



ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

Water Supply Works



Livable and Resilient Cities Project Thimphu City, Bhutan

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DEPARTMENT OF HUMAN SETTLEMENT

Ministry of Infrastructure & Transport, Royal Government of Bhutan

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This Environmental and Social Management Plan (ESMP) forms part of the environmental and social (E&S) due diligence for the Bhutan Livable and Resilient Cities Project (LRCP), a \$48 million project consisting of \$28 million in Green Climate Fund (GCF) financing. The ESIA was prepared by the Royal Government of Bhutan and follows World Bank Environmental and Social Framework (ESF), Good International Industry Practices (GIIP) and the Green Climate Fund's (GCF) Environmental and Social Policy (ESP).

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གསལ་བསྐྱགས།

མཐའ་འཁོར་དང་མི་སྡེའི་ཕན་གཞོན་བརྟག་ཞིབ་ འདི་
 འབྲུག་གི་སྔོན་གནས་དང་གཞོན་འཛེ་བཟོན་སྤྱི་ཚུ་གི་མཐའ་འཁོར་དང་མི་སྡེའི་
 འབྲེལ་བའི་ཞིབ་འཇུག་དང་བརྟག་ཞིབ་ཀྱི་ཆ་ཤས་ཅིག་ཡིན། ལས་འགུལ་འདི་གི་ རིན་ཐང་ཨ་རིའི་ཤོ་ལར་ ༤༥
 ས་ཡ་ཡིན་པ་དང་ དེ་ནང་ལུ་ གི་ མ་དངུལ་ཤོ་ལར་ ༥༥ ས་ཡ་ཚུད་པ་ཡིན།
 མཐའ་འཁོར་དང་མི་སྡེའི་ཕན་གཞོན་བརྟག་ཞིབ་འདི་ འབྲུག་གཞུང་གིས་
 རྒྱལ་སྤྱིའི་བཟོ་གྲུ་དང་ལས་རིགས་ཀྱི་ལག་ལེན་ལེགས་ཤོམ་ གི་ ལུ་གཞི་བཞག་སྟེ་བཟོ་ཡོད་པ་ཡིན།

GCF གི་བརྟན་དོན་གསལ་བསྐྱགས་སྤྱིད་བྱས་ དང་འབྲེལ་ ལས་འགུལ་འདི་གིས་གཞོན་པ་འབྱུང་སྤྱིད་པའི་མི་སྡེ་ དང་
 གཞན་འབྲེལ་ཡོད་ལས་སྟེ་ཚུ་གི་ལེ་ཕན་ལུ་གཞི་བཞག་སྟེ་ མཐའ་འཁོར་དང་མི་སྡེའི་ཕན་གཞོན་བརྟག་ཞིབ་འདི་
 གང་མཚུགས་གསལ་བསྐྱགས་འབད་དེ་ཡོད། ཡིན་རུང་ བརྟག་ཞིབ་འདི་གསལ་བསྐྱགས་འབད་བ་ཙམ་གྱིས་ GCF
 ལས་འགུལ་གིས་ མཐའ་འཁོར་དང་མི་སྡེའི་ཉུག་མེད་ ཡང་ན་ རོས་ལེན་གནང་ཡོད་པ་སྟེ་བསམ་ནི་མི་འོང་།

མཐའ་འཁོར་དང་མི་སྡེའི་ཕན་གཞོན་བརྟག་ཞིབ་འདི་ནང་ ལས་འགུལ་དང་འབྲེལ་བའི་
 གལ་ཅན་གྱི་མཐའ་འཁོར་དང་མི་སྡེའི་གནད་དོན་ཚུ་ བསམ་ནི་ནང་ བྱད་པར་དག་པ་ཅིག་འོང་སྤྱིད།
 དེ་བཟུམ་གྱི་བྱད་པར་ཡོད་པ་ཅིན་ GCF གི་མཐའ་འཁོར་དང་མི་སྡེའི་སྤྱིད་བྱས་ དང་ དང་འབྲེལ་ཏེ་

བརྟག་ཞིབ་ཞིབ་ཏུ་སྤྲོད་མཁུག་བཟོ་ནི་དང་ ཡང་ན་ ཁ་སྐོང་ཞིབ་འཇུག་འགོ་འདྲན་འཐབ་ནི་ དེ་ལས་
འཛིན་སྐྱོང་འཆར་གཞི་ཚུ་བརྒྱད་དེ་བསལ་ནི་ཡིན།

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List of Acronyms & Abbreviations

Abbreviation	Full Form
BoQ	Bill of Quantities
BPS	Bus Priority Service
C-ESMP	Contractor's Environmental and Social Management Plan
CFP	Chance Finds Procedure
CoC	Code of Conduct
DCDD	Department of Culture and Dzongkha
DECC	Department of Environment and Climate Change
DHS	Department of Human Settlement (under MoIT)
DMA	District Metered Area
DoFPS	Department of Forests and Park Services
E&S	Environmental and Social
ESF	Environmental and Social Framework (World Bank)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard (World Bank)
GBV	Gender-Based Violence
GRM	Grievance Redress Mechanism
JDNP	Jigme Dorji National Park
JHA	Job Hazard Analysis
KPI	Key Performance Indicator
LMP	Labor Management Procedures
LRCP	Livable and Resilient Cities Project
LTI	Lost Time Injury
LTIFR	Lost Time Injury Frequency Rate
MoIT	Ministry of Infrastructure and Transport (Royal Government of Bhutan)
NGO	Non-Governmental Organization
NOC	No Objection Certificate
NRW	Non-Revenue Water
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
PCR	Physical Cultural Resources
PIU	Project Implementation Unit (housed at Thimphu Thromde)
PMU	Project Management Unit (housed at DHS/MoIT)
PMSC	Project Management and Supervision Consultant
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
SCADA	Supervisory Control and Data Acquisition
SEA/SH	Sexual Exploitation and Abuse / Sexual Harassment
SEP	Stakeholder Engagement Plan
TMP	Traffic Management Plan
TOR	Terms of Reference
TT	Thimphu Thromde
WTP	Water Treatment Plant

I EXECUTIVE SUMMARY

The proposed Livable and Resilient City Project (LRCP) aims to enhance livability and climate resilience in Thimphu City by improving targeted infrastructure and service delivery. This Environmental and Social Management Plan (ESMP) focuses on the project's water supply works component (Sub-component 1.1). The subcomponent will strengthen the climate resilience, reliability, and efficiency of Thimphu's water supply system by installing SCADA and metering across key facilities and District Metered Areas, upgrading raw water intakes and treatment operations, protecting vulnerable transmission corridors from erosion and landslides, optimizing storage and distribution during floods and droughts, and replacing deteriorated mains and controlling leakage along Norzin Lam and the transport corridor.

Environmental and Social Risks

Overall risks for the water supply works component are assessed as moderate and are expected to be temporary, localized, and manageable through good design, contractor controls, and close supervision. The most sensitive location is the Dodeyna intake within JDNP: although works are minor, the protected-area setting requires stringent footprint control, formal coordination with park authorities, worker-conduct rules, and a pack-in/pack-out approach to waste. Water abstraction impacts are expected to be negligible because the project focuses on efficiency rather than increased withdrawal; however, mandated downstream environmental flows must be maintained and documented through the SCADA system. Other key risks include contamination of the raw-water source; erosion and sediment release; dust, noise, spoil, hazardous materials, and construction waste; trench collapse and confined-space hazards; traffic and pedestrian safety; temporary water-supply and access disruption; labor and worker-welfare issues; impacts on vegetation and fauna; and accidental damage to cultural heritage.

Mitigation Measures

Pre-construction phase. No civil works may begin until mandatory environmental and social prerequisites are completed and verified by the PIU, with technical support from the Project Management and Supervision Consultant (PMSC). These include approval of the site-specific Contractor's Environmental and Social Management Plan (C-ESMP) and its sub-plans; mobilization of qualified environmental, social, and occupational health and safety staff; worker contracts, Code of Conduct, labor procedures, and induction training; a functioning worker and community grievance mechanism; a water-service disruption plan; required permits and design clearances; and a site-specific JDNP Works Protocol endorsed by the relevant park authority. Final designs must demonstrate avoidance and minimization of impacts, including safe SCADA siting, climate-resilient transmission-line protection, and protection of sensitive receptors.

Construction phase. The C-ESMP will be a legally binding contract requirement and will translate this ESMP into site-specific methods and procedures. At minimum, it must include occupational and community health and safety, traffic, pollution and waste, water-service disruption, biodiversity, emergency response, and stakeholder-communication measures. Higher-risk tasks such as trenching and confined-space entry require job hazard analyses and permit-to-work systems. Open trenches must be fenced and—where they cannot be

closed overnight—covered or fitted with fauna escape ramps. Fuels and chemicals must be stored in secure, bunded areas away from water bodies; erosion and sediment controls must precede excavation; surplus spoil and waste must go only to approved facilities; and in-stream work, if required, must be isolated and scheduled during low-flow conditions. Communities must receive at least one week’s notice of planned service interruptions, with alternative water supply provided for shutdowns exceeding eight hours.

Protected areas, biodiversity, and cultural heritage. Activities in JDNP will remain within the approved minimal footprint, with zero tolerance for unauthorized clearing, hunting, waste disposal, or worker movement outside designated areas. Tree removal will require forestry clearance and compensatory planting with native species at a minimum 3:1 ratio. Environmental flows will be maintained both during temporary diversions and long-term operation. For any unexpected physical cultural resource, the Chance Finds Procedure requires immediate work stoppage within a 25 m radius, securing of the area, notification of the PIU, and formal referral to the competent cultural authority; work may resume only after written clearance.

Operation and maintenance phase. Following handover, Thimphu Thromde’s Water Division will operate and maintain the upgraded assets. Key commitments are continuous compliance with national drinking-water standards; prompt public advisories and corrective action for any water-quality non-compliance; maintenance of mandated environmental flows; active SCADA-based leakage detection and pressure management; safe disposal of water-treatment sludge; secure access to treatment plants, reservoirs, and control facilities; energy-efficient procurement and operations; and a dedicated occupational health and safety program for maintenance staff. Core performance targets include non-revenue water at or below 15 percent, continuous environmental-flow records, full compliance with drinking-water standards, and zero fatalities or lost-time injuries.

Implementation Arrangements

Roles and responsibilities. Thimphu Thromde, through the PIU, is responsible for implementation and approval of pre-construction readiness, while the Ministry of Infrastructure and Transport (MoIT) Project Management Unit (PMU) provides coordination and oversight. The PMSC will provide day-to-day technical supervision and verification. Contractors are directly responsible for implementing the approved C-ESMP, maintaining dedicated environmental and OHS personnel, training workers, keeping records, correcting non-compliance, and reporting incidents. During operation, responsibility transfers to Thimphu Thromde’s Water Division, with regulatory oversight as applicable. ESMP requirements, staffing, monitoring, training, and corrective actions must be fully costed in the bill of quantities and contract.

Monitoring and adaptive management. Monitoring combines compliance checks with effects monitoring. The contractor will maintain daily site and OHS logs, undertake routine inspections, and submit monthly environmental and social reports. The PMSC and PIU will conduct independent weekly and monthly verification, track grievances and corrective actions, and intensify monitoring near schools, hospitals, residences, businesses, water bodies, steep slopes, and shared construction corridors. Operational monitoring will cover water quality, environmental flow, non-revenue water, energy use, sludge disposal, asset security, and worker safety. The ESMP will be reviewed at least annually and updated if

designs change, unexpected impacts emerge, mitigation is ineffective, or legal requirements are revised. Material revisions will require documented review, approval, disclosure, and corresponding updates to the C-ESMP.

Immediate management priorities. Before procurement and mobilization, the project should: (i) reconcile the final design and footprint with all permit and protected-area requirements; (ii) ensure that the ESMP and all mandatory sub-plans are incorporated into bidding documents, technical specifications, and priced contract items; (iii) confirm qualified E&S and OHS staffing for the PIU, PMSC, and contractor; (iv) establish the corridor-level construction coordination mechanism and a unified public-notification protocol; (v) operationalize worker and community grievance channels; and (vi) verify a complete readiness package before issuing notice to proceed. Effective implementation of these measures will allow the component's substantial benefits—greater water security, reduced losses, improved climate resilience, and safer, more efficient operations—to be achieved while keeping residual environmental and social impacts at acceptable levels.

༡. བརྒྱུད་རྒྱུ་

གྲོ་མེ་འཆར་བཞུགས་ཡོད་མི་ སྤྱོད་གནས་དང་གཞི་རྒྱ་འཛིན་བཞུགས་ཅན་གྱི་གྲོ་མེ་འཆར་ལས་འགྲུལ་དེ་གིས་
དམིགས་གཏང་ཅན་གྱི་གཞི་རྒྱ་དང་ འབས་ཏྲུག་ཚུ་ བཟུངས་སྤྱོད་འབད་ཐོག་ལས་ ཐིམ་ཕུག་ཁོམ་འདི་
གནམ་གཤིས་གདོང་ལེན་འབད་ཚུགས་པ་དང་ སྤྱོད་བཟུངས་ཡར་ཤུག་གཏང་ནི་ལུ་ དམིགས་གཏང་སྤྱོད་པ་ཨིན།
མཐའ་འཁོར་དང་མི་སྡེ་འཛིན་སྤྱོད་འཆར་གཞི་དེ་གིས་
ཚུ་བཟུངས་སྤྱོད་ལས་འགྲུལ་ཚུ་ལུ་དམིགས་སྤྱོད་བཟུངས་པ་ཨིན། ཡན་ལག་ཆ་ཤས་ ༡.༡ ཡན་ལག་ཆ་ཤས་འདི་གིས་ ཐིམ་ཕུག་གི་
ཚུ་བཟུངས་སྤྱོད་ལས་འགྲུལ་དེ་ གནམ་གཤིས་ལུ་གདོང་ལེན་འབད་ཚུགས་པ་ གྲོ་མེ་འཆར་དང་འཛིན་ཐངས་ཅན་བཟོ་ནི་ཨིན་པ་དང་
དེ་ཚུ་ཡང་ མཐུན་སྦྲེན་གཙོ་བོ་དང་ ཚུ་བཟུངས་སྤྱོད་ལས་འབད་མཉེན་ཁུངས་ནང་ SCDA དང་ འཇལ་ཆས་ཚུ་བཟུངས་ནི། འཐུང་ཚུ་
ཚུ་ལེགས་བཅོས་ཀྱི་ཡར་ཤུག་གཏང་ནི། ཉེན་ཁ་ཡོད་པའི་བར་ལས་ཚུ་ ས་རུད་དང་ས་རུད་ལས་ཉེན་སྲུང་འབད་ནི།
ཚུ་རུད་དང་ཆར་དཀོན་གྱི་སྐབས་ བསག་མཛོད་དང་བཟུངས་སྤྱོད་ལེགས་ཤོམ་བཟོ་ནི། ཝར་འཛིན་ལས་དང་
སྤྱོད་འཛིན་བར་ལས་བདེ་ལྟོ་ ཚུ་འཛིན་ནི་ལས་བཀག་འཛིན་འབད་ཚུ་ཨིན།

མཐའ་འཁོར་དང་མི་སྡེ་ཉེན་ཁ་

ཚུ་གི་ཆ་ཤས་ཚུ་གི་དོན་ལས་ སྤྱིར་བཏང་ལུ་ ཉེན་ཁ་འདི་ རན་ཏྲུག་ཏྲུག་ཅིག་སྤྱོད་ དབྱེ་ཞིབ་འབད་དེ་ཡོད་པ་དང་
འདི་ཡང་ གནམ་སྐབས་ཅིག་གི་དོན་ལུ་ཨིན་པ་དང་ ས་གནས་ཀྱི་དོན་ལུ་ དེ་ལས་ བཟོ་བཞུགས་ལེགས་ཤོམ་དང་
ལག་འབག་གི་ཆར་འཛིན་ དེ་ལས་ ལྷ་ཏྲུག་ཚུ་ ལེགས་ཤོམ་སྤྱོད་ འཛིན་སྤྱོད་འཐུགས་པའི་རེ་བ་ཡོད་པ་ཨིན།
ཆོར་ཤུགས་ཆེ་བའི་ས་ཁོངས་འདི་ JDNF གྱི་ནང་འཁོར་ལུ་ རྩོམ་སྤྱོད་ལུ་ཨིན།
མ་གཞི་ལུ་ཚུ་ཚུང་ཀྱི་ཅིག་ཨིན་རུང་ ཉེན་སྲུང་ཅན་གྱི་ས་ཁོངས་ཀྱི་བཟོ་བཞུགས་འདི་ནང་

ས་ཁོངས་བཀག་འཛིན་འབད་ནི་དང་ གླིང་གའི་དབང་འཛིན་དང་གཅིག་ཁར་མཉམ་འབྲེལ་འབད་ནི་ དེ་ལས་
 ས་ཁོངས་ནང་ལས་ ཡུགས་སྒྲིགས་བསྐྱེལ་འབད་ཐངས་ཚུ་དགོཔ་ཨིན། རྒྱ་བསྐྱེལ་གྱི་གནོད་པ་འདི་
 ཉུང་སྤྱི་ཅིག་ལས་བརྒྱལ་མེད་པའི་ རེ་བ་བསྐྱེད་པ་ཨིནམ་ད་ དེ་ཡང་ ལས་འགུལ་འདི་གིས་
 རྒྱ་བརྟན་ནི་ཡར་སེང་འབད་ནི་ལས་ རྩོན་ཐངས་ལུ་གཙོ་བོར་བསྐྱེན་དོ་ཡོད་པ་ཨིན། ཨིན་རུང་
 མཐའ་འཁོར་གནས་སྤངས་ཀྱི་རྒྱུན་འགུལ་ཚུ་ SCADA ལས་ལུགས་བརྒྱུད་དེ་ བདག་འཛིན་འཐབ་སྟེ་
 ཡིག་ཐོག་ལུ་བཀོད་དགོཔ་ཨིན། གཞན་ཉེན་ཁ་གཙོ་བོ་ཚུ་ཡང་གཞན་མི་ཉེན་ཁ་གཙོ་བོ་འདི་
 རྩམ་རྒྱུ་ཐོན་ཁུངས་ཀྱི་བཅོམ་གྱིབ་དང་ རག་རོག་དང་ རག་རོག་ཐོན་པའི་སྒྲ་ དེ་ལས་ ཐལ་མ་དང་
 གནོད་ཉེན་ཅན་གྱི་རྒྱ་ཆ་དང་ བཅོ་སྐྱེན་གྱི་ཡུགས་སྒྲིགས་ དེ་ལས་ ས་དོར་བ་རྒྱབས་དང་
 ས་གོ་གི་ནང་འཁོར་ལུ་ཉེན་ཁ་ཡོད་མི། རྒྱུན་འགུལ་དང་རྒྱུན་འགུལ་གྱི་དོན་ལུ་རྒྱ་བསྐྱེལ་དང་
 རྒྱུན་ལས་ལུ་གནོད་པ་ཡོད་མི། ལས་མི་དང་ལཱ་གཡོག་གི་ཕན་བདེའི་གནད་དོན་ཚུ་དང་།
 སྤྱི་ཤིང་དང་སྒོག་ཆགས་ཚུ་ལུ་གནོད་པ་ཡོད་མི། དེ་ལས་ སྒོ་བྱར་བྱ་བའི་ལས་སྒོལ་ཚུ་ལུ་གནོད་སྐྱོན་ཚུ་ཨིན།

མར་ཕབ་ཐབས་ལམ།

བཅོ་སྐྱེན་གྱི་ཉེ་མའི་གནས་ཤིང་། ལས་འགུལ་འཛིན་སྐྱོང་དང་ལྷ་རྟོག་གོས་སྟོན་པ་ལས་
 འཕུལ་རིག་གི་རྒྱབ་སྐྱོར་ཐོག་ལས་ ལས་འགུལ་ལག་ལེན་སྟེ་ཕན་གྱིས་ རེས་པར་བྱ་དགོ་པའི་
 མཐའ་འཁོར་གནས་སྤངས་དང་ མི་སྡེའི་དགོས་མཁོ་ཚུ་ མཇུག་མ་བསྐྱུ་ཚུ་
 ཞི་བའི་ལཱ་ཚུ་འགོ་འདྲེན་འཐབ་མི་ཆོག།

དེ་ནང་ དམིགས་བསལ་ས་ཁོངས་ཀྱི་ ཁག་འབག་པ་གི་མཐའ་འཁོར་དང་མི་སྡེ་འཛིན་སྐྱོང་འཆར་གཞི་ (C-
 ESMP) དང་ དེའི་ཡན་ལག་འཆར་གཞི།
 རྒྱ་ཆ་དང་ཕན་པའི་རང་བཞིན་གནས་སྤངས་དང་མི་སྡེ་དེ་ལས་གཡོག་གི་འཕྲོད་བསྟེན་དང་ཉེན་སྲུང་ལས་གཡོག་པ་ཚུ་
 བསྐྱེལ་འབད་ནི། ལས་མིའི་གན་རྒྱ། ཀུན་སྒྱུད་ནམ་བཞག། ལཱ་གཡོག་གི་བྱ་སྒྲིའི་རིམ་པ་དང་ རོ་སྒྲོད་སྐྱོང་བརྟེན།
 ལས་མི་དང་ མི་སྡེའི་ཉེན་ཁ་བཤད་ཐབས་ལམ། རྒྱ་གི་ཞབས་རྟོག་བར་ཆད་ཀྱི་འཆར་གཞི།
 དགོས་མཁོའི་ཆོག་ཐམ་ཚུ་དང་ བཅོ་བཀོད་ཀྱི་གནད་བ། འབྲེལ་ཡོད་གླིང་གའི་དབང་འཛིན་གྱིས་
 ཆ་འཛིག་འབད་ཡོད་པའི་ ས་ཁོངས་རེས་གསལ་གྱི་JDNP
 གི་ལས་ལུགས་ཀྱི་གནད་བ་ཚུ་དགོ།མཐའ་དཔྱད་བཅོ་བཀོད་ཚུ་གིས་ ཉེན་སྲུང་དང་ཕན་པའི་ SCADA
 ས་ཁོངས་དང་ གནས་གཤིས་ལུ་གདོང་ལེན་འབད་ཚུགས་པའི་ རྒྱུན་འཛིན་རྒྱུན་ལས་ཉེན་སྲུང་དང་
 ཆོར་བྱགས་ཅན་གྱི་ལེན་མི་གི་ཉེན་སྲུང་བརྩིས་ཏེ་ གནོད་སྐྱོན་ཚུ་ བཀག་ཐབས་དང་ མར་ཕབ་འབད་ནི་ཚུ་
 གསལ་སྟོན་འབད་དགོཔ་ཨིན།

བཅོ་སྐྱེན་གྱི་གནས་ཤིང། C-ESMP འདི་ ཁྲིམས་མཐུན་གྱི་ལག་འབག་གི་དགོས་མཁོ་ཅིག་ཡིན་པ་དང་
 འདི་ESMP འདི་ ས་གནས་དང་འབྲེལ་བའི་ཐབས་ལམ་དང་ བྱ་རིམ་ཚུ་ལུ་ལག་ལེན་འཐབ་དགོ། འདི་ནང་
 ལུ་གཞུག་དང་མི་སྡེ་འཕྲོད་བསྟེན་དང་ཉེན་སྲུང་ རྒྱུན་འགྲུལ་ བཅོག་གི་བ་དང་ཚུད་ཟད་ སྐྱེ་ལུན་རིགས་སྣ་
 སློ་བུར་ཉེན་འཁུབ་དང་ འབྲེལ་ཡོད་ལས་སྡེའི་བརྒྱུ་རྒྱུ་ཐབས་ལམ་ཚུ་ཚུད་དགོ། ཉེན་ཁ་ཆེ་བའི་ལུ་ དཔེར་ན་
 གཡུར་བ་བརྟེན་ནི་དང་ ས་ཁོངས་ནང་འཕྱུལ་ནི་ཚུ་ ལུ་གཞུག་གི་ཉེན་ཁ་དབྱེ་དཔུད་དང་
 ལུ་འབད་ཆོག་པའི་ལས་ལུགས་ཚུ་དགོ། ས་དོང་བཞོ་ཡོད་མི་ཚུ་རམ་རྒྱབ་དགོཔ་དང་ གལ་སྲིད་
 རུབ་མོ་སློ་བསྐྱེལ་མ་ཚུགས་པ་ཅིན་ སེམས་ཅན་ཚུ་ ཐོན་འགྲོ་ནིའི་དོན་ལུ་ ལས་ཚུ་བཀག་དགོཔ་ཡིན།
 ས་སྐྱུམ་དང་རྩལ་སྦྱོར་ཚུ་ རྒྱ་ལས་ཐག་རིང་སར་ ཉེན་སྲུང་དང་ལུན་སྐྱོང་བཞག་དགོ།
 ས་རུད་དང་རག་རོ་བཀག་འཛིན་གྱིས་ ས་མ་ཆོ་བའི་རྒྱུ་མ་འབད་དགོ།
 མེད་པ་ཐལ་ནི་དང་ལྷག་ལུས་ཡོད་མི་ཕུགས་སྤྲིགས་ཚུ་ མཐུན་ཁྲེན་ནང་རྒྱུ་མ་གཅིག་བཞག་དགོ།
 དགོས་མཁོ་ཡོད་པ་ཅིན་ ཕྱིར་བརྟེན་ རུས་སྐབས་བཅོ་དགོཔ་དང་
 འབབ་ཚད་དམའ་བའི་གནས་སྤངས་ནང་བཞག་དགོ། མི་སྡེ་ཚུ་གིས་ འཆར་གཞི་བཟུམ་ཡོད་པའི་
 ཞབས་རྟེན་བར་ཆད་གྱི་སྐོར་ལས་ རྩལ་ཤོས་རང་ བརྟེན་ཕྱག་གཅིག་གི་རྒྱུ་ བརྒྱུ་ཐོབ་དགོཔ་མ་ཆད་
 རྒྱ་ཆོད་ལས་ལྷག་སྟེ་ སློ་བསྐྱེལ་བཞག་པའི་སྐབས་ རྒྱ་བཀའ་སྤྲེལ་གྱི་ ཐབས་ཤེས་གཞན་ཡང་
 ཕྱིན་དགོཔ་ཡིན།

ཉམས་སྲུང་འབད་ཡོད་པའི་ས་ཁོངས་དང་ སྐྱེ་ལུན་རིགས་སྣ་ དེ་ལས་ ལས་སློལ་གྱི་སློལ་རྒྱུ། JDNP
 ནང་གི་ལས་སྣ་ཚུ་ རོས་ལེན་འབད་ཡོད་པའི་ ས་ཁོངས་ནང་འཁོད་ལུ་འོང་དགོཔ་དང་ དེ་ནང་ གནང་བ་མེད་པར་
 ས་ཁོངས་བསལ་ནི་ ག་བདའ་ནི་ ཕུགས་སྤྲིགས་བཀོ་ནི་ ཡང་ན་ ལས་མི་ཚུ་
 རོས་འཛིན་འབད་ཡོད་པའི་ས་ཁོངས་ཀྱི་ཕྱི་ཁར་འགྲོ་མི་ཆོག། ཤིང་ཚུ་སློག་གཏང་ནིའི་དོན་ལུ་
 གནས་ཚུལ་གྱི་ཉེན་མེད་དགོཔ་དང་ དེའི་ཆབ་མ་ལུ་ རྩལ་མཐའ་ ༣:༡ གི་ཆད་གཞི་ལུ་ རིགས་སྣ་ཚུ་བཙུགས་དགོ།
 གནས་སྐབས་ཕྱོགས་བསྒྱུར་དང་ ཡུན་རིང་གི་ ལག་ལེན་གཉིས་ཆ་རའི་སྐབས་ མཐའ་འཁོར་གྱི་གནད་དོན་ཚུ་
 རྒྱུན་སྦྱོར་འཐབ་དགོ། དེ་བ་མེད་པའི་ལས་སློལ་གྱི་སློལ་ཁྱུན་ག་ཅི་ར་ཡིན་རུང་ མི་༢༣:༢༥ གི་ནང་འཁོད་ལུ་
 ལུ་ཚུ་ག་ར་ འདི་འཕྲོ་ལས་མཚམས་འཛིན་འབད་དགོ། ས་ཁོངས་འདི་ཉེན་སྲུང་དང་ལུན་སྐྱོང་བཞག་དགོཔའི་ཁར་
 གནད་དོན་འདི་ ལས་འགུལ་ལག་ལེན་སྟེ་ཕན་དང་ འབྲེལ་ཡོད་ལས་སློལ་དབང་འཛིན་ལུ་སྐྱེན་ལུ་དགོ།
 འཕྲོ་མཐུད་ལུ་དེ་ ཡིག་ཐོག་གནང་བ་ཐོབ་ཞིན་མ་ལས་རྒྱུ་མ་འབད་ཆོག

ལག་ལེན་དང་རྒྱུ་རྒྱུ་གནས་རིམ། ཅིས་སྤྱོད་འབད་བའི་ཤུལ་ལས་ ཐིམ་ཕུག་ཁོམ་སྡེ་འོག་གི་ རྒྱུ་སྡེ་ཚན་གྱིས་
 ཡར་བྲག་བཏང་ཡོད་པའི་རྒྱུ་དངོས་ཚུ་ ལག་ལེན་དང་ རྒྱུ་རྒྱུ་འཐབ་ནི་ཡིན། ལས་ལེན་གཙོ་བོ་ཚུ་ཡང་
 རྒྱལ་ཡོངས་འཐུང་རྒྱ་གི་གནས་ཚད་དང་གཅིག་ཁར་ འཕྲོ་མཐུད་དེ་ར་འཁྲིལ་ནི།
 རྒྱ་གི་སྤྱོད་ཚད་དང་མ་འཁྲིལ་མི་ལུ་ དེ་འཕྲོ་ལས་ མི་མང་བསྐྱབ་བྱ་དང་བཙོ་ལ་རྒྱབ་ནི།
 དེས་པར་བྱ་འབད་དགོ་པའི་རང་བཞིན་གནས་སྤངས་རྒྱུ་རྒྱུ་། SCADA་ཀྱི་གཞི་བཞག་སྟེ་
 འཛལ་ཐོན་གྱི་ཤེས་རྟོགས་དང་ ཞིབ་ཤུགས་འཛིན་སྤྱོད་འབད་ནི། རྒྱ་ལེགས་བཙོས་འབད་བའི་ འདམ་རྒྱུ་ཚུ་
 ཉེན་སྲུང་དང་ལཱ་ནམ་སྟེ་ བཀོ་ནི། རྒྱ་ལེགས་བཙོས་འཕུལ་ཁང་། རྒྱ་མཛེད་དང་ བཀག་འཛིན་གྱི་མཐུན་རྐྱེན་ཚུ་ལུ་
 གོ་སྐབས་བཟོ་ནི། རུས་ཤུགས་འཛིན་བྲགས་ཅན་གྱི་མཁོ་སྦྱབ་དང་ལག་ལེན། དེ་ལས་
 རྒྱུ་རྒྱུ་ལས་གཡོག་པ་ཚུ་གི་དོན་ལུ་ ལཱ་གཡོག་གི་འཕྲོད་བསྟེན་དང་
 ཉེན་སྲུང་ལས་རིམ་འགོ་འདྲན་འཐབ་ནི་ཚུ་ཡིན། ལས་དོན་གཙོ་བོ་གི་དམིགས་གཏང་འདི་ འོང་འབབ་མེད་པའི་རྒྱ་
 བརྒྱུ་ཚུ་ ༡༥ ལས་ཉུང་མ་ཡོད་ནི་དང་ རང་བཞིན་གནས་སྤངས་ཀྱི་རྒྱུ་མ་ཆད་པར་བཞག་ནི་ དེ་ལས་
 འཐུང་རྒྱ་གི་གནས་ཚད་ལུ་གནས་ནི་དང་ ཤི་རྒྱུ་འཐུང་རྒྱུ་ཚུ་མེད་པ་བཟོ་ནི།

ལག་ལེན་བདེ་སྤྱི་གཞི།

འགན་ཁུར་དང་འགན་འཁུ། ཐིམ་ཕུག་ཁོམ་སྡེ་གིས་ ལས་འགུལ་ལག་ལེན་སྡེ་མཉམ་བརྒྱུད་དེ་
 བཟོ་སྦྱོར་མ་འབད་བའི་ཉེ་མ་གྱི་སྤྱི་གཞི་ དང་ ཆ་འཛེག་འབད་ནིའི་ འགན་ཁུར་འབག་དགོས་དང་
 གཞི་རྟེན་མཁོ་ཆས་དང་རྒྱུ་འདྲན་ལྟན་ཁག་འོག་གི་ ལས་འགུལ་འཛིན་སྤྱོད་སྡེ་ཚན་གྱིས་ མཉམ་འབྲེལ་དང་
 ལྟན་འབད་དགོ། PMSC གིས་ ཉེན་བསྟར་གྱི་ འཕུལ་རིག་ལྟན་དང་ བདེན་དཔུང་ཚུ་ འབད་ནི་ཡིན།
 ལག་འབག་པ་ཚུ་གིས་ ཆ་འཛེག་གྲུབ་པའི་ C-ESMP ལག་ལེན་འཐབ་ནི་དང་ མཐའ་འཁོར་གནས་སྤངས་དང་
 OHS གི་ལས་བྱེད་པ་ཚུ་ བདག་འཛིན་འཐབ་ནི་ ལས་བྱེད་པ་ཚུ་ལུ་ སྤྱོད་བཅར་བྱིན་ནི་ ཐོ་བཀོད་བཞག་ནི་
 མ་འཁྲིལ་བར་ཡོད་མི་ཚུ་ བཙོ་ལ་རྒྱབ་ནི་དང་ བྱུང་རྒྱུ་ཚུ་ སྟན་ལུ་འབད་ནིའི་ འགན་ཁུར་དགོ།
 ལག་ལེན་འཐབ་པའི་སྐབས་ འགན་ཁུར་འདི་ ཐིམ་ཕུག་ཁོམ་སྡེ་འི་ རྒྱ་སྡེ་ཚན་ལུ་
 དགོས་མཁོའི་ཆད་འཛིན་དང་གཅིག་ཁར་ སྤྱོ་སྤར་འབད་མ་ཡིན། ESMP གི་དགོས་མཁོ་དང་ ལས་བྱེད་པ་

ལྷ་རྟོག་ སྤྱོད་བཅུ་ དེ་ལས་ ལེགས་བཅོས་དང་ལེན་ཚུ་ འབོར་ཚད་དང་ ལག་འབག་པ་གན་ཡིག་གི་
ཟད་འགོ་ནང་ཆ་ཚང་སྟེ་ བཀོད་དགོ།

ལྷ་རྟོག་དང་འབྲེལ་མཐུན་འཛིན་སྐྱོང་།

ལྷ་རྟོག་འབད་ནི་འདི་ གནས་མཐུན་ཞིབ་དཔྱད་དང་གཅིག་ཁར་ལྷ་རྟོག་གྲུབ་འབྲས་ཚུ་མཉམ་བསྐྱེལ་འབད་མ་ཡིན།
ལག་འབག་པ་གིས་ ཉིན་བསྟར་གྱི་ས་ཁོངས་དང་ ལཱ་གཡོག་གི་འཕྲོད་བསྟེན་དང་ཉེན་སྲུང་(OHS)གི་
ཐོ་ཚུ་བཞག་དགོས་པའི་ཁར་ དུས་རྒྱུན་གྱི་བརྟག་དཔྱད་འབད་ནི་ དེ་ལས་ ཟླ་རིམ་བཞིན་དུ་
མཐའ་འཁོར་དང་མི་སྡེའི་སྟན་ལུ་ཚུ་ཕུལ་དགོ། PMSC དང་ PIU གིས་ རང་དབང་གི་བདུན་རིམ་བཞིན་དང་
ཟླ་རིམ་བཞིན་གྱི་བདེན་དཔྱད་ཚུ་ འགོ་འབྲེན་འཐབ་སྟེ་ སློབ་གྲྭ་དང་སྟན་ཁང་ རྟོན་ཁང་ ཚུ་ཕུང་
གྱེན་གཟར་བྲགས་དང་ རུབ་སྤྱོད་གྱི་བཟོ་སྐྱེད་གྱི་བར་ལམ་ཚུ་ ལྷ་རྟོག་འབད་ནི་ཡིན། ལག་ལེན་ལྷ་རྟོག་འདི་གིས་
ཚུའི་སྤྱུ་ཚད་དང་ མཐའ་འཁོར་གནས་སྟངས་ འོང་འབབ་མེན་པའི་ཚུ་ ལུས་ལྷན་ལག་ལེན་འཐབ་ནི་
འདམ་ཁུབ་བཏོན་གཏང་ནི་ རྒྱ་དངོས་ཉེན་སྲུང་ དེ་ལས་ ལཱ་མི་ཉེན་སྲུང་ཚུ་ ལུབ་ཚུགས་ནི་ཡིན། གལ་སྲིད་
བཟོ་བཀོད་བསྐྱར་བཅོས་དང་ དཔྱད་རིག་རྣམ་རྟོག་མེད་པའི་གྲུབ་འབྲས་འབྱུང་ནི་ ཡན་ལག་མར་ཕབ་འདི་
ལུས་པ་མེད་པ་འགྱུར་བ་ཅིན་ ESMPགིས་ འོ་ལྟར་བཞིན་དུ་ ལུང་མཐའ་བསྐྱར་ཞིབ་འབད་ནི་ཡིན།
རྒྱ་ཆ་བསྐྱར་ཞིབ་འབད་ནི་ལུ་ ཡིག་ཐོག་བསྐྱར་ཞིབ་དང་ ཆ་འཛིག་ གསལ་བསྐྱགས་ དེ་ལས་ C-ESMP ལུ་
འབྲེལ་ཡོད་དུས་མཐུན་བཟོ་དགོས་ཡིན།

འཕུལ་མགྱོགས་འཛིན་སྐྱོང་གཙོ་རིམ། མཁོ་སྐྱབ་དང་ བསྐྱ་སྒྲིག་མ་འབད་བའི་རྟེ་མ་ ལས་འགྲུལ་འདི་གིས་
༡༡ མཐའ་དཔྱད་བཟོ་བཀོད་དང་ ལས་འགྲུལ་གྱི་ས་ཁོངས་འདི་

ཆོག་ཐམ་དང་སྤྱད་སྐྱོབ་ས་ཁོངས་གྱི་དགོས་མཁོ་ཚུ་གར་ གྲུབ་ཚུགས་པ་ངེས་གཏན་བཟོ་དགོ། (༡) ESMP
དང་ དགོས་མཁོའི་ ཡན་ལག་འཆར་གཞི་ཚུ་ རིན་བཀོད་ཡིག་ཆ་དང་ ཕུལ་རིག་གི་གསལ་བཀོད་ དེ་ལས་
ལག་འབག་གི་རིན་གོང་ཚུ་ནང་ ཚུད་པ་ཡོད་པ་ངེས་གཏན་བཟོ་དགོ། (༢) PIU དང་ PMSC དེ་ལས་
ལག་འབག་པ་ཚུ་གི་དོན་ལུ་ ཤེས་ཚད་ཅན་གྱི་ མཐའ་འཁོར་དང་མི་སྡེ་ དེ་ལས་
ལཱ་གཡོག་གི་འཕྲོད་བསྟེན་དང་ཉེན་སྲུང་ལས་བྱེད་པ་ཚུ་ཡོད་པ་ རེས་གཏན་བཟོ་དགོ།

(༤) བཟོ་སྐྱོན་མཉམ་འབྲེལ་ཐབས་ལམ་དང་

མི་མང་བརྒྱུད་ལམ་ལུགས་གཅིག་མཚུངས་སྟེ་གཞི་བཙུགས་འབད་ནི། (༥)

ལས་མི་དང་མི་སྡེའི་ཉོགས་བཤད་བཀོད་ཐངས་ཚུ་ལག་ལེན་འཐབ་ནི། (༦)

ལཱ་འཕྲོ་མཐུད་འབད་ནིའི་བྱབ་བསྐྱགས་མ་འབད་བའི་རྟེ་མ་ ག་སྤྱིག་ཆ་ཚང་ བདེན་དཔྱད་འབད་དགོ།

ཐབས་ལམ་འདི་ཚུ་ དོན་སྤྲོད་ཅན་སྟེ་ ལག་ལེན་འཐབ་མི་འདི་གིས་ ཡན་ལག་གི་ཁེ་སྤྲོད་གཙོ་བོ་

ཚུ་ཉེན་སྲུང་དང་ལཱ་མ་སྟེ་བཞག་ནི། དེ་ལས་ རྒྱུ་དཀའ་ངལ་མར་ཕབ་འབད་ནི།

གནམ་གཤིས་གདོང་ལེན་འབད་ནི་ ཡར་ཤྲག་གཏང་ནི། དེ་ལས་ རང་བཞིན་གནས་སྤངས་དང་

མི་སྡེའི་གཞོན་པ་ཚུ་ རོས་ལེན་འབད་ཚུགས་པ་སྟེ་བཞག་ནི་ཚུ་ འགྲུབ་ནི་ལཱ་ཕན་ཐོགས་ཚུགས།

2 PROJECT DESCRIPTION

2.1 INTRODUCTION AND CONTEXT

The proposed Liveable and Resilient City Project (LRCP) **will enhance the resilience and reliability of Thimphu's water supply in the core city (component 1.1)**. It aims to address the physical and operational weaknesses that currently limit the resilience of Thimphu's water supply system. Water abstraction points are vulnerable to extreme hydrological conditions; raw and treated water transmission lines are exposed to rainfall-induced landslides and erosion; and limited monitoring and high levels of non-revenue water constrain the efficient use of scarce water resources. The sub-component therefore combines infrastructure rehabilitation, digital monitoring, and operational improvements to support more reliable and equitable water service delivery under increasing climate variability. Implementation responsibility for this sub-component rests with Thimphu Thromde through the Project Implementation Unit (PIU), with technical coordination and oversight from the MoIT Project Management Unit (PMU).

The subcomponent will finance installation of Supervisory Control and Data Acquisition (SCADA) systems for better monitoring and management; balancing treatment works capacity and demand as well as allowing detailed systems analysis and demand forecasting against climate events. It will fortify raw water intake systems to function effectively under extreme climate conditions. It will reduce the risk of erosion from high rainfall-induced landslides in raw and clear water transmission lines. The project will rationalize service areas under Water Treatment Plants (WTPs) and treated water transmission lines to function at capacity and ensure the effective use of all storage reservoirs, ensuring the equitable distribution of water for continuous water supply (24/7) delivery across District Metered Areas (DMAs) in the core city. It will strengthen the distribution network to maintain an uninterrupted water supply even during droughts and flooding events by significantly reducing water losses and investing in active leakage control. These investments will ensure that the core city's urban water supply systems are better able to withstand climate impacts while ensuring services are at higher levels.

The subcomponent is a strategic initiative designed to address the acute climate vulnerabilities and systemic inefficiencies of Thimphu's urban water supply. As detailed in the project's Feasibility Study, Thimphu is highly exposed to climate hazards, including intense rainfall, flooding, and landslides, while its water infrastructure is aging, fragmented, and suffers from **Non-Revenue Water (NRW) losses exceeding 50%**. This results in intermittent supply for many residents, despite theoretically sufficient raw water sources. The LRCP directly tackles these challenges by moving beyond routine maintenance to focus on targeted rehabilitation, modernization, and a paradigm shift in service management, aligning with Bhutan's National Adaptation Plan (NAP) and the Thimphu Water Services Masterplan.

This Environmental and Social Management Plan (ESMP) has been prepared in accordance with the requirements of the World Bank Environmental and Social Framework (ESF). Given the nature and scale of the proposed works under this subcomponent, the environmental and social risks are considered moderate, and an ESMP has been prepared proportionate to

these risks. The proposed activities are not expected to lead to land acquisition, physical and economic displacement. Thus ESS5 is not applicable to this subcomponent. There is no clear presence of distinct Indigenous Peoples within the project area of influence as per ESS7 criteria hence this standard is not considered relevant either.

This ESMP provides the mitigation measures to manage the distinct risks of the Water Sector component, such as trenching along city streets, work near sensitive areas, and ensuring public service continuity. The requirements outlined herein will be integrated into the **detailed design process** to ensure that environmental and social risks are avoided or minimized from the outset. This ESMP will also be updated along with the detailed design. Subsequently, this ESMP will form a **legally binding part of the bidding and contract documents**, obligating the awarded contractor to develop a detailed, site-specific **Contractor's ESMP (C-ESMP)** based on the final designs and the measures specified in this plan. All works will be implemented in close coordination with the transport component to minimize overall public disruption.

2.2 PROJECT AREA AND KEY LOCATIONS

The activities of the Water Sector component will be implemented across Thimphu's core urban area. To the greatest extent possible, works will be strategically timed and co-located with the project's public space and transport upgrades (Components 1.2 and 1.3) to maximize construction efficiency and minimize public disruption. The project's area of influence is defined by three key categories of works (see Figure 1):

- **Core Urban Distribution Network:** The primary focus of the project is the rehabilitation of the aging water distribution network to reduce water losses and improve service reliability. The works will cover the city's core areas, including **Changzamtog, Changangkha, Motithang, Kawajangsa, Zilukha, and Yangchenphug.**
 - **Coordinated Works within Transport Corridors:** A significant portion of this network rehabilitation will occur directly under the sidewalks and rights-of-way of the areas being upgraded by the transport component, specifically the **18.7-kilometer Bus Priority Service (BPS) corridor** and the **Norzin Lam** public space improvement areas. This co-location is a core project strategy, allowing for the simultaneous upgrade of sub-surface utilities (water pipes) and surface-level infrastructure.
- **Dodeyna Water Intake and Associated Transmission Corridor:** The project's influence area extends upstream to the existing raw water intake at Dodeyna, which is situated within the Multiple Use Zone of **Jigme Dorji National Park (JDNP)**. In line with the project's focus on rehabilitating existing assets, works at the intake structure itself are minor and limited to installing monitoring equipment and security upgrades; **no expansion or significant new civil works are planned at this sensitive location.** The associated ~14 km raw water transmission line running from the intake to the Taba WTP will be assessed for climate-resilience fortifications, particularly in landslide-prone sections.
- **Key Infrastructure Nodes:** Works will also occur at discrete, existing sites crucial to the water supply system. This includes **Water Treatment Plants (WTPs) like the one at Taba**, storage reservoirs, and major pipeline junctions. Activities at these sites will focus on physical upgrades to improve connections and the installation of

Supervisory Control and Data Acquisition (SCADA) hardware to enhance system-wide monitoring and efficiency.

Figure 1: Location of Water Sector Components in Thimphu City and Its Surrounding Areas.

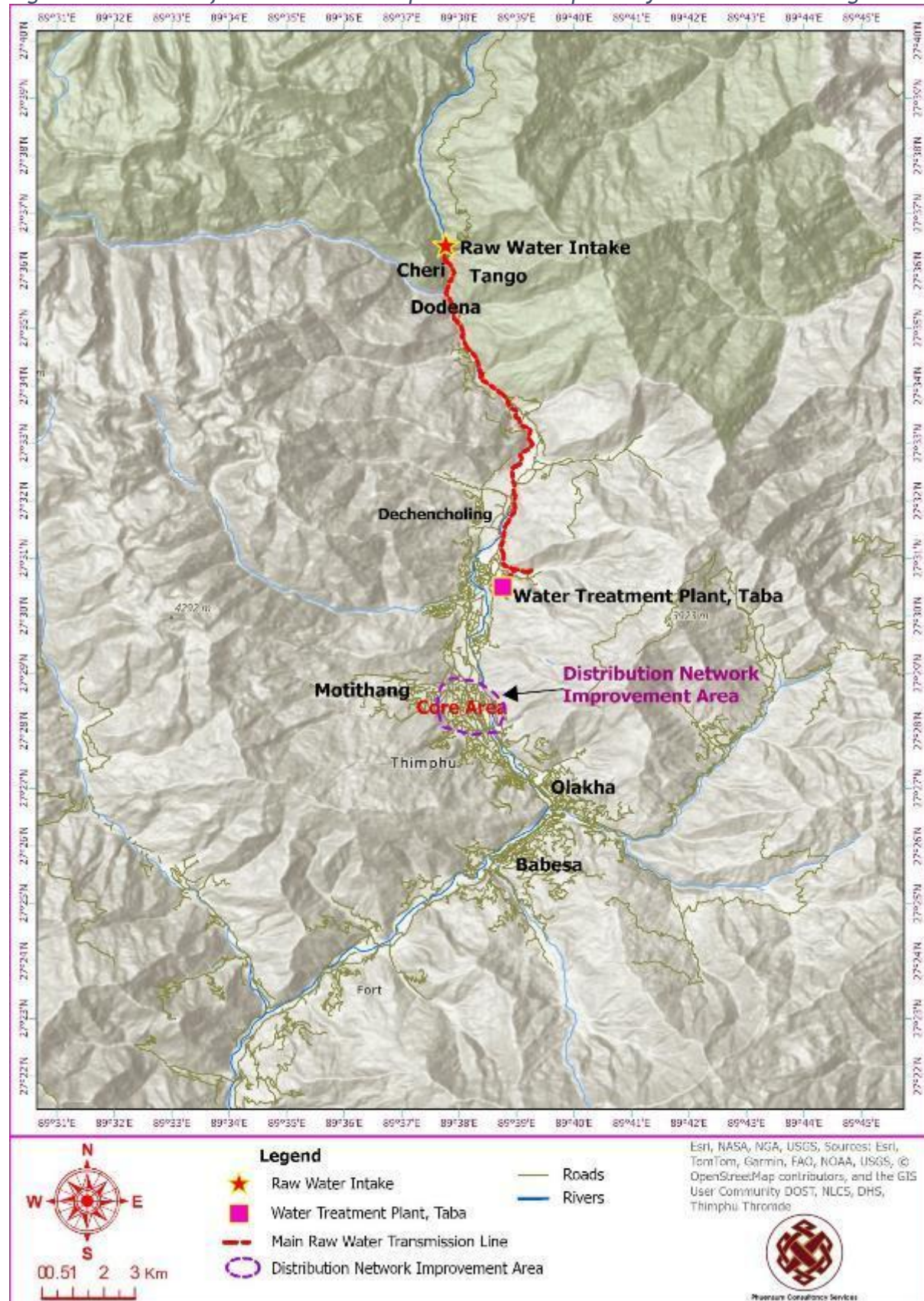
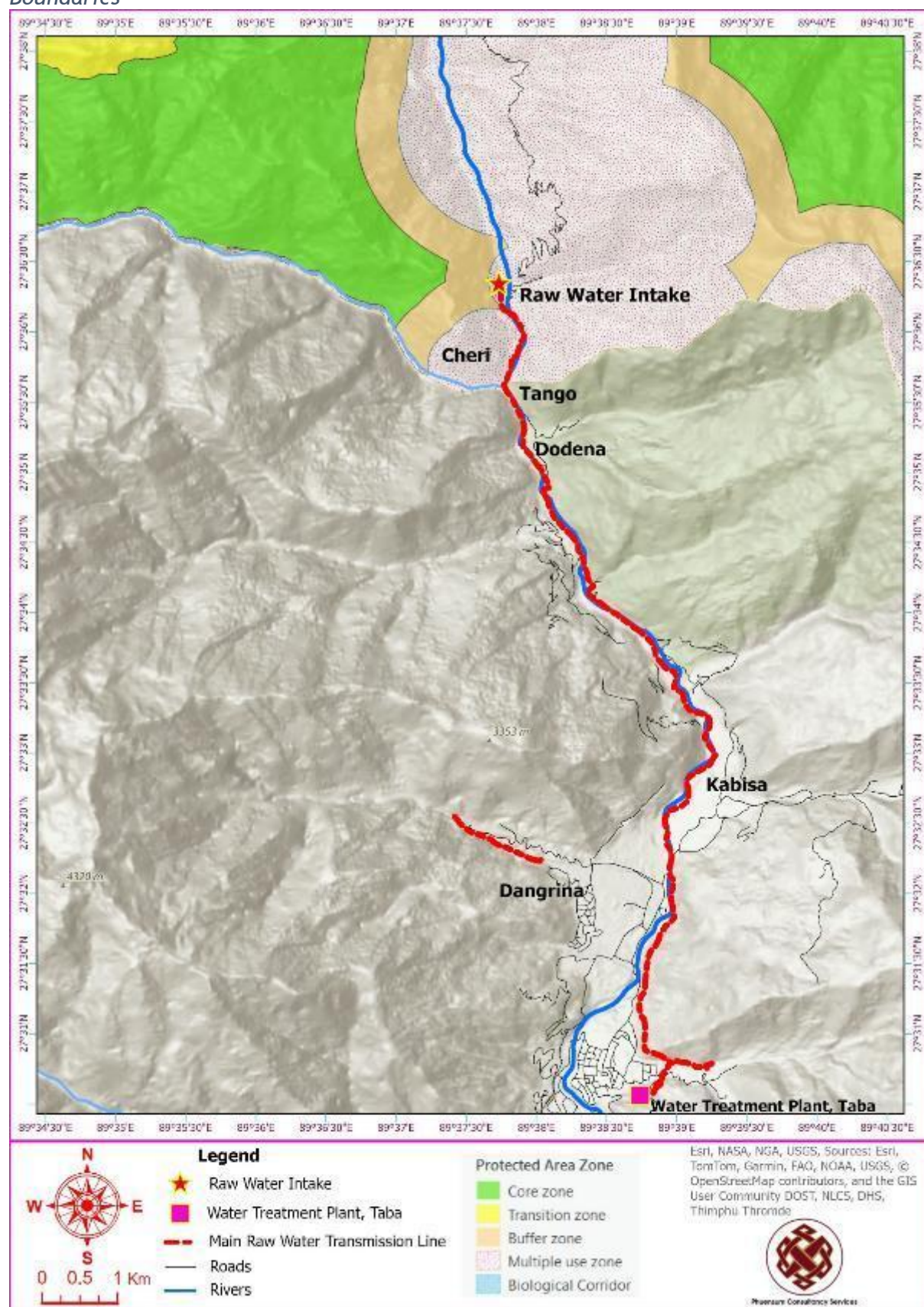


Figure 2: Overlay of Raw Water Intake and Transmission Line with Protected Area Boundaries



2.3 DETAILED SCOPE OF WORK

The scope of work for the Water Sector component is an integrated package of physical infrastructure upgrades and system modernization, designed to work in synergy with the project's other components. The activities are grouped into three main categories:

2.3.1 Strengthening the Raw Water Intake and Transmission System

This activity focuses on improving the security and climate resilience of the raw water supply before it reaches the treatment plant.

- **Dodeyna Intake Area (within JDNP):** Works at the existing intake structure inside Jigme Dorji National Park are minor and designed to be low-impact. As per the field visit findings, there will be **no major civil works, rehabilitation, or expansion of the intake itself**. The scope is strictly limited to:
 - Installation of SCADA sensors for real-time flow monitoring.
 - Construction of small, secure chambers to house sensor equipment.
 - Erection of security fencing to safeguard the equipment.
- **Transmission Line Slope Stabilization and Protection:** The project will enhance the climate resilience of the main raw water transmission line from Dodeyna to the Taba WTP by protecting it from landslides and erosion. The focus will be on fortifying the **slopes and foundations surrounding the pipeline** in high-risk sections, particularly the exposed upslope area near the Pangrizampa Bazam bridge. This will involve detailed technical assessments to design and implement appropriate **slope stabilization measures**, such as bio-engineering (e.g., live staking, deep-rooting grasses) and structural solutions (e.g., retaining walls, rock anchoring). These interventions are critical for safeguarding the pipeline, preventing physical water losses from pipe damage, and ensuring the system's resilience against climate-related hazards.

Figure 3: Climate vulnerability of LRCP components highlighted by the August 2024 Dechencholing flood. A short, intense rainfall event triggered both a landslide damaging the raw water transmission line and a flash flood that damaged the Bus Priority Service Road.



2.3.2 Reducing Leakage through Distribution Network Rehabilitation

This is a major initiative to reduce Non-Revenue Water (NRW) from over 50% to below 15% and enhance service reliability in the urban core.

- **Pipeline Rehabilitation and Replacement:** The project will replace the oldest and most leak-prone sections of the water distribution network. This work involves excavation and trenching to install new, durable pipelines. Critically, these activities will be executed in close coordination with the public space and transport upgrades (Components 1.2 and 1.3). The trenching for new water pipes will occur under the sidewalks and rights-of-way of the **18.7 km Bus Priority Service (BPS) corridor** and the **Norzin Lam** improvement area *before* new surface paving and street furniture are installed, ensuring an integrated and efficient construction sequence.

Figure 4: Highlighting the rationale for the LRCP, this 2019 news report details how Thimphu's aging distribution network causes acute water shortages, negating the benefits of the World Bank-funded Central Water Supply Scheme (under BUDP-II AF). (Source: The Bhutanese, October 19, 2019).



Why Thimphu still has water shortage even after completion of the Nu 400 mn Dodena project and promises of 24/7 drinking water

2.3.3 System Modernization through a SCADA Network

This activity involves installing a modern Supervisory Control and Data Acquisition (SCADA) system to create a "smart" water network, enabling data-driven leak detection and pressure management. This requires targeted physical works across the system:

- **Installation of Field Sensors and Meters:**
 - **Flow Meters:** Installation within underground concrete chambers at the Dodeyna intake and at the boundaries of newly established District Metered Areas (DMAs) in the city core. This requires excavation and cutting into existing pipelines.
 - **Pressure, Level, and Quality Sensors:** Installation on existing pipes, in reservoirs, and at WTPs, requiring minor works like "tapping," mounting brackets, and concrete plinths for cabinets.

- Installation of Control and Communication Hardware:
 - **Remote Terminal Units (RTUs):** Installation at strategic nodes (reservoirs, WTPs) on small concrete bases within weatherproof kiosks.
 - **Cabling and Power:** Minor trenching to lay power and communication conduits connecting sensors and RTUs to the main system.
 - **Central Control Room:** Refurbishment of a designated room at a Thimphu Thromde facility to house the central SCADA servers and operator workstations.

These physical upgrades will be supported by a dedicated **capacity-building component** for Thimphu Thromde staff, ensuring the long-term sustainability and effective operation of the modernized system.

3 ASSESSMENT OF KEY ENVIRONMENTAL AND SOCIAL RISKS

This chapter provides a brief assessment of the potential Environmental and Social (E&S) risks associated with the Water Sector component. The risks identified here form the basis for the detailed mitigation and management measures presented in the ESMP (Chapter 3). The assessment focuses on the unique sensitivities of the project's activities, particularly those related to the water intake's location within a national park and the potential impacts on water resources.

3.1 SITE SENSITIVITY: WORKS WITHIN JIGME DORJI NATIONAL PARK (JDNP)

The project's most environmentally sensitive location is the existing raw water intake at Dodeyna, which is situated within the Multiple Use Zone of Jigme Dorji National Park (JDNP), an area of high biodiversity and conservation value.

- **Risk:** Potential disturbance to the natural habitat, biodiversity, and aesthetic value of the park from any project-related activities, including worker presence and movement of materials.
- **Assessment:** While the physical works at the intake are minor in scale and limited to the rehabilitation of existing assets, the **overall risk for this specific activity is assessed as Moderate**. This elevated rating is not due to the magnitude of the works, but to the **high sensitivity of the receptor**—a national park. Any activity within a protected area carries an inherently higher risk and requires a more rigorous level of management and supervision than similar works in a non-sensitive area.
- **Management Approach:** The potential impacts, though temporary and localized (e.g., noise, waste, worker presence), will be managed through a set of **highly stringent, non-negotiable mitigation measures**. As detailed in the construction phase ESMP, a site-specific **Biodiversity Management Protocol** will be required for the JDNP site. This will include:
 - A zero-tolerance policy for any activity outside the approved minimal footprint.
 - Strict protocols for contractor conduct.
 - A "pack-in, pack-out" policy for all waste.
 - Formal coordination procedures with park authorities.

3.2 WATER RESOURCE IMPACTS

3.2.1 Water Extraction

- **Risk:** Potential negative impacts on downstream ecosystems or other water users due to a significant increase in water extraction.
- **Assessment:** This risk is considered **Negligible**. The core objective of the Water Sector component is to improve efficiency and **reduce Non-Revenue Water (NRW)** from over 50% to below 15%. The project is designed to better manage the

existing water supply, not to significantly increase the volume of raw water abstraction from the source.

3.2.2 Impacts on Aquatic Habitat and Fish Species

- **Risk:** Potential harm to aquatic habitats and fish species downstream of the Dodeyna intake due to alterations in the river's flow regime.
- **Assessment:** This is a key operational risk that requires specific management. To mitigate impacts, the operator (**Thimphu Thromde**) **will be required to maintain the mandated Environmental Flow (e-flow)** at all times. The new SCADA system will provide the primary tool for monitoring and documenting continuous compliance with e-flow requirements during the operational phase, as detailed in the O&M Mitigation Plan (Table 3).

3.3 WATER SOURCE PROTECTION AND SAFETY CONCERNS

- **Risk:** Contamination of the raw water source at the intake from human activities, particularly during the construction phase.
- **Assessment:** This risk is manageable through the strict implementation of control measures. Potential contamination sources include accidental spills of fuel/chemicals, improper disposal of construction waste, and inadequate sanitation for the workforce. The ESMP (Table 2) includes specific and stringent mitigation measures for spill prevention and response, hazardous materials management, and waste disposal to prevent any impact on the water source. Post-construction, the security upgrades (fencing) will prevent unauthorized access and potential contamination.

3.4 OTHER KEY CONSTRUCTION AND SOCIAL RISKS

In addition to the source-specific risks, the project will involve standard construction and social risks common to urban infrastructure projects, which are addressed in detail in the ESMP:

- **Occupational Health & Safety (OHS):** Activities involving significant OHS risks include trench excavation (risk of collapse) and work in existing reservoirs or chambers (risk of confined space entry).
- **Community Health & Safety:** Key risks include potential disruptions to public water supply during network tie-ins, restricted access to residences and businesses, and safety hazards from open trenches.

These risks are considered manageable through the rigorous implementation of the detailed mitigation, monitoring, and capacity-building measures outlined in the subsequent chapters of this ESMP.

4 CUMULATIVE IMPACT ASSESSMENT

4.1 INTRODUCTION AND RELEVANCE

A Cumulative Impact is the impact on the environment and community which results from the incremental impact of the project's activities when added to other past, present, and reasonably foreseeable future actions. For the Water Sector component, assessing cumulative impacts is highly relevant for one primary reason:

Concurrent Construction in Shared Corridors: A significant portion of the water pipeline rehabilitation is deliberately co-located with the LRCP's transport upgrades along the **18.7 km Bus Priority Service (BPS) corridor** and the **Norzin Lam** improvement area. While this co-location is a strategy to minimize the *duration* of overall disruption, the *intensity* of temporary construction impacts could be magnified if not managed in a coordinated manner.

This assessment focuses on the potential short-term cumulative impacts during the construction phase arising from this overlap.

4.2 POTENTIAL SHORT-TERM CUMULATIVE IMPACTS (CONSTRUCTION PHASE)

When the water sector works (trenching, excavation) occur simultaneously with the transport sector works (road widening, paving, sidewalk construction) in the same location, the following temporary impacts can be exacerbated:

- **Elevated Noise and Dust Levels:** The combined effect of noise and dust from machinery for both sub-surface (water) and surface-level (transport) works can create a more persistent and intense nuisance for sensitive receptors like schools, hospitals, residences, and businesses.
- **Increased Traffic Congestion and Network Disruption:** While coordinated, the presence of two sets of construction activities in a single corridor will inevitably lead to more significant lane closures, diversions, and movement of heavy vehicles than either component would cause alone. This can lead to widespread traffic disruption across the adjacent road network.
- **Combined Strain on Utilities and Services:** Concurrent construction increases the collective risk of accidental damage to other public utilities (power, telecommunications) and may strain municipal services like waste disposal.
- **Magnified Disruption to Businesses and Public Access:** For businesses and residents along the shared corridors, the cumulative effect of restricted access, noise, and dust from two simultaneous projects could be more severe, potentially leading to greater temporary economic losses and inconvenience than anticipated from a single project.

4.3 MITIGATION AND MANAGEMENT OF CUMULATIVE IMPACTS

Addressing these cumulative impacts requires strong inter-agency coordination. The primary mitigation strategy is not to create a separate management plan, but to ensure that the

individual ESMPs for the water and transport components are implemented in a highly coordinated and integrated manner. The responsibility for this coordination lies with the project's implementing agencies.

The key mitigation measure will be the establishment of a **Corridor-Level Construction Coordination Mechanism**, led by the PIU at Thimphu Thromde. This mechanism will ensure:

1. **Integrated Traffic Management:** A single, overarching **Traffic Management Plan (TMP)** will be developed and implemented for each shared work zone, covering the activities of *both* the water and transport contractors. This will be a mandatory requirement in the bidding documents for all contractors working in these corridors.
2. **Coordinated Work Scheduling:** The PIU will be responsible for coordinating the construction schedules of the different contractors to sequence the works logically (e.g., ensuring all sub-surface water works are completed and backfilled before surface paving begins) and to avoid simultaneous high-impact activities (like rock breaking) in the same sensitive area.
3. **Consolidated Public Communication:** A single, unified communication protocol will be used to inform the public about all planned works in the shared corridors. This will prevent conflicting messages and ensure residents and businesses receive clear, timely, and comprehensive information about the nature, timing, and duration of all disruptions.
4. **Enhanced Monitoring in "Hotspot" Areas:** The PIU, through the PMSC, will conduct enhanced environmental monitoring (particularly for noise and dust) in areas identified as "hotspots" where multiple construction activities are concentrated near sensitive receptors, to ensure that combined impacts do not excessively exceed thresholds.

By implementing this strategic coordination mechanism, the potential for significant adverse cumulative impacts can be effectively managed to acceptable levels.

5 ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

This chapter presents the **Environmental and Social Management Plan (ESMP)** for the Water Sector component. It provides a consolidated framework of practical mitigation and management measures designed to address the specific impacts and risks associated with the project's activities.

The plan is presented in a **matrix format** and is structured chronologically across the project's three key phases: **pre-construction, construction, and operation**. For each phase, the tables provide a detailed description of:

- The relevant **E&S aspects** and potential **impacts**.
- The specific **mitigation and management measures** required.
- The **key performance indicators** to measure effectiveness.
- The **responsibilities** for implementation and supervision.
- The **monitoring actions** and required **reporting mechanisms**.

This ESMP is tailored to the unique activities of the water sector, such as trenching, works near the sensitive Dodeyna intake, and the management of public water supply. While it is consistent with the principles of the overall LRCP framework, its measures specifically address water-sector risks related to Occupational Health and Safety (OHS), environmental pollution, and community health and safety.

In line with the project's focus on rehabilitation, this plan also pays particular attention to key environmental sensitivities. The project's objective is to improve efficiency and reduce leakage, **not to increase the volume of raw water extraction** from the Dodeyna source. Therefore, no negative impacts from increased water abstraction are anticipated. To mitigate impacts on aquatic habitats, this ESMP includes specific measures requiring Thimphu Thromde to maintain the mandated **Environmental Flow** at all times, a commitment that will be monitored through the new SCADA system.

5.1 PHASE I: PRE-CONSTRUCTION

The pre-construction phase is a critical preparatory stage governed by a series of **mandatory environmental and social (E&S) prerequisites**. No civil works can commence until these prerequisites are fully completed, documented, and verified.

The **Project Implementation Unit (PIU)**, as the responsible entity, holds the ultimate authority for providing clearance. This clearance will be based on the technical review and recommendation of the **Project Management and Supervision Consultant (PMSC)**, which will provide day-to-day supervisory support to the PIU throughout the project. This rigorous clearance process ensures that all contractual obligations and E&S risks are systematically addressed before any on-the-ground activity begins.

Table 1: Mandatory Pre-Construction Actions and Verification Requirements

#	E&S Aspect	Key Action / Deliverable	Performance Indicator / Target	Timing	Responsibility (Implement / Supervise)	Verification/Reporting
1	Institutional & Design Readiness	Finalize and secure approval for a comprehensive Water Sector C-ESMP , including all required sub-plans (OHS, Waste,	A comprehensive C-ESMP is formally approved by PIU/PMSC. A	Before site mobilization.	Implement: Contractor, Design Consultant	- Signed C-ESMP Approval Letter. - Signed Design Compliance Note.

#	E&S Aspect	Key Action / Deliverable	Performance Indicator / Target	Timing	Responsibility (Implement / Supervise)	Verification/Reporting
		Service Disruption, etc.) and verification that final designs are compliant (SCADA siting, climate resilience).	signed Design Compliance Note is on file.		Supervise: PIU/PMSC	
2	E&S Staff Mobilization	Mobilize the dedicated and qualified Environmental, Social, and OHS Officers for the Contractor's team, as approved during bidding.	The approved E&S and OHS Officers are on-site and officially assigned to the project.	Before any physical works.	Implement: Contractor Supervise: PIU/PMSC	Record of E&S Staff mobilization and assignment letters.
3	Labor & Worker Welfare	Finalize and approve the project-specific Labor Management Procedures and a worker Code of Conduct (CoC) .	An LMP and CoC, compliant with national law and World Bank ESS2, are approved and ready for implementation.	Before first worker is hired.	Implement: Contractor Supervise: PIU/PMSC	Approved LMP and CoC documents.
4	Pre-Construction Training	Develop and deliver a comprehensive Induction Training Program for all site personnel (management and workers) covering the C-ESMP, CoC (with focus on SEA/SH), OHS, and GRM.	100% of personnel receive and are documented as having completed induction training <i>before</i> being granted site access.	During mobilization, prior to start of any works.	Implement: Contractor Supervise: PIU/PMSC	Signed training attendance sheets and training materials.
5	Sensitive Area Safeguards (JDNP)	1. Finalize and Approve JDNP Works Plan: Finalize detailed designs for the Dodeyna intake area, formally confirming the limited scope of works. 2. Secure Park Permit/Clearance: Obtain all necessary permits or formal clearance from the Department of Forests and Park Services (DoFPS) for conducting works within the JDNP boundary. 3. Develop and Approve Site-Specific Management Protocol: Prepare a detailed, site-specific protocol for all works within the JDNP.	- Final, approved design drawings confirming the limited scope of works are on file. - A formal permit or Clearance from the park authority is obtained and on file. - A site-specific "JDNP Works Protocol" is formally approved by the PIU/PMSC and DoFPS.	Before any mobilization of personnel or equipment to the JDNP site.	Implement: PIU/Contractor Supervise: PMU/PMSC	- Approved Design Drawings for JDNP Works. - Copy of Permit/NOC from Park Authority. - Approved JDNP Works Protocol.
6	Community Engagement & Grievance Readiness	1. Establish and Publicize the GRM: Establish the full, multi-tiered Grievance Redress Mechanism (GRM). Publicize the GRM and its contact details to all project-affected communities, ensuring they are aware of the mechanism to address any concerns related to the upcoming RAP implementation and construction. 2. Develop and Disseminate Water Service Disruption Plan: Disseminate a	- A functional GRM with multiple uptake channels is established and publicly disclosed - All affected parties receive written notification of the Water Service Disruption Plan at least 1 week prior to works. - Stakeholder consultations are periodically	For the GRM: Establish the grievance mechanism no later than 30 days of the Effective Date. Organize the stakeholder consultations as envisaged in the SEP For water service Disruption Plan: Before works begin in	Implement: Contractor/PIU Supervise: PIU/PMSC	- GRM establishment report and evidence of public disclosure (e.g., photos of posters, meeting minutes). - A digital Grievance Recording and Management System is established and maintained throughout the project lifecycle. - Summary of the number, nature, and resolved and outstanding grievances received during the review period.

#	E&S Aspect	Key Action / Deliverable	Performance Indicator / Target	Timing	Responsibility (Implement / Supervise)	Verification/Reporting
		Water Service Disruption Plan to all potentially affected households and businesses, including the GRM contact details and plans for alternative water supply. 3. Organize and document periodic stakeholder consultations as per the SEP and disseminate project-related information regularly.	organized and documented.	any specific area.		• Copy of public notification materials for the water service disruption plan. • Summary of stakeholder consultations, including major question and concerns raised and response from the Project are included in the periodic reporting to the Bank.

5.2 PHASE 2: CONSTRUCTION

Once all pre-construction requirements and key approvals have been finalized, construction activities for the Water Sector Component will begin. This section presents the detailed mitigation plan for all physical works, which are based on the impact assessment from the project's Environmental and Social Impact Assessment (ESIA).

This plan forms a legally binding part of the Employer's Requirements in the bidding and contract documents. The awarded **Contractor is obligated to implement all mitigation measures** outlined herein. The primary mechanism for demonstrating compliance will be through the development, financing, and implementation of a comprehensive and site-specific **Contractor's Environmental and Social Management Plan (C-ESMP)**.

The C-ESMP must be formally submitted to the Project Implementation Unit (PIU) and receive approval, based on the technical review of the Project Management and Supervision Consultant (PMSC), **before the commencement of any civil works**.

The C-ESMP is a detailed, site-specific document that translates the requirements of this framework ESMP into actionable procedures. Once approved by the PIU, the C-ESMP is binding on the Contractor and must be strictly implemented. **This requirement will be explicitly included as a clause in the Contractor's contract.**

The C-ESMP will be treated as a living document under adaptive management, with core environmental and social commitments remaining fixed while implementation methods may be refined based on site conditions or monitoring feedback. Any proposed changes by the Contractor must follow a formal process: submitting a written request to the PIU/PMSC with justification and demonstrating equal or improved outcomes; securing written approval from the PIU based on PMSC's technical review; and documenting all approved revisions as formal addenda to ensure traceability and alignment with the overarching ESMP.

The C-ESMP must include, at a minimum, the following components:

- **Detailed, Site-Specific Sub-Plans:** The C-ESMP must contain a suite of specific management plans detailing the contractor's methodologies for managing key risks. These must include, but are not limited to:
 - Occupational Health & Safety (OHS) Plan (addressing trench safety, confined space entry, etc.)
 - Community Health & Safety Plan
 - Traffic Management Plan (TMP)

- Pollution & Waste Management Plan (covering erosion control, spills, and spoil/waste disposal)
- Water Service Disruption Plan
- Emergency Preparedness and Response Plan
- **Dedicated E&S Staffing:** The Contractor must appoint qualified and experienced Environmental and OHS Officers, whose credentials must be approved by the PIU.
- **Training and Induction:** The C-ESMP must detail a full training program for all staff, including mandatory induction on the Code of Conduct (with a focus on SEA/SH), OHS, and the Grievance Redress Mechanism (GRM).
- **Monitoring and Reporting:** The C-ESMP will outline the contractor's internal monitoring procedures and commit to the submission of Monthly E&S Reports to the PIU/PMSC using the approved project format.

The following table details the specific impacts and the minimum mitigation measures that must be incorporated into the Contractor's C-ESMP.

Table 2: E&S Impacts and Risks - Construction Environmental Management Plan

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
1	ESS2: Labor and Working Conditions	Potential for discrimination, unfair terms, child/forced labour, and unresolved worker grievances.	The Contractor's primary mitigation will be the strict implementation of the project's Labour Management Procedures (LMP) . Key actions include: • Non-Discrimination: Adhere to a zero-tolerance policy for discrimination in all aspects of employment. • Formal Contracts: Provide all workers with written, legally compliant contracts in an understandable language. • Prohibition of Child and Forced Labor: Implement robust age verification procedures. • Code of Conduct (CoC): Ensure all workers are trained on and sign the CoC as a condition of employment. • Worker GRM: Establish and maintain a functional, confidential Worker Grievance Redress Mechanism (GRM), ensuring all workers are aware of its use.	• Zero cases of child or forced labour. • 100% of workers have signed contracts. • A functional Worker GRM is operational with no unresolved grievances beyond the stipulated timeframe.	Monthly: • Audit of employment contracts, age verification, and payroll records. • Review of Worker GRM log and resolution status.	Worker GRM Log, summarized in Monthly E&S Report.
2	ESS2: Occupational Health & Safety (OHS)	Risks of injury, illness, or fatality to workers from: • Trench collapse • Confined space hazards • Working near live traffic and heavy machinery • General construction site accidents	Implement a comprehensive OHS Management System , fully compliant with Bhutan's Regulation on OHSW, 2022 . Key elements within the C-ESMP will include: 1. Risk Assessments & Procedures: • A "living" risk assessment for all work activities. • Job Hazard Analyses (JHAs) and mandatory Permit-to-Work systems for all tasks involving significant OHS risks, especially Trenching and Confined Space Entry . 2. OHS Personnel: • Appointment of a qualified and PIU-approved OHS Officer responsible for daily oversight. 3. Training: • A systematic training program, including mandatory induction, daily	• Zero fatalities or serious injuries; Lost Time Injury Frequency Rate below industry benchmark. • 100% of tasks involving significant OHS risks are preceded by a documented JHA and Permit-to-Work. • 100% PPE compliance observed during all formal inspections. • All workers are trained in their tasks and emergency	Daily: • Visual checks of high-risk areas (e.g., trench conditions), PPE use, and general site safety by the Contractor's OHS Officer. Weekly: • Formal, documented OHS inspection of the entire worksite by Contractor and PMSC.	Daily OHS Log Weekly Inspection Reports Incident Reports (as required)

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
			toolbox talks, and specialized OHS sessions. 4. Personal Protective Equipment (PPE): • Provision and strictly enforced use of appropriate and standardized PPE for all tasks. 5. Emergency Response: • A documented Emergency Response Plan (ERP) with readily available first-aid facilities and emergency transport.	procedures before starting work.		
3	ESS3: Resource Efficiency & Material Sourcing	Depletion of natural resources from improper sourcing of aggregates, stone, and sand. Inefficient use of water and energy during construction.	Implement a Material & Resource Management Plan as part of the C-ESMP. Key actions include: Material Sourcing: Source all quarry materials exclusively from government-approved and licensed vendors (e.g., NRDCL). The project will not develop any new quarry sites. • Resource Efficiency: Implement measures to conserve water (e.g., reusing water for dust suppression) and energy (e.g., using energy-efficient equipment, no-idling policies).	• 100% of quarry materials are sourced from approved, licensed sites. • No new quarry sites are developed.	Monthly: • Review of all material purchase records and quarry licenses.	Material Sourcing Records in Monthly E&S Report.
3.1	ESS3: Pollution Control (Air, Noise, Water)	Air Pollution: Nuisance and health impacts from dust generated by excavation, vehicle movement, and stockpiles. Noise Pollution: Disruption to sensitive receptors (schools, hospitals, residences) from machinery and construction activities. Water Pollution: Sedimentation and degradation of aquatic habitats from uncontrolled site runoff and in-stream construction works.	Implement an Air, Noise, and Water Pollution Control Plan as part of the C-ESMP. Key actions include: • Dust Suppression: Implement frequent water sprinkling on all haul roads and active work areas. Cover all trucks transporting loose materials. Cover all stockpiles of soil and aggregates. • Noise Mitigation: Adhere to strict working hour limits (e.g., no work at night near residential areas). Use well-maintained equipment with mufflers. Provide advance notification to communities of high-noise activities. • Erosion, Sediment, and In-stream Works Management: - General: Install and maintain erosion/sediment controls (silt fences, etc.) <i>before</i> work begins. - Timing: Schedule all in-stream works (e.g., for pipeline crossings) during the low-flow season (Nov-Mar). - Work Area Isolation: Isolate all in-stream work areas from the main flow of the river using appropriate methods (e.g., coffer dams, silt curtains). - Construction E-Flow: If temporary diversion channels are used, they must be designed to maintain adequate downstream environmental flow to support aquatic life. - Aquatic Fauna Protection: Screen all water intake hoses for construction pumps with fine mesh to prevent the entrainment of fish and other aquatic organisms. - Bank Restoration: Upon completion of works, restore all disturbed riverbanks to a stable	• No visible dust plumes leaving the worksite boundary. • No work conducted outside of approved hours near sensitive receptors. • No visible sediment plumes in water bodies downstream of worksites.	Daily: • Visual checks of dust levels, noise controls, and sediment fences.	Daily Site Log; Community GRM Log.

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
			condition, using bio-engineering or replanting with native riparian vegetation where appropriate, to prevent future erosion.			
3.2	ESS3: Waste & Spoil Management	Improper disposal of spoil and construction waste leading to land and water pollution and public nuisance.	Implement a comprehensive Waste Management Plan based on the Reduce, Reuse, Recycle (3Rs) principle. Key actions include: • Spoil Management: Maximize the reuse of suitable excavated spoil. Transport all surplus spoil only to the city-approved designated disposal site. • Waste Segregation: Sort all construction and demolition debris (broken pipes, concrete, packaging) on-site into designated, covered containers (e.g., metal, plastic, general waste). No on-site burning or dumping is permitted. • Recycling: Transport all recyclable materials (e.g., metal scraps from old pipes and valves) to approved recyclers. • E-Waste: Maintain an inventory of all replaced electronic components (SCADA, sensors) and ensure they are handled and disposed of by licensed recyclers as per Bhutan's e-waste regulations. • Site Tidiness: Contractor must maintain a clean and orderly worksite at all times.	• 100% of spoil and non-recyclable waste is disposed of at approved sites only. • Waste segregation and recycling systems are operational. • No evidence of on-site burning or dumping.	Weekly: • Formal inspection of waste management areas. Monthly: • Review of all waste, spoil, and recycling disposal receipts/manifolds.	Disposal and Recycling Receipts, summarized in Monthly E&S Report.
3.3	ESS3: Chemical & Hazardous Materials Management	Soil and water contamination from spills of fuels, oils, and other hazardous materials.	Implement a Spill Prevention and Response Plan . Key actions include: • Storage: Store all fuels, oils, and chemicals in a designated, secure, and bunded area at least 100m from any water body. • Response: Maintain fully stocked spill kits on-site and ensure all relevant staff are trained in their use and emergency response procedures.	• All fuel/chemical storage meets project standards, • Spill kits are present and fully stocked at all key worksites. • Zero major spills.	Weekly: • Formal inspection of all chemical storage areas and spill kits.	Weekly Inspection Reports.
4	ESS4: Community Interaction & Social Risks	Social tension from labour influx; risk of Gender-Based Violence (GBV) and Sexual Exploitation and Abuse/Harassment (SEA/SH); strain on local services.	Implement a Community Interaction Management Plan as part of the C-ESMP. Key actions include: • Code of Conduct (CoC): Rigorously enforce the project-wide CoC (signed by all personnel) with a zero-tolerance policy for SEA/SH, disrespectful behaviour, and illicit activities. • SEA/SH Prevention: Fully implement the project's SEA/SH Prevention and Response Action Plan, including mandatory and continuous awareness training for all personnel. • Worker Accommodation: Site and manage any worker accommodation to minimize negative interactions with communities. Provide adequate facilities to reduce strain on local services. • Local Hiring: Prioritize hiring of local unskilled labour to reduce the size of the non-local workforce.	• Zero substantiated SEA/SH complaints involving project personnel. • No valid community complaints related to worker conduct. • All worker accommodation meets project standards. • Training records are maintained for all personnel.	Weekly: • Formal inspection of worker accommodation and its management. Monthly: • Review of Community GRM log and the confidential SEA/SH reporting channel.	Community & SEA/SH GRM Logs; Summary of training in Monthly E&S Report.

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
5	ESS4: Community Health & Safety	Public safety risks from open trenches , construction traffic, and worksites. Disruption of essential public services , especially water supply and other utilities (power, telecom).	Implement a Community Health & Safety Plan as a core part of the C-ESMP. Key actions include: 1. Public Safety at Worksites: • Site Security: Securely fence all open trenches and worksites with hard fencing. Provide safe, clearly marked, and well-lit temporary pedestrian crossings, designed with universal access principles. • Traffic Management: Implement the approved Traffic Management Plan (TMP) to ensure safe vehicle movements and protect the public. 2. Management of Utility Disruptions: • Utility Coordination: Coordinate with all utility providers before excavation. Use "Dial Before You Dig" practices and manual trial pits to precisely locate existing lines. • Water Service Disruption Plan: Implement the approved plan, which must include: - Minimizing the duration of planned shutdowns. - Providing public notification at least 1 week in advance . - Arranging for an alternative water supply (e.g., tankers) for any shutdown lasting over 8 hours.	• Zero accidents involving the public. • All worksites and open trenches are securely fenced 100% of the time. • No unplanned utility disruptions occur. • All planned water shutdowns are preceded by timely public notification and provision of alternative supply as required.	Daily: • Visual inspection of site security (fencing), signage, and pedestrian access routes. As needed: • Monitor and document the implementation of all planned utility shutdowns.	Daily Site Safety Log; Community GRM Log; Records of public notifications.
6	ESS4/ESS8: SCADA Installation	Public safety risks from new chambers and kiosks (e.g., electrical hazards, trip hazards). Physical and visual impacts on Cultural Heritage Sites (ESS8) from improper siting of new, permanent infrastructure.	Implement a SCADA Installation Management Protocol as part of the C-ESMP. Key actions include: • Siting Approval: All chamber and kiosk locations must be sited to avoid/minimize impacts on sensitive receptors and public access. All locations near cultural heritage sites require formal clearance from the DCDD via the PIU before any work begins. • Secure Installation: Construct all chambers and kiosks to be secure, with lockable, tamper-proof access. • Public Safety: Install appropriate security fencing and clear signage (e.g., "Danger: Electrical Equipment") around all above-ground kiosks to prevent unauthorized access.	• No SCADA infrastructure is installed without prior PIU/DCDD approval of the location. • 100% of above-ground kiosks are securely fenced and signed. • Zero public safety incidents related to SCADA installations.	Weekly: • Inspect all new SCADA installation sites for compliance with approved siting, security, and safety measures.	Photographic evidence and site inspection reports in Monthly E&S Report.
7	ESS3: Environmental Pollution	Soil Erosion & Sedimentation from excavations, especially on slopes and near water bodies, leading to pollution of streams. Pollution from Spills of fuels, oils, or chemicals. Improper Waste & Spoil Disposal.	Implement a comprehensive Pollution & Waste Management Plan as a core part of the C-ESMP. This plan must detail procedures for: 1. Erosion & Sediment Control: • Install and maintain controls (e.g., silt fences, check dams) downslope of all excavations <i>before</i> work begins. • For any in-stream works (pipeline crossings), isolate the work area (e.g., coffer dams) and schedule works during the low-flow season (Nov-Mar). 2. Spill Prevention & Response: • Store all fuels, oils, and chemicals in a designated, bunded area at least 100m from any water body.	• No visible sediment plumes in water bodies downstream of works. • Zero spills of fuel or chemicals. • 100% of spoil and hazardous waste are disposed of at approved/licensed sites. • All fuel/chemical storage meets project standards.	Daily: • Visual check of sediment controls and waste/spoil storage areas. Weekly: • Formal, documented site environmental inspection. Monthly: • Review of all waste and spoil disposal receipts.	Weekly Inspection Reports; Disposal Receipts, summarized in Monthly Report.

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
			• Maintain fully stocked spill kits on-site and ensure staff are trained in their use. 3. Waste & Spoil Management: • Maximize reuse of spoil. Dispose of all surplus spoil and construction debris only at city-approved disposal sites. • Segregate all waste streams (e.g., old pipes, domestic, hazardous). Use licensed contractors for hazardous waste disposal.			
8	ESS6: Biodiversity Conservation	Vegetation Clearing: Removal of trees and other vegetation. Impacts on Fauna: Disturbance, displacement, injury, or mortality of local fauna due to noise, habitat clearing, and entrapment in open trenches .	Implement a Biodiversity Management Protocol as part of the C-ESMP. Key actions include: • Minimize Clearing: Demarcate and strictly adhere to the minimum necessary footprint for all works. • Tree Removal & Replanting: Obtain all required Forestry Clearances from DoFPS before any tree felling. Implement a compensatory planting program by replanting native tree species at a minimum ratio of 3:1 for every mature tree removed. • Fauna Protection: - Scheduling: To the extent feasible, schedule vegetation clearing activities outside of the primary bird nesting season (typically March-July) in areas with significant natural vegetation. - Pre-Clearing Checks: Conduct checks immediately before clearing to allow mobile fauna to move away. - Trench Management: Do not leave trenches open overnight. Where this is unavoidable, cover the trenches or install "escape ramps" (e.g., sloped earth or wooden planks) at regular intervals to allow any trapped fauna to exit. - Code of Conduct: Enforce a strict ban on hunting or harming wildlife.	• No vegetation is cleared outside the demarcated work area. • Compensatory planting is completed as per requirements • Escape ramps are observed in all trenches left open overnight during weekly inspections. • No incidents of harm to or mortality of fauna are reported.	Prior to Clearing: • Verify demarcation and Forestry permits. Daily (during trenching): • Check trenches for trapped fauna and functionality of escape ramps. Post-Construction: • Verify completion of replanting.	- Forestry Clearance Permits. - Daily Site Log (entry for trench checks). - Compensatory Plantation Completion Report.
9	ESS8: Physical Cultural Resources (PCR)	Risk of accidental damage or destruction of previously unknown Physical Cultural Resources (e.g., artifacts, structural remains) during excavation and trenching activities.	Strictly adhere to the project's Chance Finds Procedure (CFP) , which is a binding contractual requirement. All excavation staff must be trained on the CFP during induction. The procedure requires the following immediate actions upon discovery of a potential PCR: 1. STOP WORK: Immediately halt all work within a 25-meter radius of the find. 2. SECURE THE AREA: Immediately secure the area to prevent unauthorized access, damage, or theft. 3. NOTIFY: Immediately notify the Site Supervisor, who must then immediately notify the PIU E&S Specialist. The PIU will then be responsible for formally notifying the DCDD within 24 hours to initiate the expert assessment process. Work will only resume upon formal written	• 100% of excavation staff are trained on the CFP prior to starting work. • In the event of a chance find, the "Stop, Secure, Notify" procedure is implemented immediately with zero delays. • All required notifications to PIU/DCDD are made within the stipulated timeframe.	During Induction: • Verify that all excavation staff have been trained. Immediately (upon any chance find event): • Supervise and document the entire CFP implementation process.	- Training records. - Formal Chance Find Report (if required), including records of notifications and DCDD clearance.

#	E&S Aspect	Impacts / Risks	Mitigation Measures by Contractor	Key Performance Indicators	Monitoring Actions & Frequency	Reporting Mechanism
			clearance from DCDD, communicated via the PIU.			

5.3 PHASE 3: OPERATION

Upon completion of construction and formal handover of the assets, the project will transition to the long-term Operation and Maintenance (O&M) phase. The primary objective of this phase is to ensure that the upgraded water system operates efficiently, safely, and sustainably, delivering the intended public health and service reliability benefits.

The overall responsibility for O&M will shift from the contractor to **Thimphu Thromde (TT)**, with day-to-day activities managed by its **Water Division**. TT's performance will be subject to oversight from national regulatory bodies, primarily the **Department of Environment and Climate Change (DECC)**, to ensure ongoing compliance with national standards.

The management framework for this phase is structured around the following key themes:

- **Public Health and Water Quality:** Implementing a rigorous Water Quality Monitoring Program to ensure full and continuous compliance with Bhutan's National Environmental Standards for drinking water at the source, in treatment plants, and across the distribution network.
- **System Efficiency and Environmental Performance:** Utilizing the new SCADA system to proactively manage the network, identify leaks, and maintain Non-Revenue Water (NRW) below the project target. This also includes operating the Dodeyna intake to maintain mandated environmental flows and implementing a WTP Sludge Management Plan for the safe handling and disposal of treatment by-products.
- **Asset Security and Public Safety:** Ensuring all critical infrastructure, including WTPs, reservoirs, and SCADA control rooms, are securely maintained and access is restricted to authorized personnel to prevent vandalism and protect public safety.
- **Occupational Health and Safety (OHS) for O&M Staff:** Implementing a dedicated OHS Plan for routine maintenance activities, including protocols for confined space entry, chemical handling, and electrical safety. This will be reinforced through regular training and safety checks to achieve the goal of zero Lost Time Injuries (LTIs).

The following table details the specific actions, performance indicators, responsibilities, and monitoring requirements to manage the environmental and social aspects of the water system's long-term operation.

Table 3: Operation & Maintenance (O&M) Phase Mitigation Plan

#	E&S Theme	Management & Mitigation Actions	Key Performance Indicators	Responsibility (Implement / Supervise)	Verification / Reporting Mechanism
1	Public Health & Water Quality	1. Implement Water Quality Monitoring Program: Conduct regular sampling and testing of raw and treated water at WTPs and key points in the distribution network, as per National Environmental Standards (NES). 2. Implement Public Health Advisory Protocol: In any	• 100% compliance with NES for drinking water quality. • Public Health Advisory Protocol is implemented within 24 hours of any	Implement: TT Water Division Supervise: TT Management / DECC (for water quality compliance)	- Quarterly Water Quality Monitoring Reports. - Annual Facility Security & Compliance Report.

#	E&S Theme	Management & Mitigation Actions	Key Performance Indicators	Responsibility (Implement / Supervise)	Verification / Reporting Mechanism
		instance of non-compliance with drinking water standards, immediately implement the pre-approved advisory protocol to inform the public and take corrective actions. 3. Maintain Asset Security: Conduct regular inspections to ensure all WTPs, reservoirs, and SCADA control rooms remain securely fenced and locked to prevent unauthorized access.	confirmed non-compliance event. • Zero security breaches reported at key facilities.		
2	Environmental & System Efficiency	1. Maintain Environmental Flows: Operate the Dodeyna intake to ensure the mandated Environmental Flow release is continuously maintained and documented. 2. Manage Non-Revenue Water (NRW): Actively use the SCADA system to monitor flows, identify leaks, and direct repair teams to maintain NRW at or below the project target of 15%. 3. Implement WTP Sludge Management Plan: Ensure the safe, routine handling, dewatering (if applicable), and disposal of all treatment sludge to the city-approved disposal site.	• Environmental flow release is continuously maintained and documented via SCADA data. • NRW percentage is at or below 15%. • 100% of sludge is disposed of at approved sites, with records maintained.	Implement: TT Water Division Supervise: TT Management	- Monthly Operational Performance Reports (including NRW data, flow release data, and system efficiency metrics). - Annual Sludge Disposal Summary Report.
2.1	Energy Efficiency	1. Promote Energy-Efficient Procurement: During the replacement or upgrading of any electro-mechanical equipment (e.g., pumps, motors), prioritize the procurement of high-efficiency, well-rated models, considering life-cycle energy costs in the procurement decision. 2. Explore Renewable Energy: For any new or significantly upgraded remote SCADA units, assess the feasibility of using solar power as the primary energy source. 3. Monitor and Optimize Operations: Use SCADA data to monitor energy consumption per cubic meter of water and identify opportunities for operational optimization (e.g., optimizing pump schedules to off-peak hours where applicable).	• Life-cycle energy costs are included as a criterion in procurement evaluations for major equipment replacement. • Feasibility of solar power is documented for all new remote SCADA installations. • Annual review of energy consumption data is conducted and documented.	Implement: TT Water Division Supervise: TT Management	• Energy efficiency criteria included in procurement documents. • Annual review notes on energy performance and optimization opportunities.
3	OHS for Maintenance Staff	1. Implement O&M-Specific OHS Plan: Maintain and enforce a dedicated OHS Plan for all routine and emergency maintenance tasks. 2. Conduct Annual Refresher Training: Provide mandatory annual training for all O&M staff on key risks, including confined space entry, chemical handling, electrical safety, and work in live traffic. 3. Maintain and Inspect Safety Equipment: Conduct and document regular (e.g., quarterly) safety checks of all critical OHS equipment, including gas detectors, PPE, and rescue gear.	• Zero Lost Time Injuries for O&M staff. • 100% of O&M staff complete the annual refresher training. • Equipment inspection logs are complete and up-to-date.	Implement: TT Water Division Supervise: TT Management	- Annual Internal OHS Audit Reports. - Annual Training Records.

5.4 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

This Environmental and Social Monitoring Plan (E&S Monitoring Plan) is the primary tool for tracking the implementation and effectiveness of the mitigation measures outlined in this ESMP. It provides a systematic framework for collecting, analysing, and reporting on the project's E&S performance throughout its lifecycle.

The plan encompasses two key types of monitoring:

1. **Compliance Monitoring:** Verifies that the contractor's actions, plans, and documentation adhere to the requirements of this ESMP and the approved C-ESMP (e.g., Are records being kept? Is PPE being used? Is the Worker GRM functional?).
2. **Effects Monitoring:** Measures the actual environmental and social effects of the project to assess the effectiveness of mitigation measures (e.g., What are the current noise levels? What is the downstream water quality?). This is typically done through instrumental monitoring and site observations.

Objective: This plan details the monitoring activities required to:

1. Verify that all mitigation measures outlined in the Water Sector ESMP are effectively implemented.
2. Assess the actual environmental and social effects of the project's activities.
3. Ensure compliance with national regulations and the World Bank's Environmental and Social Framework (ESF).
4. Provide timely feedback for adaptive management to address any unforeseen impacts.

The monitoring activities are structured chronologically according to the project phases: Pre-Construction, Construction, and Operation & Maintenance (O&M).

5.4.1 KEY PRINCIPLES AND ADAPTIVE MANAGEMENT

This ESMP is a living document that will be managed based on the principles of adaptive management. It will be reviewed and updated as the project evolves to ensure it remains relevant and effective.

1. **Triggers for an ESMP Update** - The ESMP will be formally reviewed and, if necessary, updated in response to any of the following triggers:
 - **Changes in Project Design or Scope:** Any significant changes to the project's design, location, or scope of activities that are not covered in the current ESMP (e.g., changes in pipeline alignment, addition of new infrastructure).
 - **Unanticipated Environmental or Social Impacts:** If monitoring reveals the emergence of significant, unanticipated E&S impacts that are not adequately addressed by the current mitigation measures.
 - **Ineffective Mitigation Measures:** If monitoring indicates that the existing mitigation measures are not effective in managing the identified risks to an acceptable level.
 - **Changes in Legal or Regulatory Requirements:** Any changes to the national laws of Bhutan or the World Bank's Environmental and Social Framework that materially affect the project's E&S obligations.
 - **Routine Review:** As a matter of good practice, a comprehensive review of the ESMP's relevance and effectiveness will be conducted on an annual basis.

2. ESMP Update and Approval Process -The process for updating the ESMP will follow a clear, documented timeline:
- Identification and Scoping (Within 1 week of trigger): The need for an update can be identified by the Contractor, PIU, PMSC, or the World Bank. The PIU will be responsible for scoping the required changes.
 - Preparation of Revisions (2-4 weeks): The PIU, with technical support from the PMSC, will prepare the proposed revisions to the ESMP. This may involve additional E&S assessment or stakeholder consultation, depending on the nature of the change.
 - Submission and World Bank Review (2-3 weeks): The revised draft ESMP will be submitted to the World Bank for review and "No Objection."
 - Disclosure: Following the World Bank's "No Objection," the updated ESMP will be formally re-disclosed on the websites of the implementing agency and the World Bank.
 - Implementation: The Contractor will be formally instructed by the PIU to implement the revised measures, and the Contractor's ESMP (C-ESMP) will be updated accordingly within an agreed timeframe.

This structured process ensures that the ESMP remains a dynamic and effective tool for managing the project's environmental and social performance throughout its lifecycle.

5.4.2 Phase I: Pre-Construction Monitoring Plan

This initial phase focuses exclusively on **compliance monitoring**. Its purpose is to verify that all mandatory environmental and social prerequisites and "hold points" (as detailed in Table 1) have been successfully completed and approved by the PIU/PMSC. It is a critical clearance stage; **no physical construction works for the Water Sector may begin until all items in the following table are fully documented and closed out.**

Table 4: Pre-Construction Phase Monitoring Plan

#	Monitoring Theme	What to Monitor (Clearance Items)	How to Monitor (Verification Method)	Timing / Frequency	Responsibility (Implement / Supervise)	Verification Deliverable
1	E&S Management Readiness	• Approval of C-ESMP: A complete and approved Water Sector C-ESMP is on file. • Staff Mobilization: Approved Contractor E&S/OHS staff are mobilized on-site. • Training Completion: All personnel have completed mandatory induction training.	Document Review & Verification of: • C-ESMP approval letter. • Staff assignment records. • Signed training attendance sheets.	Once, prior to mobilization and start of any works.	Implement: Contractor Supervise: PIU/PMSC	E&S Readiness Memo from PIU, confirming Items 1-3 are complete.
2	Technical Design Readiness	• Review of Final Designs: Final engineering designs are reviewed and confirmed to include all specified climate resilience and SCADA siting measures.	Document Review & Verification of final "Issued for Construction" drawings and BoQs.	Once, prior to mobilization.	Implement: Design Consultant / Contractor Supervise: PIU/PMSC	Design Compliance Note signed by PIU/PMSC.
3	Baseline Environmental Conditions	• Establishment of Baseline Data: Baseline water quality and noise level data are collected at specified locations <i>before</i> works begin.	1. Water Quality Monitoring: Review of instrumental monitoring results from an accredited third-party lab. The baseline monitoring must test for the following key parameters at a minimum:	Once, prior to start of any works that could affect the baseline.	Implement: Contractor (via accredited lab) Supervise: PIU/PMSC	Baseline Environmental Monitoring Report submitted and formally approved by PIU.

#	Monitoring Theme	What to Monitor (Clearance Items)	How to Monitor (Verification Method)	Timing / Frequency	Responsibility (Implement / Supervise)	Verification Deliverable
			- Physical: pH, Turbidity, Total Suspended Solids (TSS), Temperature. - Chemical: Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD). - Biological: Faecal Coliforms. Sampling will be conducted at the following key locations: - Upstream of the Dodeyna water intake. - Immediately downstream of the Dodeyna water intake. 2. Noise Monitoring must be done at sensitive receptor locations if there are any community complaints.			
4	Social & Resettlement Readiness	Completion of RAP Actions: All compensation payments and resettlement assistance as per the updated RAP are completed.	Document Review & Verification of compensation payment records and signed agreements.	Prior to granting access to any land parcel or starting work in a specific area.	Implement: PIU Supervise: PMU	RAP Completion Report for water sector-specific impacts, cleared by the World Bank.
5	Community Preparedness	Dissemination of Information: The Water Service Disruption Plan and GRM contact details have been successfully disseminated to all affected communities.	Review and field verification of communication materials (e.g., flyers, public notices) and their distribution.	During mobilization, before works commence in any specific community/zone.	Implement: Contractor/PIU Supervise: PIU/PMSC	Documentation of community notification efforts included in the first Monthly E&S Report.
6	ESS5: Unanticipated Land & Livelihood Impacts	Identification of any land or asset impacts not previously identified in the Resettlement Action Plan (RAP). This includes: - Use of land beyond the demarcated project boundary. - Damage to crops, structures, or other assets outside the approved work area. - Unforeseen restrictions on access to property or livelihoods.	Procedural: - The PIU/PMSC Social Specialist will conduct weekly site inspections with the specific purpose of verifying that the contractor's activities remain within the demarcated project boundaries. - Immediate Reporting: Any potential unanticipated impact identified by the contractor or the PIU/PMSC must be immediately reported to the PIU Social Specialist. - GRM Monitoring: Monthly review of the Community GRM log to identify any complaints related to land take or asset damage.	Weekly (Site Boundary Inspections) Immediate (Upon Identification)	Implement: Contractor Supervise: PIU/PMSC (Social Specialist)	- Weekly Site Inspection Reports. - Unanticipated Impacts Report (if triggered), detailing the nature of the impact and the proposed corrective actions, submitted to the World Bank.

5.4.3 Phase 2: Construction Monitoring Plan

This phase details the active monitoring during all physical works, from trenching to SCADA installation.

Table 5: Construction Phase Monitoring Plan

#	Monitoring Theme	Monitoring Type	What to Monitor (Parameters / Indicators)	How to Monitor (Methodology)	Frequency	Responsibility
1	ESS2: OHS & Worker Welfare	Compliance	OHS Plan Implementation: Adherence to the approved C-ESMP/OHS Plan, including use of PPE, trench safety measures, and	Visual: Daily OHS checks; Weekly camp inspections.	Daily (Visual) Weekly (Procedural/Formal) Monthly (Records)	Implement: Contractor Supervise: PIU/PMSC

#	Monitoring Theme	Monitoring Type	What to Monitor (Parameters / Indicators)	How to Monitor (Methodology)	Frequency	Responsibility
			• "Permit to Work" for confined spaces. • Worker Accommodation: Condition and management of any worker accommodation facilities. • Worker GRM: Status of the Worker GRM log and timely resolution of grievances.	• Procedural: Weekly audit of higher-risk work permits. • Document: Monthly review of training records and GRM logs.		
2	ESS4: Community H&S and Social Risks	Compliance	• Site Security & Public Access: Integrity and functionality of site fencing, signage, and temporary pedestrian access routes. • Utility Disruptions: Compliance with the Water Service Disruption Plan (advance notification, provision of alternative supply). • Community GRM: Status of the Community GRM log and confidential SEA/SH reporting channel.	• Visual: Daily inspection of worksites, especially those near sensitive receptors (schools, hospitals). • Document: Weekly review of the Community GRM log. Review of public notification records prior to any service shutdown.	Daily (Visual) Weekly (Records)	Implement: Contractor/PIU Supervise: PIU/PMSC
3	ESS3: Environmental Effects	Effects	• Water Quality: Visual signs of pollution (turbidity, oil sheens) downstream of in-stream works. • Noise & Dust: Level of dust and noise at sensitive receptor locations.	• Visual: Daily visual checks of water bodies and dust levels. • Instrumental: Conduct targeted, event-based water quality sampling if visual pollution is observed or for major in-stream works. Conduct noise monitoring if major community complaints are received.	Daily (Visual) Event-Based (Instrumental, if needed)	Implement: Contractor (via lab if needed) Supervise: PIU/PMSC
4	ESS3: Environmental Compliance	Compliance	• Pollution Controls: Effectiveness of erosion/sediment controls and spill prevention measures. • Waste & Spoil Management: Proper segregation, storage, and disposal of all waste streams (spoil, hazardous, domestic).	• Visual: Daily inspection of sediment controls, spill kits, and waste storage areas. • Document: Monthly verification of all waste and spoil disposal receipts and manifests.	Daily (Visual) Monthly (Records)	Implement: Contractor Supervise: PIU/PMSC
5	ESS6/ESS8: Biodiversity & Cultural Heritage	Compliance	• Vegetation Clearing: Adherence to demarcated clearing limits and possession of valid forestry permits. • Chance Finds Procedure: Verification that all staff are trained and that the procedure is followed immediately in the event of a find.	• Visual/ Procedural: - Verify clearing limits and permits <i>before</i> clearing begins. - Immediately supervise and document any Chance Find event.	Prior to Clearing Immediately (for chance finds)	Implement: Contractor Supervise: PIU/PMSC/ DCDD

5.4.4 Phase 3: Operational Monitoring Plan

This plan covers the long-term monitoring of the upgraded water system's performance and impacts.

Table 6: Operation & Maintenance (O&M) Phase Monitoring Plan

#	Monitoring Theme	What to Monitor (Parameters / Indicators)	How to Monitor (Methodology)	Frequency	Responsibility (Implement / Supervise)	Key Reporting Deliverable
1	Public Health, Water Quality & Safety	• Water Quality: Compliance with National Environmental Standards (NES) for drinking water at WTPs and key points in the distribution network. • Asset Security: Integrity of fencing and security measures at all WTPs, reservoirs, and SCADA control rooms. • Community Grievances: Public GRM log for complaints	• Instrumental: Regular laboratory testing of water samples. • Visual: Quarterly security inspections of all key facilities. • Document: Monthly review of the public GRM log.	• Weekly/ Monthly (Water Testing) • Quarterly (Security Inspections) • Monthly (GRM Review)	Implement: TT Water Division Supervise: TT Management / DECC	Quarterly Water Quality & Service Compliance Report

#	Monitoring Theme	What to Monitor (Parameters / Indicators)	How to Monitor (Methodology)	Frequency	Responsibility (Implement / Supervise)	Key Reporting Deliverable
		related to water quality, supply interruptions, or billing.				
2	System Efficiency & Environmental Performance	• Non-Revenue Water (NRW): NRW percentage, calculated from SCADA flow data. • Environmental Flow: Daily flow release volumes from the Dodeyna intake, verified via SCADA. • Energy Consumption: Energy use per cubic meter of water supplied. • Sludge Disposal: Records of sludge removal and disposal from WTPs.	• Data Analysis: Continuous analysis of real-time data from the SCADA system. • Document: Monthly review of utility bills and sludge disposal receipts.	• Continuously (via SCADA) • Monthly (Data Reporting & Analysis)	Implement: TT Water Division Supervise: TT Management	Monthly Operational Performance Report
3	Downstream Ecological Health	Aquatic Habitats and Fish Populations: • Health and condition of the aquatic habitat immediately downstream of the Dodeyna water intake. • Presence, diversity, and health of key indicator fish species (e.g., Snow Trout).	Procedural/Scientific: • Conduct a biennial (every two years) ecological survey of the river reach immediately downstream of the intake. This survey will be conducted by a qualified third-party ecologist and will involve: - A rapid habitat assessment. - Standardized fish sampling techniques.	Biennially (Every 2 years)	Implement: TT Water Division (via qualified consultant) Supervise: TT Management / DECC	Biennial Downstream Ecological Monitoring Report
4	Asset Integrity	• Pipeline Integrity: Structural integrity of critical pipeline sections in identified landslide-prone zones. • O&M Staff Safety: OHS incident logs, training records, and status of safety equipment.	• Visual/Procedural: Annual (post-monsoon) and event-based (post-seismic) inspections of critical infrastructure. • Document: Annual internal audit of OHS plan implementation, training records, and incident reports.	• Annually / Event-Based (Asset Integrity) • Annually (OHS Audit)	Implement: TT Water Division Supervise: TT Management	Annual Asset Integrity & OHS Report
5	Stakeholder Satisfaction	• User Satisfaction: Community satisfaction with water quality, supply reliability, and customer service.	• Procedural: Conduct a biennial (every two years) user satisfaction survey targeting a representative sample of customers in the project area.	Biennially (Every 2 years)	Implement: TT Water Division Supervise: TT Management	Biennial User Satisfaction Survey Report

6 INSTITUTIONAL ARRANGEMENT & RESPONSIBILITIES

The implementation of this Water Sector ESMP follows the overall two-tiered institutional structure of the LRCP. A clear definition of roles, responsibilities, and reporting lines is essential for effective E&S management.

- Project Management Unit (PMU): Housed at the Department of Human Settlement (DHS) within the Ministry of Infrastructure and Transport (MoIT), the PMU provides overall guidance and oversight for the entire LRCP.
- Project Implementation Unit (PIU): Housed at Thimphu Thromde (TT), the PIU is the primary entity responsible for the direct implementation and supervision of the urban placemaking and water investment components. The PIU holds the ultimate accountability for ensuring the contractor's compliance with this ESMP.
- Project Management and Supervision Consultant (PMSC): Engaged by the PMU to support both the PMU and PIU, the PMSC acts as the "Engineer" for the contract. Its dedicated Environmental and Social Specialists provide day-to-day technical supervision of the Contractor, review all E&S documentation, and report to the PIU.
- Contractor: The Contractor is directly responsible for the on-the-ground implementation of all mitigation measures. They are required to hire their own qualified Environmental, Social, and Occupational Health and Safety (OHS) officers to manage daily site activities, conduct training, and prepare monthly E&S reports.

The E&S management and reporting flow for the Water Sector component is illustrated figure 5.

6.1 ROLES AND RESPONSIBILITIES OF KEY E&S SPECIALISTS

To ensure robust technical oversight, the project will be supported by a team of dedicated E&S specialists, primarily housed within the Project Management and Supervision Consultant (PMSC), who will provide direct technical support and supervision services to the PIU. The specific roles are defined as follows:

Environmental Specialist:

- Reviews and recommends for approval the environmental components of the C-ESMP (e.g., Waste Management Plan, Erosion Control Plan, Spill Response Plan).
- Conducts regular site inspections to supervise the Contractor's implementation of environmental mitigation measures.
- Oversees all environmental monitoring activities, including reviewing the results of water quality and noise level monitoring.
- Provides technical guidance to the PIU and the Contractor on all environmental matters, including compliance with national environmental regulations and park permits for the Dodeyna intake site.

Occupational Health & Safety (OHS) Specialist:

- Reviews and recommends for approval the Contractor's OHS Plan, including Job Hazard Analyses (JHAs) and emergency response procedures.
- Conducts frequent site safety audits, with a particular focus on higher-risk activities such as trench excavation, confined space entry, and work near live traffic.

- Investigates any accidents, incidents, or near misses, and ensures corrective actions are implemented.
- Verifies that the Contractor's OHS practices are compliant with both Bhutan's OHSW Regulation and the WBG EHS Guidelines.

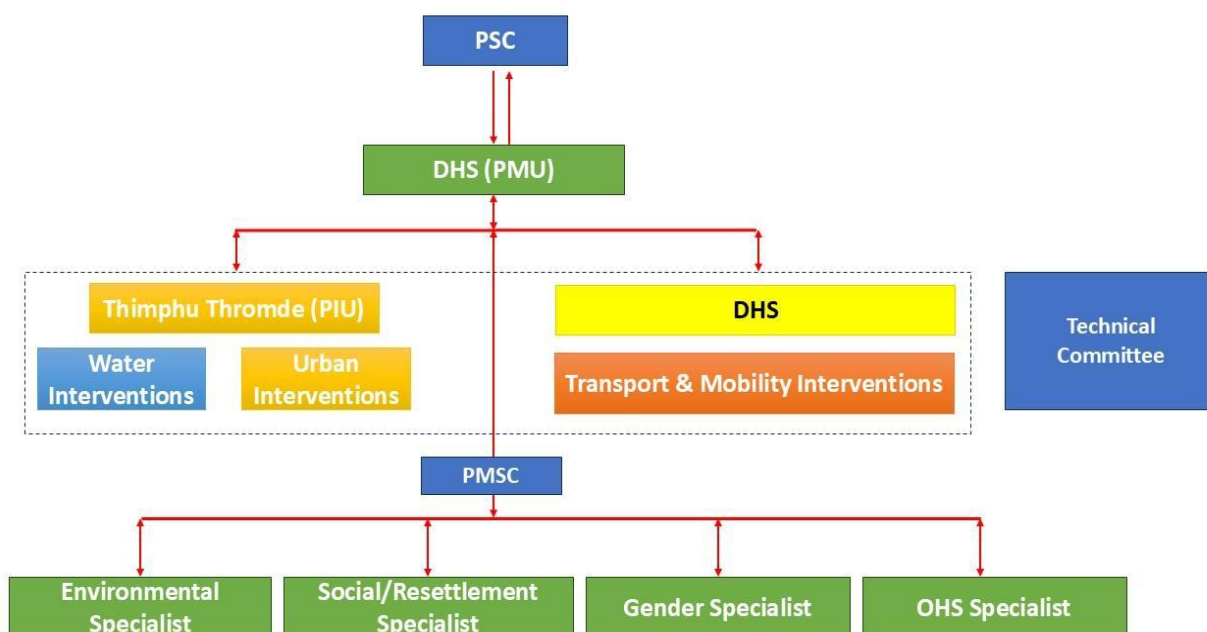
Social and Resettlement Specialist:

- Provides direct supervision and oversight for the implementation of the Resettlement Action Plan (RAP), including verifying compensation payments and monitoring livelihood restoration activities.
- Oversees the implementation of the Stakeholder Engagement Plan (SEP), ensuring that consultations are inclusive and that community concerns are being addressed.
- Manages the project's Grievance Redress Mechanism (GRM) at the PIU level, ensuring that all community complaints are logged, tracked, and resolved in a timely manner.
- Reviews and supervises the social components of the C-ESMP, such as the Community Health and Safety Plan and the Labor Management Plan.

Gender / Gender-Based Violence (GBV) Specialist:

- Oversees the implementation of the project's Gender Action Plan (GAP) and the SEA/SH Prevention and Response Action Plan.
- Ensures that the confidential reporting and referral pathway for SEA/SH incidents within the GRM is functional, safe, and survivor-centric.
- Reviews and approves the Contractor's training materials on the Code of Conduct to ensure they adequately cover SEA/SH prevention.
- Liaises with local GBV service providers (e.g., RENEW) to maintain a functional referral system for any survivors who may require support.

Figure 5: LRCP Project Organizational Chart



7 CAPACITY BUILDING AND TRAINING PLAN

To ensure the effective and compliant implementation of this Water Sector ESMP, a comprehensive Capacity Building and Training Plan will be implemented. The objective of this plan is to bridge any identified capacity gaps and ensure that all parties involved—from management to site workers—clearly understand their specific roles and responsibilities for environmental and social (E&S) management. The plan will equip personnel with the necessary skills to manage the unique hazards of water infrastructure projects (e.g., trench safety, confined space entry) and ensure they are committed to fulfilling the project's E&S requirements under the World Bank Environmental and Social Framework (ESF) and the project's Environmental and Social Commitment Plan (ESCP).

The implementation of the training plan is a shared responsibility:

- **Oversight and Coordination (PIU/PMSC):** The Project Implementation Unit (PIU), with technical support from the Project Management and Supervision Consultant (PMSC), will be responsible for the overall oversight and coordination of the training plan, including delivering high-level training modules for leadership and supervisory staff.
- **Site-Specific Delivery (Contractor):** The Contractor is **contractually obligated to develop, fund, and deliver** a detailed site-specific training program for its entire workforce, including subcontractors. This program must be detailed in the approved Contractor's ESMP (C-ESMP).

7.1 TRAINING PROGRAM

The training program is designed with different modules tailored to the specific needs of the groups involved in the Water Sector component. The PIU, through its PMSC, will oversee the overall implementation of the training plan, while the Contractor will be responsible for delivering site-specific training to its workforce.

Table 7: Water Sector Environmental and Social Training Program

#	Training Module	Target Audience	Key Content (Water Sector Focus)	Lead Trainer(s)	Schedule
A	ESF & ESMP Management (Project Leadership)	• PIU Management & E&S Staff • PMSC Senior Staff	• Detailed overview of the World Bank ESF and project-specific E&S instruments (Water ESMP, RAP, SEP, ESCP, SEA/SH Plan). • Roles, responsibilities, and legal liabilities for ESMP implementation, supervision, monitoring, and GRM management.	PMSC E&S Specialists	During Project Inception. Refresher every 6 months.
B	C-ESMP Implementation (For Supervisors)	• Contractor's Project Manager, Site Engineers, E&S/OHS Officers • PMSC Site Supervision Engineers	• Detailed review of the approved Water Sector C-ESMP and all sub-plans. • Practical Implementation: Water-specific mitigation for trenching, dewatering, confined space entry, and sediment control. • Procedures: Site inspections, non-compliance management, and reporting.	PMSC E&S Specialists & Contractor's E&S/OHS Officers	Prior to construction start. Monthly topic-specific sessions.

#	Training Module	Target Audience	Key Content (Water Sector Focus)	Lead Trainer(s)	Schedule
C	Community Awareness & Code of Conduct	• All construction workers, including subcontractors and drivers.	• Mandatory Induction Training for all personnel before site access. • Project's Code of Conduct, with a strong focus on zero tolerance for SEA/SH and GBV. • Orientation on local laws and cultural norms to foster respectful interaction • Introduction to the Worker GRM.	Contractor's E&S/OHS Officers	At staff induction. To be repeated as new workers are hired.
D	Occupational Health & Safety (Site-Specific)	• Construction crew, foremen, and equipment operators.	• Daily Toolbox Talks: Focus on daily work hazards (e.g., trench safety, utility strikes) and required PPE. • Weekly/Monthly Specialized Training on tasks involving significant OHS risk: - Trench Safety & Shoring Techniques - Confined Space Entry (for reservoirs/tanks) - Emergency Response Drills (e.g., trench rescue).	Contractor's OHS Officer	Daily (Toolbox Talks). Weekly/Monthly (Specialized Topics).
E	O&M Phase E&S Management	• TT Water Division technical staff and future O&M personnel.	• Overview of the O&M stage ESMP requirements. • Safety procedures for routine maintenance (confined space entry, work in live traffic, electrical safety). • Environmental protocols for managing WTP sludge and maintaining environmental flows.	PIU/PMSC E&S Specialists	Towards the end of the construction phase and during the initial O&M period.

7.2 TRAINING RECORDS AND REPORTING

The maintenance of accurate and complete training records is a mandatory requirement to verify compliance with this plan.

- **Contractor's Responsibility:** The Contractor is responsible for creating and maintaining a comprehensive log of all training activities delivered to its personnel. These records must be kept on-site and be available for inspection by the PIU/PMSC at all times.
- **PIU/PMSC's Responsibility:** The PIU/PMSC will audit the Contractor's training records regularly to ensure completeness and quality.

At a minimum, all training records must include the title and topic of the training, date, trainer's name, a summary of content, and a **signed list of all participants**. A summary of training activities will be a required component of the Contractor's **Monthly E&S Reports**.

8 INDICATIVE ENVIRONMENTAL AND SOCIAL IMPLEMENTATION BUDGET

8.1 BUDGET PRINCIPLES

The successful implementation of this Environmental and Social Management Plan (ESMP) is contingent upon the allocation of adequate financial resources. The costs are covered through two primary mechanisms:

- **Contractor's Costs:** The costs for direct, on-the-ground mitigation and management measures are to be included by the contractor in their bid prices as part of the civil works contract. This includes costs for personnel (E&S/OHS staff), worker accommodation, OHS & PPE, and all site-based environmental management activities.
- **Direct Project Costs:** Costs for supervision, third-party monitoring, capacity building, and stakeholder engagement will be financed from a dedicated budget managed by the Project Implementation Unit (PIU).

8.2 ESTIMATED BUDGET

The total estimated cost for the implementation of the Water Sector ESMP is Nu. 30,690,000. This comprises an estimated Nu. 23,600,000 to be included in the contractor's Bill of Quantities (BoQ) and a direct budget allocation of Nu. 7,090,000 for the PIU.

Table 8: Indicative ESMP Implementation Budget for the Water Sector Component

#	Item	Unit / Basis for Costing	Quantity	Rate (Nu)	Amount (Nu)	Remarks
A	PERSONNEL COSTS					
1	Contractor's E&S/OHS Staff	Person-Months	48	200,000	9,600,000	Contractor Cost (in BoQ). Assumes 2 dedicated specialists (1 E&S, 1 OHS) for a 24-month period.
2	PIU E&S Specialist (Water Sector)	Person-Months	30	100,000	3,000,000	PIU Cost. Budget for dedicated E&S staff within Thimphu Thromde PIU for supervision.
B	DIRECT MITIGATION & MANAGEMENT COSTS (to be included in Contractor's BoQ)					
3	Worker Accommodation & Facilities	Lump Sum	1	-	6,000,000	Contractor Cost (in BoQ). Cost for establishing and maintaining worker camps/facilities compliant with OHSW Regulation 2022.
4	OHS & PPE	Lump Sum	1	-	2,500,000	Contractor Cost (in BoQ). Includes all required PPE for water-specific hazards (e.g., confined space entry gear, trench shoring), first-aid, and safety barricading.
5	Environmental Management, Site Reinstatement & Greening	Lump Sum	1	-	5,500,000	Contractor Cost (in BoQ). Covers erosion controls, pollution/waste/spoil management, full reinstatement of all excavated areas, and implementation of the compensatory afforestation/replanting program.
C	MONITORING COSTS (funded by PIU)					

#	Item	Unit / Basis for Costing	Quantity	Rate (Nu)	Amount (Nu)	Remarks
6	Instrumental Environmental Monitoring				1,590,000	<i>PIU Cost.</i> To be conducted by an accredited third-party lab. Includes pre-construction baseline and quarterly monitoring.
	- Water Quality Monitoring	Samples (2 loc x 9 rounds)	54	15,000	810,000	Focus on works near water bodies.
	- Air & Noise Quality Monitoring	Samples (3 loc x 5 rounds)	15 each	52,000	780,000	Targeted monitoring at sites with significant excavation near sensitive receptors.
D	STAKEHOLDER ENGAGEMENT & CAPACITY BUILDING (funded by PIU)					
7	Stakeholder Engagement Plan (SEP) Implementation	Lump Sum	1	-	2,000,000	<i>PIU Cost.</i> Covers public notifications for service disruptions, GRM operation, and public awareness campaigns.
8	Capacity Building & Training	Events	2	250,000	500,000	<i>PIU Cost.</i> Covers specialized training for TT and Contractor staff on ESF, ESMP, and OHS for water systems.
	TOTAL (Items in Contractor BoQ)				23,600,000	This total represents the estimated cost to be included in the Contractor's bid price.
	TOTAL (Direct PIU Budget)				7,090,000	This is the direct budget allocation required by the PIU.
	TOTAL ESTIMATED ESMP COST				30,690,000	

APPENDIX I – CHANCE FINDS PROCEDURE (CFP) FOR THE LRCP WATER SECTOR COMPONENT

Purpose and Application

This Chance Finds Procedure (CFP) outlines the mandatory actions to be taken by all project personnel, including contractors and subcontractors, in the event that Physical Cultural Resources (PCR) are discovered during any ground-disturbing activities for the LRCP Water Sector component. This procedure is designed to ensure compliance with Bhutan's national regulations and the World Bank's Environmental and Social Standard 8 (ESS8): Cultural Heritage.

This procedure applies to all project activities involving excavation, including but not limited to:

- Trenching for water transmission and distribution pipelines.
- Excavation for the installation of SCADA system chambers, valves, or meters.
- Any civil works at WTPs, reservoirs, or intake areas that involve breaking new ground.

Adherence to this procedure is a binding contractual requirement.

Definition of Physical Cultural Resources (PCR)

For the purposes of this project, a "chance find" is the unexpected discovery of any object or site of potential cultural, historical, archaeological, or paleontological significance. Examples of PCR include, but are not limited to:

- Ancient man-made articles such as pottery, weapons, tools, coins, or ornaments.
- Human or animal skeletal remains.
- Structural remains (e.g., old foundations, walls, ruins of *dzongs* or *lhakhangs*).
- Religious or sacred items (e.g., *tsha-tshas*, statues, prayer wheels).
- Fossils or buried rock carvings, inscriptions, or paintings.

Procedure Steps

1. Immediate Actions Upon Discovery: "Stop, Secure, Notify"

If any person discovers a potential PCR, the following steps must be taken **immediately and without exception**:

- i. **STOP WORK:** Immediately halt all work within a **25-meter radius** of the discovery. This includes stopping all machinery and manual excavation.
 - ii. **SECURE THE AREA:** The Site Supervisor must immediately secure the location using barricade tape, fencing, or a guard to prevent unauthorized access, damage, or theft. The find must **not be disturbed** (touched, moved, or cleaned).
 - iii. **NOTIFY:** The person who made the discovery must immediately notify their direct supervisor. The Site Supervisor must then **immediately notify the PIU's Environmental and Social (E&S) Specialist**.
- #### 2. Formal Reporting and Assessment Chain
- i. **PIU Notification to DCDD:** Upon receiving notification, the PIU E&S Specialist will formally report the chance find to the Department of Culture and

- Dzongkha Development (DCDD) within 24 hours. The report will include the location (with GPS coordinates), a description, and photos.
- ii. **DCDD Assessment:** The DCDD will dispatch a qualified expert to assess the find's significance. The Contractor and PIU will provide full access and support.
 - iii. **Mitigation Planning:** Based on the assessment, the DCDD, in consultation with the PIU, will determine the appropriate course of action (e.g., Record and Proceed; Salvage/Excavation; or In-Situ Preservation, which may require project redesign).

Resumption of Work

Construction activities within the secured 25-meter radius may **only resume after receiving formal written clearance from the DCDD**, which will be officially communicated to the Contractor through the PIU.

Roles and Responsibilities

The roles and responsibilities for the implementation of this CFP are summarized below.

Table 9: Roles and Responsibilities for the Chance Finds Procedure

Role	Key Responsibilities
All Project Personnel	• Be aware of the possibility of encountering physical cultural resources (PCR). • Immediately report any potential find to their supervisor.
Contractor's Site Supervisor & E&S/OHS Officer	• Implement the "Stop, Secure, Notify" steps immediately. • Ensure all workers are trained on the Chance Find Procedure (CFP) during site induction. • Maintain the security of the find site until DCDD arrives.
PIU E&S Specialist	• Serve as the primary contact point for all chance find events. • Formally notify and liaise with the DCDD. • Document all steps taken and issue the formal instruction to resume work upon DCDD clearance.
Department of Culture and Dzongkha Development (DCDD)	• Provide expert assessment of the significance of any finds. • Determine the appropriate mitigation measures. • Provide formal written clearance for the resumption of work.

Training and Awareness

The Contractor is responsible for providing **mandatory training** on this CFP to all relevant personnel (including machinery operators, supervisors, and labourers) as part of their site induction, before any excavation begins. This training will be supported by the PIU/PMSC and will include visual aids showing examples of potential artifacts.

Budgetary Provisions

The Contractor's bid shall include the costs associated with the implementation of this procedure, including potential minor delays and the costs of site security. Any costs associated with major mitigation works (e.g., professional archaeological excavation) will be managed as a variation to the contract, as instructed by the PIU.

APPENDIX 2 – CODE OF CONDUCT

Presented in a separate document

APPENDIX 3 – TEMPLATE A: WEEKLY E&S/OHS SITE INSPECTION CHECKLIST

Purpose: To be completed weekly by the Contractor's E&S/OHS Officer and reviewed by the PMSC E&S Specialist. This checklist serves as the primary record of on-site compliance with the C-ESMP.

Project: Livable and Resilient Cities Project - Water Sector Component			Inspection Date:
Contractor:			Inspector Name & Title:
Location / Chainage Inspected:			Weather Conditions:
Item #	Monitoring Aspect & Specific Checkpoint	Status (C/NC/NA) *	Observations & Corrective Action Required (Include Responsibility & Deadline)
1	OHS & Worker Safety		
1.1	Are all workers wearing required PPE (helmets, vests, boots)?		
1.2	Are all trenches/excavations >1.2m deep properly shored, benched, or sloped?		
1.3	Is a valid "Permit to Work" in use for any confined space entry?		
1.4	Are first-aid kits fully stocked and easily accessible?		
1.5	Are emergency contact numbers clearly posted?		
2	Community Health & Safety		
2.1	Are all open trenches and work areas securely fenced with hard barricades?		
2.2	Are safe and clearly marked pedestrian access routes maintained?		
2.3	Is traffic management (signage, flaggers) being implemented as per the TMP?		
2.4	Have residents been notified in advance of any planned water service disruptions?		
3	Environmental Management		
3.1	Are dust control measures (e.g., water sprinkling) being implemented effectively?		
3.2	Are erosion and sediment controls (silt fences, etc.) in place and properly maintained?		

3.3	Is waste segregated correctly in designated, labeled bins?		
3.4	Is fuel/chemical storage in a secure, bunded area away from water bodies?		
4	Worker Welfare		
4.1	Is there an adequate supply of safe drinking water for all workers?		
4.2	Are sanitary facilities for workers clean, functional, and segregated by gender?		

* *C = Compliant; NC = Non-Compliant; NA = Not Applicable*

Inspector's Signature:	Contractor Representative's Signature:

APPENDIX 4 – TEMPLATE B: MONTHLY E&S MONITORING FORMAT

Purpose: To be prepared by the Contractor and submitted to the PIU/PMSC. This report summarizes all E&S activities and performance for the reporting period.

Cover Page

- Project Name: Livable and Resilient Cities Project - Water Sector Component
- Contractor Name:
- Reporting Period: (e.g., July 2025)
- Submission Date:

1. Introduction

- Brief summary of construction activities and progress during the month.

2. E&S Management Performance

- **OHS:** Summary of compliance, key safety meetings, any incidents or near misses.
- **Labor & Worker Welfare:** Confirmation of contract compliance, status of Worker GRM.
- **Community Health & Safety:** Summary of site security, traffic management, and status of Community GRM.
- **Environmental Management:** Summary of dust, noise, erosion, and waste/spoil management.

3. Summary of Monitoring Activities

- Summary of all weekly site inspections conducted.
- Results of any instrumental monitoring (e.g., water quality, noise) conducted during the month.

4. Non-Compliance and Corrective Action Log

- A table detailing all non-compliances identified during the month, the corrective actions taken, and their current status (Open/Closed).

5. Training & Consultation

- Summary of all E&S training conducted (e.g., toolbox talks, inductions).
- Summary of any community consultations or public notifications issued.

6. Annexes

- Copies of all Weekly E&S/OHS Site Inspection Checklists for the month.
- Photographic Log (dated photos of good practices and non-compliances).
- Copies of Training Records (attendance sheets).
- Updated Grievance Logs (Worker and Community).
- Copies of all waste/spoil disposal receipts.

Purpose: To be maintained by the Contractor's designated personnel (e.g., Community Liaison Officer) and reviewed weekly by the PMSC. This log tracks all complaints from receipt to resolution.

[illegible]

APPENDIX 6 – GUIDANCE NOTE ON THE PREPARATION OF CONTRACTOR’S ENVIRONMENTAL AND SOCIAL MANAGEMENT SUB-PLANS

1.0 Purpose

This Guidance Note provides the minimum requirements for the key management sub-plans that the Contractor must prepare as part of their comprehensive, site-specific Contractor’s Environmental and Social Management Plan (C-ESMP). Its purpose is to ensure a consistent and high-quality approach to managing the specific E&S risks of the Water Sector Component. All sub-plans must be submitted to the PIU/PMSC for approval before the commencement of any related civil works.

2.0 Key Sub-Plans and Minimum Content

2.1 Waste and Spoil Management Plan

- **Objective:** To ensure all project-generated waste and spoil are managed in a manner that prevents pollution and complies with national regulations.
- **Minimum Content:**
 - Waste Stream Identification: An inventory of all anticipated waste streams (e.g., excavated spoil, old pipes, domestic waste from camps, hazardous waste like used oil).
 - Spoil Management: A plan for maximizing the reuse of suitable excavated spoil. It must identify the specific, approved Thimphu Thromde disposal site for all surplus spoil and detail the haulage routes.
 - Waste Segregation and Storage: A site layout plan showing the locations of designated, labelled, and covered waste segregation and storage areas.
 - Disposal Procedures: A description of the procedures for the disposal of each waste stream, including coordination with Thimphu Thromde’s municipal services for domestic waste and the use of licensed contractors for hazardous and e-waste.
 - Record Keeping: A system for tracking all waste from generation to final disposal, using weighbridge tickets or disposal receipts.

2.2 Spill Prevention and Response Plan

- **Objective:** To prevent and, if necessary, respond to any accidental spills of hazardous materials.
- **Minimum Content:**
 - Hazardous Materials Inventory: A list of all hazardous materials to be used on-site (e.g., fuel, lubricants, chemicals).
 - Prevention Measures: Details on the designated, secure, and bunded storage areas for all liquids (must be >100m from water bodies and have 110% containment capacity). Procedures for safe refueling and material handling.
 - Spill Response Preparedness: A map showing the locations of fully-stocked spill response kits at all key work sites and storage areas.

- Response Procedure: A clear, step-by-step procedure for immediate action in case of a spill (Stop, Contain, Notify, Clean-up, Dispose).
- Emergency Contact List: A list of all relevant personnel and authorities to be contacted in case of a spill (e.g., Contractor's OHS Officer, PIU, DECC).

2.3 Community Health & Safety Plan

- **Objective:** To manage all risks posed by construction activities to the public.
- **Minimum Content:**
 - Site Security and Hazard Management: Procedures for securely fencing all open trenches and excavation sites with hard barricades and clear warning signs, especially those left open overnight.
 - Safe Pedestrian Access: A plan for providing and maintaining safe, clearly marked, and well-lit temporary pedestrian pathways around all worksites, designed with universal access principles.
 - Public Communication Protocol: A procedure for implementing the project's Water Service Disruption Plan, including methods for providing advance public notification of any planned service shutdowns and details on the provision of alternative water supplies.
 - GRM Awareness: A plan for posting clear signage at all worksites with contact information for the Community Grievance Redress Mechanism (GRM).

2.4 Traffic Management Plan (TMP)

- **Objective:** To ensure the safety of road users and workers and to minimize traffic disruption, especially during trenching along public roads.
- **Minimum Content:**
 - Traffic Control Procedures: Site-specific traffic control layouts for all work zones on or near roads, showing the use of signage, cones, barriers, and trained flag persons.
 - Coordination: A protocol for coordinating all road works with Thimphu Thromde and the Royal Bhutan Police (Traffic Division).
 - Emergency Access: A specific procedure to ensure that access for emergency vehicles is maintained at all times.
 - Scheduling: A commitment to schedule the most disruptive works during off-peak traffic hours where feasible.

2.5 SCADA Installation Management Protocol

- **Objective:** To manage the specific risks associated with the installation of permanent, above-ground SCADA infrastructure.
- **Minimum Content:**
 - Siting Verification: A checklist confirming that the final location for any SCADA kiosk or chamber has been reviewed and approved by the PIU, particularly for sites near sensitive cultural heritage, to avoid physical and visual impacts.
 - Public Safety Measures: A standard design for the security of all above-ground kiosks, including robust fencing and clear signage warning of electrical hazards, to prevent unauthorized public access.

2.6 Biodiversity Management Protocol (for works within JDNP)

- **Objective:** To ensure all activities at the Dodeyna intake site are conducted with the highest level of environmental care and in full compliance with national park regulations.
- **Minimum Content:**
 - **Strict Adherence to Scope:** A confirmation that all works are limited to the approved, minor rehabilitation activities, with a zero-tolerance policy for any unapproved works or expansion of the site footprint.
 - **Contractor Site Discipline:** A strict set of rules for all personnel working at the site, including an absolute ban on hunting, fishing, littering, open fires, or any disturbance to flora and fauna.
 - **Waste Management:** A "pack-in, pack-out" policy for all waste generated at the site. No waste is to be left within the park boundary.
 - **Coordination Protocol:** A procedure for all communication and coordination with the relevant park authorities (Department of Forests and Park Services).

APPENDIX 7 – ENVIRONMENTAL AND SOCIAL SCREENING FORM

1. Basic Project Information

Project Component:	Livable and Resilient Cities Project (LRCP) – Water Supply Component
Country:	Bhutan
Project Location:	Thimphu City (Core Urban Area and Dodeyna Intake)
Implementing Agency:	Thimphu Thromde (TT) - PIU
Date of Screening:	July 24, 2025

2. Component Description

This component focuses on enhancing the resilience and reliability of Thimphu's urban water supply. The physical works are primarily rehabilitation and modernization of existing assets and include:

- Rehabilitation of the Dodeyna Water Intake: Minor, low-impact works (SCADA sensors, security fencing) within the Multiple Use Zone of Jigme Dorji National Park (JDNP). No expansion or new civil works.
- Transmission Line Protection: Slope stabilization (bio-engineering, retaining walls) to protect the existing ~14 km raw water pipeline from landslides.
- Distribution Network Rehabilitation: Replacement of old, leaky pipes, primarily through trenching within the rights-of-way of existing city streets. Much of this work will be co-located with the transport component's upgrades.
- System Modernization: Installation of SCADA hardware (sensors, meters, RTUs) at existing WTPs, reservoirs, and key pipeline junctions.

3. Project Setting and Baseline Context

The project is located in a dense urban environment and a sensitive natural area.

- Urban Setting: The distribution network rehabilitation will occur in the core of Thimphu, an area with high traffic density, numerous businesses and residences, and a complex network of existing underground utilities.
- Sensitive Natural Area: The raw water intake is located within Jigme Dorji National Park (JDNP), a protected area of high biodiversity value. The transmission line runs through hilly, forested terrain identified as being prone to landslides.

4. Initial Screening of Potential Environmental & Social Risks and Impacts

Risk / Impact Category	Description of Potential Risk
Environmental Risks	
Biodiversity (ESS6)	Minor, temporary disturbance to habitat at the Dodeyna intake site within JDNP. Risk is low due to the limited scope of works, but sensitivity is high due to the location. Potential for disturbance to fauna during slope stabilization works along the transmission line.
Pollution Management (ESS3)	Risk of soil erosion and sedimentation into streams from trenching and slope stabilization works. Potential for small-scale spills of fuel/lubricants from construction machinery. Improper disposal of old pipes (potentially asbestos-containing, though unlikely) and other construction debris.
Community Health & Safety (ESS4)	Safety hazards for the public from open trenches, construction traffic, and material storage in a dense urban setting. Potential for planned or accidental disruptions to the public water supply during pipeline tie-ins.
Social Risks	
Labor and Working Conditions (ESS2)	Occupational Health & Safety (OHS) risks for workers are significant, particularly from trench collapse and confined space entry into reservoirs and chambers.

Cultural Heritage (ESS8)	Risk of chance finds of previously unknown physical cultural resources during trenching activities in the historic urban core.
Land Acquisition & Resettlement (ESS5)	No permanent land acquisition or physical displacement is anticipated for this component, as all works will be conducted on existing sites or within existing public rights-of-way. Temporary economic displacement of businesses due to access restrictions during trenching is possible but will be managed through coordination with the transport component.

5. Initial Screening of Environmental and Social Standards (ESSs)

ESS	Standard	Relevance / Triggering	Justification
ESS1	Assessment and Management of E&S Risks	Relevant	The project has multiple E&S risks across different settings that require a consolidated management plan (this ESMP).
ESS2	Labor and Working Conditions	Relevant	The project will use contracted workers for civil works involving significant OHS risks (trenching, confined space entry).
ESS3	Resource Efficiency and Pollution Prevention	Relevant	Construction will generate waste (old pipes, spoil) and presents risks of erosion and spills.
ESS4	Community Health and Safety	Relevant	Trenching in a dense urban area poses direct safety risks to the public and can disrupt essential water services.
ESS5	Land Acquisition & Resettlement	Relevant (for screening)	While no permanent impacts are expected, the potential for temporary economic disruption requires that ESS5 be considered and managed, primarily through coordination and the project's GRM.
ESS6	Biodiversity Conservation	Relevant	Works are located within a National Park (JDNP), a high-value biodiversity area, triggering the standard.
ESS7	Indigenous Peoples	Not Relevant	The screening confirms that there are no groups in the project area that meet the ESS7 criteria for Indigenous Peoples.
ESS8	Cultural Heritage	Relevant	Excavation works in the urban core carry a risk of encountering previously unknown physical cultural resources, requiring a Chance Finds Procedure.
ESS10	Stakeholder Engagement	Relevant	The project will affect city residents and businesses through construction disruptions, requiring robust stakeholder engagement and a functional GRM.

6. Proposed Environmental and Social Risk Classification (ESRC) for the Water Component

PROPOSED ESRC: MODERATE

Justification for Rating:

While the overall LRCP project is rated 'Substantial', the Water Supply Component on its own is proposed to be classified as 'Moderate'. This is because:

- The project's physical footprint is limited, and the works consist primarily of the rehabilitation of existing assets, with no new large-scale infrastructure or significant land acquisition.
- The potential environmental and social risks (e.g., OHS from trenching, community disruption, pollution) are well-understood, site-specific, and can be readily managed through the implementation of standard, good-practice mitigation measures as outlined in this ESMP.
- The highly sensitive works within the JDNP are minor in scale and low-impact, with risks that can be effectively controlled through strict site protocols and coordination with park authorities.