the timing for needed permits and on any critical outstanding permits required as per the construction schedule and actual progress.

The permit register includes information on the object/activity permitted, the title of the permit, the issuing authority, the project phase and applicable/supporting regulations.

4.8.4 Reporting on ESMP Compliance

DGPC and its Contractors will prepare periodic monitoring reports on the status of the implementation of ESMP, which will be submitted to the World Bank for their review and feedback. Details of these reports and their content are given in Table 4.5.

Table 4-5: ESMP Monitoring and Compliance Reports

#	Title of the Report	Contents of the Report	Frequency of Report	Report to be prepared by
1	E&S Monitoring Report	The compliance status of the Project with environmental and social mitigation and monitoring measures. The report also covers the following: • environmental incidents; • wildlife-related incidents, • health and safety incidents, • health and safety supervision: • Usage of PPEs by workers • worker accommodations • Training conducted, and workers participated • Workers grievances • Community grievances • Chance finds (if any)	Monthly	Contractor
2	ESMP Monitoring Report	The compliance status of the overall Project with ESMP requirements	Quarterly	DGPC/PMU
3	Incident Reports	Incident investigation reports for all major incidents covering details of the incident, root cause analysis, and actions taken to address the future recurrence of this event. Contractors need to inform the PMU within 24 hours in case of a serious or fatal accident. The PMU needs to inform the World Bank within 48 hours of such an accident following the World Bank reporting procedure. GBV-SEA/SH cases need to be communicated immediately to the PMU and the World Bank following	Initial investigation report within 24 hours Detailed Investigation Report in 15 days or otherwise, as agreed with	Contractor

#	Title of the Report	Contents of the Report	Frequency of Report	Report to be prepared by
		the World Bank procedure for these cases. The GBV-SEA/SH Prevention and Response Action Plan also includes a specific reporting procedure.	the World Bank	

Part 2
ESMP on Non-Construction-Related E&S Impacts and Risks

5 ESMP ON NON-CONSTRUCTION AND OPERATIONAL-RELATED IMPACTS AND RISKS

The non-construction-related impacts in this chapter cover the impacts that are not associated with the contractors and, hence, need to be managed by the PMU with the support of relevant government agencies. This includes the implementation of the Land Acquisition and Livelihood Restoration Plan (LALRP), Stakeholder Engagement Plan (SEP), Cultural Heritage Management Plan, and Biodiversity Management Plan (BMP). These plans are not duplicated in the ESMP. A summary of these documents and relevant management plans is given in Table 5.1. This chapter also includes Operational and Maintenance (O&M) Stage-related impacts and their mitigation and monitoring measures.

Table 5-1: Non-Construction-Related Management Plans

#	E&S Aspect	Key Measures in the Plan
1	Land Acquisition and Livelihood Restoration Plan (LALRP)	• Details all land acquisition and livelihood restoration measures for the permanent acquisition of 900.08 acres of SRF land and 18.89 acres private land permanently from 50 households and two institutions, the physical displacement of one household (totaling 53 affected HHs) and economic impact on 6 households due to loss of currently cultivated land.
2	Stakeholder Engagement Plan (SEP)	• The SEP has been prepared as a management tool to guide stakeholder engagement during the project lifecycle. It includes mapping of stakeholders, stakeholder engagement process, roles and responsibilities for stakeholder engagement, monitoring and evaluation. It also includes a Project GRM and the GBV-SEA/SH-specific redresss Mechanism. The SEP will be updated and improved throughout the project's implementation.
3	Biodiversity Management Plan (BMP)	• The BMP includes measures to compensate for the clearance of 778 acres of natural habitat, protect and conserve terrestrial and aquatic biodiversity (fauna and flora) to achieve net biodiversity gains for critical habitats, address the construction, filling and operation phases of the DHPP in order ensure a project compliant the principles of WB ESS6.
4	Cultural Heritage Management Plan	• It includes the location and description of the cultural heritage site identified and measures to protect cultural heritage near the DHPP.
5	Local Area Development Plan	• Providing a fund for the infrastructure development in the local communities affected by the Project

5.1 O&M Stage Mitigation Plans

The O&M stage mitigation plans to be implemented by DGPC are given in Table 5.2.

Table 5-2: O&M Stage Mitigation Measures

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
1	Reservoir	Impact on hydrology and hydraulic flows as the dam impoundment will induce the rise of water surface elevation in the reservoir area.	• Develop a flow regulation strategy that considers the seasonal variations in water discharge. • Establish a well-defined reservoir operation protocol that considers the inflow-outflow dynamics. • Implement environmental flow releases that mimic natural flow patterns, particularly during low-flow periods. • Develop a flood forecasting system that provides early warnings about potential high-water discharges. • Design and implement sediment management strategies to prevent excessive sediment build-up within the reservoir.
2		Degradation of the water quality in the reservoir and downstream	• Implement sediment management strategies to reduce sedimentation in the reservoir. • Develop and implement strategies to regulate water temperature in the reservoir. • Implement watershed management practices to control nutrient inputs into the reservoir. • Establish monitoring programs to detect early signs of algal blooms. • Develop and implement continuous water quality monitoring • Manage flow releases from the reservoir to minimize abrupt changes in downstream water quality. • Implement erosion control measures in the catchment area to minimize sediment input into the reservoir. • Raise awareness among local communities and stakeholders about the importance of maintaining water quality.
3	Sediment	Modification of sediment transport and erosion	• Develop and implement specific strategies tailored to critical periods when sediment management is most essential. • Implementing sediment flushing during the high-flow season to release sediments deposited in the reservoir. • Consider targeted desilting as a supplementary measure to sluicing, concentrating on areas with significant sediment accumulation. • Implement regular sediment accumulation and water quality monitoring for timely adjustments to sediment management strategies.
4	Waste	Generation of waste from offices, colonies and facilities	• About 6 months prior to construction demobilization, DGPC and the Contractor will start engaging with the Mongar/Lhuentse Dzongkhags administration to plan for

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
			the handover of waste management facilities established in the project. • Prior to the formal handover, the Contractor will undertake an asset condition assessment and provide it to the Mongar/Lhuentse Dzongkhags administration.
5	Workers' health and safety during EMF Exposure		• Prepare and implement an EMF safety program with the following components • Identify potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities. • Train workers in the identification of occupational EMF levels and hazards. • Establish and identify safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure and limiting access to adequately trained workers. • Implement action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The recommended EMF exposure levels by ICNIRP are 10 kV/m for the electrical field and 1000 μT for the magnetic field. • Personal exposure monitoring equipment will be set to warn of exposure levels that are below occupational exposure reference levels (for example, 50 percent). • Implement actions to minimize occupational exposure, which include limiting exposure time through work rotation, increasing the distance between the source and the worker when feasible, or using shielding materials. • Workers always use personal noise protective gear when working in high-noise areas (typically areas with noise levels greater than 85 dBA). • Transmission line workers will be provided with adequate PPEs and training on the safe use of equipment.
6	Community health and safety	Rapid variations in river flow due to peaking operations increase the risk of drowning for	• Implement a targeted public awareness program at least one month prior to the initial reservoir impoundment, informing local communities of upcoming changes in water levels and associated risks.

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
		community members and livestock.	• Install temporary signage at least one month before the reservoir filling to alert residents and visitors to the impending changes. • Conduct on-site patrols immediately before and throughout the reservoir impoundment process to identify and warn individuals potentially exposed to rising water levels. • Coordinate these patrols with similar efforts aimed at rescuing and relocating wildlife that may become trapped. • Establish an annual awareness and information program for communities located around the reservoir and along the riverine corridor down to the Kurichhu reservoir. • Inform river users about the dangers associated with peaking operations, including fluctuating water levels and sudden discharges. • Fence off all project-related infrastructure and control access points to prevent unauthorized entry. • Prohibit public access to dam-related facilities and discourage access to the reservoir shoreline. • Place clear, permanent safety signage at primary access points to the reservoir and along its shores, warning of sudden water level changes and the risk of drowning. • Install similar signage at strategic locations along the riverbanks between the tailrace outlet and the Kurichhu reservoir tail and throughout the bypassed river section, highlighting the risk of unexpected spills during the monsoon season. • Deploy an audible siren system to alert downstream communities before increasing flow rates, allowing people time to vacate potentially hazardous areas. • Control downstream water level rise gradients, maintaining a maximum increase of less than +5 cm/min to ensure public safety. • Conduct a dedicated study to determine the most appropriate water rise gradient for the DHPP, then adjust flow rates accordingly. Confirm compliance through ongoing water height measurements and refine operations to maintain safe conditions during daily energy production increases.

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
7		Increased incidence of waterborne or water-related diseases	Liaise regularly with the local health authority, particularly Mongar Regional Referral Hospital, to monitor and identify any increasing trend in waterborne disease incidence.
8	Terrestrial habitat	Impact on Wildlife Movement in Biodiversity Corridor #7	• Implement the Biodiversity Management Plan • Downstream dewatered reach will improve the connectivity. Implement BMP with net gain measures.
9	Aquatic habitat	Impact from Variation of water quality in the reservoir and downstream	• Measure to manage water quality in the reservoir and downstream • Maintain an environmental flow: The E-flow will reduce the dam's impacts on aquatic ecosystems.
10		Impact due to changes in sediment load during routine operation and also during flushing of sediments	• Maintain an environmental flow: The E-flow will reduce the dam's impacts on aquatic ecosystems. • Establishment of sediment monitoring on all impacted sections • Develop and implement strategies to avoid invasive species (fish) intrusion. • Installation of grid/screens to limit fish mortality • Monitoring impacts to define adaptive management measures.
11		The barrier to fish migration	• Implement the catch-and-release protocol for migratory fish. A fish hatchery will be established to supplement the native fish population. • Monitoring of fish populations downstream, in the reservoir, in side streams and upstream, as well as migratory/mobile species and species with limited distribution. • A fish hatchery will be established to supplement the populations of dominant fish species that naturally occur in the Kurichhu River and to address the cumulative impacts of this Project and other hydropower schemes in the catchment.
12	Birds	Risks of bird collision from transmission lies	• Electrocution risks will be minimized by design by using raptor-friendly towers with perch deterrents, including necessary insulation and allowing a spacing between vertical conductors that exceeds the wingspan of large birds. • Bird flight diverters will be installed on wires to improve visibility. Underground cabling will be used where possible, and transmission line routing will avoid bird-sensitive areas (wetlands and migratory paths) to the extent possible.

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
			• Trees in the proximity will be pruned, and anti-climbing devices, such as baffles, collars of metal spikes and non-toxic slippery surfaces, will be installed on towers.
13	Dam safety	Potential risks on the dam structure	• Develop and implement an Operational - Emergency Management Plan • Permanent monitoring of the dam structure by qualified personnel, using technical sensors implemented during construction: Leakages/infiltration, Pressure, Displacement, Settlement, etc. • Periodic visual inspection of the structure and evacuation devices by the operator and periodic in-depth technical inspections by specialized engineering services. • Inspections using specialized instruments (water level meter, piezometer, pendulum, etc.). • Maintenance work (preventive and curative) is planned and carried out by qualified personnel. • Verify evacuation devices through maintenance and valve lifting tests. • Strict implementation of EPR prevention procedures and measures in normal and exceptional situations. • Enforcement of security measures around the structures: 24/7 control of the critical facilities and night lightning of the dam accesses. • Information on downstream communities about dam risks and related emergency measures is needed. This addresses the concerned population and local/regional authorities through leaflets, public meetings, and site visits. • Awareness training of communities on appropriate behaviour in case of emergency. • Implementation of an alert procedure to alert and mobilize personnel on-site, local authorities and the population concerned; the process describes the various decision steps to be implemented and the persons to contact depending on the type of event. • Emergency evacuation training of concerned communities, including specific alert system recognition, meeting points on elevated sites, minimum items to take for evacuation, identification of community safety leaders, and behaviour during and after evacuation.

#	E&S Aspect	Impacts	Mitigation Measures by DGPC
			• Describe the operator organization, including the functions, responsibilities, and means allocated for implementing the EPR Plan. • Training and drills are to be organized to ensure the EPR organization is adequate for an immediate and efficient response to any critical situation.

5.2 O&M Stage Monitoring Plan

The O&M stage monitoring is summarized in Table 5.3. DGPC and the DHPP operators are responsible for implementing this monitoring plan.

Table 5-3: O&M Stage Monitoring

Parameters	Means of Monitoring	Frequency
Downstream river flows	Measurements of discharges to the downstream	Monthly
Water quality	Sampling will be carried out in the following stations: -About 4 to 6 stations in the Dorjilung reservoir area, regularly distributed from the reservoir entrance down to the immediate upstream of the dam. - At least five stations along the Kurichhu by-passed section, one close to the E-flow outlet, one in the middle of the river stretch, one upstream of the junction with the tailrace, one in the tailrace discharge and one 500 m downstream the tailrace outlet (roughly in the tail of Kurichhu HPP). The water parameters to be monitored include at least: Total coliforms, BOD5, COD, Total Nitrogen, Nitrate, Nitrite, Phosphate, Total hydrocarbons, pH, TSS, Turbidity, dissolved O2 and toxic metals (Pb, Cd, Hg, Cr6+).	Six-monthly
Dissolved Oxygen	Monitoring will be carried out in the same sampling stations as the long-term monitoring. Measurements will be done in situ using a well-calibrated multiparameter probe (O2, pH, Turbidity, TDS). For the stations in the Dorjilung reservoir, measurements will be taken at various depths to identify any anoxic situation in the lower part of the reservoir and the presence of an oxycline. Along the dewatered river stretch, O2 measurement will take place on a routine monthly basis, but also when sediment flushing will occur to complement aquatic fauna monitoring presented in the BMP.	Monthly
Sedimentation and erosion	Monitoring every 3 years of sedimentation in the reservoir and of riverbed erosion/accretion of the river downstream of the structure: - In the reservoir area, bathymetric monitoring of a longitudinal profile and 5 cross sections (always the same).	Six-monthly

Parameters	Means of Monitoring	Frequency
	- In the reservoir area: sediment sampling for particle size analysis of 5 to 10 samples for the longitudinal profile and 2 samples for each cross-section. - Downstream area: bathymetric monitoring of a longitudinal section of the river and cross profiles (always the same) in areas considered as potentially sensitive to the phenomenon. - Downstream area: sediment sampling for particle size analysis of 3 samples for the longitudinal profile and 2 samples for each cross-section. - Implementation of cross sections along the river stretch in existing sand deposits presently exploited by communities.	
EMF Exposure to workers	Monitor EMF Levels in the powerhouse and switchyard.	Continuous monitoring
Drowning risks	Inspection of facilities established to mitigate drowning risks	Monthly
Waste	Collection and disposal of waste, including hazardous waste	Monthly
Dam safety	Monitoring of data from dam safety equipment	Quarterly

6 ESMP IMPLEMENTATION BUDGET

The total ESMP budget for the Project, both during the construction and operational stages, is estimated at US$ 34 million including 20% contingencies as shown in **Table 6-1**.

Table 6-1: Total Estimated Budget

Particulars	Budget (USD)
Total Pre-Construction	1,585,000
Total Construction	10,593,460
Total Operation	16,262,045
Total	**28,440,505**
Contingency (20%)	5,688,101
Grand Total	**34,128,607**

6.1 Pre-construction Stage Budget

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
Action Plan Pre-construction Stage (PPA)						
General						
PPA-01: Appointment of the PMU-ESHS Manager & staff	DGPC	DGPC	Pre-construction	200,000.00	1	200,000.00
PPA-02: ESHS Capacity Building of PMU-Staff	DGPC	DGPC	Pre-construction	100,000.00	1	100,000.00
PPA-03: Preparation of Contractor ESHS Specifications	DGPC	DGPC	Pre-construction	15,000.00	1	15,000.00
PPA-04: Emergency Preparedness and Response Plan	DGPC	DGPC	Pre-construction	50,000.00	1	50,000.00
Water quality and sediment monitoring	DGPC	DGPC	Pre-construction	150,000.00	1	150,000.00
Public Consultations	DGPC	DGPC	Pre-construction	150,000.00	1	150,000.00
E&S team from DGPC	DGPC	DGPC	Pre-construction	500,000.00	1	500,000.00
BMP Preparation, start of BMP field studies	DGPC	DGPC	Pre-construction	150,000.00	1	150,000.00
Start of ESMP implementation (inc. temporary works)	DGPC	DGPC	Pre-construction	130,000.00	1	130,000.00
Recruitment of E&S team from DGPC (full time)	DGPC	DGPC	Construction	100,000.00	1	100,000.00

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
E&S Expert panel	DGPC	DGPC	Pre-construction	40,000.00	1	40,000.00
TOTAL - Pre-construction Stage						**1,585,000.00**

6.2 Construction Stage Budget

The budget estimates for the construction stage are US$10.6 million. Details are given below.

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
CONSTRUCTION						
Construction - Environment						
E&S Monitoring for Lenders	DGPC	Lenders	Construction	150,000.00	5	750,000.00
E&S Expert panel	DGPC	DGPC	Construction	30,000.00	5	150,000.00
Purchase of E&S monitoring equipment	DGPC	DGPC	Construction	125,000.00	1	125,000.00
General E&S monitoring	DGPC	DGPC	Construction	10,000.00	5	50,000.00
PAC-01: Erosion and Sediment Control Plan	CC	CC	Construction	Include in the EPC budget		-
PAC-02: Muck Disposal Planning and Management Plan	CC	CC	Construction			-
PAC-03: Waste Management Plan	CC	CC	Construction			-
PAC-04: Hazardous Substances Management Plan	CC	CC	Construction			-
PAC-05: Explosive and Blasting Management Plan	CC	CC	Construction			-
PAC-06: Emergency Preparedness and Response Plan	CC	CC	Construction			-
PAC-07: Water Quality Monitoring Plan (by DGPC)	DGPC	DGPC	Construction	5,000.00	30	150,000.00
PAC-08: Water Quality Monitoring Plan (by CC)	CC	CC	Construction	Include in the EPC budget		-
PAC-09: Construction Material Sourcing, Extraction, Quarry MP	CC	CC	Construction			-
PAC-10: Emissions, Dust and Noise Management Plan	CC	CC	Construction			-
PAC-11: Physical Cultural Resources (PCR) Management	CC	CC	Construction			-
PAC-12: Vegetation Clearing Plan	CC	CC	Construction			-
PAC-13: Landscaping and Re-vegetation Plan	CC	CC	Construction			-
PAC-14: Biodiversity Protection Plan	CC	CC	Construction			-
PAC-15: ESHS Training for Construction Workers Plan	CC	CC	Construction			-

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
PAC-16: Road Traffic Management Plan	CC	CC	Construction			-
PAC-17: Construction Sites Access Management Plan	CC	CC	Construction			-
PAC-18: Management of Construction Worker Colonies (Camps)	CC	CC	Construction			-
PAC-19: Occupational Health and Safety Plan	CC	CC	Construction			-
PAC-20: Communities Health and Safety Management Plan	CC	CC	Construction			-
PAC-21: Site Cleaning and Rehabilitation Management Plan	CC	CC	Construction			-
PAC-22: Reservoir First Impoundment Management Plan	CC	CC	Construction			-
PAC-23: Monitoring of Construction Activities (OE/PMU)	DGPC	DGPC	Construction	Include in the OE & PMU budget		-
PAC-24: Air Quality and Noise Monitoring (OE)	DGPC	DGPC	Construction			-
PAC-25: Control of CC Water Quality Monitoring (OE)	DGPC	DGPC	Construction			-
PAC-26: Biodiversity Conservation (BMP)	CC	CC	Construction	30,000.00	5	150,000.00
PAC-27: Labor influx management plan	CC	CC	Construction	Include in the EPC budget		
PAC-28:: Security Force Management plan	CC	CC	Construction			
Emergency Preparedness and Response Plan	DGPC	DGPC	Construction	20,000.00	1	20,000.00
Sub-Total / Construction - Environment						**1,395,000.00**
Construction - Biodiversity (BMP)						
Organisation and owner staff (Additional to PMU in the ESMP)	DGPC	DGPC	Construction		1	485,000.00
Information and training	DGPC	DGPC	Construction		1	96,000.00
Avoid and reduce measure	DGPC	DGPC	Construction		1	50,000.00
Afforestation program (Offsetting)	DGPC	DGPC	Construction		1	40,000.00
Offsetting and monitoring CHQ and emblematic species.	DGPC	DGPC	Construction		1	2,960,000.00
Audit/monitoring of the BMP implementation and adaptative management provision	DGPC	DGPC	Construction		1	105,000.00
Sub-Total / Construction - Biodiversity						**3,736,000.00**
Construction - Environmental Flow (E-flow)						
General costs for Management Plans and Monitoring	DGPC	DGPC	Construction plus 4yrs Ops			451,000.00
MP_COMMUNITY: Community Safety Management Plan	DGPC	DGPC				254,000.00
MP_RIVERMORPH: River Morphology Management Plan	DGPC	DGPC				485,500.00
MP_FISH: Native Fish Stock Management Plan	DGPC	DGPC				104,500.00

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
MP_RESEARCH:	DGPC	DGPC				427,000.00
NNL / NG additional contingency	DGPC	DGPC				2,000,000.00
Sub-Total / Construction - Environmental Flow						**3,722,000.00**
Construction - Social						
LALRP - initial budget for COMPENSATION (Land, Structures, Crops)	DGPC	DGPC	Construction		1	79,803.07
LALRP Livelihood restoration	DGPC	DGPC	Construction		1	204,684.69
LALRP IMPLEMENTATION	DGPC	DGPC	Construction		1	195,972.55
Local Development Plan (LDP)	DGPC	DGPC	Construction		1	1,000,000.00
Grievance Redress Mechanism (GRM)	DGPC	DGPC	Construction	12,000.00	5	60,000.00
Communities communication	DGPC	DGPC	Construction	20,000.00	5	100,000.00
Cultural Heritage Management Plan	DGPC	DGPC	Construction	10,000.00	5	50,000.00
Cultural Heritage Management Plan	CC	DGPC	Construction	Include in the EPC budget		-
Recruitment and workforce influx management plan	CC	DGPC	Construction	10,000.00	5	50,000.00
Recruitment and workforce influx management plan	CC	CC	Construction	Include in the EPC budget		-
Community Forest compensation	DGPC	DGPC	Construction	To be clarified during Pre-Construction		
Sub-Total / Construction - Social						**1,740,460.31**
TOTAL - CONSTRUCTION						**10,593,460.00**

6.3 O&M-Stage Budget

The O&M stage budget is estimated at US$16.3 million. The details are given below.

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
OPERATION						
Operation - Environment						
E&S team from DGPC	DGPC	DGPC	Operation	35,000.00	10	350,000.00

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
OPERATION						
PAE-01: Waste Management	DGPC	DGPC	Operation	Include in OE budget		-
PAE-02: Hazardous Products Management	DGPC	DGPC	Operation			-
PAE-03: Accidental Spill Management	DGPC	DGPC	Operation			-
PAE-04: Water Quality Management (Compliance)	DGPC	DGPC	Operation	5,000.00	10	50,000.00
PAE-05: Water Quality Monitoring (Environmental)	DGPC	DGPC	Operation	20,000.00	10	200,000.00
PAE-06: Sedimentation and Erosion Monitoring	DGPC	DGPC	Operation	40,000.00	10	400,000.00
Reservoir impoundment plan (inc. fauna rescue)	DGPC	DGPC	Impoundment	25,000.00	1	25,000.00
Reservoir clearing	DGPC	DGPC	Impoundment	Include in the EPC budget		-
Reservoir, sediment and flow management plan	DGPC	DGPC	Operation	Include in OE budget		-
Emergency and Response Plan (ERP)	DGPC	DGPC	Operation	25,000.00	1	25,000.00
General E&S monitoring	DGPC	DGPC	Operation	5,000.00	10	50,000.00
Sub-Total / Operation - Environment						**1,100,000.00**
Operation - Biodiversity (BMP)						
PAE-07: Biodiversity Monitoring Plan	DGPC	DGPC	Operation			
Organisation and owner staff (Additional to PMU in the ESMP)	DGPC	DGPC	Operation			1,074,000.00
Information and training	DGPC	DGPC	Operation			108,000.00
Afforestation program (Offsetting)	DGPC	ONGs	Operation			5,760,900.00
Offsetting and monitoring CHQ and emblematic species.	DGPC	ONGs	Operation			5,130,000.00
Audit/monitoring of the BMP implementation and adaptative management provision	DGPC	ONGs	Operation			842,545.00
Sub-Total / Operation - Biodiversity						**12,915,445.00**
Operation - Environmental Flow (Eflow)						
MP_OPERATION: Dam Eflow Operation Management Plan	DGPC	DGPC	Operation			200,000.00
MP_COMMISSIONING: Eflow Commissioning Management Plan	DGPC	DGPC	Operation			35,000.00
Monitoring	DGPC	DGPC	Operation			794,500.00

Measures	Responsibility		Phase	Costs (USD)		Budget (USD)
	Financial	Implementation		Per year/measures	Quantity	
OPERATION						
Sub-Total / Operation - Environmental Flow						**1,029,500.00**
Operation - Social						
Local Development Plan (LDP)	DGPC	DGPC	Operation		1	700,000.00.00
LALRP Livelihood restoration (5 years maintenance of Plantation)	DGPC	DGPC	Operation	2,882.00	84	242,100.00.00
HIV measurement materials and equipment	DGPC	DGPC	Operation	7,500.00	10	75,000.00
Sexual awareness and education	DGPC	DGPC	Operation	5,000.00	10	50,000.00
Health and nutritional awareness education	DGPC	DGPC	Operation	5,000.00	10	50,000.00
Communities communication	DGPC	DGPC	Operation	10,000.00	10	100,000.00
PAE-08: Occupational Health and Safety Management Plan	DGPC	DGPC	Operation	5,000.00	10	50,000.00
PAE-09: Public Safety Management Plan	DGPC	DGPC	Operation	10,000.00	10	100,000.00
PAE-10: Operation Emergency Preparedness and Response Plan	DGPC	DGPC	Operation	25,000.00	1	25,000.00
Sub-Total / Operation - Social						**1,217,100.00**
TOTAL - OPERATION						**16,262,045.00**