

Initial Environmental Examination

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Bangladesh: Cluster Towns Water Supply and
Sanitation Project

Ishwardi Cluster

CURRENCY EQUIVALENTS

(As of 15 June 2026)

Currency Unit	–	Bangladeshi Taka (BDT)
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\$ 1.00	=	BDT 122.5957

ABBREVIATIONS

ACM	-	Asbestos Containing Materials
ADB	-	Asian Development Bank
BCCSAP	-	Bangladesh Climate Change Strategy and Action Plan
BWDB	-	Bangladesh Water Development Board
CHS	-	Community Health and Safety
CTWSSP	-	Cluster Town Water Supply and Sanitation Project
CuCC	-	Cumilla City Corporation
CWIS	-	City-Wide Inclusive Sanitation
DED	-	Detailed Engineering Design
DMA	-	District Metering Area
DoE	-	Department of Environment
DPHE	-	Department of Public Health Engineering
EARF	-	Environmental Assessment and Review Framework
ECA	-	Ecologically Critical Area
ECC	-	Environmental Clearance Certificate
ECR	-	Environment Conservation Rules
EIA	-	Environmental Impact Assessment
EMoP	-	Environmental Monitoring Plan
EMP	-	Environmental Management Plan
ESMS	-	Environmental and Social Management System
FGD	-	Focus Group Discussion
FSM	-	Fecal Sludge Management
GIS	-	Geographical Information System
GoB	-	Government of the People's Republic of Bangladesh
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GWTP	-	Groundwater Treatment Plant
IBAT	-	Integrated Biodiversity Assessment Tool
IEE	-	Initial Environmental Examination
INGO	-	Independent Non-Governmental Organization
KBA	-	Key Biodiversity Area
KII	-	Key Informant Interview
LCC	-	Location Clearance Certificate
LGD	-	Local Government Division
LGED	-	Local Government Engineering Department
MHM	-	Menstrual Hygiene Management
MSL	-	Mean Sea Level
NRW	-	Non-Revenue Water
O&M	-	Operation and Maintenance

OHS	- Occupational Health and Safety
OHT	- Over Head Tank
PAM	- Project Administration Manual
PCR	- Physical Cultural Resources
PIU	- Project Implementation Unit
PMSC	- Project Management and Supervision Consultant
PMU	- Project Management Unit
PSC	- Project Steering Committee
PTW	- Production Tube Well
REA	- Rapid Environmental Assessment
ROW	- Right of Way
SCADA	- Supervisory Control and Data Acquisition
SEAH	- Sexual Exploitation, Abuse and Harassment
SEMP	- Site-specific Management Plan
SEMR	- Semi-Annual Monitoring Report
SPS	- Safeguard Policy Statement
SWM	- Solid Waste Management
SWTP	- Surface Water Treatment Plant
ToR	- Terms of Reference
UFW	- Unaccounted for Water
UIIPF	- Urban Infrastructure Improvement Preparatory Facility
UNDP	- United Nations Development Program
WASA	- Water Supply and Sewerage Authority
WB	- The World Bank
WHO	- World Health Organization of the United Nations
WSS	- Water Supply and Sanitation

NOTE

In this report, "\$" refers to United States dollars.

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EXECUTIVE SUMMARY

Bangladesh is experiencing rapid urbanization, with the urban population rising from 31.1 million in 2001 to 53.8 million by 2022. This demographic growth has placed severe pressure on urban water supply and sanitation infrastructure, which remains significantly underdeveloped. As of 2024, only 32% of the urban population had access to piped water supply connections, and an equivalent proportion had access to safely managed sanitation facilities. Non-revenue water (NRW) across project towns is estimated to exceed 50%, attributable to aging infrastructure, absence of pressure management, inadequate metering, and poor asset management practices.

To address these challenges, the Government of Bangladesh has requested the Asian Development Bank (ADB) to support the Cluster Towns Water Supply and Sanitation Project (CTWSSP). This project employs a cluster approach to deliver safe, reliable, and climate-resilient water supply and sanitation services to one city and seven towns organized under two geographic clusters: the Cumilla Cluster, comprising Cumilla City Corporation (CuCC) and the *Paurashavas* of Hajiganj, Chandpur, and Laksam; and the Ishwardi Cluster, comprising the *Paurashavas* of Ishwardi, Pabna, Nator, and Gopalpur. The combined population across all eight project towns was approximately 1.2 million in 2022 and is projected to reach 1.55 million by 2045.

The Cluster Towns Water Supply and Sanitation Project will improve the resilience, quality, sustainability, and coverage of urban water services in the Ishwardi Cluster, comprising the *Paurashavas* of Ishwardi, Pabna, Nator, and Gopalpur. The subproject will support priority investments in water supply and sanitation infrastructure, including rehabilitation and improvement of existing facilities, development of new or upgraded production, treatment, storage, transmission, distribution, and service connection systems, and associated sanitation and environmental management interventions. The Department of Public Health Engineering will serve as the executing agency, with the relevant *Paurashavas* and project implementation arrangements supporting implementation, operation, and maintenance.

Based on the environmental screening and assessment undertaken, the Ishwardi Cluster subproject is classified as environment Category B. The anticipated adverse impacts are site-specific, largely temporary or reversible, and manageable through good engineering design, careful construction planning, and effective implementation of the Environmental Management Plan. No Category A impacts are anticipated, provided that the final design remains within the assessed scope and any additional or materially changed components are screened and assessed before implementation. The present Initial Environmental Examination (IEE) pertains exclusively to the water supply and sanitation subproject within the Ishwardi Cluster. The Department of Public Health Engineering (DPHE) will serve as the executing agency and *Paurashavas* of Pabna, Ishwardi, Gopalpur and Natore will be the key implementing agencies for Ishwardi cluster. This IEE has been prepared in accordance with the ADB Safeguard Policy Statement (SPS) 2009 and the environmental laws and regulations of the Government of Bangladesh.

Scope of the Ishwardi Cluster Subproject.

The Ishwardi Cluster subproject covers four municipalities in north-eastern Bangladesh: Pabna *Paurashava*, Ishwardi *Paurashava*, Gopalpur *Paurashava*, and Natore *Paurashava*. These towns lie along and near the Dhaka–Rajshahi high-value economic corridor, designated as a priority development area by the Government of Bangladesh. The total estimated population

served by the proposed subproject area is approximately 366,775 people, as per the census of 2022. The project area of influence for environmental impact assessment is defined as a direct impact zone of up to 50 meters and an indirect impact zone of 50 to 100 meters from pipeline alignments, PTW sites, OHT sites, and other non-linear components.

The subproject will cover the following:

- Construction of approximately 742 kilometers of distribution network with 24,500 metered household connections prioritizing low-income communities, slums, and informal settlements where feasible to improve equitable access to safe water supply in the town and *Paurashavas* of Ishwardi Cluster. Volumetric metering and district metered area (DMA) approaches will be introduced to improve operational efficiency and reduce nonrevenue water;
- Rehabilitation of six (6) existing overhead storage tanks (OHT);
- Construction of five (5) new OHTs;
- Rehabilitation of two (2) existing iron removal plants (IRP); and
- Rehabilitation of thirty-seven (37) existing production tube wells (PTWs);
- Replacement of five (5) existing PTWs;
- Construction of three (3) new PTWs;
- Construction of four hundred (400) pit latrines; and
- Construction of two (2) public toilets.

Additional cross-cutting infrastructure includes the installation of a Supervisory Control and Data Acquisition (SCADA) system for automation and operational monitoring, GIS-based digital asset management, and DMA-based pressure management systems across all four municipalities. A phase-wise approach will be implemented to fully rehabilitate and improve the whole water supply system in Ishwardi cluster due to budget constraints of the government. The government has limited funds so that all construction and rehabilitation activities cannot be accommodated or implemented at the same time. Thus, the subproject will initially cover the improvement of existing water supply infrastructures. Other rehabilitation activities such as the upgrading of surface water intake and main transmission lines will be considered in subsequent projects when additional government counterpart funding becomes available. Regardless of this phase-wise approach, the subproject will have many small excavation and construction activities covering approximately 65 sq km within the busy areas of the *Paurashavas* of Pabna, Ishwardi, Gopalpur and Natore.

Environmental Categorization and Regulatory Requirements.

The subproject has been screened in accordance with the ADB Safeguards Policy Statement (SPS) 2009 and classified as Category B for environment. This categorization is appropriate because the potential environmental impacts are expected to be site-specific, limited in scale, largely temporary or reversible, and readily manageable through standard mitigation and environmental management measures. Accordingly, an IEE with an Environmental Management Plan (EMP) is required.

In compliance with the statutory laws of Bangladesh, including ECA 1995 and Environmental Conservation Rules (ECR) 2023, the subproject is classified under Orange Category. This classification requires the preparation of an IEE, EMP, and issuance of an environmental clearance certificate (ECC) from the Department of Environment (DOE). DPHE will obtain one

ECC that will cover all subprojects, which include the Cumilla Cluster subproject. No major gaps exist between GoB regulations and ADB SPS requirements for this subproject.

Baseline Environmental Conditions. The subproject area is predominantly built-up and densely urbanized. Field surveys and desktop assessments identified 68 terrestrial floral species (34 trees, 25 herbs, 9 shrubs) and 30 aquatic faunal species, including amphibians, reptiles, birds, mammals, and freshwater fish. No national parks, wildlife sanctuaries, game reserves, or Ecologically Critical Areas (ECAs) are located within or adjacent to the subproject sites.

The Ishwardi Cluster lies within the floodplains of north-eastern Bangladesh, characterized by predominantly flat, low-lying terrain typical of the Bengal Delta. The towns are situated within the Padma system floodplain. Soils are composed largely of alluvial deposits. Ambient air quality measurements confirm levels broadly consistent with national standards, though localized exceedances exist in high-traffic urban corridors. Noise levels in commercial zones approach or exceed permissible limits during peak hours. Groundwater quality assessments indicate low to moderate mineralization, with chloride concentrations of 15–100 mg/l and total dissolved solids of 200–615 mg/l, both within national standards; arsenic has not been identified as a dominant concern. Surface water quality across the Ichamoti-Padma river system ranges from poor to very poor according to the Water Quality Index, with elevated turbidity, fecal coliform levels, and organic loads, particularly during the dry season.

Current piped water supply service coverage across the cluster is approximately 17% of the total population, with NRW exceeding 50%. The distribution network is aging, with frequent leakages, poor pressure management, and inadequate metering. Water quality does not consistently meet national standards. Sanitation services, particularly fecal sludge management, remain underdeveloped. Women bear disproportionate burdens from inadequate water access, both in time expenditure for water collection and in increased caregiving responsibilities arising from waterborne illnesses.

Assessment of Environmental Impacts and Proposed Mitigation Measures. A systematic initial environmental examination was conducted for all project phases using a structured significance matrix based on impact magnitude, spatial extent, reversibility, likelihood, and receptor sensitivity.

The environmental assessment considered the design, pre-construction, construction, post-construction, and operation stages of the proposed subproject. It reviewed the existing environmental setting, applicable regulatory requirements, potential impacts and risks, existing facilities requiring rehabilitation or integration, stakeholder views, and institutional arrangements for environmental management. The assessment confirms that the main construction-phase impacts are expected to relate to excavation and pipe-laying works, temporary traffic disruption, dust and noise generation, management of excavated materials and construction waste, worker and community health and safety, protection of utilities and access, and site reinstatement. These impacts can be effectively mitigated through traffic management, dust suppression, spoil and waste management, occupational and community health and safety controls, utility coordination, reinstatement of disturbed areas, and timely public notification.

Operation-phase impacts are expected to be limited and manageable, provided that the water supply and sanitation systems are operated and maintained in accordance with design standards, regulatory requirements, and the EMP. Key operational risks include water source sustainability, sludge and wastewater management, energy use, chemical handling where

applicable, occupational health and safety, emergency preparedness, and continued performance of rehabilitated assets. These risks will be managed through routine monitoring, preventive maintenance, operator training, environmental compliance procedures, emergency response arrangements, and periodic reporting.

Potential impacts on the physical environment. Impacts on air quality, acoustic environment, surface water and groundwater quality, waste disposal, and other forms of nuisance during construction phase are like impacts expected from other construction activities elsewhere, which can be mitigated through good international construction and engineering practices. Mitigation measures to avoid all potential impacts are included in the EMP. During the pre-construction phase, the Contractor/s will develop its/their respective site-specific EMPs (SEMPs) and other allied work plans (e.g. traffic management plan for the distribution network component), following applicable international best practices that will include World Bank's EHS Guidelines on Construction and Decommissioning Activities.¹

Potential impacts on physical cultural resources. None of the existing non-linear components (OHTs, DTWs) is located near or adjacent any internationally or nationally protected physical cultural resources (PCRs) or heritage sites. However, the alignments of the distribution network will pass through many roads in residential and commercial areas, including local PCRs that were identified during site surveys. Easements and rights of way separate the boundaries of these PCRs from the roads where civil works will be undertaken. These easements and rights of way have varying widths, which are deemed enough to ensure pipelaying during construction phase will not impact the PCRs. Typical and inherent in community setting in Bangladesh are properties or structures, such as mosques or prayer areas, built very near the boundaries of roads. For works in these relatively constricted or congested areas, the excavation protocols known in the construction industry to avoid or mitigate impacts to structures will be implemented and included in the EMP. Additionally, the horizontal directional drilling (HDD) method will be utilized as much as possible to avoid any impact particularly in the congested or busy areas. Where the HDD method is not suitable as per the site condition, then open trench excavation method shall be used, but with mitigation measures specified in the EMP. A detailed chance finds procedure has also been developed to ensure any heritage assets found along the excavation sites are preserved or handled properly per Bangladesh Department of Archaeology. These procedures and protocol are discussed and outlined in this IEE report.

Potential impacts due to asbestos cement (AC) pipes. The existing distribution system in the Ishwardi cluster has some pipelines made of AC pipes. Therefore, the subproject implementation may also deal with potential handling of AC pipes during rehabilitation works. Although the general methodology is abandonment of existing AC pipes, no asbestos cement pipe will be extracted from the existing alignments. Any replacement pipes will be installed at specific portions of the alignments that will ensure the existing AC pipes are not disturbed. However, as a precautionary measure for any unwarranted event and accidental exposure to asbestos, the subproject will follow specific mitigation measures on handling and disposal of the AC pipes.

Potential impacts on biodiversity. Despite being in a built-up and developed urban area, the subproject sites have been assessed in terms of biodiversity. The Integrated Biodiversity Assessment Tool (IBAT) screening confirmed no direct overlap with legally protected areas or

¹ IFC World Bank Group. 2007. [Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning](#).

World Heritage Sites within a 1-km buffer. The IBAT screening did not trigger an automatic Critical Habitat determination, though the presence of threatened species in the wider landscape warrants continued vigilance during implementation. Subproject sites are entirely within developed urban areas, and no component will be located within the Ichamoti-Padma and Chalanbeel zones where sensitive aquatic species are known to habitat.

The overall conclusion is that no critical or high-significance adverse impacts are anticipated after implementation of the proposed mitigation measures. All impacts are classified as site-specific, temporary or reversible, and manageable through good engineering and environmental management practices.

Environmental Management Plan. The EMP prescribes a comprehensive set of mitigation, management, and monitoring measures for each subproject phase, covering air quality, noise, surface and groundwater quality, solid waste, physical cultural resources, community and occupational health and safety, ecological resources, and socioeconomic parameters. Environmental monitoring activities include listing environmental samples (air quality, noise, and water quality) to be examined at least twice annually during pre-construction, construction and operation phases of the subprojects.

The indicative cost estimate for EMP implementation for the entire Ishwardi Cluster has been prepared and will be incorporated into the contract documents as part of the contractor's obligations. The total estimated EMP implementation budget is USD450,252 (equivalent to BDT 55.381 million), and this estimate is indicative. Any shortfall identified during implementation shall be supplemented from the provisional sum of the Contractor's contract.

This IEE report will form part of bidding and contract documents and be verified by PMU. The contractors shall not commence or undertake any construction work until PMU confirms that the final IEE report has been cleared by ADB, and all statutory clearances, including the ECC is obtained. The contractors will be required to designate a full-time environment, health and safety (EHS) officer (or equivalent) to ensure implementation of EMP during construction works. The contractors will also be required to submit to PMU/PIU, for review and approval, their respective site-specific environmental management plans (SEMPs) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program per EMP; and (iv) budget for SEMP and EMP implementation. No work can commence until SEMP is approved by PMU/PIU.

Consultation, Disclosure and Grievance Redress. Consultations have been conducted throughout the study to ensure that the knowledge, experience, and views of stakeholders and the public are considered during the IEE work. Environmental and social safeguards consultants of ADB and DPHE conducted 25 stakeholder and public consultation meetings across the four Ishwardi cluster towns during project preparation. These meetings engaged community members, local government officials and community women. The IEE report and associated environmental safeguard documents will be formally disclosed on both the ADB website and the DPHE website upon ADB clearance. Summary documents will be translated into Bangla and disseminated at Paurashava and ward offices, public notice boards, and contractor site offices throughout implementation. A structured three-tier Grievance Redress Mechanism (GRM) will be established to provide an accessible, inclusive, gender-sensitive, and culturally appropriate platform for receiving and resolving project-related complaints. All grievances will be fully documented, tracked, and reported in Semi-Annual Environmental Monitoring Report (SEMR) which will be submitted to ADB and disclosed publicly during the implementation phase.

Monitoring and Reporting. During the implementation phase, DPHE/PMU is required to prepare and submit SEMR to ADB. Each SEMR will describe progress in EMP implementation, document environmental compliance and non-compliance issues, record corrective actions taken, and report on GRM activities. After the implementation phase, annual reporting to ADB will continue until ADB issues a Project Completion Report.

Conclusions. It is envisaged that the proposed subproject will contribute to providing reliable and sustainable water supply services in the Ishwardi Cluster. Once implemented, the subproject will have direct benefits to the people of the four municipalities in the cluster, with a reliable and sustainable piped drinking water supply.

The IEE for this subproject has been undertaken based on the location of the SWTPs, PTWs, OHTs, and distribution network; and on initial or preliminary design prepared for the rehabilitation and upgrading of these components. The baseline environmental conditions have been gathered with respect to the subproject locations and the cluster, and all potential impacts to the environment as a result of implementing the subproject have been identified. Based on these impacts, corresponding mitigation measures have been developed and compiled in the EMP.

The overall conclusion of the IEE is that the Ishwardi Cluster subproject is environmentally feasible, provided that all mitigation, monitoring, consultation, audit corrective actions, and institutional requirements set out in the IEE and EMP are fully implemented. The subproject is expected to generate significant positive benefits by improving access to safe, reliable, and climate-resilient water supply and sanitation services, while the potential adverse environmental impacts can be avoided, minimized, mitigated, and monitored through the measures specified in this IEE.

During construction phase, the subproject will only involve straightforward civil works, and operation phase will only involve common or traditional maintenance works for water supply infrastructures, so impacts will be mainly localized. These impacts can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures in the EMP. On a positive note, the IEE process also confirms the beneficial impacts of the subproject over the long term, with a reliable and sustainable piped drinking water source for the people of Ishwardi Cluster.

Recommendations. During the finalization of the design, the DPHE technical design team shall ensure sustainability of the subproject in terms of the supply and quality of raw water, including the quality of treated water which should comply with the Bangladesh National Drinking Water Quality Standards. In view of the environmental audit conducted on the existing facilities, the following corrective actions are recommended for consideration in conjunction with other environmental safeguard measures in the final detailed design and operations of the future water supply system.

Issue	Mitigation Measures	Responsible Agency
Unsustainable dependence on groundwater; heavy metals (iron, manganese, arsenic) contamination	• Install iron/manganese removal units and arsenic-safe treatment technologies. • Diversify sources by shifting to surface water. • Introduce demand management (metering, leakage reduction, tariffs). • Regular monitoring against Bangladesh	DPHE

	National Drinking Water Standards.	
Non-compliance with national drinking water quality standards	• Upgrade treatment plants to meet Bangladesh National Drinking Water Quality Standards. Upgrade designed for worst case water quality of Padma River in the medium to long term. This may include, among others, additional coagulation, sedimentation, filtration and disinfection units. • Introduce standard operating procedures for chemical dosing, monitoring, and emergency handling. • Implement wellhead protection zones to prevent contamination.	DPHE
Distribution network leakage and non-revenue water	• Replace aging PVC pipelines with HDPE/ductile iron. • Implement DMAs. • Prioritize repair of high-leakage zones.	DPHE
Inadequate manpower and institutional capacity	• Provide consultant support in the interim. • Build staff capacity for monitoring, preventive maintenance, record-keeping. • Training on safeguards and occupational safety.	Paurashavas, supported by DPHE/ADB

During pre-construction phase, the contractor/s shall prepare the following required work plans and submit to PIU, through the PMU or PMSC, for approval. No work shall commence until any relevant or required work plan is approved, which includes, among others, the following:

- Site-Specific Environmental Management Plan (SEMP);
- Emergency Preparedness and Response Plan;
- Utility Protection and Relocation Plan;
- Spill Prevention and Response Plan;
- Camp Management Plan (if camps used);
- Traffic Management Plan;
- Spoil Management Plan;
- Waste Management Plan; and
- Health and Safety Management Plan (Community and Occupational).

This IEE needs to be updated during the detailed design phase to reflect the final design ensuring compliance with the design measures suggested in this document, including measures to ensure sustainability of the drinking water supply system. The updated IEE shall be submitted to ADB for review, clearance and disclosure during detailed design phase but prior to start of construction. The cleared updated IEE shall be treated as the final IEE. No works can commence until (i) the final IEE cleared by ADB is provided to the contractor/s, and (ii) the SEMP, including other work plans, prepared by the contractor, is approved by PMU. If circumstances are required, the IEE will be further updated for ADB's review during the implementation period. In the event of unanticipated impact and/or any design change and/or non-compliance during subproject implementation period, the IEE shall be updated to include (i) assessment of the unanticipated impact and corresponding mitigation measures; and/or (ii) information on the design change and assessment of associated environmental impacts, if any; and/or (iii) corrective actions, associated cost and schedule; respectively. Further, the PMU shall:

- Include this IEE in the bidding and contract documents;
- Obtain all statutory clearances and ensure relevant conditions or requirements are incorporated in the detailed design;
- Update/revise this IEE based on final detailed design that ensures sustainability and/or if there are unanticipated impacts or significant change in scope in any component of the subproject;
- Conduct safeguards induction to the contractor/s after award of contract;
- Ensure contractor/s appoint/s qualified environment, health and safety (EHS) officer prior to start of works;
- Disclose information and establishment of GRM in a timely manner;
- Strictly supervise EMP implementation;
- Continue consultations with stakeholders; and
- Monitor and report status of implementation of the EMP on a regular basis as indicated in the IEE.

This IEE report has been prepared in accordance with ADB SPS requirements for projects classified as Category B for environment. With the above premises considered, the classification of Category B for environment is confirmed. Separately, ECR, 2023 of Bangladesh, the overall project is classified under “Orange” category. Hence, preparation of an IEE is required. Upon approval of the submitted IEE, ECC must be obtained from the DOE prior to award of contracts.

I. INTRODUCTION

A. Project Background

1. Bangladesh's urban population was 31.1 million in 2001, 35.1 million in 2011, and 53.8 million in 2022. Rapid urbanization is putting further pressure on already inadequate services and infrastructure. As of 2024, 32% of the urban population had a piped water supply connection to their home and the same amount (32%) had access to safely managed sanitation facilities. Inadequate urban services create significant public health risks and produce negative environmental impacts.

2. The Government of Bangladesh seeks to make quality urban infrastructure and services, underpinned by good urban governance, available to cater to rapid urbanization. The required urban sector investment is projected to grow from about 2.4% of gross domestic product (GDP) in fiscal year (FY) 2021 to 7.0% of GDP by FY2041. To cover increased investment needs, the government has set out three strategies: tax mobilization, private financing, and user-pays cost recovery for services such as water supply, sewerage, and solid waste disposal. For urban areas, plans include increasing tap-water connectivity from 40% to 100%, sewerage connectivity to 100% (no baseline), and water-sealed sanitary toilets from about 42% to 100% in the period 2018 to 2041, while also making solid waste and wastewater treatment plants available to all. The government has requested Asian Development Bank's (ADB) support to improve water supply and sanitation services in one city and seven towns (together the 'project towns') using a 'cluster approach'. The clusters are (i) Cumilla city corporation and the *Paurashavas* of Hajiganj, Chandpur, and Laksam under the Cumilla cluster; and (ii) the *Paurashavas* of Ishwardi, Pabna, Nator, and Gopalpur under the Ishwardi cluster. The towns lie within or near the Dhaka-Chattogram and Dhaka-Rajshahi high-value economic corridors, identified as priority development areas by the government. The combined population in these clusters was about 1.2 million in 2022; with future population increases assumed to be 50% less than in the years 2011 to 2022, this would climb to 1.55 million by 2045. The towns have been selected based on their inadequate water supply services, geographic proximity, and location along major river systems.

3. Water quality in the project towns generally fails to meet government standards, and overall piped service coverage remains low, reaching only about 17% of the total population across the eight project towns. Nonrevenue water (NRW) is estimated to exceed 50%, mainly due to inadequate metering, the absence of pressure management, poor asset operation and management, and the age of the distribution networks, i.e., deteriorated materials resulting in leakage. Revenues are insufficient for cost recovery because of poor billing systems and services that are not of sufficient quality to satisfy paying customers. Many treatment plants and overhead tanks require refurbishment or repair, and about half of groundwater production tube wells need refurbishment. Public toilets are limited and poorly maintained, while fecal sludge and solid waste services remain underdeveloped. In addition, the urban local bodies of the project towns lack sufficient technical and financial capacity to operate, maintain, and sustainably expand water supply and sanitation systems. The proposed project aims to address these challenges and deliver safe, reliable, and climate-resilient water supply and sanitation services for residents of high-growth secondary cities.

4. **Climate risks.** Bangladesh remains one of the most climate-vulnerable countries in the world, facing frequent hydro-meteorological hazards, such as monsoon flooding, tropical cyclones, and droughts, all of which are projected to intensify with climate change. Unplanned urbanization is occurring without due consideration of these and other emerging risks, such as

heatwaves, leaving infrastructure and land use in a state of constant vulnerability. The capacity of local governments to improve resilience is also limited by technical knowledge and financial resources. Although *Paurashava* and city corporation masterplans have been prepared to guide urban development, they are not legally binding and therefore lack enforceability for effective development control and climate adaptation. Strengthening climate resilience in the project towns will require technical training, updating of masterplans, and improving local government finances.

5. Proposed ADB funded CTWSSP will support safely managed, inclusive, and resilient drinking water and sanitation services in Cumilla Cluster comprising Cumilla City Corporation (CuCC), Laksam, Hajiganj and Chandpur Paurashava and in Ishwardi Cluster comprising Ishwardi, Pabna, Nator and Gopalpur Paurashava. Implementation of CTWSSP will be conducted in two phases, where Phase 1 will be of construction and rehabilitation of existing water supply infrastructures (PTWs, OHTs, SWTP and GWTP), DMA based water distribution networking, and institutional development and sanitation projects in Hajiganj Paurashava under Cumilla Cluster and Gopalpur Pourashva for Ishwardi Cluster. DPHE will be the executing agency of charge of these components. Respective city corporations and Paurashavas will be implementing agencies for water supply.

6. **Project objectives.** The proposed project aims to improve water, sanitation, and solid waste management services in the project towns, thereby improving public health, livability, and climate resilience. Specifically, the project will: (i) reduce NRW by rebuilding and optimizing distribution networks using a district metered area (DMA) approach; (ii) enhance availability of water; (iii) improve drinking water quality to comply with government standards; (iv) strengthen water service provider entities such that they achieve long-term cost-effective lifecycle-based service provision to set service standards; (v) strengthen municipal capacity for revenue enhancement; (vi) increase municipal capacity in incorporating climate resilience in masterplans, programs, projects, and operations; and (vii) promote gender equality by reducing women's unpaid water collection time, expanding access to safe sanitation, and enabling women's participation in water governance. The provision of reliable water supply will stimulate commercial activity in the project towns, stimulating private sector investment and job creation.

7. **Water supply development.** The project will rehabilitate and expand existing distribution networks to increase household connections and introduce volumetric metering to each household, along with a DMA approach. Overhead tanks and water treatment plants will be refurbished or upgraded as needed, while groundwater production tube wells will be refurbished or renewed and integrated into the overall system. In addition, where sustainable, additional utility-level water will be supplied through increased extraction from existing local surface sources, shifting groundwater extraction from private wells to public ones, development of possible rainwater harvesting systems, construction of surface water storage facilities, artificial aquifer recharge, savings from NRW reduction, and other innovative water sourcing methods. A supervisory control and data acquisition system will be installed to enhance automation, monitoring, and operational efficiency. To improve access and affordability in low-income communities and slum areas, the project will prioritize new connections to these areas. As new assets are constructed, the project will populate a digital asset management system to support strategic operations, investment planning, and improved O&M practices. Water quality will be improved by developing, implementing, and monitoring a robust water quality management system (e.g., adequate frequency of sampling, sufficient laboratories and equipment, testing, dissemination of test results, corrective actions on substandard results, etc.).

8. Sanitation and solid waste management improvement. The project will take a citywide inclusive sanitation (CWIS) approach to improving sanitation in the project towns to achieve a more comprehensive, effective, and sustainable services, as well as higher resource recovery. This will include constructing 400 household level twin pit latrines and public toilets facilities with gender-segregated design and features for menstrual hygiene management (MHM), ensuring safety, accessibility, and dignity for women and girls. Where feasible, women's groups will manage these facilities, that will be run on a fee basis. This shall include digitalizing records of septic tank locations, introducing a digital system for ordering fecal sludge collections and tracking payments for collection, introducing payment options at local kiosks, and setting collection fees according to service cost.

9. The Department of Public Health Engineering (DPHE) will be the executing agency, while Cumilla City Corporation and the seven participating *Paurashavas* will act as implementing agencies. A project management unit will be established within DPHE, and project implementing units will be formed.

10. Project execution arrangements. The Department of Public Health Engineering (DPHE) will be the executing agency, while Cumilla City Corporation and the seven participating *Paurashavas* will act as implementing agencies. A project management unit will be established within DPHE, and project implementing units will be formed.

11. The project area is in selected 8 towns, including Cumilla City Corporation and *Paurashavas* of Laksam, Hajiganj and Chandpur, Ishwardi, Pabna, Gopalpur and Nator. This IEE report is for the subproject covering the *Paurashavas* of Ishwardi, Pabna, Gopalpur and Nator, hereinafter referred to as "Ishwardi Cluster".

B. Project's Impact and Outcome

12. **Outcome statement:** Resilience, quality, sustainability, and coverage of urban water services improved in the Cumilla and Ishwardi clusters.

C. Project's Outputs

13. Anticipated outputs of the project are:

- (i) **Output 1: Resilient and inclusive urban water supply and sanitation infrastructure upgraded and expanded.** The project will rehabilitate and expand water supply systems through the construction, replacement, and rehabilitation of surface water and groundwater treatment plants, groundwater production tube wells, overhead storage tanks, and distribution networks. About 1,790 kilometers of water distribution network and 65,000 metered household connections will be installed, at least 10% of which will be for low-income communities, slums, and informal settlements.² A DMA approach will be introduced through the establishment of 78 DMAs to improve system monitoring, reduce nonrevenue water to below 20%, and support digital asset management. The project will rehabilitate 66 groundwater production tube wells, 15 overhead storage tanks and seven water treatment plants (four surface water-based and three groundwater-based) with a combined treatment capacity of 40 million liters per day (MLD), ensuring compli-

² The 65,000 household connections comprise 30,689 new household connections and 34,311 rehabilitated existing connections. Based on the holding (property) tax assessment records, on average, each household connection is expected to serve 3.4 households.

ance with national drinking water quality standards.³ It will construct 15 new groundwater production tube wells and 11 overhead storage tanks, and replace 19 groundwater production tube wells to enable continuous water supply with a minimum residual pressure of 10 meters at the distribution network end. Integrated supervisory control and data acquisition (SCADA) systems will be established in the project towns and DPHE headquarters to support real-time monitoring of water production, DMAs, customer services, and assets. The SCADA system will be implemented through a cluster approach that enables shared support services across project towns, strengthening operational efficiency and sustainable O&M.

The project will also construct about 1,200 twin-pit latrines and four public sanitation facilities with gender-responsive and disability-inclusive features, including menstrual hygiene management facilities in Hajiganj and Gopalpur.⁴ Locations for the public sanitation facilities will be selected in consultation with women from the communities to ensure safety and accessibility. The facilities will be leased to women, with priority given to sanitation workers and women from vulnerable communities, creating livelihood opportunities for women while supporting sustainable O&M.

- (ii) **Output 2: Sustainable water supply service delivery operationalized in project towns.** This output will strengthen the governance, institutional, operational, and financial capacity of DPHE, Cumilla City Corporation and local government authorities, and water supply service providers to improve the sustainability, performance, and climate resilience of urban water services through four areas of support:

- a. **Sustainable O&M of water supply systems.** A hybrid O&M model will combine the technical expertise of an O&M contractor with the local knowledge and community engagement of the water supply sections under DPHE oversight.⁵ The project will finance a 3-year O&M contract, with project towns expected to finance a subsequent 5-year O&M period. Formal agreements will define roles and responsibilities, staffing requirements, service standards, performance monitoring, and financing mechanisms, including tariffs and town budget allocations. The model will strengthen customer management, billing, DMA management, nonrevenue water reduction, water quality monitoring, and digital asset management.⁶

³ The groundwater treatment plants comprise three iron and manganese removal plants and one arsenic and iron removal plant.

⁴ Menstrual hygiene management facilities are toilets with privacy, water, soap, and appropriate facilities for changing and disposing of menstrual materials.

⁵ A hybrid O&M model is an approach in which operational responsibilities are shared between the public and private sectors and tailored to local institutional capacity and service delivery needs. The public utility typically retains responsibility for core utility functions, such as billing, customer management, and operational oversight, while the contractor undertakes specialized operational and technical functions, including DMA management, provides additional O&M personnel, and delivers on-the-job capacity enhancement. By balancing operational and commercial responsibilities, the model reduces implementation risk, strengthens local capacity, and improves the viability of private sector participation in water service delivery, making the approach appropriate for Bangladesh's evolving urban water supply sector.

⁶ The DMAs will be managed by the contractor through a dedicated DMA unit led by a DMA manager responsible for leakage control, pressure management, and flow monitoring.

- b. **Capacity development and water service planning.** The project will strengthen technical, operational, financial, and managerial capacity of water supply sections through classroom and on-the-job training. Water safety plans, 5-year water supply service improvement plans, that include DMA management plans, and groundwater monitoring plans will be prepared and implemented in all the project towns, supported by cluster-level technical assistance and peer-to-peer learning.
- c. **Institutional strengthening.** The project and the attached TA will support the establishment of the Cumilla WASA and its mission to deliver efficient, customer-oriented, and financially sustainable water services. The TA will assist the government in preparing the WASA charter, service rules, organizational structure, and other institutional arrangements required to operationalize the utility. In the remaining project towns, the project will strengthen ring-fencing of water supply accounts and update staffing structures.
- d. **Community engagement and behavior change.** The project will strengthen community participation and behavior change to promote household water connections, acceptance of metering and tariffs, registration of private wells, sustainable groundwater use, and equitable access to water services, particularly for women, girls, and vulnerable groups, and awareness of gender equality, personal safety, legal rights.⁷

D. Purpose of the Initial Environmental Examination

14. The overall objective of the initial environmental examination (IEE) is to provide guidance to the Department of Public Health Engineering (DPHE) (as the executing agency), participating *Paurashavas* (as the implementing units), project consultants and contractors on how to plan, build and operate in an environmentally responsible manner the subprojects that will (i) construct drinking water distribution network, (ii) construct of new drinking water overhead storage tanks, (iii) rehabilitate existing production tube wells (PTWs), including refurbishment or augmentation of corresponding treatment units, (iv) construct new PTWs, and (v) construct public toilets and household twin-pit latrines. The IEE will help ensure that all potential negative effects of subproject implementation are avoided or mitigated, and all positive impacts are enhanced. A set of actions that will need to be implemented to eliminate or at least reduce the environmental impacts to a level acceptable to ADB and Government of Bangladesh (GOB) are identified and planned during the assessment.

E. Methodology

15. This IEE report has been prepared based on preliminary design information, field investigations, stakeholder consultations, and literature and research papers to meet the requirements for environmental assessment process and documentation per ADB SPS, 2009. Environmental assessment was conducted through the following:

- (i) Primary data collection during site visits and secondary data from various sources, socio-economic, hydrological, topographic, and engineering surveys at subproject sites, meaningful consultation with the stakeholders, including concerned government officials, project personnel and the public;

⁷ The Integrated Urban Governance Improvement Project established town- and ward-level coordination committees and courtyard meetings to enhance community participation, strengthen governance, and improve service delivery.

- (ii) Appropriate assessment of impact of the subproject implementation on cultural and heritage assets, including other public- and private-owned structures, that may likely be disturbed or damaged during pipelaying works for the distribution network;
- (iii) Gathering of baseline information from most recent secondary sources on environmental quality such as air quality, noise level, surface water quality, and groundwater quality within the corridor of impact of the subproject, and against which predictions of changes to these environmental media during the construction period will be compared in order to assess such changes, if any, and their significance; and
- (iv) Screening and assessing potential risks on the biological environment, which include the protected areas or critical habitats that may exist around the subproject sites.

16. Initial scoping and field reconnaissance visits were conducted at subproject sites, to establish the potential impacts and categorization of subproject activities. Formal and informal consultation activities were conducted with the community, and other stakeholders of the subproject. The methodology of the IEE study was then conveyed and elaborated to these stakeholders and discussed all potential impacts and corresponding mitigation measures to address or bring the magnitude of these impacts to acceptable levels.

F. Structure of the Report

17. The report has been structured in compliance with ADB SPS, 2009.

- (i) **Executive Summary.** This section describes concisely the critical facts, significant findings, and recommended actions.
- (ii) **Introduction.** Presents a brief overview of the overall project along with its background, objectives, and purpose and specific subproject scope of the IEE, among others.
- (iii) **Policy, Legal, and Administrative Framework.** This section discusses both ADB SPS and GOB's national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which GOB is a party.
- (iv) **Description of the Subproject.** This section describes the proposed subproject in terms of its major components, geographic location, and interaction with the environment in terms of ecological, socio-cultural, and economic standpoint, etc., including any associated facility required by and for the subproject.
- (v) **Description of the Environment.** This section describes relevant physical, biological, and socio-economic conditions within the subproject area. It also looks at current and proposed development activities within the subproject area of influence, including those not directly connected to the subproject. It indicates accuracy, reliability, and sources of data.
- (vi) **Anticipated Environmental Impacts and Mitigation Measures.** This section predicts and assesses the subproject's likely positive and negative direct and indirect impacts to physical environment, biological environment or ecology, socioeconomic environment (including occupational health and safety, community health and safety, and impacts on livelihoods through environmental media), and physical cultural resources in the subproject's area of influence, in qualitative and quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores

opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not require further attention; and examines global, transboundary, and cumulative impacts as appropriate.

- (vii) **Information Disclosure, Consultation, and Participation.** This section (i) describes the process undertaken during subproject design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders; (ii) summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in subproject design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women; and (iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during subproject implementation.
- (viii) **Grievance Redress Mechanism.** This section describes the grievance redress mechanism that will be adopted under the subproject, which includes the timeframe and mechanisms for resolving complaints about environmental performance.
- (ix) **Environmental Management Plan.** This section deals with the set of mitigation and management measures to be taken during subproject implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions (mitigation, monitoring, and performance indicators).
- (x) **Monitoring and Reporting.** Outlines the environmental monitoring program and reporting system, including the cost of implementing the EMP.
- (xi) **Conclusion and Recommendations.** Presents the conclusion and recommendations of the IEE study.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Safeguard Policy Statement

18. ADB SPS requires borrowers to meet a set of requirements (Safeguards Requirements 1) when delivering environmental safeguards for projects supported by ADB. The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process. Hence, the project is required to comply with these requirements. Summary of the step-by-step process is discussed below in this section. Detailed discussions are provided in the ADB SPS.⁸

19. **Screening and categorization.** The proposed overall project will need to be assigned with one of the following environmental categories per ADB SPS:

- (i) **Category A.** The project is likely to have significant adverse environmental impacts that are diverse, irreversible, and unprecedented. Impacts may affect an area larger than the sites or facilities subject to physical work. A full-scale environmental impact assessment (EIA) has to be undertaken, which includes an

⁸ ADB. 2009. [Safeguard Policy Statement](#). Manila.

- environmental management plan (EMP) that must be prepared by the borrower/client.
- (ii) **Category B.** The project's potential environmental impacts are less adverse and fewer in number than those in category A. Impacts are site-specific, and only few of which, if any, are irreversible. Impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE) must be undertaken, which includes an EMP that must be prepared by the borrower/client.
 - (iii) **Category C.** The project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, but a desk review of the project's environmental implications will need to be conducted.
 - (iv) **Category FI.** The project involves the investment of ADB funds to or through a financial intermediary. An environmental and social management system is required.

20. The project will need to be screened for its expected environmental impacts and is assigned to a specific category as enumerated above. Screening and categorization are needed for each subproject or component. Final categorization for the overall project is to be based on the most environmentally sensitive subproject or component. ADB will officially confirm this final categorization prior to its approval of the project.

21. For the proposed subproject, initial screening using ADB REA checklist indicates that the subproject will not cause any significant negative environmental impacts and that most impacts are site specific, temporary, and therefore the subproject is classified as Category B for Environment per ADB SPS. See Appendix 1 for the REA checklist accomplished.

22. If during the full environmental assessment stage that one or more of the subproject's components can trigger Category A or with potentially significant adverse impacts that are diverse, irreversible, and unprecedented, the executing agency and/or implementing agency shall examine alternatives to the subproject's location, design, technology, and components that would avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks, and to meet Category B categorization. The rationale for selecting the subproject location, design, technology, and components will be properly documented, including cost-benefit analysis, taking environmental costs and benefits of the various alternatives considered into account. The "no action" alternative will be also considered.

23. **Environmental Assessment.** The executing agency will conduct the appropriate environmental assessment based on the categorization of the project. Environmental assessment shall include description of environmental and social baselines to provide an understanding of current conditions forming the benchmark against which project impacts are assessed. Environmental impacts and risks will be analyzed for all relevant stages of the project cycle, including design and planning stage, construction, operations, decommissioning, and post-closure activities such as rehabilitation or restoration. The results of the environmental assessment including other activities per requirements of ADB SPS shall be translated into written report in the form of an IEE report, with suggested and typical outline in Appendix 2.

24. **Environmental Planning and Management.** The executing agency and/or implementing agency shall prepare environmental management plan (EMP) to be included in the IEE report. The EMP shall describe and address the potential impacts and risks identified by the environmental assessment. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

The EMP shall include the proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

25. **Public Disclosure.** The executing agency shall submit the following environmental safeguard documents to ADB for disclosure on ADB website so affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:⁹

- (i) final IEE upon receipt;
- (ii) a new or updated IEE and corrective action plan prepared during project implementation, if any; and
- (iii) environmental monitoring reports submitted during project implementation upon receipt.

26. The executing agency shall also disclose the same environmental safeguard documents on its website.

27. **Consultation and Participation.** Executing agency and implementing agency shall carry out meaningful consultation¹⁰ with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

28. **Grievance Redress Mechanism.** The executing agency and implementing agency shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the project. As of the ADB loan processing for the project, a Grievance Redress Mechanism covering the subproject has been established and discussed in detail in Section VI below.

29. **Monitoring and Reporting.** Executing agency and implementing agency shall monitor, measure and document the progress of implementation of the EMP. If necessary, the executing agency and/or implementing agency will identify the necessary corrective actions and reflect them in a corrective action plan. During implementation phase (i.e. from effectivity date of the project up to the applicable period of operation phase), executing agency will prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. After the implementation phase, reporting to ADB will continue at the minimum on an annual basis until ADB issues a project completion report.

⁹ Per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

¹⁰ Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

30. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during project implementation, executing agency shall update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

31. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the project, the executing agency and implementing agency shall ensure that pollution prevention and control technologies and practices consistent with international good practices are applied. When the Government of Bangladesh regulations differ from these levels and measures, the project shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project or subproject circumstances, the executing agency will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

32. **Occupational Health and Safety.** The executing agency and/or implementing agency¹¹ shall ensure that workers¹² are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the project work areas, including physical, chemical, biological, and radiological hazards. Executing agency and/or implementing agency shall ensure to take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

33. Implementing agency shall ensure to apply preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's *Environmental, Health and Safety Guidelines*.¹³

34. **Community Health and Safety.** Executing agency and/or implementing agency shall ensure to identify and assess the risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the project, and will establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

35. **Physical Cultural Resources.** The executing agency and/or implementing agency is responsible for siting and designing the project to avoid significant damage to physical cultural resources. Such resources likely to be affected by the project will be identified, and qualified and experienced experts will assess the project's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a project component is in areas where physical cultural resources are

¹¹ In case where responsibility is delegated to project Contractors during construction phase, executing agency and/or implementing agency shall ensure that the responsibilities on occupational health and safety as described herein are included in the contract documents.

¹² Including nonemployee workers engaged by the borrower/client through Contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

¹³ World Bank Group, 2007. *Environmental, Health, and Safety General Guidelines*. Washington, DC.

expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

36. **Environmental Audit.** When the project involves existing activities or facilities, executing agency and/or implementing agency is responsible to ensure that relevant external experts will perform environmental audits to determine the existence of any areas where the project may cause or is causing environmental risks or impacts. If the project does not foresee any new major expansion, the audit constitutes the environmental assessment for the project.

37. **Bidding and Contract Documents.** IEE report with EMP is to be included in bidding and contract documents and verified by the executing agency and/or implementing agency. The executing agency and/or implementing agency shall also ensure that bidding and contract documents include specific provisions requiring Contractors to (i) comply with all other conditions required by ADB,¹⁴ and (ii) to submit to the implementing agency, for review and approval, their respective site-specific environmental management plans (SEMPs), including (a) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (b) specific mitigation measures following the approved EMP; (c) monitoring program as per EMP; and (d) budget for EMP and SEMP implementation. No work can commence prior to approval of the corresponding SEMP. A copy of the EMP or approved SEMP will be always kept on site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP or SEMP constitute a failure in compliance and shall require corrective actions.

38. **Conditions for Award of Contract and Commencement of Work.** Executing agency shall not award any Works contract for the subproject until (i) relevant provisions from the EMP are incorporated into the Works contract; and (ii) the IEE is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance of such IEE. Executing agency and/or implementing agency shall ensure no works for the subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the contract; and (ii) the IEE is updated if there is any change in subproject's detailed design, and that the executing agency has obtained ADB's clearance of such updated IEE.

B. Government of Bangladesh Environmental Laws and Regulations

1. Overview of the Environmental Approval Process

39. Key legislation governing the environmental approvals process for the proposed overall project (and hence the subproject) is the Bangladesh Environmental Conservation Act, 1995 (ECA, 1995) and the Environmental Conservation Rules (ECR, 2023). According to Rule 5 of ECR, 2023 proposed developments within Bangladesh are classified as one of four categories, as follows:

- (i) Green;
- (ii) Yellow;
- (iii) Orange; and
- (iv) Red.

¹⁴ Contractors to comply with (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

40. The category of a project determines the procedure for issuance of an Environmental Clearance Certificate (ECC). All proposed industrial units and projects that are considered to be low polluting are classified under "Green" and shall be granted Environmental Clearance. For proposed industrial units and projects classified under the Yellow, Orange and Red Categories, a Location Clearance Certificate (LCC) and a subsequent ECC are required from the DOE depending on geographical location of project, extent of project activities and possible pollution load, human health and possible adverse impacts on environment. A detailed description of the approval process for the four categories of industry/projects are documented in Rules 9 – 19 of ECR, 2023.

41. Key milestones in the approvals process are outlined in . These comprise:

- (i) **Location Clearance Certificate:** An LCC will be issued by DOE upon approval of all requirements, including compliance with the site selection requirements as minimum for Yellow category projects. In addition to this compliance with site selection requirements, IEE study is required for Orange category projects and EIA study for Red category projects; and
- (ii) **Environmental Clearance Certificate:** The ECC will be issued by DOE upon approval of requirements. ECC is issued to Green category project upon approval of the General Description of project; and to Yellow, Orange and Red category projects after issuance of LCC.

2. Procedure for Obtaining Location Clearance Certificate and Environmental Clearance Certificate

42. The environmental assessment process consists of three stages: screening, IEE, and detailed EIA per ECR, 2023. The ECR also contains the procedures for obtaining the LCC and ECC from the DOE for different categories of proposed industrial units or projects. Any person or organization wishing to establish an industrial unit or project must obtain an LCC and ECC from the Director General of DOE. The application for such certificate must be in the prescribed forms provided together with the prescribed fees laid down in Schedule 6 and Schedule 7, through the deposit of a Treasury Chalan in favor of the Director General of DOE. The procedure of getting the LCC and ECC of four categories of project are briefly described as follows and the process flow outlined in Figure below:

- (i) **Green:** Projects categorized as Green projects are listed in Schedule 1. The proponent has to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1), Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents;

In addition, as per Schedule 9: Industry or Project Site Selection Guideline, Rule 8 Sub-Rule (kha), Rule 9 Sub-Rule (2), Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), and Rule 14 Sub-Rule (2) must be followed by the proponent; and

The Client must Deposit/Pay the mentioned amount of fees to DOE per Schedule 7: Location Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4).

DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction on the submitted documents. The ECC needs to be renewed every 5 years.

- (ii) **Yellow:** Projects categorized as Yellow are listed in Schedule 1. The proponent has to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1), Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents;

Deposit/pay the mentioned amount of application processing fee to DOE per Schedule 6: Location Clearance or Environmental Clearance Certificate Application Process Fee, Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), Rule 14 Sub-Rule (2), and related documents and detail information per Schedule 9: Industry or Project Site Selection Guideline, which shall be followed;

The relevant DOE office will conduct a site visit to the project and prepare a report with justification and opinion. Within 8 working days of receiving the application, the concerned DOE office will notify the applicant to pay the fee specified in Schedule-7, provided the information in the application is satisfactory and the on-site inspection is completed;

The Client must Deposit/Pay the mentioned amount of location clearance fee to DOE per Schedule 7: Location Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4); and

After issuance of LCC, the Client submits its application for issuance of ECC to DOE. DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction with the submitted documents. The ECC needs to be renewed every 2 years.

- (iii) **Orange:** Projects categorized as Orange require proponents to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application for Location Clearance, along with Deposit /Payment of the mentioned amount of fees for the project to DOE per Schedule 6, submission of related documents and detailed information, an Initial Environmental Examination (IEE) Study report, and compliance with Schedule 9: Industry or Project Site Selection Guideline. After approval from the Authority, the Client must Deposit/Pay the mentioned amount of fees for the project to DOE per Schedule 7 for obtaining the Location Clearance for the project.

The relevant DOE office will visit the project site and prepare a report. This report, along with the application, will be sent to the appropriate ECC committee based on the project's serial number listed in Schedule 1. The ECC committee will review the application and the report and decide. The applicant will then be notified to pay the fee listed in Schedule 7 for the LCC issuance;

Within 21 days from payment of fees per Schedule 7, DOE issues the LCC. Upon obtaining the LCC, the Proponent/Client will apply for an ECC from the DOE. The DOE office will then perform a site visit to ensure LCC compliance and review relevant issues. A report justifying the issuance or rejection of the ECC will be prepared and forwarded, along with the application, to the appropriate ECC committee. The committee will decide within 20 working days of the application

date and issue the ECC. If an initial environmental examination of an Orange Category project reveals significant pollution impacts, the ECC Committee may recommend an Environmental Impact Assessment (EIA). With approval from the Director General, the proponent must conduct the EIA. The ECC needs to be renewed every year.

- (iv) **Red:** Projects categorized as Red Projects require proponents to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application for Location Clearance, along with Deposit /Payment of the mentioned amount of fees for the project to DOE per Schedule 6, related documents, detail information, draft Terms of Reference (ToR) of Environmental Impact Assessment (EIA) and compliance with Schedule 9: Industry or Project Site Selection Guideline;

Per Schedule 10: Environmental Impact Assessment Scope of Works Guidelines, Rule 14 Sub-Rule (3), a draft Terms of Reference (TOR) will be prepared for the conduct of an Environmental Impact Assessment and submitted to the DOE for approval;

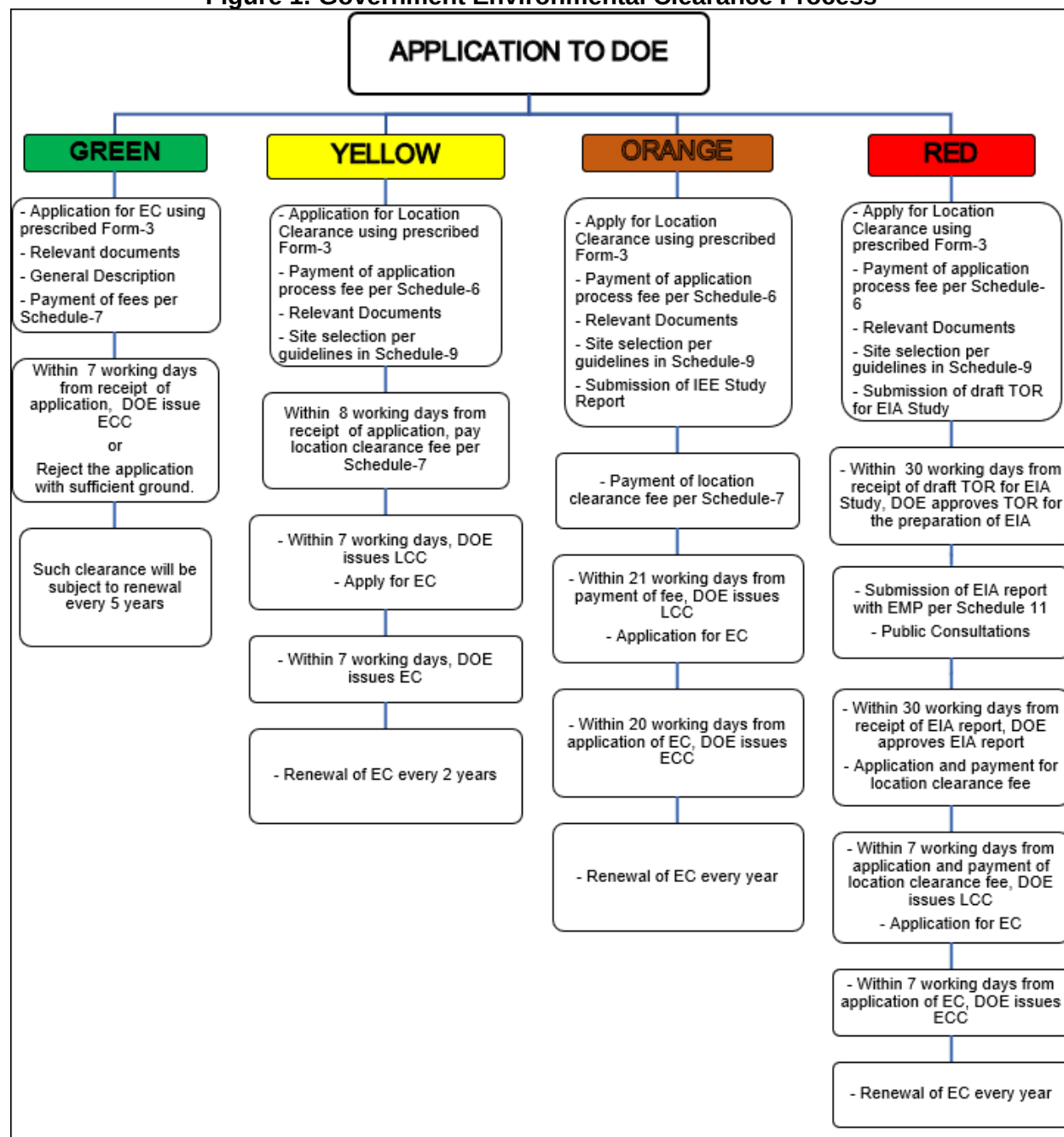
The relevant DOE office will visit the project site to review the documents and all pertinent issues. A report with justifications and findings on the rationale for issuing the location clearance certificate and draft ToR for the EIA will be forwarded to the ECC Committee. Upon receiving the documents, the ECC Committee will review and evaluate them, then submit a report to the Director General (DG) for approval. With the DG's approval, the concerned office will approve the ToR for the EIA within 30 working days;

An EIA study shall be prepared based on DOE's approved TOR. An Environmental Management Plan should be prepared as an integral part of the EIA study according to Schedule 11: Industry or Project Environmental Impact Assessment Study Preparation Guidelines, and Rule 15 Sub-Rule (3). Public consultations for the EIA study shall be carried out;

The proponent must submit the EIA report to the ECC Committee as per Schedule 11. If the EIA is approved by the DG, the proponent has to pay the fee specified in Schedule-7 within a maximum of 7 working days and the LCC will be issued within 7 working days of submission of fee to the concerned DOE office; and

After issuance of the LCC, proponent/client will submit the application for issuance of ECC. The relevant DOE office will conduct a site visit to verify the conditions of the LCC and the recommendations of the EIA etc. A report will be prepared and forwarded to the ECC committee. Upon reviewing the reports and documents, the ECC Committee will make recommendations to the DG regarding the issuance of the ECC. Once the DG approves these recommendations, the concerned office will issue the ECC within 30 working days. The ECC needs to be renewed every year.

Figure 1: Government Environmental Clearance Process



DOE = Department of Environment, EC = Environmental Clearance, ECC = Environmental Compliance Certificate, EIA = environmental impact assessment, EMP = environmental management plan, IEE = initial environmental examination, LCC = Location Clearance Certificate, TOR = terms of reference.

3. Government Environmental Categorization

43. Environmental Conservation Rules, 2023 clearly defines the classification of all industrial and project schemes into four broad categories. The categorization considers all the physical interventions in implementation of those projects or industries and operational procedures and risk associated therein. Susceptibility of the location where the projects would be implemented

also determines the categories; sometimes stringent management issues are levied on the project implementation and operation.

44. Urban development projects often comprise multiple segments and varied types of interventions implemented under a single project umbrella. Each component or subproject is assessed and environmentally categorized on an individual basis, and the highest-risk category among them is applied to the overall project to ensure enhanced environmental protection and risk mitigation. Accordingly, while the nature of works of individual subprojects may fall under different environmental categories, the overall project is required to comply with the requirements of the most stringent classification, which in this case is the Orange Category. DPHE will therefore obtain a single ECC for the entire project, covering all subprojects. At present, DPHE is coordinating with the DOE and undertaking preparatory activities to comply with the requirements applicable to the Orange Category, including completion of the required IEE. The application for the ECC will be submitted once the IEE is approved, and the LCC is issued by the DOE.

Table 1: Categorization of the Subproject

Subproject/ Component	Interventions	ECR Category
Drinking Water Supply System	Construction and rehabilitation of production tube wells and overhead tanks and laying of water pipelines along the existing road network, including crossing water bodies and railway systems.	Orange
Sanitation Facility	Construction of Twin pit latrines and public toilets	Orange

C. Other National Environmental Act and Laws

45. Table below provides a summary of policies, plans and strategies which deal with the drinking water supply sector, including climate change.

Table 2: Summary of Relevant National Environmental Acts and Laws

Laws, Regulations, and Standards	Details	Relevance to the Subproject
The Constitution of the People's Republic of Bangladesh	The constitution of the country was adopted in 1972, but the 15th amendment to this constitution made in 2011 included the concept of the protection and improvement of environment and biodiversity under fundamental principles of state policy (part II). To this end, Article 18A clearly states that the state shall endeavor to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests and wildlife for the present and future citizens. Inclusion of this clause into the constitution underscores the requirement for the protection and improvement of environment and biodiversity and also has influenced to develop and promulgate	The clauses stated in the constitution clearly put directives to protection and improvement of natural environment and biodiversity, social justice and conservation of monuments, objects or places having special artistic or historical importance, during the planning, construction and O&M phases of the subproject.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	further environmental laws, rules and directives in Bangladesh. The constitution also proclaims that the state shall adopt effective measures to remove social and economic inequality between man woman and to ensure the equitable distribution of wealth among citizens endeavor to ensure equality of opportunity and participation of women in all spheres of national life. The same also emphasizes adopting measures for the protection against disfigurement, damage or removal of all monuments, objects or places of special artistic or historic importance or interest.	
Environmental Conservation Act (ECA), 1995 (and subsequent amendments)	Provides for the conservation of environment, improvement of environmental standards and control and mitigation of environmental pollution. In line with these provisions of the Act, the Environmental Conservation Rules have been framed with various amendments. This Act provides for (i) remedial measures for injury to ecosystem; (ii) provides for any affected person due to environmental pollution to apply to Department of Environment (DOE) for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity for testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to environment; and (vi) penalty for non-conformance to environment act under the various sections. The main strategies of the Act can be summarized as: • Declaration of ecologically critical areas (ECAs), and restriction on the operation and process, which can be carried out or cannot be initiated in the ecologically critical areas. • Regulation in respect of vehicles emitting smoke harmful to the environment. • Environmental clearance. • Regulation of the industries and other development activities – discharge permits. • Promulgation of standards for quality of	According to this law, no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General. The subproject forms part of the overall project that is required to obtain ECC. The subproject's distribution network pipelines will also likely pass through areas adjacent receiving bodies of water. No subproject component activities should be allowed that could further pollute these bodies of water.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	air, water, noise and soil for different areas for different purposes • Promulgation of standard limit for discharging and emitting waste. • Formulation and declaration of environmental guidelines. Amendment 2000 of the Bangladesh Environmental Conservation Act focuses on: (i) ascertaining responsibility for Compensation in cases of damage to ecosystems, (ii) increased provision of punitive measures both for fines and imprisonment, and (iii) fixing authority on cognizance of offences. The next amendment in 2002 emphasizes: (i) restriction on polluting automobiles, (ii) restriction on the sale and production of environmentally harmful items like polythene bags, (iii) assistance from law enforcement agencies for environmental actions, (iv) break up of punitive measures, and (v) authority to try environmental cases. The latest amendment in 2010 declares demarcation of wetlands and water bodies, and imposes restrictions on hazardous waste import, transportation, storage etc.; and activities on cutting of hills and/or mountains along with Ecologically Critical Areas. Failure to comply with any part of the Environment Conservation Act 1995 may result in punishment to a maximum of 5 years' imprisonment or a maximum fine of BDT 100,000, or both.	
Environment Conservation Rules, 2023	The Environment Conservation Rules, 2023 (ECR, 2023) provide the set of rules under the Environment Conservation Act, 1995. These provide, amongst other items, standards and guidelines for: • Categorization of industries and development projects; • Procedure for obtaining environmental clearance; and • Environmental quality standards in relation to inland surface water, coastal water, drinking water, sewage water, and industrial wastewater quality parameters are mentioned under schedule 2, 3, 4 and 5. Whereas standards for air pollution and noise are referenced to the Air Pollution	In accordance with the ECR, 2023, the overall project is classified under Orange Category, requiring an IEE for the issuance of ECC from DOE. This ECC must be obtained prior to commencement of the project and thus with the subproject.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	Control Rules, 2022 and Noise Pollution Control Rules, 2006, respectively. ECR, 2023 classifies industrial units and development projects into four categories for the purpose of issuance of Environmental Clearance Certificate (ECC). These categories are: Green; Yellow; Orange; and Red. Per ECR 2023, all existing and new industries and projects in Orange and Red category require an Environmental Management Plan (EMP) to be prepared (after conducting an IEE or EIA) and submitted along with other necessary papers while applying for environmental clearance.	
Bangladesh Climate Change Strategy and Action Plan 2009	The Government of Bangladesh prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. It is built around the following six themes: • Food security, social protection and health to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change. All programs focus on the needs of this group for food security, safe housing, employment and access to basic services, including health. Comprehensive disaster management to further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities. • Infrastructure to ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructures (cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change. • Research and knowledge management to predict that the likely scale and timing of climate change impacts on different sectors of economy and socioeconomic groups; to underpin future investment strategies; and to ensure that Bangladesh is networked	This strategy and action plan is relevant to the subproject. Accordingly, the subproject is required to integrate appropriate climate change mitigation and adaptation measures into its design to ensure that key infrastructure components, such as the quality and durability of concrete and steel reinforcement structures, pipe materials, elevation of infrastructure, and depths of production tube wells, are resilient to the projected impacts of future climate change. Incorporating these climate-resilient design measures will enhance the long-term sustainability of the subproject and contribute to the effective implementation and achievement of the objectives of the strategy and action plan.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	into the latest global thinking on climate change. Mitigation and low carbon development to evolve low carbon development options and implement these as the country's economy grows over the coming decades. • Capacity building and Institutional strengthening to enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change.	
National Water Policy 1999	The National Water Policy was promulgated in 1999 with the intention of guiding both public and private actions to ensure optimal development and management of water to benefit both individuals and society at large. The policy aims to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people, and protection of the natural environment. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) will have to enhance environmental amenities and ensure that environmental resources are protected and restored while executing their activities. Environmental needs and objectives will be treated equally with the resources management needs. The policy has several clauses related to the protection and conservation of the natural environment to ensure sustainable development.	Clause 4.6(b) of this policy stipulates that natural depressions and water bodies in major urban areas must be preserved to facilitate groundwater recharge and effective rainwater management. Furthermore, Clause 4.9(b) requires that measures be implemented to minimize disruption to the natural aquatic environment, including streams and water channels. In addition, the policy mandates that all water resources development projects and rehabilitation programs to consider environmental protection, restoration, and enhancement measures consistent with the National Environmental Management Action Plan and the National Water Management Plan, and adhere to a formal environmental impact assessment process where required by the Government (Clauses 4.12(a) and 4.12(b)). These policy requirements are directly relevant to the nature and scope of the subproject. The policy is also applicable due to the subproject's potential to cause pollution of surface water bodies and groundwater during both construction and operation phases. Accordingly, the subproject is required to comply with the provisions of this policy and integrate the relevant requirements into its design and implementation.
National Safe Drinking Water Supply and Sanitation Policy 1998	The National Safe Drinking Water Supply and Sanitation Policy was adopted in 1998 and sets out the basic framework for the improvement of public health quality and to ensure an improved environment, together with a set of broad	This policy is applicable to the subproject with respect to the management and provision of water supply. The subproject serves as one of the key interventions to support the achievement of the policy's

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	sectoral action guidelines. The policy has the following objectives: (i) To manage water supply and sanitation related basic needs for all; (ii) To bring about a positive change of peoples' attitude towards water and sanitation; (iii) To reduce the outbreak of water-borne diseases; (iv) To increase the efficiency of the Local Government and associated communities for handling the problems related to water supply and sanitation; (v) To improve sustainable water supply and sanitation system; (vi) To promote proper conservation, management and use of surface water and to control water pollution considering the scarcity of groundwater; and (vii) To take necessary steps to capture and use rainwater.	objectives, particularly those related to improving the efficiency and reliability of the water supply system and addressing challenges associated with water scarcity. As such, the subproject is aligned with and contributes directly to the implementation of the policy's intended outcomes.
The Forest Act (1927) and the Forest (Amendment) Act (2000)	The Forest Act (1927) was enacted to control trespass, illegal resources extraction from forests, and to provide a framework for the forestry revenue collection system. It is the main legislative context for forestry protection and management in Bangladesh. The Act allows for the notification of forest reserves in which the government, through the Forest Department, regulates the felling, extraction and transport of forestry produce in Bangladesh. The Act grants the government several basic powers, largely for conservation and protection of government forests, and limited powers for private forests.	Although no forested areas are located within the subproject sites or along the proposed alignments, this Act remains relevant due to the potential need for cutting individual trees in certain areas affected by the subproject. Accordingly, the subproject will be required to obtain the necessary permits and approvals from the relevant authorities prior to the cutting or removal of any trees and before the commencement of civil works.
Wildlife (Conservation and Security) Act, 2012	This Act provides for the conservation and safety of biodiversity, forest, and wildlife of the country by repealing the previous laws, i.e., Wildlife (Preservation) Act of 1973. The Department of Forest (BFD) has the primary responsibility for implementing this Act. The key features of this Act are: i) Prohibition made in relation to wild animals and plants that no person can hunt any wild animal without a license or willfully pick, uproot, destroy or collect any plant; ii) Determination of vulnerable, endangered and critically endangered species of wild animals and plants; iii) Declaration of sanctuary for the conservation of forest and habitat of	This Act is relevant to the subproject as certain proposed alignments may traverse areas where wildlife species and their habitats could potentially be disturbed or damaged. Such disturbances may arise during site preparation, construction, or ancillary activities. Accordingly, appropriate mitigation and management measures will be required to avoid, minimize, and manage potential impacts on wildlife and their habitats, and to ensure the conservation, protection, and security of affected species in accordance with the provisions of the Act.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	wildlife and prohibitions made on such sanctuary; iv) Requirement of license to cultivate, extract, manufacture, rear, export or import any wild animal or part of its body, meat, trophy, uncured trophy or any plant; and v) Restriction on import, export and re-export of wild animals and plants.	
Bangladesh Public Procurement Rule (PPR), 2025	This rule applies to the Procurement of Goods, Works or Services by any government, semi-government or any statutory body established under any law. The rule includes the adequate measure regarding the “Safety, Security and Protection of the Environment’ in the construction works. This clause includes contractor responsibility to take all reasonable steps to (i) safeguard the health and safety of all workers working on the site and other persons entitled to be on it, and to keep the site in an orderly state and (ii) protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of the Contractors methods of operation.	DPHE, as a government entity, is required to comply with the environmental requirements stipulated under this Rule. Compliance is mandatory, as explicitly specified in the provisions of the Rule, and applies to all activities undertaken by DPHE in the planning, design, and implementation of the subproject.
National Environmental Policy, 2018	The central theme of the policy is to ensure protection and improvement in the environment. The policy gives a thrust to sustainable development and long-term use of natural resources. The National Environment Policy contains policy statements and strategic options about population and land-use management, management and utilization of natural resources and other socio-economic sectors, as well as the necessary arrangements for the implementation of the policy.	The subproject is expected to result in site-specific environmental impacts and will therefore require the implementation of appropriate mitigation measures to avoid, minimize, and manage potential adverse effects, and to ensure the protection and improvement of the surrounding environment.
Environmental Court Act, 2000	Enacted to establish Environment Courts and make rules for protection of environmental pollution. Environment Courts are situated at the district level, but Government may by notification in the official Gazette, establish such courts outside the districts. Environment Courts were given the power to directly take cognizance of any offence relating to environmental pollution. The proceedings of this Court will be like criminal courts. One important feature of this Act is that it	This Act is relevant to the subproject, as its implementation may give rise to environmental complaints or disputes that could potentially be elevated to the Environmental Court. The Environmental Court has jurisdiction over all subproject-related environmental cases, litigations, or complaints formally brought before it. Accordingly, the subproject is subject to the provisions of this Act and the jurisdiction of the Environmental

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	has been given retrospective effect of any crime committed under environment laws and thus any crime previously committed but is not taken before any court can be taken before the Environment Court or any special Magistrate.	Court for the resolution of any environmental issues or grievances arising from its implementation
National Water Act 2013 National Water Rules 2018	Ensures Bangladesh water sources are free from any type of pollution. Pollution from water in urban outfalls and reservoirs, e.g., lakes, canals, ponds and ditches may result in amenity losses, fisheries depletion, health problems and fish and aquatic species of contamination.	The subproject is required to implement appropriate preventive and mitigation measures during the design and construction phases to avoid pollution of water sources, particularly surface water bodies used as raw water sources and intake locations or which could receive runoff or discharges along the alignments of the water supply subproject.
Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural waterbodies such as lakes, ponds, <i>beels</i> , <i>khals</i> , tanks, etc. affected by man-made interventions or other causes. Prevents the filling of publicly owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. Prevents unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.	The subproject is required to implement appropriate design, construction, and site management measures to ensure that nearby water bodies are not adversely affected by subproject activities. This requirement is particularly relevant for subproject sections located near riverbanks, streams, drainage channels, or natural depressions, where there is a higher risk of sedimentation, runoff, or accidental pollution. Effective mitigation measures will be necessary to prevent impacts on these water bodies and maintain their ecological and hydrological functions.
The Embankment and Drainage Act (1952)	This Act describes the protection of embankments and drainage facilities	Disposal of construction material may create drainage obstruction. So, adherence to relevant section of the Act must be addressed in the environmental assessment.
The Bangladesh Water Development Board Act, 2000	The Bangladesh Water Development Board Act, 2000 was enacted for the development and efficient management of water resources. The Water Development Board is established under the Act, with the power to control the flow of water in all rivers, channels and underground aquifers.	This Act is relevant to the subproject, as portions of the proposed alignments may be located near waterways. Accordingly, the subproject will be required to implement appropriate design and construction measures to ensure that natural water flows in adjacent <i>khals</i> , canals, and other drainage channels are not obstructed or disrupted.
National Disaster Management Act 2012	The National Disaster Management Act 2012 recognized the impacts of climate change and provides guidance for setting up an institutional mechanism for disaster management, reducing vulnerabilities,	This Act is relevant to the subproject, as potential disaster risks may arise during the construction phase, necessitating the implementation of appropriate preparedness,

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	rehabilitation, and providing humanitarian assistance to the victims of both disasters and climate change impacts.	prevention, and response measures to avoid or effectively manage adverse impacts. While the design of the water supply infrastructure will incorporate disaster-resilient features to withstand foreseeable hazards, there remains a residual risk of impacts from natural disasters and climate-related events. Accordingly, the Act underscores the need for clear guidance on the establishment and operation of an institutional mechanism for disaster risk management, including defined roles and responsibilities, coordination arrangements, and emergency response procedures. Such institutional arrangements, together with sound operation and maintenance practices, will ensure that risks associated with disasters and climate change are proactively managed and minimized throughout the lifecycle of the subproject.
National 3R Strategy for Waste Management, 2010	The 3Rs are meant to be a hierarchy, in order of importance – ‘reduce’ followed by ‘reuse’ and then ‘recycle’, which classify waste management strategies according to their desirability. The National 3R goal for waste management is to achieve eliminate waste disposal on open dumps, rivers and floodplains and promote recycling of waste through mandatory segregation at source as well as create a market for recycled products and provide incentives for recycling.	This strategy is relevant to the subproject, as the implementation of the subproject may result in the generation of waste, particularly during the construction phase. Accordingly, proper management, handling, and disposal of construction wastes will be required to prevent adverse environmental impacts. The subproject is therefore required to comply with the provisions of this strategy to ensure that construction waste is managed in an environmentally sound manner and that potential negative impacts on the surrounding environment are avoided.
National Land Use Policy, 2001	Sets out guidelines for improved land-use and zoning regulations. The main objective of this policy is to ensure criteria-based uses of land and to provide guidelines for usage of land for the purpose of agriculture, housing, afforestation, commercial and industrial establishments, rail and highway and for tea and rubber gardens.	Sitting of subproject components need to comply with land use and zoning regulations.
The Paurashava Act 2009 / Ordinance issued for the amendment of local	Provides guidance for subproject integrated community and workers' health and hygiene at the construction and operation and maintenance stages of the	The subproject will comply with the provisions of this Act throughout all phases of implementation. The institutional arrangements for the

Laws, Regulations, and Standards	Details	Relevance to the Subproject
government (municipality) ordinance, 2009 and 2010; The <i>Paurashava</i> Ordinance, 1977; Municipal Administration Ordinance, 1960	project.	subproject include the involvement of the relevant <i>Paurashava</i> administration at the local level. As such, mandated coordination with the appropriate <i>Paurashava</i> committees will be established and maintained to ensure the effective implementation of disaster management measures, as well as other environmental safeguard measures developed for the subproject.
Air Pollution Control Rules, 2022	APCR, 2022 contains air quality standards based on WHO Guidelines (Interim Goals); emissions limits and technical specifications for key sectors; mandates and coordination mechanisms among relevant line ministries to control both household and outdoor air pollution. The rules elevated the air quality management dialogue and leadership beyond the environment sector; by establishing the National Committee on Air Pollution Control, a multi-sector decision-making body presided by the Cabinet Secretary to coordinate the APCR implementation and instruct relevant agencies on specific interventions to comply with the new rules.	Subproject construction activities are expected to generate air emissions, including dust and smoke. Accordingly, the subproject will be required to implement appropriate mitigation measures and comply with the applicable air emission and ambient air quality standards specified under the Rules in order to prevent adverse impacts on air quality and public health.
Noise Pollution (Control) Rules, 2006	The Noise Pollution Rules, 2006 addresses that the sound levels to be no more than 50dB in Silent Zones ^a during daytime (6 am to 9 pm) and 40 dB at night-time (9 pm to 6 am). In residential areas these levels are 55 dB and 45 dB, in mixed area ^b 60 dB and 50 dB, in commercial and industrial areas 70 dB and 60 dB and in industrial areas 75 dB and 70 dB for daytime and night-time respectively.	Subproject activities, particularly linear construction works, will be undertaken across multiple locations characterized by varying land uses. Accordingly, the subproject is required to comply with the applicable noise level standards corresponding to the specific land use classifications at each site, in order to prevent adverse impacts on surrounding communities and sensitive receptors.
Solid Waste Management Rules 2021	The Rules provides a comprehensive set of rules based on national 3R strategy and other national and international policies and guidelines pertaining to solid waste management. It defines the roles and responsibilities of relevant government ministries and agencies, including local government authorities and other stakeholders in implementing solid waste management undertakings. It also includes the environmental requirements necessary for these undertakings, provision of incentives for	The subproject will generate solid wastes during its implementation and will therefore be required to implement appropriate waste minimization, handling, storage, and disposal measures in accordance with the provisions of the Rules.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	the promotion of sustainable waste management practices, etc.	

^a The area within 100 meters from hospital, academic institutions or places identified/identifiable by the government

^b An area, which is primarily a residential area with either or both commercial and industrial parts in it

D. Legislation Relating to Occupational Health and Safety

46. Relevance of occupational health and safety are presented in the below Table.

Table 3: Relevance of Occupational Health and Safety Legislation

Title of Laws and Rules	Relevance
Social Security under the Act, 1923 and an amendment in 1980	The Act is relevant to the subproject as it applies to project workers engaged during construction and operation. The Act governs provisions related to workers' welfare, social protection, benefits, and labor-related safeguards, which must be complied with to ensure adequate social security coverage and protection of all eligible workers under the subproject.
Bangladesh Labor Law of 2006	The Law is relevant to the subproject as it governs the employment of project workers and requires compliance with provisions on employment standards, occupational safety and health, workers' welfare and social protection, labor relations and social dialogue, and enforcement mechanisms, including the strict prohibition of child and adolescent labor in all subproject activities.
Bangladesh Labor Rules, 2015	The Rules are relevant to the subproject as it serves as the implementing rules of the Bangladesh Labor Law. The Rules require contractors to implement appropriate occupational health and safety measures and establish contractor liability for compensation arising from work-related injuries, accidents, or occupational illnesses affecting project workers.
The Employer's Liability Act, 1938	The Act is relevant to the subproject due to the engagement of project workers, as it establishes employer liability for employment-related injuries and disallows the use of the doctrines of common employment and assumed risk as defenses in claims for damages. In addition, in conjunction with applicable maternity benefit laws and their implementing rules, the provisions ensure that female workers engaged under the subproject are entitled to maternity benefits, including maternity leave before and after delivery, which must be observed during project implementation.
Public Health (Emergency Provisions) Ordinance, 1994	The Ordinance is relevant to the subproject as it mandates special measures to protect public health in emergency situations. In the event of an outbreak or risk of the spread of human disease, the Ordinance requires the adoption of appropriate actions to prevent disease transmission, safeguard public health, and ensure the provision of adequate medical and other essential services. These requirements are particularly applicable during construction activities, where both project workers and surrounding communities may face increased public health risks.
The Employees State Insurance Act, 1948	The Act is relevant to the subproject as it requires the provision of health care, injury, sickness, and related social security benefits to eligible project workers at the workplace. Compliance with the Act ensures that workers engaged under the subproject are adequately protected against employment-related illness, injury, or health contingencies during

Title of Laws and Rules	Relevance
	subproject implementation.
Bangladesh Factory Act, 1979	The Act is relevant to the subproject as it requires workplaces, including small- and large-scale construction sites where women are employed, to provide appropriate childcare facilities. The Act also mandates the provision of adequate medical facilities, first-aid services, and accident and emergency response arrangements at workplaces, which must be complied with to safeguard the health, safety, and welfare of project workers during subproject implementation.

E. Relevant International Conventions, Treaties

47. Relevant International Conventions, Treaties and Protocols (ICTPs) are given in the following Table.

Table 4: International Environmental Conventions Relevant to the Subproject Activities

Sl. No.	International Treaties	Ratified/ Accessed (AC)/ Accepted (AT)/ Adaptation (AD)	Relevance
1	International Plant Protection Convention (Rome, 1951) & Plant Protection Agreement for SE Asia and Pacific (1999 Revision)	01.09.1978 04.12.1974 (AC)	This Convention is relevant to the subproject as it requires that all construction materials, equipment, and component work used in project implementation are managed and sourced in a manner that prevents the introduction and spread of plant pests, thereby protecting local agriculture and ecosystems.
2	Convention on Wetlands of International Importance, 1971 (Ramsar Convention)	20.04.1992 (ratified)	This Convention is relevant to the subproject as it provides for the protection of significant wetlands and prohibits their draining, filling, or degradation during construction activities. Compliance with this Convention ensures that construction works are planned and implemented in a manner that avoids adverse impacts on wetland ecosystems within or adjacent to subproject areas.
3	Convention Concerning the Protection of World Cultural and Natural Heritage (Paris, 1972)	03.11.1983 (ratified)	This Convention is relevant to the subproject as it requires the protection of culturally and historically significant sites, monuments, and heritage resources, and prohibits any damage, destruction, or disturbance to such assets during construction and related project activities. Compliance with this Convention ensures that physical cultural resources are identified, preserved, and managed appropriately throughout subproject implementation.
4	Montreal Protocol on Substances that Deplete the	02.08.90 31.10.90 (AC)	This Protocol is relevant to the subproject as it requires the use of environmentally

Sl. No.	International Treaties	Ratified/ Accessed (AC)/ Accepted (AT)/ Adaptation (AD)	Relevance
	Ozone Layer (Montreal 1987)	(entry into force)	friendly equipment and facilities, such as refrigeration and air-conditioning units that utilize ozone-friendly chemicals or substances. Compliance with this requirement helps prevent ozone layer depletion and ensures that project implementation aligns with applicable environmental protection standards.
5	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, Switzerland, 1989)	01.04.93 (AT) 30.06.93 (entry into force)	This Convention is relevant to the subproject as it regulates and restricts the transboundary movement of hazardous wastes, including potential asbestos-containing materials that may be associated with construction activities, construction equipment and machinery, or labor camp facilities. The Convention allows such movements only when they comply with the principles of environmentally sound management, thereby ensuring that hazardous materials are handled, transported, and disposed of in a manner that protects human health and the environment during subproject implementation.
6	Convention on Biological Diversity, 1992 (Rio de Janeiro)	03.05.1994	This Convention is relevant to the subproject as it requires the protection of biodiversity during both construction and operational phases. Compliance with the Convention ensures that project activities are planned and implemented in a manner that avoids, minimizes, or mitigates adverse impacts on flora, fauna, and natural habitats within and around the subproject area.
7	Cartagena protocol on Biosafety to the Convention on Biological Diversity	In the process of Ratification	Protection of biodiversity during construction and operation.
8	Convention on Persistent Organic Pollutants, 2001	In process	This Convention is relevant to the subproject as it regulates and restricts the use of pesticides and herbicides during construction and operation activities. Compliance with the Convention ensures that any use of such chemicals is controlled, minimized, and conducted in an environmentally sound manner to prevent adverse impacts on human health, soil, water resources, and biodiversity within and around the subproject area.

Sl. No.	International Treaties	Ratified/ Accessed (AC)/ Accepted (AT)/ Adaptation (AD)	Relevance
9	United Nations Framework Convention on Climate Change, 1997	22.10.2001 13.11.2003 (amended)	This Convention is relevant to the subproject as it aims to reduce greenhouse gas concentrations in the atmosphere to levels that prevent dangerous anthropogenic interference with the climate system. Compliance with the Convention requires the subproject to integrate climate-responsive measures in its design, construction, and operation, including improving energy efficiency, minimizing emissions, and adopting practices that contribute to climate change mitigation.

F. Gaps in Legal and Guiding Instruments

48. Comparative analysis of Environmental Safeguard principles is shown in the following Table.

Table 5: Comparative Analysis of Environmental Safeguard Policy

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
1	Use of screening process to determine the appropriate environmental assessment	Uses sector-specific rapid environmental assessment checklist for screening and assigns categories based on potential impacts: A- EIA required (irreversible, diverse or unprecedented adverse environmental impacts); B- IEE required; C- No environmental assessment required but a review of environmental implications; FI - ESMS required.	ECA 1995 and ECR 2023 set screening criteria to classify industries/ projects based on potential environmental impacts as follows: Green, Yellow, Orange and Red (cause significant environmental impacts). The screening criteria is based on the project or industry type and do not consider the scale and location. The category determines the level of environmental assessment.	No major gaps
2	Conduct an environmental assessment	EIA and IEE - Identify potential impacts on physical, biological and socioeconomic aspects in the context of project's area of influence (i.e., primary project site and associated facilities) ESMS for FIs	Industry/project category Green- no environmental assessment required. Yellow – compliance with site selection criteria. Orange – compliance with site selection criteria and conduct of IEE required; Red – compliance with site selection criteria, and both IEE and EIA required.	No major gaps
3	Examine alternatives	Analyze alternatives to the project's location, design, and	Regulations (i.e., ECA 1995 and ECR 2023) do not	Not required by law for

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
		technology. Document rationale for selecting the particular project location, design, and technology Consider "no project" alternative	require specifically the identification and analysis of alternatives	projects classified as Green, Yellow or Orange under the national regulation. But the ToR for any EIA (Red Category) to be approved by the DOE now includes a discussion on analysis of alternatives.
4	Prepare an environmental management plan (EMP)	EMP to include monitoring, budget and implementation arrangements.	EMP and procedures for monitoring included in the IEE and EIA (i.e., Yellow, Orange, and Red category projects)	No major gaps
5	Carry out meaningful Consultation	Starts early and continue during implementation; Undertaken in an atmosphere of free intimidation Gender inclusive and responsive tailored to the needs of vulnerable groups Allows for the incorporation of all relevant views of stakeholders Establish a grievance redress mechanism	For projects classified under Red Category, public consultation is required based on ECR 2023 Grievance redress mechanism is not mentioned in ECA 1995 and ECR 2023; EIA format required by DOE includes stakeholders' consultation.	Not required by law for projects classified as Green, Yellow or Orange under the national regulation. But approval of the ToR of EIA (Red Category) by DOE includes mandatory consultation with stakeholders.
6	Timely disclosure of draft environmental assessment (including the EMP)	Draft EIA report posted on ADB website at least 120 days prior to Board consideration; Draft EA/EARF prior to appraisal. Final or updated EIA/IEE upon receipt. Environmental monitoring report submitted by borrowers upon receipt.	No requirement for public disclosure of environmental reports but DOE posts the minutes of the meeting on the application for environmental clearance certificate to its website, http://www.doebd.org/minutes.php	Still no requirement for public disclosure of environmental Assessment.
7	Implement EMP and monitor	Prepare monitoring reports on the progress of EMP	For project classified under Orange and Red Categories,	No major gaps

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
	effectiveness	Retain qualified and experienced external experts or NGOs to verify monitoring information for Category A projects Prepare and implement corrective action plan if noncompliance is identified Requires submission of quarterly, semi-annual, and annual reports to ADB for review	ECC is subject to annual renewal based on compliance of the conditions set by DOE.	
8	Avoid areas of critical habitats (use of precautionary approach to the use, development and management of renewable natural resources)	Provides guidance on critical habitats.	ECA 1995 and ECR 2023 identifies ecologically-critical areas and the rules to protect them.	No major gaps
9	Use pollution prevention and control technologies and practices consistent with international good practices	Refers to World Bank's Environmental Health and Safety (EHS) General Guidelines 2007 (or any update). If national regulations differ, more stringent will be followed. If less stringent levels are appropriate in view of specific project circumstances, provide full and detailed justification	Effluent standards, ambient and emission standards included in ECA 1995 and ECR 2023. Ambient noise levels included in Noise Pollution Control Rules 2006.	No major gaps
10	Provide workers with safe and healthy working conditions	Refers to WB EHS General Guidelines 2007 (or any update).	Occupational health and safety standards included in the Factories Act 1965, the Bangladesh Labour Act 2006, and its 2013 amendment.	No major gaps
11	Conserve physical cultural resources (PCR) and avoid destroying or damaging them	Use of field-based surveys and experts in the assessment. Consult affected communities on PCR findings Use chance find procedures for Guidance.	Preservation and protection of cultural resources are within the Antiquities Act 1968.	No major gaps

G. Permits and Clearance

49. Per ECA, 1995 (amended 2010) and ECR, 2023, it is mandatory for each type of industry and project to obtain ECC from the DOE. For the issuance of ECC, any proponent should follow the steps described above in Section B of this chapter.

50. The application and requirement for issuance of ECC are described in the ECR, 2023 and summarized in Section B above. This involves the completion and submission of an application using a form available from the DOE website,¹⁵ which is revised from time to time. The accomplished application form is submitted to DOE together with requirements as enumerated in Section B above. The proponent is also required to pay equivalent application fee prescribed in ECR, 2023.

51. For the project classified under the Orange Category, the ECC is issued within 20 working days from the day of approval of the IEE report by DOE, provided that LCC has been issued prior. LCC is normally issued within approximately 7 working days from the application along with summary report of initial environmental report and payment of fees. Once issued, ECC is required to be renewed every year from the date of its effectivity for Orange category project. For the overall project, DPHE, is responsible for application for ECC. This ECC will cover all subprojects identified under the overall project. Completion of the IEE is ongoing, and application for ECC will be submitted once LCC is issued by DOE, and the IEE is approved.

52. Per National Water Act 2013, and National Water Rules 2018, the project will also require no objection certificate (NOC) from the Water Resources Planning Organization (WARPO) for ground water extraction.

H. Applicable Environmental Standards

53. The ECR, 2023 prescribes the applicable national environmental quality standards relevant to the subproject, as presented in this chapter. In accordance with the requirements of the ADB SPS, the subproject will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in the World Bank Group EHS Guidelines. Where discrepancies exist between national regulations and the EHS Guidelines, the more stringent standards and measures shall be applied. In cases where less stringent standards or alternative measures are considered appropriate due to specific project circumstances, DPHE will provide a full and detailed justification, demonstrating consistency with the requirements of the ADB SPS. The tables below present a comparison of applicable national standards and internationally recognized guidelines.

Table 6: Bangladesh National Drinking Water Quality Standards

Parameter	Unit	Standard
1,1 Dichloroethane (1,1 C ₂ H ₄ Cl ₂)	mg/l	0.030
1,2 Dichloroethane (1,2 C ₂ H ₄ Cl ₂)	mg/l	0.030
2,4,6 Trichlorophenol	mg/l	0.200
Aldrin/Dieldrin	mg/l	0.030
Aluminium (Al)	mg/l	0.200
Ammonia (NH ₃)	mg/l	1.500
Anionic Detergents	mg/l	0.200
Arsenic (As)	mg/l	0.050
Barium (Ba)	mg/l	0.700

¹⁵ Government of Bangladesh. [Department of Environment](#).

Parameter	Unit	Standard
Benzene (c6H6)	µS/cm	0.010
Boron (B)	mg/l	1.000
Cadmium (Cd)	mg/l	0.003
Calcium (Ca)	mg/l	75.000
Carbon Tetra Chloride (CCl4)	mg/l	0.005
Chloride	mg/l	250.000*
Chloroform (CHCL3)	mg/l	0.090
Color	Hazen Unit	15.000
Copper (Cu)	mg/l	1.500
Cyanide (CN)	mg/l	0.050
Fecal Coliform	NFU/100ml	0
Fluoride (F-)	mg/l	1.000
Free Residual Chlorine	mg/l	0.20
Hardness as CaCO3	mg/l	500.000
Iron (Fe)	mg/l	0.3-1.0
Lead (Pb)	mg/l	0.010
Magnesium (Mg)	mg/l	30-35
Manganese (Mn)	mg/l	0.400
Mercury (Hg)	mg/l	0.001
Nickel (Ni)	mg/l	0.050
Nitrate (NO3-)	mg/l	45
Nitrite (NO2-)	mg/l	1.000
Odor	---	Odorless
Oil and Grease	mg/l	0.010
Overall Beta variance	BQU/L	1.000
Pentachlorophenol	mg/l	0.009
pH	---	6.5-8.5
Phenols	mg/l	0.002
Potassium	mg/l	12.000
Radioactive Materials Emitting Alpha Radiation	BQU/L	0.100
Selenium (Se)	mg/l	0.010
Silver (Ag)	mg/l	0.020
Sodium (Na)	mg/l	200.000
Sulfate (SO4-2)	mg/l	250.000
Sulfide as HsS	mg/l	0.050
Suspended Solid (SS)	mg/l	10.000
Temperature	°C	20-30
Tetrachloroethane (C2H4C14)	mg/l	0.040
Tin (Sn)	mg/l	2.000
Total Chromium (Total Cr)	mg/l	0.050
Total Coliform	NFU/100ml	0
Total Dissolved Solids (TDS)	mg/l	1000.000
Total Kjeldal Nitrogen	mg/l	1.000
Trichloroethane (C2H3C13)	mg/l	0.020
Turbidity	NTU	5.000
Zinc (Zn)	mg/l	5.000

* 1,000 mg/l in coastal areas

Source: ECR, 2023

Table 7: Bangladesh Inland Surface Water Standards

Best Practice Based classification	pH	DO mg/l	BOD mg/l	NO ₃ -N mg/l	NH ₄ -N mg/l	PO ₄ -P mg/l	Total Cr mg/l	Pb mg/l	Hg mg/l	Total Coliform cfu/100ml	TDS mg/l	COD mg/l
Source of drinking water for supply only after disinfecting:	6.5-8.5	≥6	≤2	7.0	0.1	0.1	0.02	0.03	0.001	≤100	1000	10
Water usable for recreational activity	6.5-8.5	≥5	≤3	7.0	0.3	0.5	0.2	0.05	0.001	≤50	1000	10
Source of drinking water for supply after conventional treatment	6-9	≥5	≤3	7.0	0.3	0.5	0.02	0.03	0.001	≤5000	1000	25
Water usable by fisheries	6-9	≥5	≤6	7.0	0.3	0.5	0.05	0.1	0.004	≤5000	1000	50
Water usable by various process and cooling industries	6.5-8.5	≥1	12	-	2.7	-	0.1	0.1	0.05	-	1000	100
Water usable for irrigation	6.5-8.5	-	≤12	5.0	1.5	2.0	0.1	0.1	0.002	≤50000	1000	100

Note: Electrical conductivity for irrigation water 2250 μ S/cm (at a temperature of 250C); Sodium less than 26%; boron less than 0.2%.

Source: ECR, 2023

Table 8: Applicable Ambient Air Quality Standards for Bangladesh Projects

Parameter	Bangladesh Ambient Air Quality Standard (μ g/m ³) and Averaging Time ^a	WHO Air Quality Guidelines (μ g/m ³) Global Update ^b 2021
PM ₁₀	50 (1-year) 150 (24-h)	15 (1-year) 45 (24-h)
PM _{2.5}	35 (1-year) 65 (24-h)	5 (1-year) 15 (24-h)
SO ₂	80 (24-h) 250 (1-h)	40 (24-h)
NO _x	40 (1-year) 80 (24-h)	10 (1-year) 25 (24-h)
CO	5,000 (8-h) 20,000 (1-h)	4 (24-h)
Lead	0.25 (1-year) 0.50 (24-h)	
Ozone (O ₃)	180 (1-h) 100 (8-h)	60 (peak season) 100 (8-h)
NH ₃	100 (1-year) 400 (24-h)	

ADB = Asian Development Bank, CO = carbon oxide, h = hour, μ g/m³ = microgram per cubic meter, min = minute, NO_x = oxides of nitrogen, PM_{2.5} = particulate matter 2.5, PM₁₀ = particulate matter 10, SO₂ = sulfur dioxide, WHO = World Health Organization.

^a Air Pollution Control Rules 2022

^b Recommended 2021 WHO Global Air Quality Guidelines. <https://www.who.int/>

Table 9: Applicable Noise Levels for Bangladesh Projects

Receptor/ Source	National Noise Standard Guidelines ^a (dB)		WHO Guidelines Value For Noise Levels Measured Out of Doors ^b (One Hour LAq in dBA)	
	Day (06:00-21:00)	Night (21:00-6:00)	07:00 – 22:00	22:00 – 07:00
Industrial area	75	70	70	70
Commercial area	70	60	70	70
Mixed Area	60	50	55	45
Residential Area	55	45	55	45
Silent Zone ^c	50	40	55	45

^a Noise Pollution Control Rules, 2025, Schedule 1

^b WHO. 1999. Guidelines for Community Noise; World Bank Group. 2007. Environmental, Health and Safety General Guidelines. Washington, D.C.

^c Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/establishments identified/to be identified by the Government is designated as Silent Zones where use of horns of vehicles or other audio signals, and loudspeakers are prohibited.

Table 10: Applicable Effluent Discharge Standards

Sl. No	Parameter	Unit	Maximum Tolerable Limit at Discharge point except pH		
			Internal Surface Water	2nd Stage process of public sewage	Coastal Areas
	Nitrogen (N)	mg/l	50	50	50
	Ammonia (NH ₃)	mg/l	5	5	5
	Arsenic (As)	mg/l	0.2	0.2	0.2
	BOD ₅ at 20°C	mg/l	30	250	100
	Boron (B)	mg/l	2	2	4
	Cadmium (Cd)	mg/l	2	1	2
	Chlorine (Cl ⁻)	mg/l	600	600	---
	Total Chromium	mg/l	0.5	1	1
	COD	mg/l	200	400	250
	Hexavalent Cr	mg/l	0.1	2	1
	Copper (Cu)	mg/l	3	3	3
	Fluoride (F)	mg/l	2	15	15
	Sulphide (S)	mg/l	1	--	5
	Iron (Fe)	mg/l	3	3	3
	Total Kjeldal nitrogen	mg/l	100	--	100
	Lead (Pb)	mg/l	0.1	1	2
	Manganese (Mn)	mg/l	2	2	2
	Mercury (Hg)	mg/l	0.01	0.01	0.01
	Nickel (Ni)	mg/l	1	2	5
	Nitrite (N)	mg/l	10	--	20
	Oil & Grease	mg/l	10	20	20
	Phenol (C ₆ H ₅ OH)	mg/l	1	5	5
	Phosphorus (P)	mg/l	5	--	--
	Radioactive Material Alpha Particle Beta Particle	Micro Curie/L	Standard Set by Bangladesh Atomic Energy Commission	---	----
	pH	---	6-9	6-9	6-9
	Selenium (Se)	mg/l	0.05	0.05	0.05

Sl. No	Parameter	Unit	Maximum Tolerable Limit at Discharge point except pH		
			Internal Surface Water	2nd Stage process of public sewage	Coastal Areas
	Zinc (Zn)	mg/l	5	15	15
	Temperature	°C	Not more than 5°C of reservoir water temperature	--	Not more than 5° C of reservoir water temperature
	Suspended Solids	mg/l	100	500	100
	Cyanide	mg/l	0.1	2.0	0.2
	Total Residual Chlorine	mg/l	1.0	--	1.2
	Bio Assay Test		90% fishes remain alive after 96 hours in the treated liquid waste	90% fishes remain alive after 96 hours in the treated liquid waste	90% fishes remain alive after 96 hours in the treated liquid waste

Source: ECR, 2023

III. PROJECT DESCRIPTION

54. The Cluster Towns Water Supply and Sanitation Project (CTWSSP) will improve safe, reliable, inclusive, and climate-resilient urban water supply and sanitation services in selected secondary towns of Bangladesh. The project is organized under two clusters: the Cumilla Cluster and the Ishwardi Cluster. This IEE covers only the Ishwardi Cluster subproject, comprising the Paurashavas of Ishwardi, Pabna, Gopalpur and Natore.

55. The Ishwardi Cluster subproject will rehabilitate and expand existing water supply infrastructure and construct selected new assets to improve service coverage, reliability, operational efficiency, water quality management, and climate resilience. The main interventions include production tube wells, overhead tanks, surface water treatment plant rehabilitation, secondary mains, rising mains, distribution networks, household metered connections, district metered areas, SCADA, GIS-based asset management, and selected sanitation facilities.

56. The subproject is designed to address low piped-water coverage, high non-revenue water, aging and leaking distribution networks, inadequate metering, poor pressure management, intermittent supply, weak water quality surveillance, and underdeveloped sanitation services. The subproject will prioritize service improvements in low-income communities, slums, and informal settlements where technically feasible and socially appropriate.

57. The CTWSSP, funded by the Asian Development Bank (ADB), seeks to improve sustainable urban water supply and sanitation services in above mentioned targeted *Paurashavas* in Bangladesh. The proposed subproject is to construct the drinking water distribution network and small sanitation components in the Ishwardi cluster, which composed of Pabna, Ishwardi, Gopalpur and Natore Municipalities. The coverage areas are described in the following table:

Table 11: Covered Municipalities by Subproject

Cluster	Municipalities or <i>Paurashavas</i>	Wards	Population (BBS, 2011)	Population * (projection 2045)
Ishwardi Cluster	Pabna Paurashava (A – Category)	15	144,442	279,339
	Ishwardi Paurashava (A – Category)	9	66,255	128,138
	Gopalpur Paurashava (B – Category)	9	21,033	40,693
	Natore Paurashava (A – Category)	9	81,203	157,040

* Source: Situation Analysis Report for Towns of Ishwardi Cluster (April 2023)

Figure 2: Subproject Location Relative to Map of Bangladesh



A. Scope Covered by this IEE

58. This IEE covers the environmental assessment of the Ishwardi Cluster subproject components proposed for implementation under the current project phase. These include civil works and rehabilitation activities within the Paurashavas of Ishwardi, Pabna, Gopalpur and Natore. The IEE covers the design, pre-construction, construction, post-construction, and operation phases of these components.

59. The IEE does not constitute environmental clearance for future project phases that are not yet designed or financed, including any future expansion of major surface water intake, bulk transmission, or additional treatment infrastructure not included in the present scope. Such future works, if proposed, shall be screened and assessed separately or through an updated IEE in accordance with ADB SPS 2009 and applicable Government of Bangladesh requirements.

60. Existing facilities to be rehabilitated under the subproject, including production tube wells, surface water treatment plants, overhead tanks, and existing distribution networks, are covered by this IEE and by the environmental audit of existing facilities. Audit findings shall be reflected in the final design, EMP, and corrective action measures.

B. Subproject Components¹⁶

61. Specific components of each package are enumerated in below table. The component quantities presented below are preliminary until confirmed during detailed engineering design. The final IEE and EMP will be updated to reflect confirmed quantities, locations, alignments, construction methods, land requirements, and package boundaries. Any discrepancy between the Executive Summary, Project Description, EMP, and bidding documents will be resolved before disclosure and before award of civil works contracts.

Table 12: Description of Town/City wise proposed Project Components

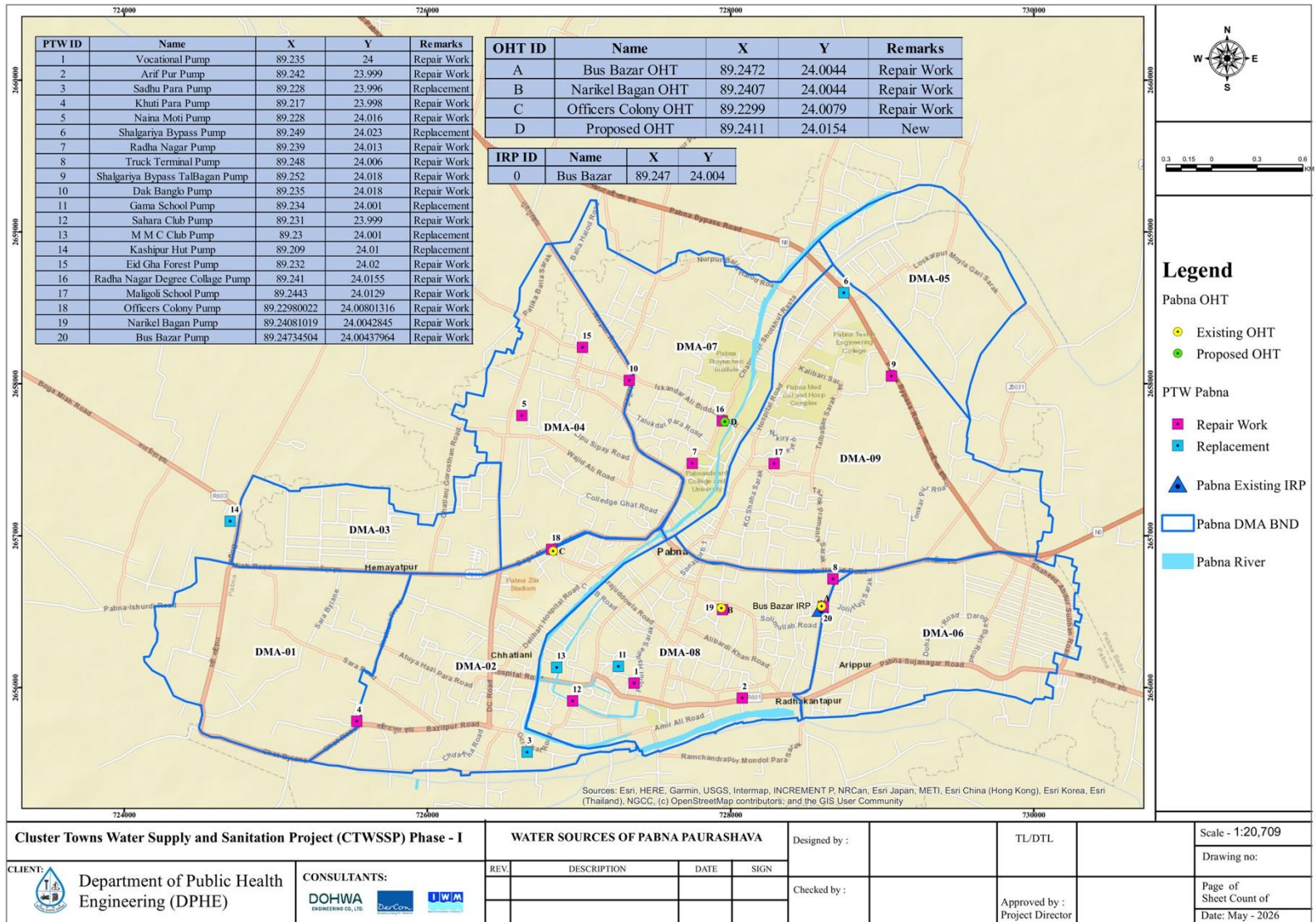
Town	Components	Purpose
Pabna (21351 m ³ /day)	Distribution pipeline	289 km new pipeline
	New Connections	11000
	Rehabilitation of existing PTWs	Existing PTWs: 20 nos. In operational (need repairs): 15 nos. Need replacement: 5 nos. Total PTWs required: 20 nos.
	Rehabilitation of existing and construction of new OHT	Existing OHTs: 3 nos. (need repair works) New OHTs proposed: 1 Nos.
Ishwardi (16840 m ³ /day)	Distribution pipeline	175 km new pipeline
	New Connections	6000
	Rehabilitation of existing PTWs	Existing PTWs: 10 nos. In operational (need repairs): 10 nos. New PTWs proposed: 0 nos. Total PTWs required: 10 nos.
	Construction of new OHT	New OHTs proposed: 3 Nos.

¹⁶ For other subproject aspects, quantification of labor work force, water requirements and construction materials have not been determined as of the assessment period. These sets of information will be determined during the detailed design and included in the updating of the IEE and SEMP.

Town	Components	Purpose
Natore (16705 m ³ /day)	Distribution pipeline	208 km new pipeline
	New Connections	5000
	Rehabilitation of existing PTWs	Existing PTWs: 12 nos. In operational (need repairs): 12 nos. Total PTWs required: 12 nos.
	Rehabilitation of existing OHTs	Existing OHTs: 3 nos.
	IRP/AIRP	Existing IRP/AIRP: 2 nos. (Rehabilitation)
Gopalpur (43,763 m ³ /day)	Distribution pipeline	70 km new pipeline
	New Connections	2500
	Construction of new PTWs	New PTWs proposed: 3 nos. Total PTWs required: 3 nos.
	Construction of new OHT	1. New OHTs proposed: 1 Nos.
	Sanitation Facilities	H/H Twin pit latrines: 400 nos. Public Toilets (proposed new): 2 nos.

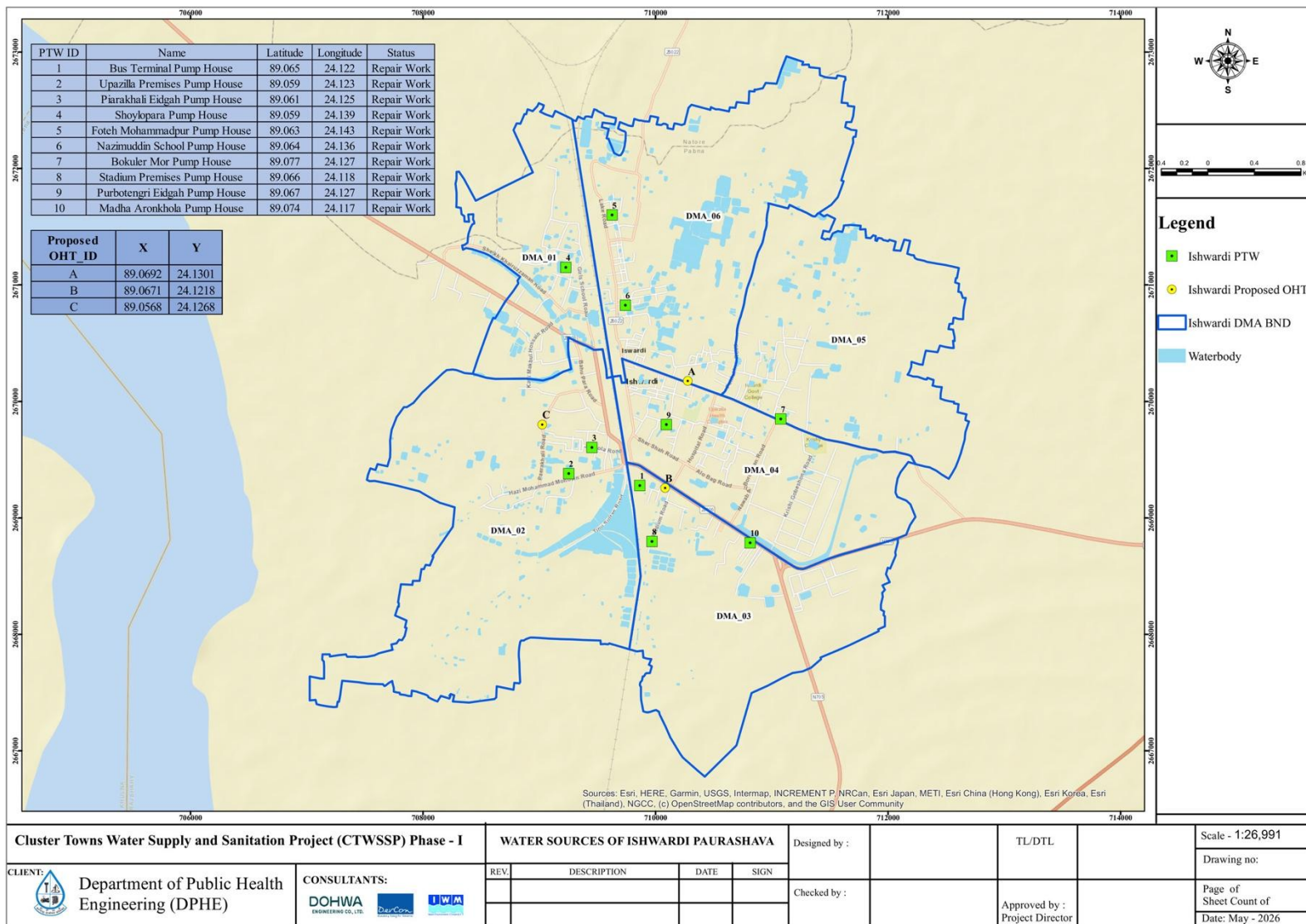
Sources: Detailed Engineering Design, DPHE

Figure 3: Water Sources Pabna (Ishwardi Cluster)



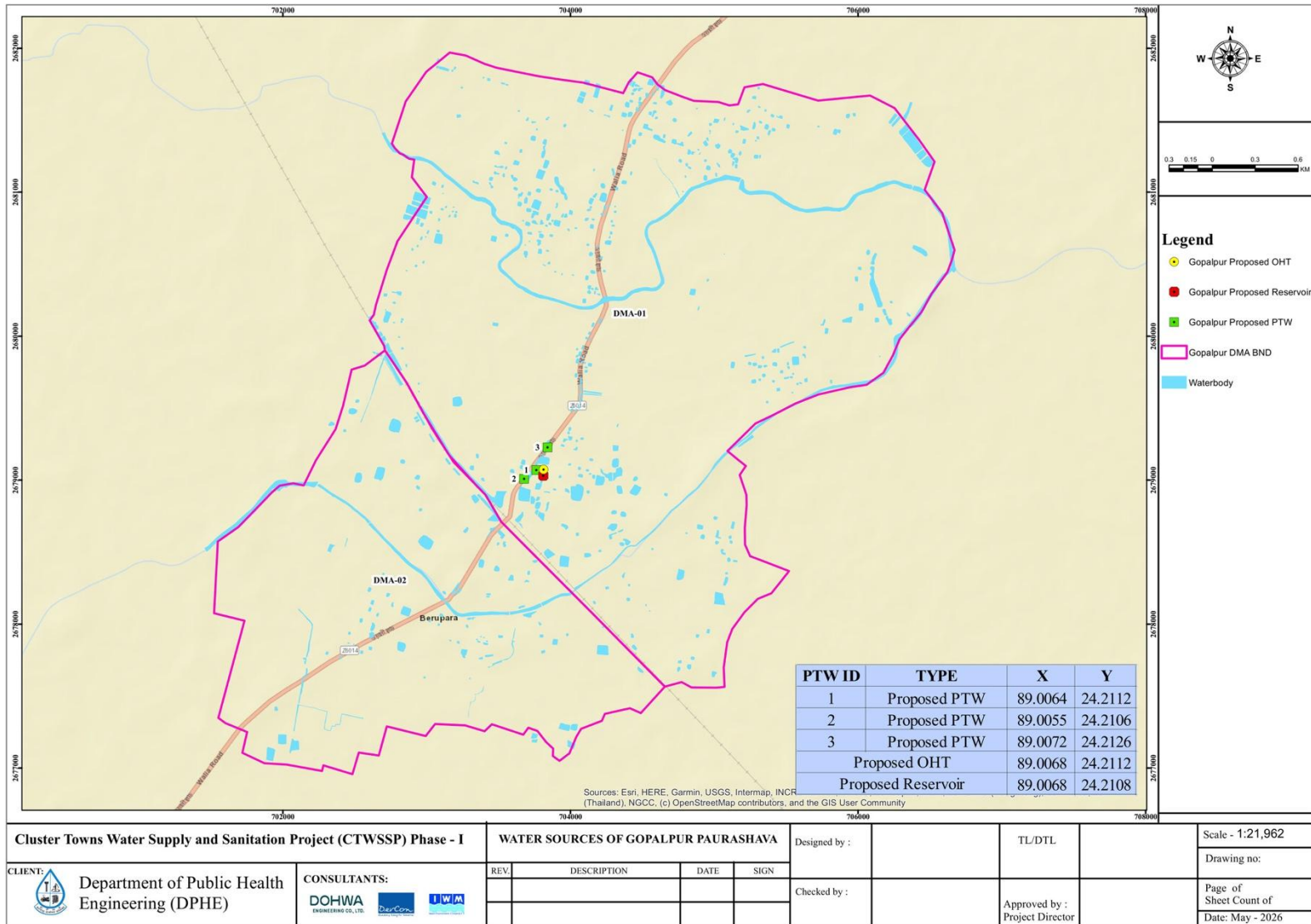
Source: DPHE

Figure 4: Water Sources of Ishwardi



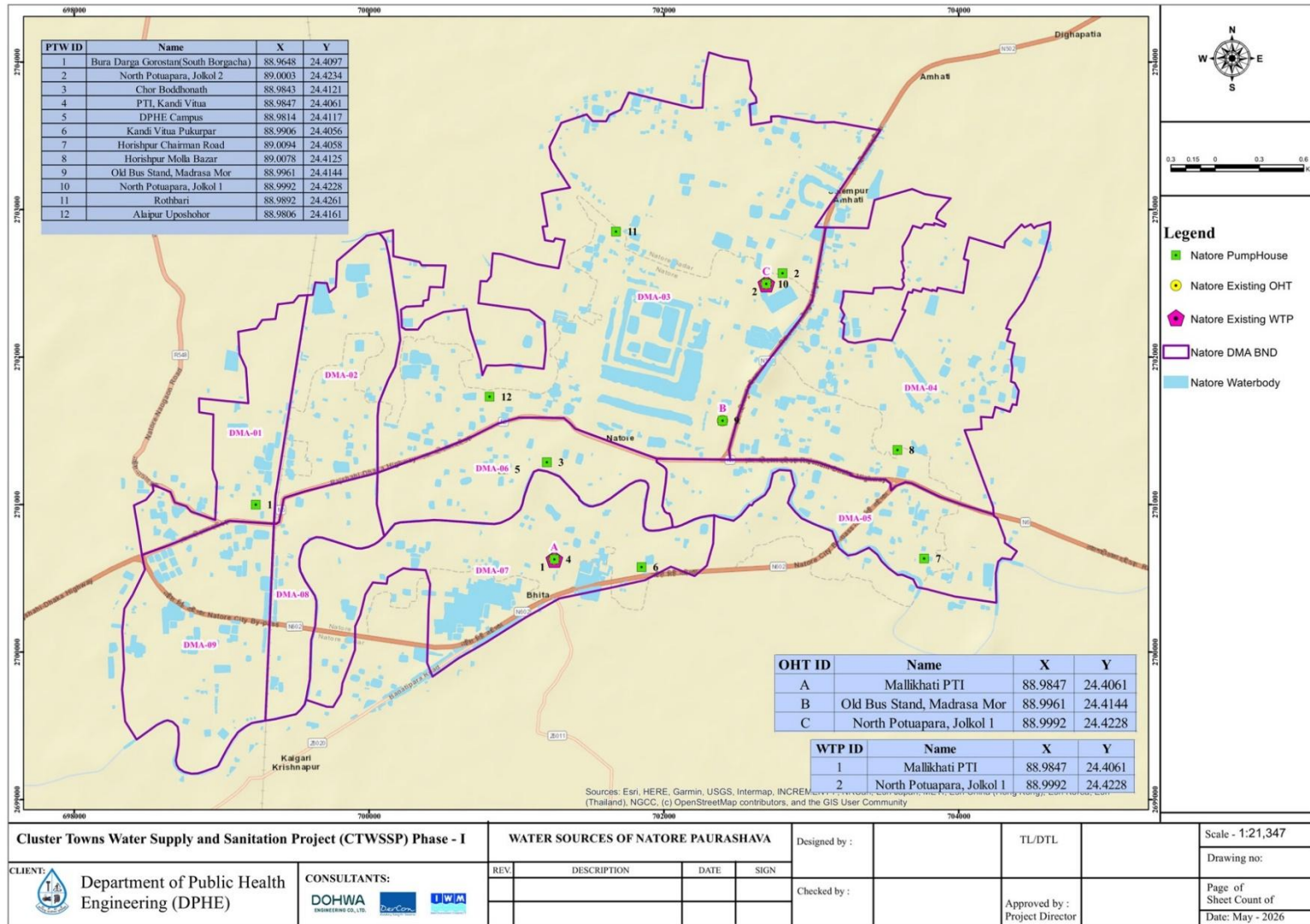
Source: DPHE

Figure 5: Water Sources of Gopalpur



Source: DPHE

Figure 6: Water Sources of Natore



Source: DPHE

C. Existing Facilities and Rehabilitation Scope

62. The Ishwardi Cluster water supply systems include existing production tube wells with treatment units, overhead tanks, and distribution networks that are currently operating with varying levels of performance. These facilities are characterized by low service coverage, intermittent supply, high non-revenue water, aging pipes, leakage, weak pressure management, and inconsistent water quality monitoring.

63. Rehabilitation of existing facilities is a core part of the subproject. The rehabilitation scope will include selected production tube wells, surface water treatment plants, overhead tanks, and associated distribution infrastructure. The purpose of rehabilitation is to improve operational reliability, water quality, hydraulic performance, safety, energy efficiency, and service delivery.

64. Because the subproject involves existing facilities, an environmental audit has been prepared as part of this IEE. The findings of the environmental audit will be used to inform final design, rehabilitation priorities, corrective action measures, and the EMP. Any existing facility retained for continued use will be rehabilitated and operated in accordance with the mitigation measures and monitoring requirements in this IEE and EMP.

D. Water Source and Sustainability Considerations

65. The Ishwardi Cluster subproject will use groundwater as raw water source. The design shall confirm sustainable yield, abstraction rates, water-level trends, source protection requirements, and water quality compliance.

66. The project's long-term strategy should reduce unsustainable reliance on groundwater where feasible and strengthen conjunctive use of surface water and groundwater. Any future shift to larger-scale surface water abstraction or bulk transmission facilities shall be assessed separately if not included in the present detailed design.

E. Construction Methods and Sequencing

67. The distribution network will be constructed largely along existing roads and rights-of-way within built-up urban areas. Construction methods may include open-cut trenching and trenchless methods, such as horizontal directional drilling, depending on road width, underground utility constraints, traffic conditions, sensitive receptors, physical cultural resources, drainage crossings, and site-specific engineering conditions.

68. Open-cut trenching may generate dust, noise, spoil, temporary access disruption, utility interference, and community safety risks. Horizontal directional drilling or other trenchless methods should be prioritized in congested or sensitive areas where open trenching would create unacceptable disruption or risk. The final selection of construction methods shall be confirmed during detailed design and further specified in the contractor's SEMP and method statements.

69. Construction shall be sequenced to minimize cumulative disturbance across wards and municipalities. Active work fronts should be limited in length, reinstatement should be completed promptly, and simultaneous works on parallel access routes serving the same communities should be avoided. Traffic management, pedestrian access, emergency access, utility

protection, and community notification will be implemented before construction begins at each location.

F. Subproject Area of Influence

70. The area of influence was defined based on the nature, location, and expected impacts of each subproject component. For linear works, including secondary mains, rising mains, and distribution pipelines, the direct impact zone includes the active construction corridor and adjacent areas up to 50 metres from the alignment. The indirect impact zone extends from 50 to 100 metres, particularly where traffic diversion, access disruption, noise, dust, utility disturbance, or community health and safety risks may extend beyond the immediate work front.

71. For non-linear facilities such as production tube wells, overhead tanks, surface water treatment plants, public toilets, and other site-specific infrastructure, the direct impact zone includes the facility footprint, construction work area, access route, material storage area, and immediately adjacent receptors. The indirect impact zone includes surrounding residential, commercial, institutional, cultural, and ecological receptors that may be affected by noise, dust, traffic, drainage disruption, visual impacts, or safety risks.

72. The area of influence will be refined during detailed design based on final alignments, confirmed facility locations, construction methods, sensitive receptor mapping, utility surveys, and site-specific environmental and social screening. The contractor's SEMP shall identify the area of influence for each active work site and specify the mitigation and monitoring measures required for that site.

Table 13: Area of Influence

Component Type	Direct Impact Zone	Indirect Impact Zone	Key Receptors / Risks
Distribution pipelines and secondary mains	Active work corridor and up to 50 m from alignment	50–100 m or wider where traffic diversion occurs	Houses, shops, schools, health facilities, mosques, utilities, roads, drains, markets, pedestrians
Production tube wells	Facility footprint, drilling area, access, and storage area	Nearby receptors within 50–100 m	Groundwater, noise, drilling waste, chemical/oil storage, workers, nearby residents
Overhead tanks	Site footprint, laydown area, access road, crane/scaffolding zone	Nearby receptors within 100 m or as determined by work-at-height risk	Residents, traffic, work-at-height safety, dust, noise, spoil, visual impact
Public toilets and twin-pit latrines	Facility footprint and immediate construction area	Nearby households, wells, drains, and public users	Groundwater contamination, odor, access, desludging, flood risk, inclusive design

73. The proposed works are expected to include a combination of new construction, rehabilitation, replacement, and upgrading of water supply and sanitation facilities. These may include production and source development works, treatment facilities where required, transmission and distribution pipelines, storage reservoirs, pumping systems, service connections, metering or control systems, rehabilitation of existing water supply assets, and associated sanitation and environmental improvement measures. The final scope, locations, capacities, and package-wise implementation arrangements will be confirmed during detailed design. Any component not assessed in this IEE, or any material change in location, technology, capacity, alignment, or construction method, shall be subject to environmental screening and, where required, update of the IEE and EMP before procurement or implementation. The sub-project components are described in the succeeding section.

74. **Pipelines.** There will be 760.3 km long distribution networks across Ishwardi cluster to be laid along the existing urban road networks, including, sensitive receptors, (school, hospital, mosque, shrines etc.), water bodies and railway crossings. Because of the leaner shape activities, the physical corridor of impact shifts dynamically as a moving workspace.

75. **Production Tube Wells (PTWs).** A total of 45 PTWs are proposed for Ishwardi cluster for Phase-I of which 35 for rehabilitation, and 10 are proposed for new construction (including 4 replacements). These constructions will have stationary point-source impacts. Unlike the linear pipeline corridor, their influence is concentrated on specific sites allocated for rehabilitation or new construction.

76. **Overhead Tanks (OHTs).** Six existing OHTs will be rehabilitated. Besides, Five new overhead drinking water storage facilities will be constructed in the newly selected sites in four towns of Ishwardi cluster. Although proposed new sites are away from populated areas, there will be a requirement of managing civil construction debris, high noise, safe operation and handling of construction equipment and scaffolding.

77. **Iron Removal Plant (IRP).** There is 2 existing IRPs in Ishwardi cluster, all located in Natore *Paurashava*. These plants are being in a non-operation due to the running cost and technical knowhow. After rehabilitation there are opportunities to manage backwash sludge and wastewater treatment before disposal. Rehabilitation works are to be conducted at these sites, while little impacts are projected as these are confined within boundaries and structures. However, chemical handling, storage, and dosing should consider proper precautionary measures to prevent health hazards. A standard operating procedure (SOP) is to provide for IRP operation and maintenance.

78. **Sanitation Facilities.** The subproject considers the construction of 400 household level twin pit latrines and 2 public toilets in Gopalpur *Paurashava*. The area of influence during the construction of these public toilets and household latrines is highly localized within community hubs and low-income neighborhoods. The immediate focus is managing temporary sub-soil disruptions and ensuring work takes place without compromising household privacy. The baseline records of groundwater and surface water will be of importance to understand contamination due to these infrastructures to be constructed in Gopalpur *Paurashava*.

79. The subproject will be implemented mainly within existing urban and peri-urban areas, road rights-of-way, public utility corridors, existing facility premises, and land made available for project purposes. Construction activities will involve site preparation, excavation, pipe-laying, civil works for facilities, temporary storage of materials, movement of equipment and vehicles, reinstatement of disturbed areas, and testing and commissioning of completed works. Works

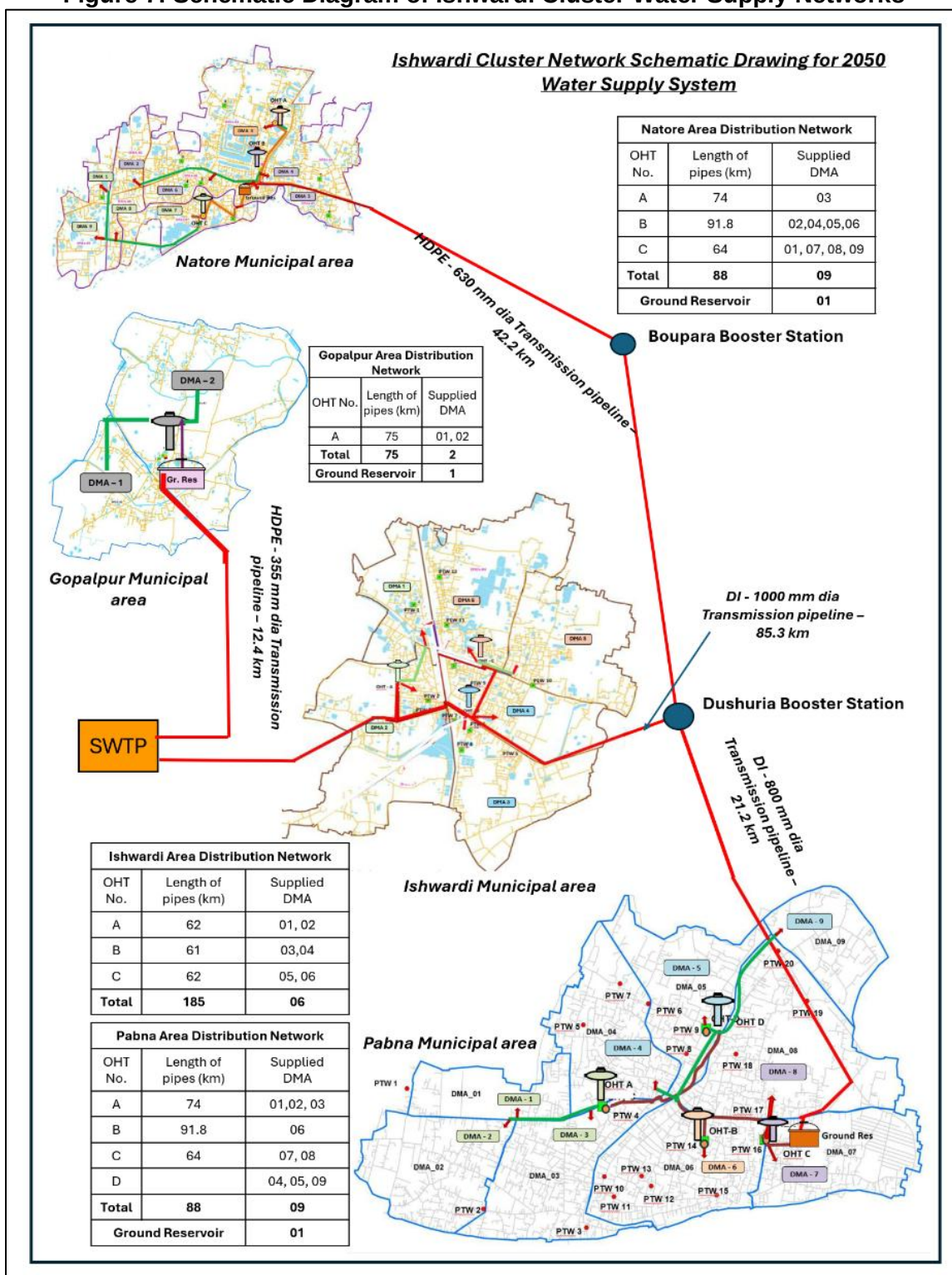
will be planned to minimize disruption to traffic, access to properties, local businesses, public services, and community facilities.

80. The subproject does not anticipate significant conversion of natural habitat or impacts on legally protected areas, provided that final designs remain within the assessed footprint and avoid sensitive ecological receptors. Most impacts are expected within the immediate corridor of works and facility sites. The design will incorporate measures to avoid or minimize environmental impacts, including selection of appropriate alignments, protection of existing utilities, drainage and erosion control, climate-resilient design standards, safe handling of chemicals and materials, worker and community health and safety provisions, and provision for operation and maintenance.

81. Existing facilities that will be retained, rehabilitated, replaced, or integrated into the proposed system are covered by the environmental audit and by the corrective action requirements of this IEE. Audit findings shall be reflected in final design, contract specifications, the EMP, and site-specific EMPs. No work will commence on facilities or packages requiring environmental clearance, permits, or other statutory approvals until such approvals have been obtained and relevant conditions have been incorporated into implementation arrangements.

82. **Crossings and Utilities.** The distribution network and secondary mains may cross or run parallel to existing utilities, drains, roads, railways, and water bodies. Such locations present higher construction risks, including utility damage, service interruption, traffic disruption, drainage blockage, sedimentation, and safety hazards. During detailed design, DPHE and the design consultant will prepare a crossings and utility inventory. This inventory shall identify all major road crossings, railway crossings, drainage crossings, water body crossings, and known underground or overhead utilities. The inventory shall be used to finalize construction methods, traffic management plans, utility protection measures, permit requirements, and site-specific method statements. No excavation or drilling will commence at crossing locations until utilities are identified, relevant authorities are consulted, required permits are obtained

Figure 7: Schematic Diagram of Ishwardi Cluster Water Supply Network8



IV. DESCRIPTION OF THE ENVIRONMENT

83. The existing environmental condition of the subproject area is described based on a combination of primary and secondary baseline environmental data, including reliable online sources, established literatures, and maps, among others. This section presents the bases for the prediction of potential environmental issues and impacts of the subproject which are necessary to assess.

84. The proposed subproject has 15 civil works packages focusing on four distinct area under Ishwardi Cluster.

A. Land Environment

1. Topography

85. The topography of Pabna District is predominantly a flat, low-lying alluvial plain characteristic of the Ganges-Padma floodplain, with an average elevation of 11 to 13 meters above mean sea level (MSL), ranging from 0 meters near water bodies to a maximum of 23 meters. Pabna Municipality itself sits at an average elevation of around 13 meters above MSL. The district's landscape is highly influenced by major river networks, with the Padma River forming its southern boundary and the Ichamati River snaking directly through the town area. The region features a mix of recent alluvial deposits and active floodplains. Further west, Ishwardi Municipality exhibits a slightly higher and more stable topographic profile, with an average elevation of 15 meters above MSL. It features a naturally plain to gently undulating terrain defined by the older Ganges floodplain deposits. The Padma River flows alongside the southern edge of Ishwardi Upazila, providing a natural drainage outlet, though seasonal peak discharges can restrict urban outflow and trigger localized drainage congestion during heavy monsoons.

86. The landscape of Natore District is notably low-lying and flat, featuring an average elevation of 14 meters above MSL, with a terrain that slopes gently towards the vast Chalan Beel wetland complex. Natore Municipality shares this low-lying, plain terrain with an average elevation of approximately 14 meters above MSL. The hydrology is dominated by the Narad River, which cuts through the town, as well as a complex network of seasonal canals (khals). Due to its proximity to the Chalan Beel depression, the area is highly susceptible to natural drainage blockages. The lack of an adequate or fully integrated municipal storm drainage system regularly induces waterlogging in low-lying commercial and residential pockets during the rainy season. Southward along the northern banks of the Padma River lies Gopalpur (Lalpur Upazila). This area features a flat, fertile alluvial plain with elevations averaging between 12 to 14 meters above MSL. Its landscape is continuously shaped by the dynamic flow of the Padma River, featuring active floodplains and shifting sandy lands (chars). While riverbank embankments exist to control structural flooding, the area remains vulnerable to high-water tables, and internal drainage constraints cause localized waterlogging during intense monsoon events.

87. The municipal urban zones across Pabna, Ishwardi, Gopalpur, and Natore mostly sit comfortably above the critical flood risk thresholds of the immediate active river beds. These urban slopes and minor gradient transitions (averaging a steady 12 to 15 meters above MSL) will not affect the construction of structural water transmission and distribution networks. Furthermore, the development of District Metered Area (DMA) based pressurized water supply

systems across these four cluster towns will remain unaffected by the minor regional relief variations and gentle terrain gradients.

2. Land Use

88. The major land use categories of the subproject area, particularly within Pabna District, include extensive agricultural plains, expanding urban and semi-urban settlements, vast water bodies (including rivers and seasonal wetlands), and scattered homestead vegetation. However, the land use profiles of Pabna Municipality and its surrounding peri-urban pockets are transforming rapidly due to high urbanization pressures. Built-up residential and commercial structures are steadily engulfing fertile crop fields and low-lying water bodies. This transition has led to a noticeable reduction in urban green canopy and natural drainage basins within the municipal boundary over the last decade, mirroring a broader district-wide shift where infrastructure development is systematically replacing traditional rural floodplains. Westward in Ishwardi Municipality, the land use dynamic is distinctly shaped by its status as a major regional transport, economic, and industrial hub (driven by the Ishwardi Export Processing Zone and proximity to major national infrastructure). While agricultural land historically dominated the landscape, large-scale conversions into industrialized zones, warehouses, and commercial semi-built environments have accelerated. This rapid industrial expansion has caused a significant drop in orchards, agricultural plots, and local wetlands, replacing them with impervious surfaces that alter the area's natural drainage capacity.

89. In Natore District, land use is traditionally anchored by its unique geography, sitting adjacent to the Chalan Beel—one of the largest wetland ecosystems in Bangladesh. Consequently, land use is dominated by deep-water agriculture and massive seasonal water bodies. However, Natore Municipality itself is experiencing distinct environmental transformations. Driven by population growth and commercial expansion, built-up areas within the Paurashava have steadily expanded. This urban sprawl has come at the direct expense of peripheral wetlands, low-lying agricultural fields, and natural drainage ditches (khals). The loss of these crucial urban water bodies and vegetation covers has noticeably reduced the town's natural water retention capacity.

90. Southward along the Padma River, Gopalpur (under Lalpur Upazila) exhibits a land use pattern heavily influenced by both industrial presence (such as the North Bengal Sugar Mills) and river dynamics. The rural matrix is a mix of sugarcane farming, fruit orchards, and dense homestead vegetation. However, the urban core of Gopalpur is transitioning into a dense semi-urban and industrialized space. This growth has resulted in a gradual contraction of open agricultural spaces and local water bodies, with built-up infrastructure expanding outward along the primary transport corridors.

3. Geology, Geomorphology and Soil

91. The subproject area across the Ishwardi cluster is located in the west-central region of Bangladesh, primarily composed of Holocene alluvial deposits and Late Pleistocene sediments associated with the High Ganges River Floodplain. The regional geomorphology consists of flat to gently undulating floodplains, heavily dictated by the dynamic hydrology of the Ganges-Padma river system. Unlike the eastern variants, this region lacks prominent hill ranges, featuring instead a network of natural levees, broad flood basins, abandoned channels, and the expansive Chalan Beel wetland depression to the northeast.

92. Sediments in the subproject area are primarily formed by unconsolidated fluvial deposits carried down by the Ganges River and its historical distributaries. A prominent geomorphological reality for towns like Ishwardi, Pabna, and Gopalpur (Lalpur) is their direct interaction with the Padma River channel. This massive river system exerts immense hydrologic force, generating ongoing channel migration, seasonal bank erosion, and the formation of unstable sandy land masses (chars). In contrast, Natore Municipality borders the low-lying structural depression of the Chalan Beel, where fine-grained, lacustrine (lake-bed) and slow-water alluvial sediments dominate.

93. The regional soil profile is classified largely as Calcareous Brown and Calcareous Grey Floodplain soils, heavily dominated by riveralluvium. In terms of physical and chemical properties, these soils contrast sharply with eastern Bangladesh:

- (i) **Texture & Subsoil:** The topsoil predominantly consists of well-stratified silty loams and clayey silts on the ridge crests, transitioning into heavy, dense clays within the deep basins. The subsoil, extending from 30 to over 130 meters deep, is characterized by alternating strata of fine-to-medium sand, micaceous silt, and clay.

94. Chemical Properties: Unlike the acidic soils of eastern clusters, the soils here are moderately calcareous, containing fine fragments of lime. Consequently, the chemical reaction is generally neutral to slightly alkaline, with a pH range typically between 7.4 and 7.9.

- (i) **Fertility:** Backed by an organic matter content that maintains a fertile base, these highly productive loamy and clayey soils provide an excellent foundation for intensive regional agriculture while remaining stable enough for buried infrastructure design when kept clear of direct active erosion zones.

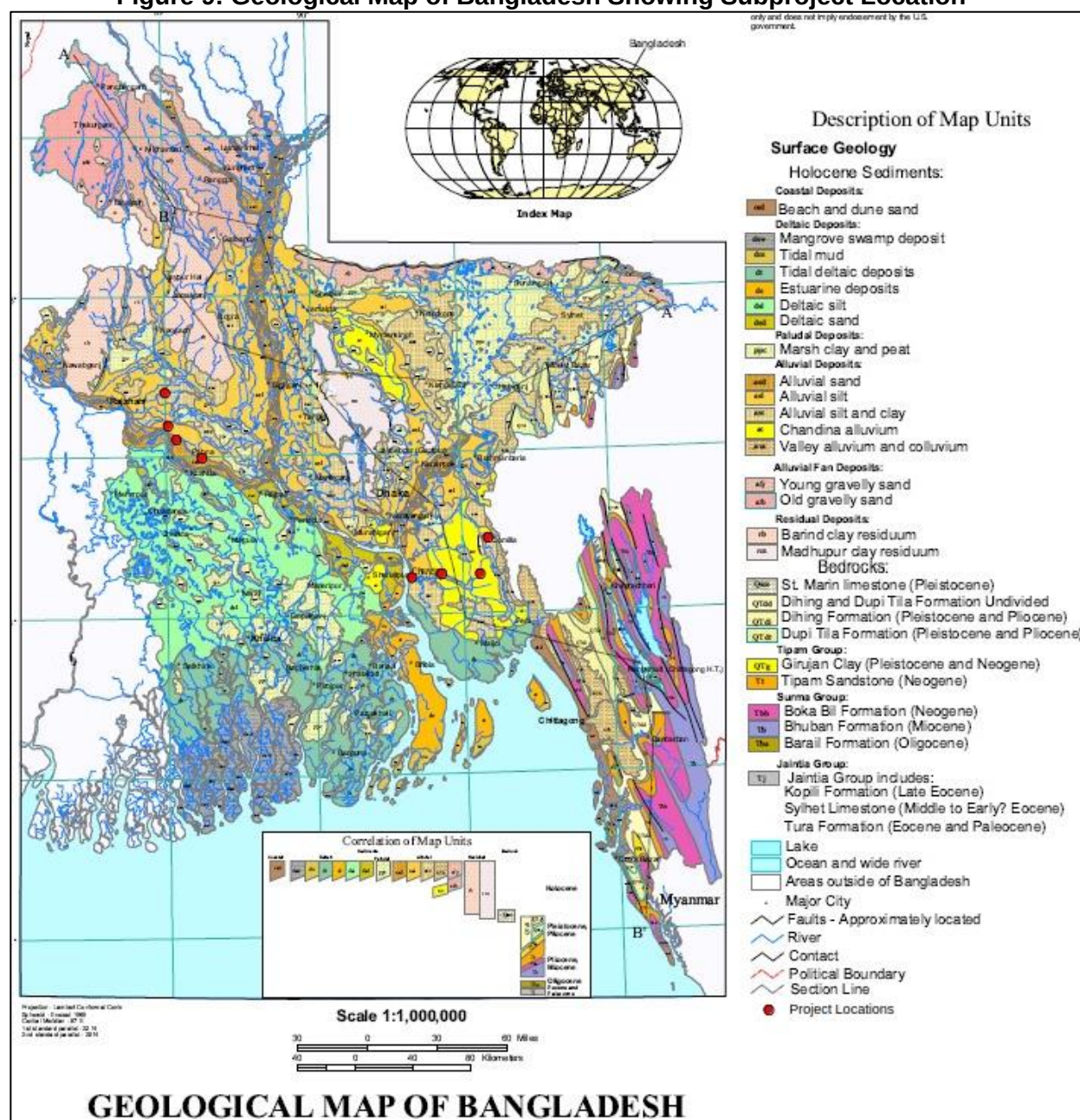
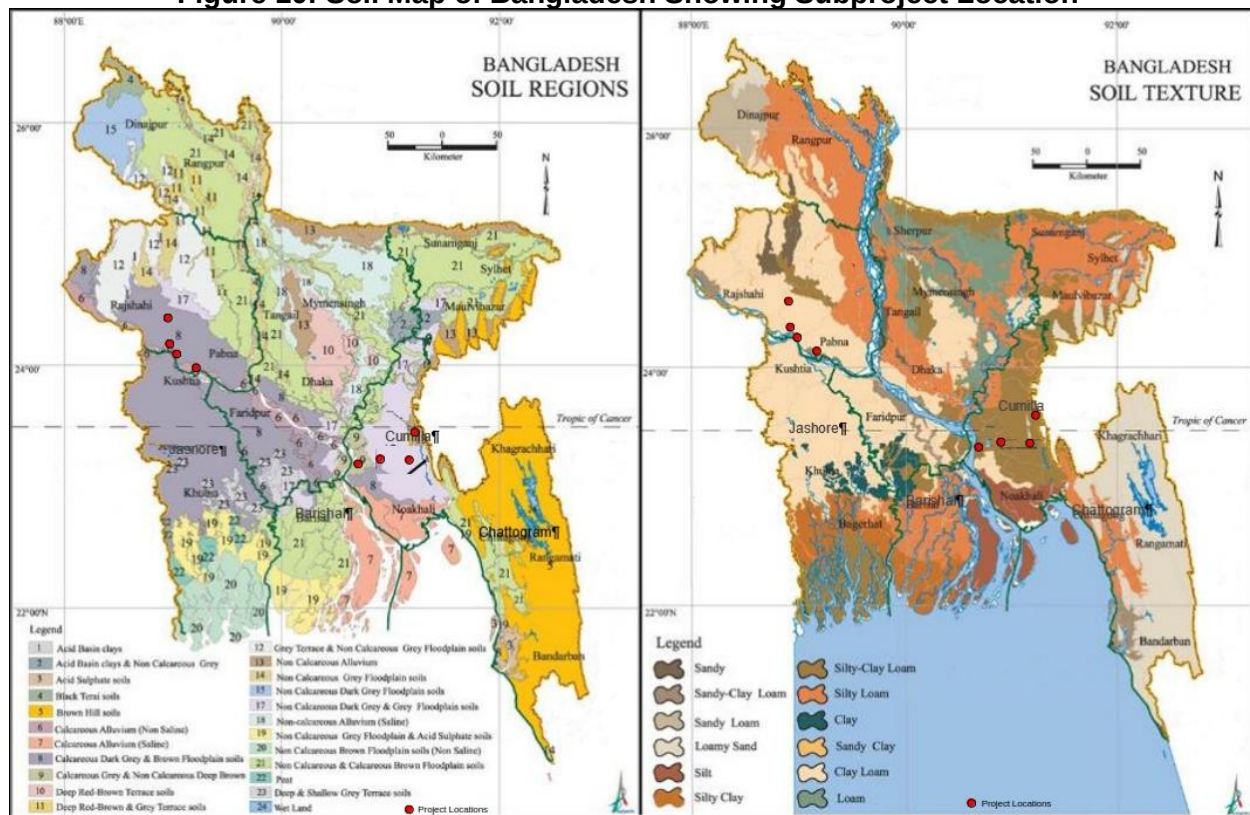
Figure 9: Geological Map of Bangladesh Showing Subproject Location^a

Figure 10: Soil Map of Bangladesh Showing Subproject Location^a



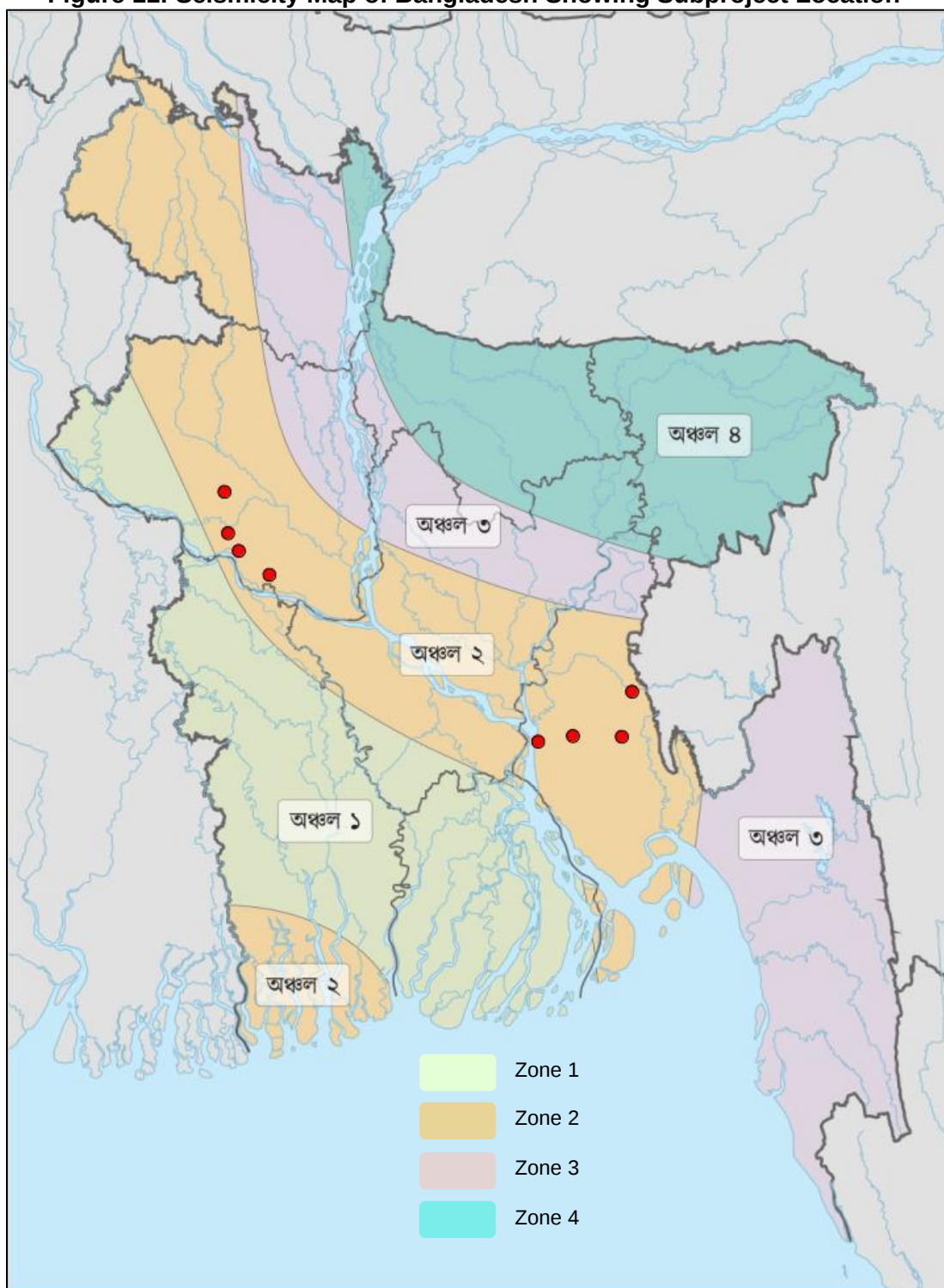
Source: FAO 1988 and Banglapedia

^a Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

4. Seismology

95. Bangladesh has been classified into three seismic zones, with Zone-I the most severe and Zone-III the least. The study area falls in the Zone II. So, the activities should be undertaken considering the risks of zone II.

Figure 11: Seismicity Map of Bangladesh Showing Subproject Location^a



Source: Geological Survey of Bangladesh. <https://gsb.portal.gov.bd/>

^a Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

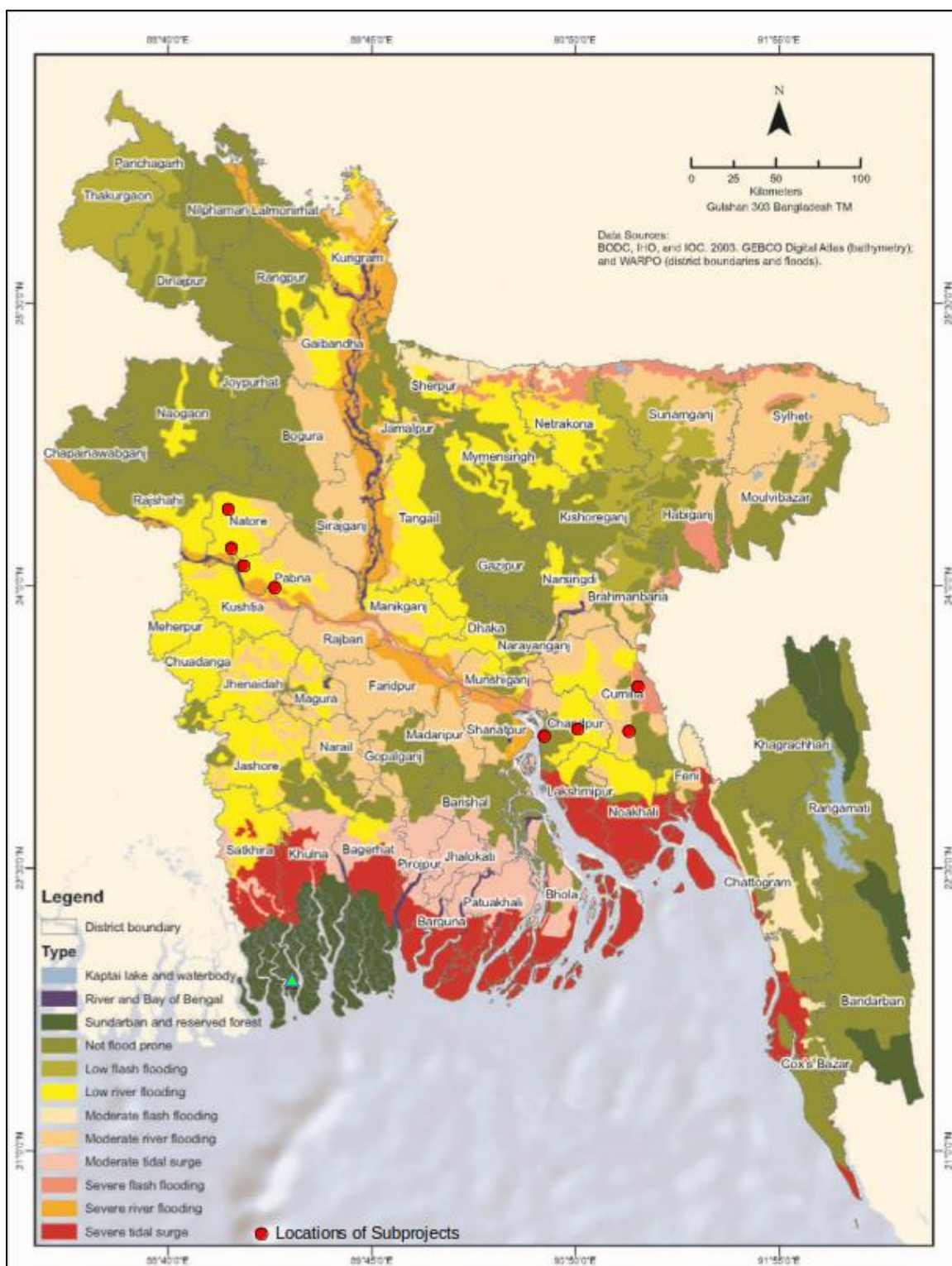
5. Other Natural Hazards

96. Flood. Bangladesh is the most flood-prone country in the world, with approximately 60% of its population exposed to high flood risk. The geographical location of Bangladesh is at the base of the Ganges-Brahmaputra-Meghna (GBM) delta measuring about 80% of its landmass characterized as low-lying floodplains. In general, normal monsoon rains submerge 20% to 25% of the country, while severe catastrophic cycles can inundate up to 80% of the landmass.

97. Based on flooding pattern and inundation level, flood in Bangladesh may be below types:

- (i) **Riverine/Monsoon Floods:** This is the most dominant and severe category of natural flooding affecting this western cluster. Pabna, Ishwardi, and Gopalpur (Lalpur) are situated along the northern bank of the dynamic Ganges-Padma River system. From July to September, massive seasonal discharges driven by upstream Himalayan snowmelt and transboundary monsoon rains cause the Padma to swell significantly. While the structural cores of Pabna and Ishwardi municipalities are largely protected by major flood control embankments (such as the historic Pabna Irrigation and Rural Development Project embankments), peripheral areas, low-lying extensions, and adjacent sandy lands (chars) face regular, deep seasonal inundation.
- (ii) **Flash Floods:** Unlike the eastern and northeastern borders of Bangladesh (such as Cumilla, Feni, or Sylhet) which suffer from violent, rapid flash floods cascading down from steep Indian hills, this western cluster is highly insulated from sudden flash floods. The terrain is flat, and there are no adjacent mountain ranges to generate high-velocity, short-duration runoff. Any water level rises in the local rivers or the nearby Chalan Beel wetland complex occur gradually over days rather than hours, giving municipal authorities adequate lead time for operational adjustments.
- (iii) **Wetland & Depression Driven Floods (Chalan Beel Overflows):** Unique to Natore Municipality, this specialized flooding pattern occurs due to its proximity to the Chalan Beel—the largest structural wetland depression in northwestern Bangladesh. During the peak monsoon, the Beel acts as a massive retention basin fed by rivers like the Atrai and Baral. When the Beel fills to capacity, it creates a backwater effect on Natore's internal river, the Narad. The river's flow slows to a halt or reverses, causing gradual, prolonged agricultural and peripheral urban inundation that can last for weeks, directly threatening low-lying civil infrastructure.
- (iv) **Urban Floods:** Urban flooding is a recurring, high-probability issue across all four municipalities, driven by intense local cloudbursts colliding with inadequate, outdated, or silted-up internal drainage systems. In Pabna and Natore Municipalities, the natural primary drainage channels (the Ichamati and Narad rivers, respectively) have suffered from heavy illegal encroachment and waste dumping. Consequently, during heavy monsoon downpours, stormwater cannot clear quickly, resulting in localized waterlogging (standing water of 0.3 to 0.6 meters) in commercial hubs and residential neighborhoods.

Figure 12: Flood Prone Areas of Bangladesh and Classifications^a

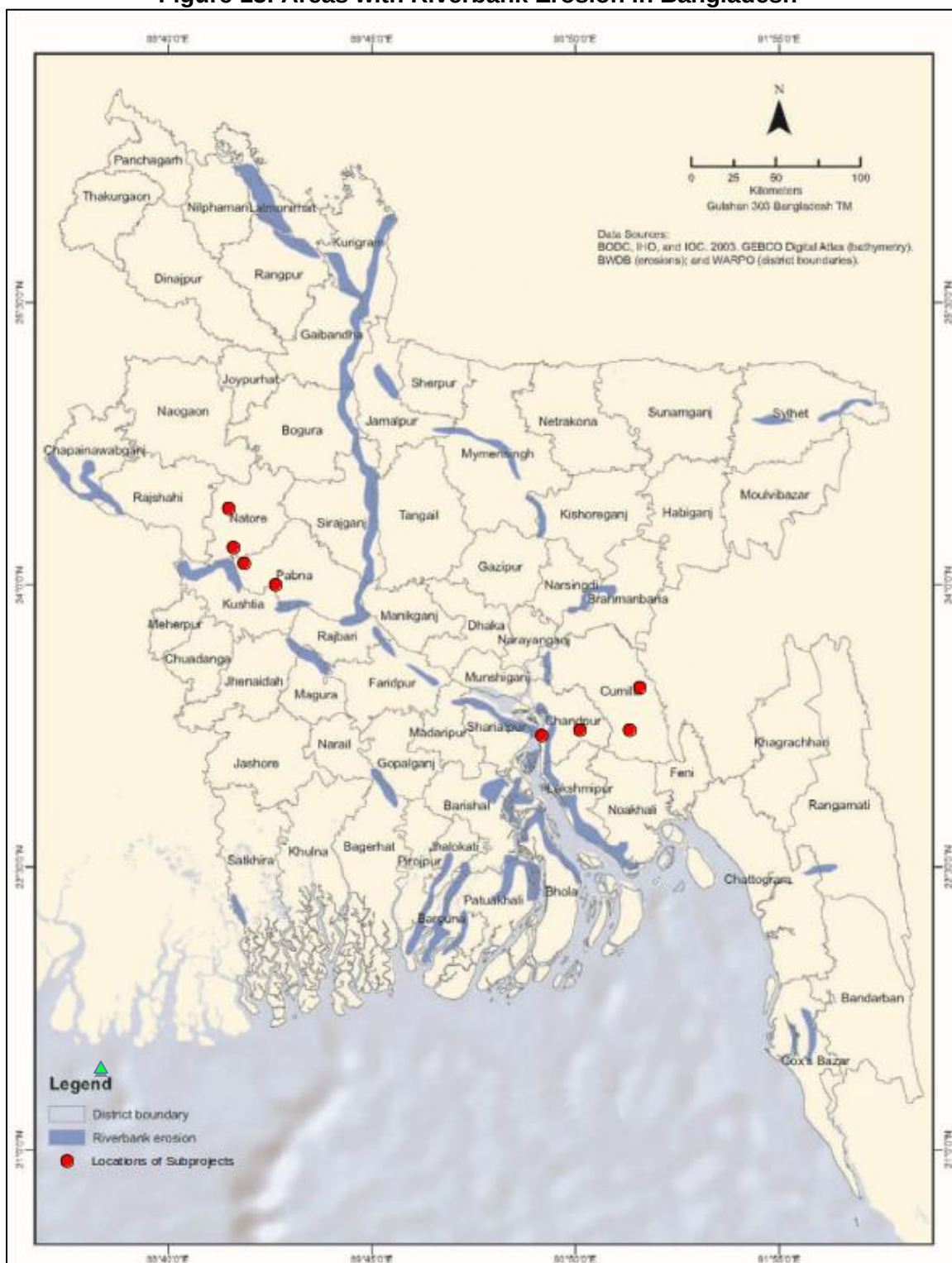


Source: Bangladesh Climate and Disaster Risk Atlas. ADB. December 2021

^a Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

98. **Soil Erosion.** Riverbank erosion in Bangladesh is a severe, chronic natural disaster, particularly along the Padma, Jamuna, and Meghna rivers caused due to high-velocity monsoon flows and braided river structures. Nearly 20 out of 64 districts face erosion, with major impacts in Kurigram, Gaibandha, Jamalpur, Sirajganj, Shariatpur and Chandpur. Annually 10,000 hectares of land are eroded that displaces around 200,000 people from homes and livelihoods. Riverbank erosion destroys agricultural land, homes, and infrastructure, contributing heavily to rural-to-urban migration. Municipalities in the Ishwardi cluster are not adjacent to any of the rivers causing bank erosion.

Figure 13: Areas with Riverbank Erosion in Bangladesh^a



Source: Bangladesh Climate and Disaster Risk Atlas. ADB. December 2021

^a Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

B. Atmospheric and Acoustic Environment

1. Climate

99. **Climatic conditions:** The climatic conditions of the subproject area, spanning Pabna, Ishwardi, Gopalpur (Lalpur), and Natore municipalities, are governed by a tropical monsoon climate. However, because of their geographic location in the western zone of Bangladesh, these towns exhibit a much more pronounced continental character with sharper seasonal variations compared to the eastern clusters. The climate is defined by three distinct periods: a hot, dry pre-monsoon summer (March to May), a sultry, rain-heavy monsoon season (June to October), and a significantly cooler, dry winter (November to February). The defining meteorological feature of this region is the systemic seasonal reversal of wind circulation, where hot, moisture-laden south-westerly winds dominate the summer monsoon, replaced by cool, dry northeasterly winds during winter.

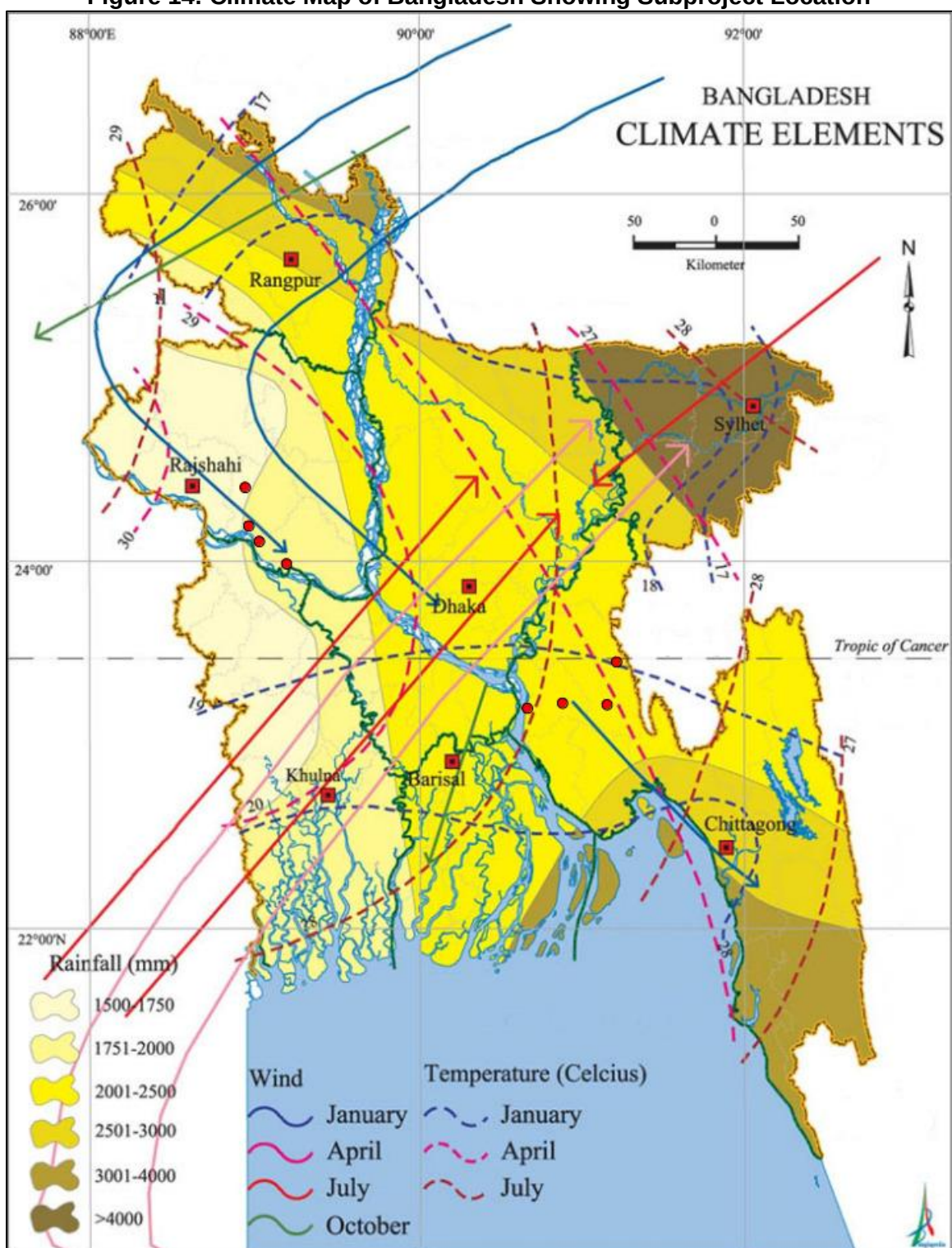
100. A critical localized variation within this cluster is its position within the lowest rainfall zone of the country, often referred to as the western dry zone. Unlike the eastern districts (such as Cumilla and Chandpur) which consistently experience heavy annual downpours, this cluster features a significantly drier baseline. The annual average rainfall across Ishwardi and Pabna Municipality ranges between 1,200 mm and 1,400 mm. Over 80% of this total precipitation is tightly packed into the monsoon months of June to October.

101. Temperature patterns in this western cluster are remarkably extreme and pose unique challenges for local engineering design:

- (i) Summer Microclimate: During the pre-monsoon peak, Gopalpur (Lalpur) and Ishwardi routinely record some of the most intense summer heatwaves in Bangladesh. Long-term maximum mean temperatures escalate between 35.7°C and 42.5°C, creating highly volatile weather conditions with severe localized convective storms (Nor'westers) and rapid surface water evaporation.
- (ii) Winter Microclimate: Conversely, the dry winter season brings distinct drops in temperature. Average winter minimums in Natore and Pabna Municipality drop to around 10°C to 12°C in December and January, occasionally plummeting lower during intense cold waves, accompanied by thick morning fog.

102. While the general seasonal timeline aligns with the rest of Bangladesh, the severe summer heat, lower overall precipitation volumes, and sharp winter drops distinguish the Pabna-Natore cluster as an extreme climatic zone. These sharp temperature fluctuations and high-intensity, short-duration monsoon downpours heavily influence urban drainage patterns and require specialized temperature-resilient considerations for the construction of water supply infrastructure.

Figure 14: Climate Map of Bangladesh Showing Subproject Location



Source: Banglapedia – Encyclopedia of Bangladesh, <https://en.banglapedia.org/index.php/Climate>

Table 14: Average Climatic Data – Temperature, Rainfall, Transpiration, and others

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Pabna</i>												
Average maximum °C	25.7	28.3	33.4	36.3	35.1	33.2	31.8	31.8	32.3	31.9	29.3	26.6
Average minimum °C	11.5	13.7	18.2	22.6	24.6	25.6	25.9	26.2	25.9	23.3	17.4	12.8
Rainfall, mm	8.9	20	42.7	71.4	175.8	288.3	267.8	273.7	224.3	141.8	16.2	4
Potential Evapo-transpiration, mm	63.6	85.1	145.1	168.0	169.0	122.7	130.5	124.0	120.0	113.1	77.7	60.1
Relative Humidity % (9 AM & 6 PM)	77 68	71 55	67 44	71 41	79 61	85 81	86 85	85 84	84 85	79 81	75 76	76 75
<i>Ishwardi</i>												
Rainfall, mm	8.5	18.1	21.8	58.9	163.9	311.6	288.4	307.6	239.5	140.3	22.8	3.4
Potential Evapo-transpiration, mm	59.5	81.8	140.4	163.8	160.9	123.9	120.3	118.7	110.4	107.0	74.4	54.6
<i>Natore</i>												
Rainfall, mm	10.5	15.3	28.3	31.8	149.0	289.0	305.5	292.8	249.7	138.0	17.0	2.5

Source: Land Resources Appraisal of Bangladesh for Agricultural Development, Technical Report No.2.UNDP/FAO

2. Air Quality

103. Ambient air quality measurement at key locations of the subproject area has been completed, and the results are shown in Table 14-17. Air quality depends on substances which are present in the atmosphere in such concentrations that they produce undesirable effects on human beings, animals as well as plant life. These components include gases (SO_x, NO_x, CO, O₃, etc.), Suspended Particulate Matter (PM_{2.5} and PM₁₀), etc. The air quality parameters were analysed from samples collected over twenty-four (24) hour period at each sampling site. In all cases, the minimum, average, and maximum concentration of all the parameters is below the standard value at all locations.

Table 15: Ambient air monitoring report of Pabna Paurashava

Sl. No.	Parameters for Analysis	Unit	Location of AQ Testing, Pabna		DOE Standard
			Radhanagar Degree College Pump	Bas Bazar Pump House	
1	SPM	µg/m ³	137.00	127.00	-
2	PM _{2.5}	µg/m ³	61.40	41.40	65
3	PM ₁₀	µg/m ³	95.00	74.40	150
4	SO _x	µg/m ³	16.60	17.44	80
5	NO _x	µg/m ³	19.30	21.74	80
6	CO	mg/m ³	1.3	1.2	5

Table 16: Ambient air monitoring report of Ishwardi Paurashava

Sl. No.	Parameters for Analysis	Unit	Location of AQ Testing, Ishwardi		DOE Standard
			Municipal office Pump	Foteh Mohammadpur Pump House	
1	SPM	µg/m ³	28.00	48.17	-
2	PM _{2.5}	µg/m ³	8.67	12.33	65
3	PM ₁₀	µg/m ³	14.67	25.50	150
4	SO _x	µg/m ³	16.88	17.54	80
5	NO _x	µg/m ³	20.78	19.84	80
6	CO	mg/m ³	1.6	1.5	5

Table 17: Ambient air monitoring report of Natore Paurashava

Parameters for Analysis	Unit	Location of AQ Testing, Natore		DOE Standard
		Patuapara Jolkol	Molikhati Pump	
SPM	µg/m ³	19.33	21.50	-
PM _{2.5}	µg/m ³	6.67	8.75	65
PM ₁₀	µg/m ³	7.00	9.50	150
SO _x	µg/m ³	16.36	15.88	80
NO _x	µg/m ³	21.66	18.69	80
CO	mg/m ³	1.5	1.4	5

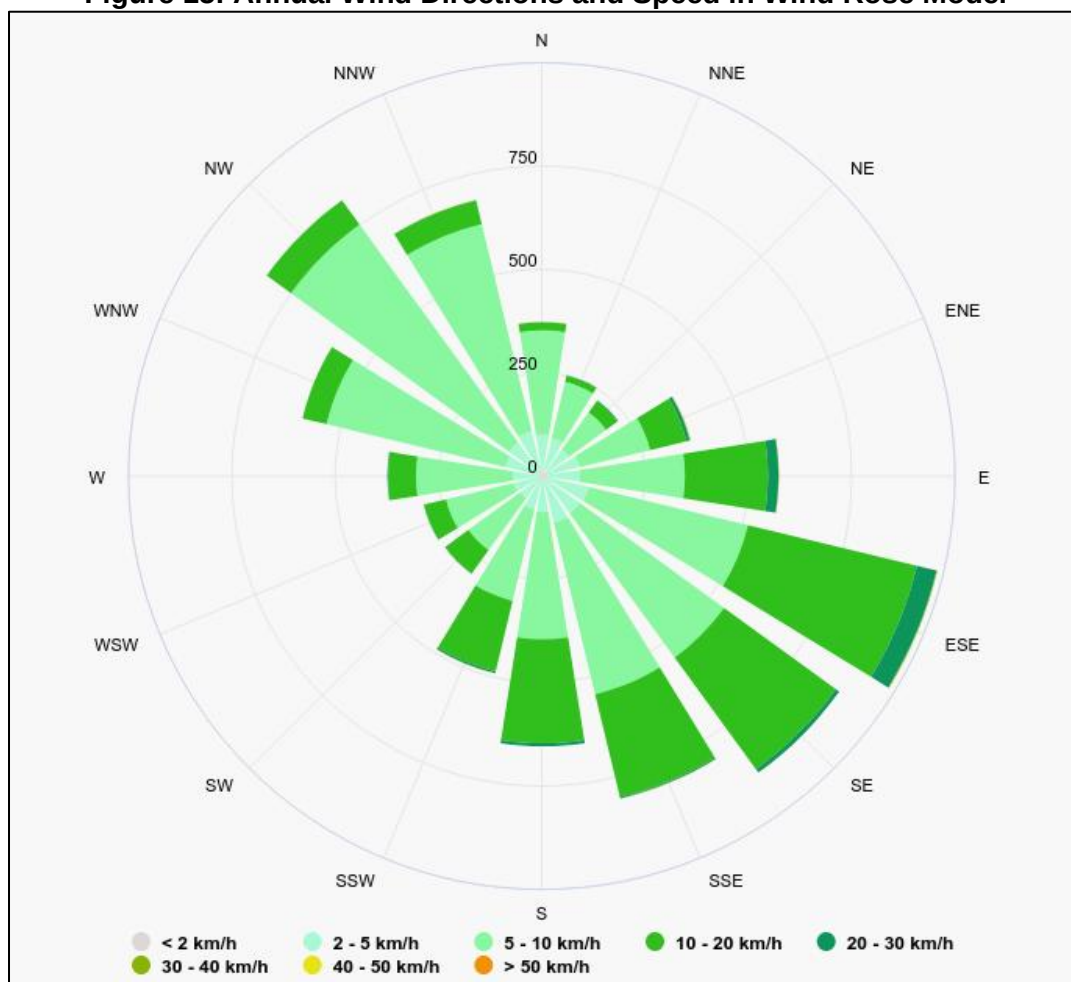
Table 18: Ambient air monitoring report of Gopalpur Paurashava

Parameter for Analysis	Unit	Location of AQ Testing, Gopalpur		DOE Standard
		Proposed OHT	Beruara Proposed Pump	
SPM	$\mu\text{g}/\text{m}^3$	19.67	24.67	-
PM _{2.5}	$\mu\text{g}/\text{m}^3$	5.33	7.00	65
PM ₁₀	$\mu\text{g}/\text{m}^3$	8.33	10.00	150
SO _x	$\mu\text{g}/\text{m}^3$	18.46	17.88	80
NO _x	$\mu\text{g}/\text{m}^3$	24.78	22.26	80
CO	mg/m^3	1.3	1.3	5

3. Wind

104. The seasonal wind pattern in Natore municipality shifts between two primary directions, influenced closely by its location in the western geographic zone of Bangladesh. During the summer monsoon (March to October), winds predominantly blow from the South and Southeast, bringing in moist air from the Bay of Bengal. During the winter (late October to February), the system shifts, and winds predominantly blow from the North and Northwest, bringing cooler, drier air from the Himalayan region. Average wind speed is notably higher during the monsoon and pre-monsoon periods, peaking at roughly 12 to 20 km/hr in July. Conversely, wind speeds drop significantly as the seasons transition, with November seeing the lowest average speeds (11 to 13 km/hr), making it the calmest month of the year. The Wind Rose model (Figure 14) shows these localized wind directions and speed intervals for reference.

Figure 15: Annual Wind Directions and Speed in Wind Rose Model



Source: Simulated (Model: ERA5T) historical climate & weather data for Natore.
https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/natore_bangladesh_7483813

4. Groundwater

105. Groundwater samples were collected on 3 May 2026, from the hand tube wells of the subproject area of Ishwardi cluster. Sample collection and storage followed standards protocol. This period of sampling may be considered as dry season for groundwater level and water quality testing. The samples were submitted to the DPHE laboratory for testing of pH, TDS, EC, Hardness, Iron, Manganese, Arsenic, Fluoride, Chloride, Fecal Coliform and Total Coliform from stations. The results show high level (beyond DOE standards) of Fe, FC and TC for most of the groundwater samples, and high level of Arsenic and Mn for the groundwater samples of Pabna and Natore Paurashavas. For representativeness of water quality, it is suggested to collect and test groundwater samples from the same tubewells the during monsoon period (July/August).

Table 19: Groundwater Monitoring Report of Pabna Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	Radhanagar Degree College Pump	Bas Bazar Pump	Drinking Water Standard (BD)
1	pH	--	7.4	7.5	6.5 - 8.5
2	EC	micromho/cm	940	860	--
3	TDS	mg/l	470	430	1000
4	Chloride (Cl)	mg/l	60	40	250
5	Fluoride (F)	mg/l	0.070	0.067	1.0
6	Hardness	mg/l	210	220	500
7	Arsenic (As)	mg/l	0.001	0.007	0.05
8	Iron (Fe)	mg/l	0.32	0.23	0.3 - 1.0
9	Manganese (Mn)	mg/l	1.23	0.80	0.4
10	Ammonia	mg/l	0.14	0.12	1.50
11	Nitrate	mg/l	1.2	1.0	45

Table 20: Groundwater Monitoring Report of Ishwardi Paurashava

Sl No.	Parameter for Laboratory Test	Unit	Pouro Office Pump	Foteh Mohammadpur Pump	Drinking Water Standard (BD)
1	pH	--	8.0	7.4	6.5 - 8.5
2	EC	micromho/cm	400	1230	--
3	TDS	mg/l	200	615	1000
4	Chloride (Cl)	mg/l	30	100	250
5	Fluoride (F)	mg/l	0.056	0.120	1.0
6	Hardness	mg/l	150	225	500
7	Arsenic (As)	mg/l	0.005	0.042	0.05
8	Iron (Fe)	mg/l	0.06	1.20	0.3 - 1.0
9	Manganese (Mn)	mg/l	0.03	0.77	0.4
10	Ammonia	mg/l	0.14	0.13	1.50
11	Nitrate	mg/l	1.16	2.0	45

Table 21: Groundwater Monitoring Report of Natore Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	North Potuapara Jolkol	Mollikhati Pump	Drinking Water Standard (BD)
1	pH	--	7.5	7.6	6.5 - 8.5
2	EC	micromho/cm	760	740	--
3	TDS	mg/l	380	370	1000
4	Chloride (Cl)	mg/l	20	20	250
5	Fluoride (F)	mg/l	0.062	0.048	1.0
6	Hardness	mg/l	160	170	500
7	Arsenic (As)	mg/l	0.002	0.001	0.05
8	Iron (Fe)	mg/l	4.33	0.20	0.3 - 1.0
9	Manganese (Mn)	mg/l	0.57	0.32	0.4

Sl. No.	Parameter for Laboratory Test	Unit	North Potuapara Jolkol	Mollikhati Pump	Drinking Water Standard (BD)
10	Ammonia	mg/l	0.10	0.10	1.50
11	Nitrate	mg/l	1.9	1.3	45

Table 22: Groundwater Monitoring Report of Gopalpur Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	Near Proposed OHT	--	Drinking Water Standard (BD)
1	pH	--	7.8		6.5 - 8.5
2	EC	micromho/cm	680		--
3	TDS	mg/l	340		1000
4	Chloride (Cl)	mg/l	15		250
5	Fluoride (F)	mg/l	0.092		1.0
6	Hardness	mg/l	165		500
7	Arsenic (As)	mg/l	0.003		0.05
8	Iron (Fe)	mg/l	0.05		0.3 - 1.0
9	Manganese (Mn)	mg/l	1.86		0.4
10	Ammonia	mg/l	0.15		1.50
11	Nitrate	mg/l	1.1		45

5. Noise Level

106. Noise level monitoring was conducted from 01 May to 09 May 2026 at the 4 towns of Ishwardi Cluster. Two noise monitoring sites have been selected considering both commercial and mixed zone of ambience noise level the towns of the subproject area. As result obtained, noise level of none of the sampling areas irrespective of day and night times of Ishwardi and Gopalpur Paurashavas has been found compliant with the noise standards of the DoE. Exception has been observed for Pabna Paurashava where noise level has been found compliant for night time standards, however it has been found non-compliant with the day time noise standards. One location of Natore Paurashava showed non-compliant at nighttime.

Table 23: Noise level monitoring report

Sl.	Sampling Point	Standard (BD) dBa	Time	Result dBa	Land Use category
	Pabna Paurashava				
1	Radhanagar Degree Collage Pump	70	Day	74.08	Commercial
		60	Night	55.51	
2	Bash Bazar Pump House	60	Day	72.87	Mixed
		50	Night	45.52	
	Ishwardi Paurashava				
3	Pouro Office Pump	70	Day	60.01	Commercial
		60	Night	42.05	
4	Foteh Mohammadpur Pump	70	Day	65.47	Commercial
		60	Night	46.17	
	Natore Paurashava				

Sl.	Sampling Point	Standard (BD) dBa	Time	Result dBa	Land Use category
5	North Patuapara, Jolkol	60	Day	57.17	Mixed
		50	Night	64.16	
6	Mollikhati Pump at Natore	60	Day	53.12	Mixed
		50	Night	41.25	
	Gopalpur Paurashava				
7	Proposed Overhead Tank	60	Day	58.12	Mixed
		50	Night	46.22	
8	Berupara Proposed Pump House	60	Day	57.52	Mixed
		50	Night	43.21	

C. Water Environment

1. Drainage and Hydrology

107. The subproject area, encompassing Pabna, Ishwardi, Gopalpur (Lalpur), and Natore municipalities, lies within the lower Ganges-Padma River basin and the northern fringe of the active delta. It is characterized by a complex network of major transboundary rivers (the Padma), secondary internal rivers (the Ichamati and Narad), seasonal canals (khals), and sprawling structural wetland depressions (beels). The hydrological regime is primarily governed by the southwest monsoon and upstream transboundary inflows, which generate high seasonal variations. Surface drainage is naturally directed toward the Padma River and the massive Chalan Beel system, while groundwater stored within the prolific alluvial aquifers serves as the primary source for municipal, domestic, and industrial water supply.

108. **Pabna Municipality** occupies a stable alluvial plain intersected by the Ichamati River, which flows directly through the urban core. The river historically acted as a primary drainage artery, but urban encroachment and siltation have structurally restricted its flow capacity.

109. **Ishwardi Municipality**, situated slightly further upstream, features a higher topographic profile. Its hydrology is heavily influenced by its proximity to the hardpoint of the Padma River near the Hardinge Bridge. While its internal urban drainage is relatively efficient due to gentle natural slopes, high monsoon stages in the adjacent Padma River frequently create a backwater effect, slowing down localized stormwater discharge.

110. **Natore Municipality** presents a distinct hydrological dynamic due to its position bordering the Chalan Beel, the largest wetland depression in northwestern Bangladesh. The town's primary drainage channel, the Narad River, flows through the municipality and empties into this massive basin network. During the monsoon, the Chalan Beel transforms into an expansive inland sea, causing the water levels of the Narad River to stagnate or reverse. This backwater phenomenon drastically reduces the town's natural drainage capacity, resulting in extended surface water accumulation and a high localized water table that assists shallow groundwater recharge but challenges subsurface infrastructure. **Gopalpur (Lalpur Upazila)** is situated directly on the northern bank of the dynamic Padma River system, making it one of the most hydrologically volatile segments of the cluster. The drainage matrix here consists of active floodplains, distributary channels, and temporary sandy land formations (*chars*). The hydrology is entirely dominated by the massive seasonal fluctuations, heavy sediment transport, and continuous riverbank erosion-deposition processes of the Padma. Surface water is abundant

during the monsoon, but drops drastically during the dry winter, leaving the area highly dependent on deep tube wells tapping into the underlying thick alluvial aquifer systems.

111. Historical discharge data from the Bangladesh Water Development Board (BWDB) for the Ganges-Padma river system highlights the extreme seasonal fluctuations characteristic of this western cluster. **Monsoon Peak:** River flows begin a sharp ascent in May and June as upstream Himalayan meltwater combines with local monsoon precipitation. Peak monthly discharges are recorded between July and September, when massive volumes move through the main channel. This high stage significantly elevates the local water table across Pabna, Ishwardi, and Gopalpur. **Dry-Season Lean:** Conversely, during the dry season (January to April), flows drop drastically to their annual minimums. This sharp reduction limits surface water availability dries up secondary channels like the Ichamati and Narad and causes a seasonal decline in the shallow unconfined water table.

Table 24: Recent discharge data of Padma River near Hardinge bridge (Ishwardi)

Sl.	Date	Discharge Data (m ³ /s)
1	30 April, 2026	1677.57
2	2 May, 2026	1680.06
3	3 May, 2026	1652.22
4	4 May, 2026	1645.08
5	5 May, 2026	1864.43
6	6 May, 2026	2280.99
7	7 May, 2026	2551.60
8	9 May, 2026	2486.50
9	10 May, 2026	2403.34
10	11 May, 2026	2492.93
11	12 May, 2026	2551.02
12	13 May, 2026	2518.41
13	14 May, 2026	2464.26
14	16 May, 2026	2361.06
15	17 May, 2026	2338.07
16	18 May, 2026	2226.60
17	19 May, 2026	2252.06
18	20 May, 2026	2222.73
19	21 May, 2026	2285.52
20	23 May, 2026	2294.92
21	24 May, 2026	2492.77
22	25 May, 2026	2697.46
23	31 May, 2026	2941.31

Source: Bangladesh Water Development Board, Hydrological Station Database

2. River Systems and Water Quality

112. Surface water in the subproject region is primarily sourced from the Padma (Ganges) Ichamoti, Narod and Baral rivers, along with a network of local channels and beels, characterized by high seasonal discharge variability, localized fecal coliform contamination due to inadequate sanitation infrastructure, and prominent mineral turbidity, especially within the Active Ganges Floodplain. Surface water quality of the Padma River near the industrial and urban hubs of Ishwardi and Gopalpur (Lalpur, Natore) is generally within acceptable baseline limits, but suffers from cyclical, seasonal deterioration driven by industrial effluents, agrochemical runoff from intense cultivation, and untreated domestic sewage from the target Paurashavas of Pabna and Natore. However, surface water quality during monsoon (July to October) would be better due to the dilution factor. This subproject does not have scope to monitor monsoon water quality status due to time constraint.

113. Key physicochemical parameters indicate that the surface water fluctuates from slightly alkaline to neutral and experiences elevated turbidity and suspended solids during the monsoon, with sharp differences in dissolved oxygen and pollutant concentrations between the lean dry season and the peak rainy season.

114. Key parameters tested show that the BOD level in the Ichamoti river at Pabna and Gopalpur points are facing high level of BOD, turbidity, FC and TC; i.e. samples represent high pollution concentration particularly in Pabna and Gopalpur area (Table 24 and 27). Surface water quality for Padma River near Ishwardi show similar results (Table 25). Similar results are found for Narod River in Natore (Table 26). However, surface water of these points are not used for water supply purpose. These reports correspond to dry season low flow and pollution caused by dumping seasonal fruits (such as, watermelon) in the river. The test results of the samples taken from the various surface water sources on 03-May-2026 are provided in Table 24 – 27:

Table 25: Surface water quality analysis report at Pabna Pourashva

Sl. No.	Parameter for Laboratory Test	Unit	Ichamoti River near Radhanagar Degree College Pump	Ichamoti River near Bas Bazar Pump	Drinking Water Standard (BD)
1	pH	--	7.2	7.1	6.5 - 8.5
2	DO	mg/l	4.1	4.25	> 6
3	BOD	mg/l	17	12	< 2
4	COD	mg/l	76	52	10
5	TDS	mg/l	650	600	1000
6	Turbidity	NTU	325	512	--
7	Salinity	mg/l	0.65	0.60	--
8	Nitrate	mg/l	2.6	1.5	7
9	Phosphate	mg/l	6.76	8.09	--
10	Sulphate	mg/l	2	1	--
11	Fecal Coliform	cft/100ml	112	64	--
12	Total Coliform	cft/100ml	228	130	> 100
13	Oil and Grease	mg/l	< 2.0	< 2.0	--

Table 26: Surface water quality analysis report at Ishwardi Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	Padma River near Pouro Office Pump	Near Foteh Mohammadpur Pump	Drinking Water Standard (BD)
1	pH	--	7.2	7.4	6.5 - 8.5
2	DO	mg/l	4.60	3.90	> 6
3	BOD	mg/l	10	16	< 2
4	COD	mg/l	48	72	10
5	TDS	mg/l	410	360	1000
6	Turbidity	NTU	0.82	15.8	--
7	Salinity	mg/l	0.41	0.36	--
8	Nitrate	mg/l	1.9	1.0	7
9	Phosphate	mg/l	0.20	3.01	--
10	Sulphate	mg/l	2	1	--
11	Fecal Coliform	cft/100ml	10	72	--
12	Total Coliform	cft/100ml	28	156	> 100
13	Oil and Grease	mg/l	< 2.0	< 2.0	--

Table 27: Surface water quality analysis report at Natore Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	Narod River near North Potuapara Jolkol	Narod River Water Near Mollikhati Pump	Drinking Water Standard (BD)
1	pH	--	7.4	7.3	6.5 - 8.5
2	DO	mg/l	4.7	4.82	> 6
3	BOD	mg/l	11	10	< 2
4	COD	mg/l	48	36	10
5	TDS	mg/l	940	630	1000
6	Turbidity	NTU	215	190	--
7	Salinity	mg/l	0.94	0.63	--
8	Nitrate	mg/l	2.5	2.2	7
9	Phosphate	mg/l	4.2	3.65	--
10	Sulphate	mg/l	2	1	--
11	Fecal Coliform	cft/100ml	80	60	--
12	Total Coliform	cft/100ml	160	124	> 100
13	Oil and Grease	mg/l	< 2.0	< 2.0	--

Table 28: Surface water quality analysis report at Gopalpur Paurashava

Sl. No.	Parameter for Laboratory Test	Unit	Ichamoti River near Proposed OHT		Drinking Water Standard (BD)
1	pH	--	7.4		6.5 - 8.5
2	DO	mg/l	4.56		> 6
3	BOD	mg/l	13		< 2
4	COD	mg/l	52		10
5	TDS	mg/l	580		1000

Sl. No.	Parameter for Laboratory Test	Unit	Ichamoti River near Proposed OHT		Drinking Water Standard (BD)
6	Turbidity	NTU	445		--
7	Salinity	mg/l	0.58		--
8	Nitrate	mg/l	1.6		7
9	Phosphate	mg/l	8.94		--
10	Sulphate	mg/l	2		--
11	Fecal Coliform	cft/100ml	90		--
12	Total Coliform	cft/100ml	200		> 100
13	Oil and Grease	mg/l	< 2.0		--

D. Ecological Environment

115. The ecological features of areas within and surrounding the sites/locations of the proposed project include both flora, fauna and the fish of the proposed project sites. An ecological survey was conducted to determine the diversity and distribution of the flora and fauna as baseline, and the extent to which that may be impacted due to the proposed project activities. The water distribution pipeline of the proposed project in the Ishwardi Cluster may cross some water bodies, and therefore, possible impact of construction activities on aquatic environment of these water bodies is of particular interest in the environmental assessment. A team led by the environmental expert of the IEE team visited the proposed project sites in April and May 2026 to collect first-hand data on floral and faunal diversity. The study was conducted only in daytime. Herpeto-faunal and mammalian survey was done through visual search and also through discussion with local people and literature review. Aural and visual searching was the main survey method for ornithological survey. Information on fisheries was collected through interviewing Department of Fisheries (DoF) as well as survey of local fish market. Rapid field survey and discussion with local people was the main method for floral survey. The collected data were cross-checked through literature review. The areas that were surveyed for this ecological assessment are: Pabna Municipality, Natore Municipality, Ishwardi Municipality and Gopalpur Municipality under Ishwardi Cluster of this project. This baseline information has been used in the relevant section of this report to identify and assess impact of the proposed project on the ecological resources, and finally, to suggest mitigation measures.

116. To this study, the macro ecological features of the study area are considered that primarily consists of floral and faunal diversity including fish species. Descriptions of these ecological features are presented in this Section.

117. **Ganges River Floodplain & Active Ganges Floodplain.** The Ishwardi cluster-comprising Pabna, Ishwardi, Natore, and Gopalpur municipalities-is situated in the western geographic zone of Bangladesh. This region is heavily influenced by the mighty Padma (Ganges) River system and its active tributaries, distributaries, and adjacent low-lying wetlands (beels), such as the nearby Chalan Beel ecosystem.

- (i) **Landscape:** This zone features a distinct combination of stable, high Ganges floodplains and dynamic, low-lying alluvial plains. The landscape is characterized by prominent riverine features including broad natural levees, active chars (river islands) along the Padma, and extensive flatlands. The area experiences moderate seasonal fluctuations in water levels, with a drier climate compared to

- eastern Bangladesh, making its agricultural landscape unique and highly productive.
- (ii) Flora: The vegetation is highly adapted to the relatively drier climate, rich alluvial soils, and distinct riverbank conditions of western Bangladesh. Common species include:
- Fruit trees: Mango (*Mangifera indica*)—for which the Rajshahi/Natore/Pabna region is nationally famous—Litchi (*Litchi chinensis*) which thrives exceptionally well in Ishwardi, and Guava.
 - Timber: Teak (*Tectona grandis*), Mahogoni (*Swietenia mahagoni*), Babla (*Vachellia nilotica*), and Date Palm (*Phoenix dactylifera*), which is widely tapped for juice and molasses in Natore and Pabna.
 - Aquatic plants: Water hyacinth (*Eichhornia crassipes*), Lotus (*Nelumbo nucifera*), and various species of water lilies dominate the extensive beels and floodable lowlands.
- (iii) Fauna: The terrestrial and aquatic ecosystems host diverse wildlife. The river channels and remaining wetlands support a variety of waterfowl, including Great Egrets, Lesser Whistling Ducks, and Kingfishers. In the rural fringes and orchard-dense areas of Natore and Ishwardi, small mammals like the Golden Jackal, Common Mongoose, and the Indian Flying Fox (fruit bats) are highly prevalent. The Padma River adjacent to Ishwardi and Pabna also serves as a habitat for local freshwater fish species and occasional sightings of the endangered Ganges River Dolphin.

Table 29: Ecological Features in the Subproject Area

Feature	Pabna & Ishwardi Municipalities	Natore & Gopalpur Municipalities
Primary River	Padma (Ganges) River / Ichamati River	Ichamati River / Narad River / Proximity to Chalan Beel
Soil Type	Calcareous Dark Grey Floodplain soils and Calcareous Alluvium	Calcareous Brown Floodplain soils and Grey Floodplain soils
Key Vegetation	Intensive Litchi and Mango orchards, Timber (Mahogoni), Date Palm	Mango orchards, Sugarcane plantations, Banana, and Wetland reeds
Aquatic Focus	Major Riverine channels (Padma) and active chars	Extensive Inland Beels, seasonal floodplains, and internal canal networks
Dominant Fauna	Fruit bats, terrestrial/riverine birds, and river fish	Wetland birds (Egrets, Herons), amphibians, and small mammals

118. Rapid urbanization and industrialization (notably around the Ishwardi EPZ and expanding municipal centers) have led to the significant filling of natural ditches, ponds, and local canals (khals), such as the historical Narad River in Natore and Ichamati River in Pabna. The traditional, dense mango and litchi orchard ecosystems—which historically functioned as local microclimate stabilizers—are increasingly being fragmented by paved surfaces and brick kilns. This habitat loss directly impacts indigenous bird and bat populations that rely on these fruit canopies. Environmental and conservation priorities for the Ishwardi cluster focus heavily on: i) Restoring and dredging dying urban canal systems to prevent artificial waterlogging. ii) Preserving agro-forestry patterns (especially the iconic litchi and mango groves). iii) Mitigating riverbank erosion along the dynamic active floodplains of the Padma River.

1. Terrestrial Fauna

119. Terrestrial environment dependent wildlife is known as terrestrial fauna. They fully or partially depend on terrestrial environment to live or to get food, shelter, nest, breed, and produce offspring. Several species of amphibia, reptile, bird and mammal are the main component of terrestrial fauna. The project areas have different types of lands, e.g. agricultural dry land, seasonal wetland, homestead land, fallow land, roadside low land, as well as rivers, canals, ditches, which provide moderate environment for terrestrial habitat. Terrestrial wildlife is divided into 4 major group viz. mammal, bird, reptile and amphibia. A total of 62 faunal species has so far been identified in the project areas and a breakdown of the subspecies is shown in this report. This indicates that the area is rich in faunal species. A complete list of terrestrial faunal species is given in Table 30.

Table 30: Identified terrestrial fauna at three major sampling areas of Ishwardi Cluster

Class	Family	English Name	Scientific Name
Rhacophoridae	Maculated Tree frog	<i>Polypedates maculatus</i>	
Ranidae	Bull frog	<i>Hoplobatrachus tigerinus</i>	
	Cricket frog	<i>Limnonectes limnocharis</i>	
	Boulenger's Frog	<i>Rana alticola</i>	
Reptilia	Scincidae	Common Skink	<i>Mabuya carinata</i>
	Gekkonidae	Common House Lizard	<i>Hemidactylus flaviviridis</i>
		Common House Lizard	<i>Hemidactylus brooki</i>
	Agamidae	Common Garden Lizard	<i>Calotes versicolor</i>
	Varanidae	Grey Monitor Lizard	<i>Varanus bengalensis</i>
		Yellow Monitor Lizard	<i>Varanus salvator</i>
	Dipsadidae	Common Wolf Snake	<i>Lycodon aulicus</i>
	Colubridae	Rat Snake	<i>Coluber mucosus</i>
Aves	Scolopacidae	Fantail Snipe	<i>Gallinago</i>
	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>
		White-throated Kingfisher	<i>Halcyon smyrnensis</i>
	Meropidae	Green Bee Eater	<i>Merops orientalis</i>
	Megalaimidae	Lineated Barbet	<i>Megalaima lineata</i>
	Apodidae	Asian Palm Swift	<i>Cypsiurus balasiensis</i>
	Psittacidae	Rose ringed Parakeet	<i>Psittacula krameri</i>
	Jacaniidae	Bronze-winged Jacana	<i>Metopidius indicus</i>
	Laniidae	Brown Shrike	<i>Lanius cristatus</i>
	Dicruridae	Black Drongo	<i>Dicrurus macrocercus</i>
	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>
	Motacillidae	White-browed Wagtail	<i>Motacilla alba</i>
	Ardeidae	Indian Pond heron	<i>Ardeola grayii</i>
		Cattle Egret	<i>Bubulcus ibis</i>
		Little Egret	<i>Egretta garzetta</i>
	Centropodidae	Indian Cuckoo	<i>Cuculus micropterus</i>
	Columbidae	Spotted Dove	<i>Streptopelia chinensis</i>

Class	Family	English Name	Scientific Name
		Rock Pigeon	<i>Columba livia</i>
	Laridae	Common Tern	<i>Sterna hirunda</i>
	Rostratulidae	Greater Painted-Snipe	<i>Rostratula bengalensis</i>
	Accipitridae	Brahminy Kite	<i>Haliastur Indus</i>
	Passeridae	House Sparrow	<i>Passer domesticus</i>
		Baya Weaver	<i>Ploceus philippinus</i>
		Paddy field Pipit	<i>Anthus rufulus</i>
	Sulviidae	Striated Grassbird	<i>Megaurus palustris</i>
		Common Tailorbird	<i>Orthotomus sutorius</i>
		Common Babbler	<i>Turdoides caudatus</i>
	Nectariniidae	Purple Sunbird	<i>Nectarinia asiatica</i>
	Corvidae	House crow	<i>Corvus splendens</i>
		Rufous Tree Pie	<i>Dendrocitta vagabunda</i>
	Sturnidae	Asian Pied Starling	<i>Sturnus contra</i>
		Common Myna	<i>Acridotheres tristis</i>
	Irenidae	Common Iora	<i>Aegithina tiphia</i>
	Laniidae	Long-tailed Shrike	<i>Lanius schach</i>
	Ploceidae	White throated Munia	<i>Lonchura malabarica</i>
	Oriolidae	Black-headed Oriole	<i>Oriolus xanthornus</i>
	Picidae	Black-rumped Flamback	<i>Dinopium benghalense</i>
	Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>
		White-throated Fantail	<i>Rhipidura albicollis</i>
Mammalia	Muridae	House Mouse	<i>Mus musculus</i>
		Common House Rat	<i>Rattus</i>
		Bandicoot Rat	<i>Bandicota indica</i>
		Indian Field Mouse	<i>Mus booduga</i>
		Indian mole Rat	<i>Bendicota bengalensis</i>
	Soricidae	Grey Musk Shrew	<i>Suncus murinus</i>
	Felidae	Fishing cat	<i>Prionailurus bengalensis</i>
	Pteropodidae	Flying Fox	<i>Pteropus gigantius</i>
	Herpestidae	Small Indian Mongoose	<i>Hervested auropunctatus</i>
	Vespertilionidae	Indian Pipistrelle	<i>Pipistrellus coromandra</i>

2. Terrestrial Flora

120. The terrestrial plant species make a complex ecosystem in which wildlife has direct relationship through their ecological niche. Commercial fruit garden and vegetable plantation were observed at project areas. Common terrestrial flora are Mango - *Mangifera indica*, Betelnut - *Areca catechu*, Coconut - *Cocos nucifera*, Rain tree - *Samanea saman*, etc. Scattered

terrestrial flora was observed beside the highway and few terrestrial flora were also observed at the project areas.

121. Three types of terrestrial plant habit e.g. trees, shrubs and herbs exist in the project areas. Except herbs and shrubs, few natural trees (naturally originated) exist in the project area. Most of the plants particularly the trees and shrubs are planted and cultivated. 68 floral species have so far been identified in the project areas of which 34 are tree species, 25 are herb species and the rest are shrubs.

Table 31: Identified terrestrial flora at three major sampling areas for the Project Area

Name			Habit
Scientific	Family	Native	
Litchi chinensis	Sopindaceae	Lichee	Tree
Spondias dulcis	Anacardiaceae	Golden Apple /Amra	Tree
Zizyphus mauritiana	Rhamnaceae	Boroi, Kul	Tree
Datura metol	Solanaceae	Dhuttra	Herb
Azadirachta indica	Meliaceae	Neem	Tree
Clerodendrum viscosum	Verbinaceae	Vat	Herb
Calotropis procera	Asclepiadaceae	Seto/Gedla Akonda	Tree
Calotropis gigantean	Asclepiadaceae	Akonda	Tree
Averrhoa carambola	Averrhoaceae	Kamranga	Tree
Basella rubra	Basellaceae	Pui Shak	Shrub
Chrysopogon aciculate	Gramineae	Chore kata	Herb
Acacia auriculiformis	Leguminosae	Akashmoni	Tree
Acacia mangium	Leguminosae	Mangium	Tree
Erythrina variegata	Leguminosae	Mandar	Tree
Tamarindus indica	Leguminosae	Tetul	Tree
Centella asiatica	Hydrocotyleaceae	Thankuni	Herb
Solanum indicum	Solanaceae	Titbegun	Shrub
Ficus glomorea	Moraceae	Jagadumur	Shrub
Eucalyptus citriodora	Myrtaceae	Eucalyptus	Tree
Albizia procera	Leguminosae	Koroi	Tree
Diospyros embryteris	Ebenaceae	Gab	Tree
Anthocephalus chinensis	Rubiaceae	Kadam	Tree
Dalbergia sissoo	Leguminosae	Sisu	Tree
Musa spp	Musaceae	Kala	Herb
Barringtonia acutangula	Lecythidaceae	Hijal	Tree
Aegle marmelos	Rutaceae	Bel	Tree
Blumea lacera	Compositae	Sheyalmutra	Herb
Areca catechu	Palmae	Supari	Tree
Leonurus sibiricus	Libiatae	Raktadrone	Herb
Carica papaya	Caricaceae	Pape	Shrub
Bombix cilia	Bombacaceae	Simul	Tree
Cynodon dactylon	Gramineae	Durbaghas	Herb
Solanum nigrum	Solanaceae	Phutibegun	Herb
Acacia nilotica	Leguminosae	Babla	Tree

Name			Habit
Scientific	Family	Native	
Mikania cordata	Compositae	Assamlata	Herb
Samanea saman	Leguminosae	Rendi	Tree
Lindernia procumbens	Scrophulariaceae	Bakpuspa	Herb
Bambusa spp	Gramineae	Bansh	Tree
Mangifera indica	Anacardiaceae	Am	Tree
Coccinia indica	Cucurbitaceae	Telakucha	Herb
Ricinus communis	Euphorbiaceae	Reri, venna	Shrub
Polygonum hydropiper	Polygonaceae	Bishkatali	Herb
Ipomoea fistulosa	Convolvulaceae	Dholkalmi	Herb
Alstonia scholaris	Apocynaceae	Chatim	Tree
Delomix regia	Leguminosae	Krishnachura	Tree
Alternanthera sesilis	Amaranthaceae	Haicha	Herb
Clerodendrum velsosum	Verbinaceae	Bhant	Herb
Heliotropium indicum	Boraginaceae	Hatisur	Herb
Swietenia mahagoni	Meliaceae	Mehagini	Tree
Ficus benghalensis	Moraceae	Bot	Tree
Clematis gouriana	Ranunculaceae	Chagalbati	Herb
Cocos nucifera	Palmae	Narikel	Tree
Lagerstroemia speciosa	Lythidaceae	Jarul	Tree
Phoenix sylvestris	Palmae	Khejur	Tree
Phyllanthus reticulatus	Euphorbiaceae	Chitki	Shrub
Ficus hispida	Moraceae	Kakdumur	Shrub
Artocarpus heterophyllus	Moraceae	Kathal	Tree
Casuarinas equisetifolia	Casuarinaceae	Jhau	Tree
Borassus flabellifer	Palmae	Tal	Tree
Ocimum sanctum	Labiatae	Tulsi	Herb
Hyptis suaveolens	Labiatae	Tokma	Herb
Centolla asiatica	Hydrocotyleaceae	Than kuni	Herb
Saccharum spontaneum	Graminaceae	Kash	Herb
Ocimum sanctum	Labiatae	Tulsi	Herb
Chrysopogon aciculatus	Gramineae	Chore Kanta	Herb
Hyptis suaveolens	Labiatae	Tokma	Herb
Molocanna bambusoides		Muli bansh	Shrub
Pteris vittata		Dhekishak	Pteridophytes

3. Aquatic Fauna

122. Some species of amphibia, reptile, bird, mammal and freshwater fish are the main components of the aquatic fauna. The reproduction, breeding and multiplication of aquatic fauna is finely tuned and adjusted to the rhythm and amplitude of monsoon flooding. Aquatic wildlife is divided into 4 major group viz. mammal, bird, reptile and amphibia. A total of 30 aquatic faunal species has so far been identified and a breakdown of the subspecies is provided in this report. This indicates that the area is also rich in aquatic fauna. A complete list of aquatic faunal species is given in in Table 32.

Table 32: Identified aquatic fauna at three major sampling areas for the Ishwardi Cluster

Class	Family	English Name (Status)	Scientific Name
Amphibia	Ranidae	Skipper frog	<i>Euphlyctis cyanophlyctis</i>
Reptilia	Bataguridae	Indian Roofed Turtle	<i>Kachuga tecta</i>
	Natricidae	Checkered Keelback	<i>Xenochrophis piscator</i>
	Homalopsidae	Common Smooth Water Snake	<i>Enhydryis</i>
Aves	Anhingidae	Darter	<i>Anhinga melanogaster</i>
	Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>
	Dendrocygnidae	Brown Crake	<i>Amauornis akool</i>
		White-breasted Waterhen	<i>Amauornis phoenicurus</i>
		River tern	<i>Sterna albiformis</i>
Mammalia	Platanistidae	Ganges River Dolphin	<i>Platanista gangetica</i>
Fresh water Fish/ Osteichthyes	Claridae	Magur	<i>Clarius batrachus</i>
	Gobiidae	Tank Goby	<i>Glossogobius giuris</i>
		Bumblebee Goby	<i>Brachygobius nunas</i>
	Clupeidae	Hilsa	<i>Tenuulosa ilisha*</i>
		Indian River Shad	<i>Gudusia chapra</i>
	Nandidae	Mottled Nandus	<i>Nandus</i>
	Polynemidae	Indian Threadfish	<i>Polydactylus indicus</i>
	Belontiidae	Sunset Gourami	<i>Colisa sota</i>
	Heteropneustidae	Stinging Catfish	<i>Heteropneustes fossilis</i>
	Ariidae	Gagora catfish	<i>Arius gagora</i>
		Soldier Catfish	<i>Osteogeneiosus militaris</i>
	Channidae	Asiatic Snakehead	<i>Channa orientalis</i>
		Spotted Snakehead	<i>Channa punctatus</i>
	Pangasidae	Pungus (cultured)	<i>Pangasius</i>
	Cyprinidae	Catla	<i>Catla catla</i>
		Rohu	<i>Labeo rohita</i>
		Mrigal	<i>Cirrhinus mrigala</i>
		Ticto / Firefin Barb	<i>Puntius ticto</i>
		Swamp/ Chola Barb	<i>Puntius chola</i>
	Mastacembelidae	Tire-trak Spinyeel	<i>Mastacembelus armatus</i>
		One-stripe Spinyeel	<i>Macrognathus aculeatus</i>
	Polynemidae	Indian Threadfish	<i>Polydactylus indicus</i>
	Anabantidae	Climbing Perch	<i>Anabas testudineus</i>
	Bagridae	Tengra Mystus	<i>Mystus tengara</i>
		Long-whiskered Catfish	<i>Aorichthys aor</i>
	Chacidae	Indian Chaca	<i>Chaca chaca</i>
	Notopteridae	Grey Featerback	<i>Notopterus notopterus</i>
	Synbranchidae	Gangetic mudeel	<i>Monopterusuchia</i>
	Cyprinidae	Indian carplet	<i>Ambhypharyngodon microlepis</i>

4. Aquatic Flora

123. The project area has low land / seasonal wetland with varieties of aquatic flora. The aquatic flora is divided into three major types, viz. tree, shrub and herb. These floral species

grow in ponds, canals, ditches, river, seasonal wetland and low-lying agricultural lands as submerged, free-floating, or rooted floating states. The common aquatic floral species in the project area include Sada Shapla - *Nymphaea* sp, Kachuripana - *Eichhornia crassipes*, Khudipana - *Lemna perpusilla*, Helencha- *Enhydra fluctuans*, Kalmi - *Ipomoea aquatica* etc. A total of 24 aquatic floral species has been identified of which two are trees, 21 are herbs and the rest are shrubs.

Table 33: Identified terrestrial flora at three major sampling areas for the Ishwardi Cluster

NAME			HABIT
Scientific	Family	Native	
<i>Lemna perpusilla</i>	Limnaceae	Khudipana	Herb
<i>Pistia strateotes</i>	Araceae	Topapana	Herb
<i>Salvinia cuculata</i>	Salviniaceae	Indurkanipana	Herb
<i>Eichhornia crassipes</i>	Pontederiaceae	Kachuripana	Herb
<i>Hydrilla verticillata</i>	Hydrocharitaceae	Janjhi, Kurcli	Herb
<i>Dillenia pentagyna</i>		Hargoza	Shrub
<i>Scirpus articulatus</i>	Cyperaceae	Chechra	Herb
<i>Alternanthera philoxeroides</i>	Amaranthaceae	Helencha	Herb
<i>Ceratophyllum demersum</i>	Ceratophytaceae	Jhanjhi	Herb
<i>Barringtonia acutangula</i>	Lecythidaceae	Hijal	Tree
<i>Crataeva nurvala</i>	Capparidaceae	Barun, banny	Tree
<i>Colocasia esculenta</i>	Araceae	Katchu	Herb
<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	Herb
<i>Enhydra fluctuans</i>	Compositae	Helencha	Herb
<i>Aponogeton natans</i>	Aponogetonaceae	Ghenchu	Herb
<i>Calamus</i> sp	Palmae	Bet	Herb
<i>Fagopyrum hydropiper</i>	Polygonaceae	Biskhatali	Herb
<i>Monochoria vaginalis</i>	Pontederiaceae	Sarkachu	Herb
<i>Nymphaea nouchali</i>	Nymphaeaceae	Sada shapla	Herb
<i>Cynogyne dichotoma</i>	Marantaceae	Sitalpati	Herb
<i>Vallisneria spiralis</i>	Hydrocharitaceae	Patajhanghi	Herb
<i>Utricularia aurea</i>	Utriculariaceae	Jhanghi	Herb
<i>Hygroryza aristata</i>	Gramineae	Phutki janglidhan	Herb
<i>Ipomoea aquatica</i>	Convolvulaceae	Kalmi	Herb

5. Threatened Flora and Fauna

124. Specific scientific criteria are followed to declare a specie as threatened (critically endangered, endangered etc.). It is declared by the World Conservation Union (IUCN) for each country. Floral or faunal species that exist in threatened condition are generally known as threatened species. Currently, 147 wildlife and 54 freshwater fish species are threatened in Bangladesh; 40 plant species are also threatened in Bangladesh. No threatened floral species have been identified in the project area. However, some threatened wildlife and fish species have been identified in the project areas which are considered threatened throughout the country as well. A systematic research work in different seasons of the year will provide a complete and more accurate status of the threatened wildlife and fish fauna of the study areas.

Table 34: List of Critically Endangered, Endangered and Vulnerable wildlife and fish fauna in the study area

Biological Class	English name	Scientific name	O	CE	E	V	CT	T	DD
Reptilia	Grey Monitor Lizard	<i>Varanus bengalensis</i>				√			
	Yellow Monitor Lizard	<i>Varanus salvator</i>			√				
	Common Wolf Snake	<i>Lycodon aulicus</i>				√			
Mammalia	Ganges River Dolphin	<i>Platanista gangetica</i>			√				
Osteichthyes	Mottled Nandus	<i>Nandus</i>				√	√		
	Asiatic Snakehead	<i>Channa orientalis</i>				√	√		
	Ticto / Firefin Barb	<i>Puntius ticto</i>				√	√		
	Tire-trak Spinyeel	<i>Mastacembelus armatus</i>			√		√		
	One-stripe Spinyeel	<i>Macrogathus aculeatus</i>				√	√		
	Long-whiskered Catfish	<i>Aorichthys aor</i>				√	√		
	Indian Chaca	<i>Chaca</i>			√				
	Grey Featherback (V)	<i>Notopterus</i>				√	√		
	Gangetic mudeel (V)	<i>Monopterus albus</i>				√	√		

[**Legend:** O = Observed, CE = Critically Endangered, E = Endangered, V = Vulnerable, CT = Commercially T = Threatened, DD = Data Deficient].

6. Protected Area

125. The protected areas within and surrounding Pabna, Natore, Gopalpur, and Ishwardi municipalities are less about vast national parks and more about Cultural Heritage Sites, Urban Green Spaces, and Ecologically Critical Riverine Zones. While these areas do not house large-scale wildlife sanctuaries like the Sundarbans, they contain significant pockets of biodiversity and legally protected historical landscapes. The Red Line bounded areas in the Location Map of Bangladesh (Figure 15) shows Protected areas – none of them are within subproject influence area.

126. Pabna and Natore Municipalities: Heritage, Urban Tanks, and Ecological Protection

- (i) Pabna and Natore are historic urban centers where protection efforts blend architectural heritage with crucial urban wetlands that serve as ecological sanctuaries within built-up areas.
- (ii) **Pabna Mental Hospital (Hemu Babu's Zamindar Estate) and Anukul Chandra Ashram Grounds:** While historically and medically significant, these sprawling, institutional campus lands in Pabna act as critical, low-density green zones. They preserve mature local tree species, provide an undisturbed habitat for urban wildlife, and serve as a "green lung" for the municipality.
- (iii) **Natore Rajbari and Uttara Ganabhaban (Dighapatia Rajbari) Precincts:** The expansive grounds of these historic palaces are protected heritage zones. Surrounded by deep, interconnected moats (Dighis), they function as vital urban wetlands and micro-ecosystems that support local fish species, resident waterbirds, and diverse flora, while regulating the local microclimate and groundwater tables.
- (iv) **The Ichamati River Corridor (Pabna):** Efforts to protect and restore the Ichamati River within Pabna municipality focus on clearing encroachments. This

corridor is crucial for urban drainage and serves as a linear green ecosystem cutting through the city.

127. Ishwardi and Gopalpur Municipalities: Agro-Ecological and Riverine Conservation

- (i) In the Ishwardi and Gopalpur (located in Lalpur) regions, protection mechanisms are tied directly to the mighty Padma River ecosystem and the area's vital agricultural research landscapes.
- (ii) **Padma River Riparian Zone and Char Lands:** The stretch of the Padma River flowing past Ishwardi and Gopalpur is an ecologically sensitive zone. It acts as a critical habitat for migratory birds and local fish species. Municipal and local administrative regulations restrict permanent concrete structures on these fragile floodplains to prevent erosion and preserve riparian vegetation.
- (iii) **Regional Agricultural Research Sanctuaries (BRRI & BARI Estates, Ishwardi):** Ishwardi houses massive, controlled institutional landholdings for the Bangladesh Rice Research Institute (BRRI) and Bangladesh Agricultural Research Institute (BARI). These highly protected, secure agro-ecosystems act as de facto conservation zones for plant genetic resources, preserving soil biodiversity and traditional crop varieties far better than typical urbanized lands.
- (iv) **Gopalpur North Bengal Sugar Mills Catchment and Waste Stabilization Zones:** In Gopalpur, protection focuses on regulating the industrial footprint on nearby water bodies. Specific drainage channels and low-lying containment areas are managed to prevent untreated effluents from disrupting the local aquatic food chain.

128. Local Wetlands and Beel Ecosystems (Cluster Outskirts)

- (i) The Ishwardi cluster does not feature massive national parks but relies heavily on floodplains and community-managed water bodies tied to the greater Chalan Beel ecosystem.
- (ii) **Beel and Khari Ecosystem Buffers:** On the outskirts of Natore and Ishwardi, community-managed seasonal wetlands (Beels) and natural drainage canals (Kharis) function as de facto protected areas during the monsoon. Local community groups work alongside the Department of Fisheries to enforce seasonal fishing bans to allow native fish species to breed.
- (iii) **Homestead Agro-Forestry and Litchi Orchards:** The extensive, dense litchi orchards of Ishwardi and the traditional homestead forests of the cluster act as vital community-driven green canopies. These private but ecologically rich zones preserve the local microclimate, act as carbon sinks, and provide a sanctuary for fruit bats, pollinators, and diverse bird species.

Table 35: Summary of Archaeological Sites and Protected Areas

Municipality	Type of Protected Area	Key Agency
Pabna	Institutional Green Zones & Ichamati River Corridor	Local Municipality / BWDB / Department of Archaeology
Natore	Palace Moats (<i>Dighis</i>), Heritage Precincts & Beel Buffers	Department of Archaeology / Local Govt / Dept. of Fisheries
Ishwardi	Agro-Research Sanctuaries & Padma Riparian Zones	BARI / BRRI / Forest Department / Local Government
Gopalpur	Industrial Drainage Buffer & Padma	Local Municipality / Department of

Municipality	Type of Protected Area	Key Agency
	Floodplain Strips	Environment (DoE)

7. National Park

129. A National Park (NP) is a reserve land, usually declared and owned by a national government, protected from most human development activities and pollution. No NP exists at or near the proposed project sites.

8. Game Reserve

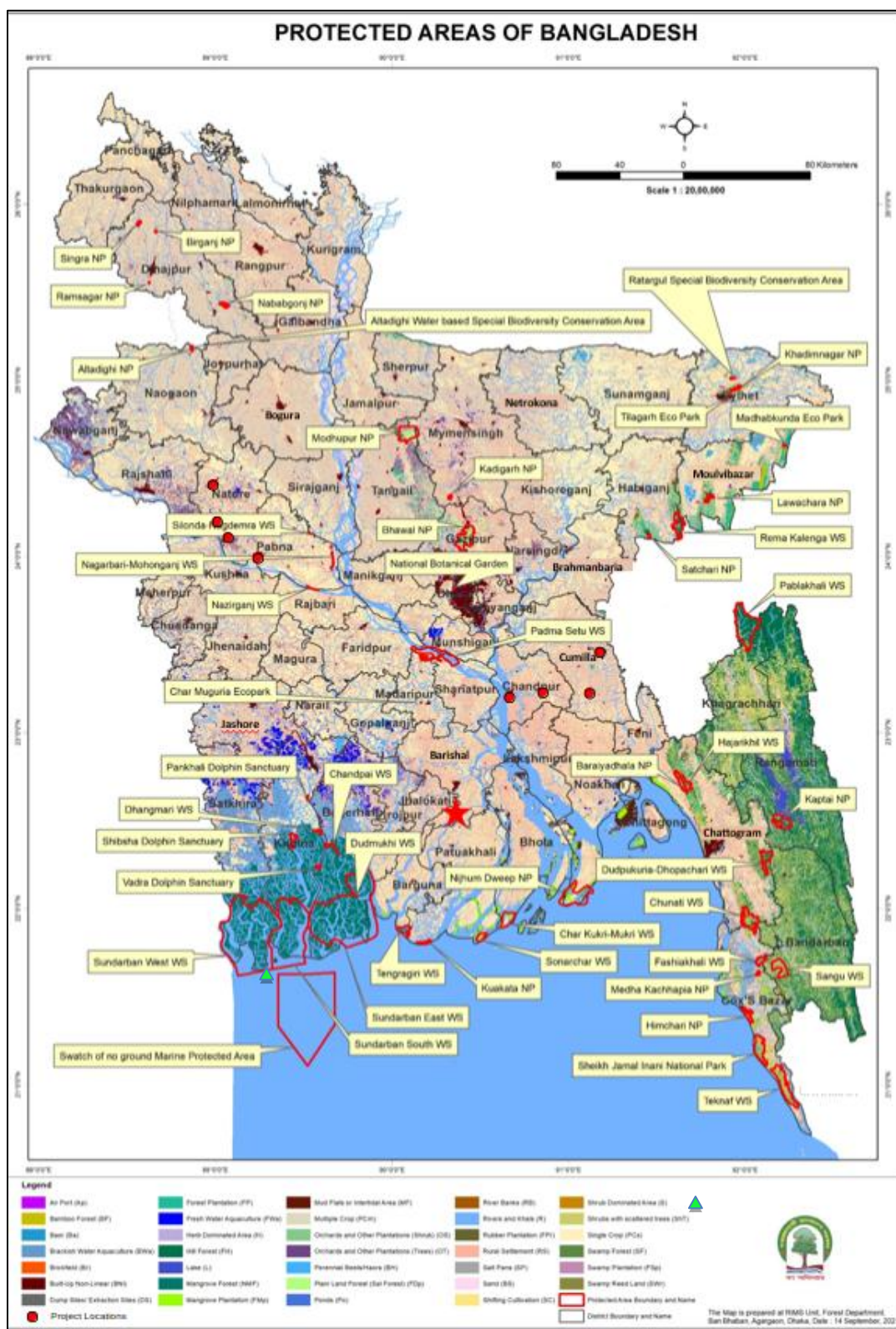
130. A Game Reserve (GR) is an area of land set aside for maintenance of wildlife for tourism or hunting purposes. No GR exists at or near the proposed project sites.

9. Wildlife Sanctuary

131. A Wildlife Sanctuary (WS) is an area that assures the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment where these require specific human manipulation for their perpetuation. No WS exists at or near the proposed project sites.

132. It is an environmental protection zone, defined by the Government of Bangladesh under the Bangladesh Environment Conservation Act, 1995, where ecosystem is considered to be threatened. There is no ECA in the project area.

Figure 16: Map Showing Location of Subproject Site Relative to Protected Areas



10. Critical Habitat

133. The subproject areas encompassing Pabna, Ishwardi, Gopalpur (Lalpur), and Natore municipalities are located within long-established, built-up urban and peri-urban landscapes. Despite their developed character, these sites have been thoroughly evaluated to determine their critical habitat status. An initial biodiversity screening using the Integrated Biodiversity Assessment Tool (IBAT) was conducted to map potential risks to sensitive ecological zones or critical habitats within a default 50-km radius of the project centers.

134. The IBAT screening indicates that all four municipal project locations are situated within heavily modified human landscapes, with zero direct overlap with legally protected areas, national parks, or World Heritage Sites within an immediate 1-km engineering buffer. However, because this cluster sits along major river networks and a massive wetland system, several ecologically sensitive areas and Key Biodiversity Areas (KBAs) are located within the wider 50-km regional buffer:

- (i) The Chalan Beel System: Positioned directly adjacent to Natore Municipality and within the wider buffer of Pabna, this is the largest wetland complex in northwestern Bangladesh. While not a formally designated Ramsar site, it functions as a critical regional KBA, serving as a vital breeding ground for native freshwater fish and a major wintering staging area for migratory waterbirds.
- (ii) The Padma River Sanctuary Network: The southern boundaries of Ishwardi, Gopalpur (Lalpur), and Pabna align with the main channel of the Padma River. Portions of this river system are subject to seasonal protection frameworks managed by the Department of Fisheries to protect critical fish habitats and megafauna.
- (iii) The regional screening identified a high diversity of species potentially occurring within the broader aquatic and terrestrial landscapes, including several species listed as Critically Endangered (CR) and Endangered (EN) on the IUCN Red List.

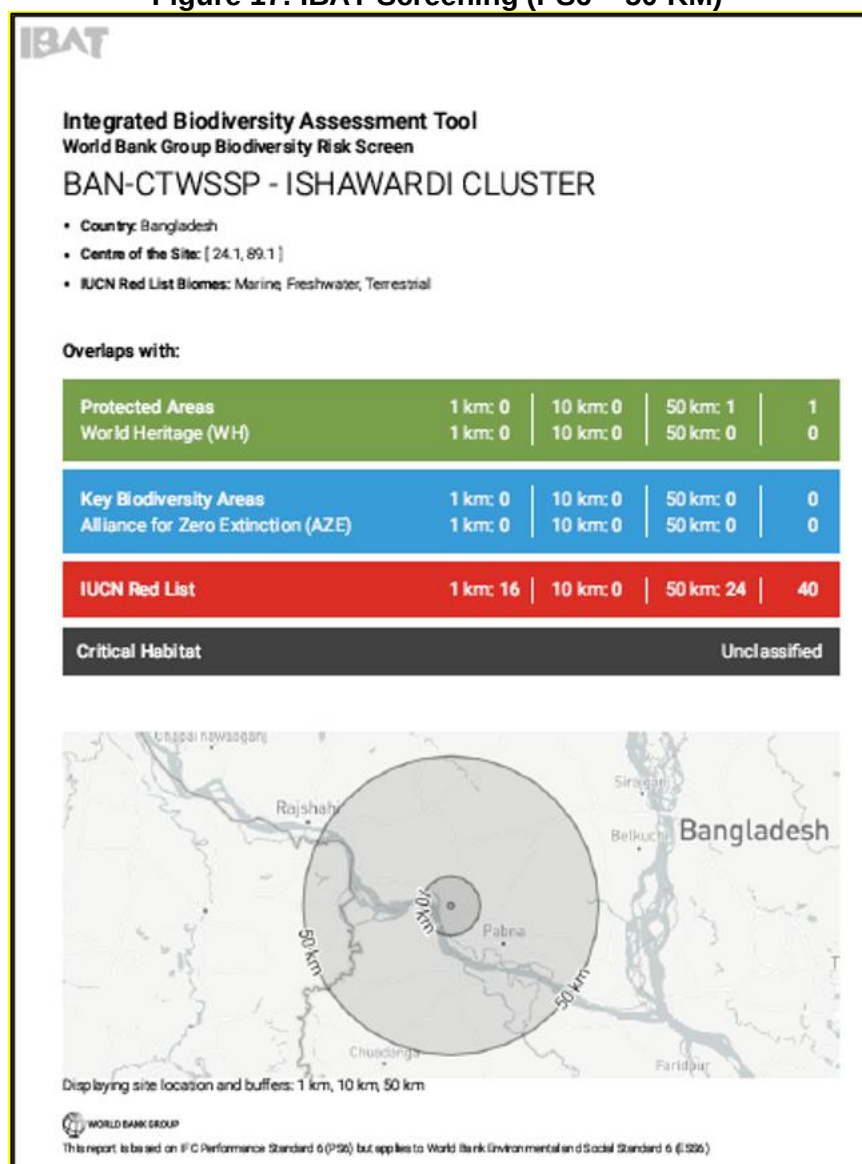
135. Within the 1-km to 50-km buffers of the Pabna, Ishwardi, and Gopalpur subprojects, priority species of high conservation interest include the Endangered Ganges River Dolphin (*Platanista gangetica*), which is regularly recorded in the deep scour holes of the Padma River near the Hardinge Bridge (Ishwardi) and Lalpur. Additionally, the broader riverine and beel floodplains support several threatened freshwater turtles, the Critically Endangered Three-striped Roofed Turtle (*Batagur dhongoka*), and various threatened birds of prey and migratory waterbirds that rely on seasonal mudflats.

136. In Natore Municipality, the proximity to the Chalan Beel depression introduces specific sensitivities regarding seasonal migratory bird pathways and native floodplain fish species. While the actual physical interventions (laying water mains and building distribution networks) will take place entirely within highly disturbed municipal rights-of-way, the presence of these high-priority riverine and wetland species within the wider municipal catchment highlights the need for strict construction safeguards. This ensures that any trenching, pipe-laying, or localized discharge does not inadvertently impact adjacent natural drainage channels like the Ichamati or Narad rivers, which feed into these critical regional habitats.

137. Overall, the IBAT results conclude that while no automatic Critical Habitat determination is made at the screening stage, there are biodiversity features within the wider project influence area that may potentially trigger Critical Habitat considerations under IFC Performance Standard 6, particularly due to the presence of threatened species and nearby KBAs.

138. With this result, further assessment was undertaken through site visits and interviews with the locals, including targeted desktop review, where relevant, to confirm the likelihood of species occurrence. The subproject sites such as roadsides (water supply distribution network alignments) and specific inland sites (PTWs, OHTs and pump houses) are all located in the built up and developed areas. No project component will be constructed or located within or along embankments or riparian sections of water bodies such as rivers where the CR and EN species identified in the IBAT screening are known to thrive. Thus, project activities will have no direct or indirect impact to these species.

Figure 17: IBAT Screening (PS6 – 50-KM)



E. Socioeconomic Environment^{17 18}

1. General Socio-Economic Profiles and Administrative Structures

139. **Pabna Paurashava.** Pabna Paurashava (Municipal Corporation) is a major urban local government institution in Bangladesh, covering an administrative area of 27.24 square kilometers. The city plays a strategic role in the western region of the country, functioning as an administrative, commercial, and service center. Its urban footprint is compact yet dense,

¹⁷ Secondary information taken from the following websites: (i) <https://ps.pabna.gov.bd/> (for Pabna Paurashava); (ii) <http://ishurdi.pabna.gov.bd/> (for Ishwardi Paurashava); (iii) <https://natorePaurashava.gov.bd/> (for Natore Paurashava); and (iv) <https://lalpur.natore.gov.bd/> (for Gopalpur Paurashava under Lalpur Upazila)

¹⁸ Information on demography, and status of water supply systems and sanitation is taken from the Situation Analysis Report for Ishwardi Cluster Region. UIIPF Project (DPHE Component). April 2023.

reflecting both its historical importance as one of the oldest municipalities in the subcontinent and its contemporary growth as a regional city.

140. Administratively, the city is divided into 15 wards, which allow decentralized governance and more efficient delivery of municipal services. These wards serve as the basic planning and implementation units for local infrastructure development, community services, and regulatory oversight. Ward-level representation also facilitates citizen participation in local decision-making and service prioritization. With an estimated population of approximately 176,000 residents, the city exhibits significant demographic pressure on urban services and infrastructure. The municipality manages around 44,600 holding units, indicating a relatively large stock of residential, commercial, and institutional properties. This tax base is essential for financing municipal operations, maintenance, and development projects.

141. **Ishwardi Paurashava.** Ishwardi Paurashava (Municipal Corporation) is a vital urban local government institution in Bangladesh, covering an administrative area of approximately 31.10 square kilometers. The city plays a highly strategic role in the western region of the country, functioning as a premier industrial, economic, and regional transport hub—notably serving as the headquarters for the western zone of Bangladesh Railway and sitting adjacent to major national installations like the Ishwardi Export Processing Zone (EPZ) and the Rooppur Nuclear Power Plant project. Its urban footprint is rapidly evolving, driven by substantial industrial expansion and its historical positioning along the Padma River network.

142. Administratively, the city is structured into 9 wards, which facilitate decentralized governance and more systematic delivery of essential municipal services. These wards act as the primary operational units for localized utility expansions, public health infrastructure, and regulatory enforcement. With a baseline population expanding toward an estimated 77,000 to 103,000 residents (complemented by a substantial daily floating population of industrial workers and traders), the municipality faces increasing demographic and infrastructural pressure. The local government manages thousands of structural holding units, establishing a commercial, industrial, and residential property tax base that is central to funding municipal infrastructure operations, asset maintenance, and upcoming water and sanitation development initiatives.

143. **Gopalpur Paurashava.** Gopalpur Paurashava is a specialized urban local government institution located within Lalpur Upazila of Natore District, covering an administrative area of approximately 16.16 square kilometers. The municipality plays a vital economic and industrial role in the west-central region of the country, most notably anchoring the historic North Bengal Sugar Mills—one of the foundational agro-industrial enterprises in Bangladesh. Its urban footprint presents a distinct linear-to-nucleated growth pattern, running parallel to the northern banks of the dynamic Padma River system and surrounding regional transportation lines.

144. Administratively, the municipality is organized into 9 wards, which provide the structural framework for decentralized public administration and localized infrastructure management. These wards serve as the primary implementation tracks for basic public utilities, public health interventions, and municipal zoning controls. With a growing population estimated at approximately 243,000 residents, the town experiences targeted demographic demands on its service delivery systems, particularly during peak crop-crushing seasons when the local floating workforce increases. The Paurashava manages its local holding units across residential, commercial, and heavy institutional categories, establishing an essential property and industrial tax base needed to fund urban utility extensions, drainage upkeep, and sustainable water supply development projects.

145. **Natore Paurashava.** Natore Paurashava is the principal urban municipality within Natore Sadar Upazila and serves as the administrative, political, and commercial headquarters of Natore District. It is one of the oldest institutional municipalities in the region, established in 1869 during the colonial era, and covers a jurisdiction of approximately 39.84 square kilometers. The Paurashava functions as the highly urbanized nucleus of the district, driving the local economy and serving as the primary commercial and public service center for the surrounding agrarian floodplains and nearby peri-urban settlements.

146. A defining feature of Natore Paurashava is its profound historical and cultural background, famously serving as the seat of the historic Rajshahi Raj Zamindari and anchoring prominent heritage complexes like the Rani Bhabani Rajbari and the Uttara Ganabhaban (the official northern residence of the Government of Bangladesh). This rich heritage shapes the town's dense, nucleated spatial footprint, which is physically bisected by the Narad River channel. Divided into 9 administrative wards, the municipality faces high demographic pressures with an urban population of over 120,000 residents. The core wards present highly consolidated residential and commercial patterns, creating a substantial holding tax base that is vital for supporting municipal utility modernization, central storm drainage rehabilitation, and municipal water safety infrastructure.

2. Population

147. **Pabna Paurashava.** Pabna Paurashava is the most populous and primary urban center in this western cluster, with an estimated population of about 176,000 residents residing across 15 wards within an administrative area of 27.24 km². It serves as the district's main administrative, commercial, and educational powerhouse, attracting steady in-migration from neighboring upazilas and rural floodplains. The demographic profile is heavily weighted toward working-age individuals, service-sector employees, and a large undergraduate student population, driving high population densities in the central historical wards. This sustained population growth has significantly intensified the structural demand for urban housing, modernized water supply grids, integrated sanitation, and resilient storm drainage infrastructure.

148. **Ishwardi Paurashava.** Ishwardi Paurashava is a rapidly expanding industrial and economic urban center with a population estimated between 85,000 and 103,000 residents, living within 9 wards over an administrative area of approximately 31.10 km². The town functions as a premier national transport and industrial hub, driven by its strategic railway junction, the Ishwardi Export Processing Zone (EPZ), and nearby mega-infrastructure projects. Settlement patterns are highly compact around the transport corridors and industrial zones, hosting a large, dynamic population of industrial workers, railway employees, small traders, and daily laborers. This rapid influx of an industrial workforce places immediate and severe strain on existing municipal utility lines, demanding scalable, pressurized water distribution networks.

149. **Gopalpur Paurashava.** Gopalpur Paurashava is a specialized, medium-sized industrial municipality with an estimated population of about 23,000 residents, spread across 9 wards within a localized area of approximately 16.16 km². Anchored by the historic North Bengal Sugar Mills, the town's demographic and socio-economic character is uniquely split between heavy agro-industrial labor and agricultural livelihoods like sugarcane farming. Population density is moderately concentrated near the mill complex and primary transit lines, fading into semi-rural patterns toward the banks of the Padma River. The town's unique demographic profile, combined with a fluctuating seasonal floating workforce during the crop-crushing season, places sharp, episodic pressures on localized housing, water supply, and basic sanitation infrastructure.

150. **Natore Paurashava.** Natore Paurashava is the largest municipality in the cluster after Pabna, housing a population of approximately 121,000 residents distributed over 9 wards within an area of about 39.84 km². As a historic regional seat and major administrative capital, Natore supports a dense, nucleated population primarily engaged in public services, commercial trading, and agro-based businesses linked to the surrounding fertile floodplains. Population density is exceptionally high in the core commercial wards and around historical landmarks, while peripheral zones bordering the Chalan Beel remain less dense. The city's demographic dynamics are heavily influenced by seasonal factors and high-water tables, which consistently compound the municipal pressure for upgraded water safety and centralized environmental management systems.

3. Economic Structure

151. **Pabna Paurashava:** Pabna Paurashava has developed a strong commercial base supported by its municipal kitchen markets, shopping centers, and municipally owned commercial spaces. These facilities provide organized commercial spaces for retail trade, small businesses, and service providers, contributing to employment generation and local economic vitality. Municipally owned commercial assets also serve as a stable source of revenue for the municipality. Rental income from shops and market spaces helps fund routine municipal services such as waste management, road maintenance, and public lighting. The distribution of markets across the city supports accessibility for residents and reduces congestion in the central business areas.

152. Licensing functions are a key regulatory responsibility of the Paurashava. The issuance of thousands of trade licenses indicates a relatively high degree of formal economic activity for a regional hub. In addition, non-motorized vehicle and electric rickshaw/E-taxi licenses have been issued, reflecting the importance of informal and local transit services in daily urban mobility and livelihoods for low-income groups.

153. **Ishwardi Paurashava.** The economy of Ishwardi Paurashava is dominated by industrial manufacturing, heavy transport logistics, commercial trade, import-export services, and agro-processing industries. The municipality benefits immensely from its highly strategic position as one of the country's premier inland transport nodes, anchoring a vital railway junction, intersecting national highways, and sitting adjacent to major economic engines like the Ishwardi Export Processing Zone (EPZ), the Rooppur Nuclear Power Plant project, and several major auto-rice mills. This unique industrial ecosystem facilitates massive inter-district and international movement of industrial inputs, construction materials, agricultural produce, and manufacturing goods.

154. Employment within the municipality includes a high share of formal jobs across manufacturing factories, corporate offices, multinational engineering firms, national utility projects, banking systems, and railway administrations. Parallel to this industrial core is a large, vibrant informal workforce engaged in retail trade, industrial logistics, heavy vehicle transport operations, mechanics, and small-scale support businesses. While this industrialized, diversified livelihood base drives high economic resilience and strong local purchasing power, it also introduces employment and income vulnerabilities for low-skilled daily laborers and seasonal migration groups moving in search of industrial work.

155. **Natore Paurashava.** The economy of Natore Paurashava is dominated by agricultural commerce, wholesale trade, public services, transport operations, educational services, and small-to-medium enterprise (SME) agro-processing units. The municipality benefits significantly

from its strategic position as a vital highway and railway transit hub in northern Bangladesh, which facilitates the massive regional trade of rice, sugarcane, fish, and seasonal crops from the surrounding floodplains and the fertile Chalan Beel basin.

156. Employment within the municipality includes formal positions across government administrations, banking institutions, healthcare facilities, and notable educational hubs, alongside a highly active informal workforce. This informal sector is heavily engaged in retail trading, agricultural logistics, road transport operations, processing local sweets (such as the famous Kachagolla), and daily labor. While this diversified livelihood base supports a resilient municipal economy, it also presents income vulnerabilities for low-income and day-laboring groups, particularly during agricultural off-seasons and seasonal flood fluctuations.

157. **Gopalpur Paurashava.** The socio-economic profile of Gopalpur Paurashava reflects a highly specialized, agro-industrial livelihood base. Across the surrounding Lalpur Upazila, major income sources are anchored by agriculture and crop cultivation (52.88%), commercial trade (15.54%), formal and informal services (10.12%), and transport and communication (3.73%). Within the municipal boundaries, however, non-agricultural livelihoods and industrial occupations are significantly more dominant.

158. A substantial portion of the municipal workforce is directly or indirectly tied to heavy agro-industrial operations, most notably the North Bengal Sugar Mills, alongside commercial sugarcane handling, wholesale trading, and local transport logistics. The town also features a large informal employment sector, including retail trade, rickshaw and easy-bike transport services, and agricultural processing labor. This distinct economic structure provides strong seasonal dynamism—particularly during the peak sugarcane crushing season—but also exposes low-income groups and daily laborers to structural income vulnerability during the industrial off-season.

4. General Economic Livelihood Condition

159. **Pabna Paurashava.** Pabna Paurashava has a diversified urban economy largely driven by commerce, trade, institutional services, and small-to-medium enterprises, which provide the primary sources of livelihood for the city's residents. The city accommodates multiple large public markets, key shopping complexes, and thousands of municipally registered commercial establishments supporting wholesale trade, food distribution, and daily consumer services. The issuance of thousands of trade licenses annually highlights the prevalence of micro-, small-, and medium-sized enterprises, including retail shops, light engineering workshops, automotive repair services, and food establishments. A significant proportion of the workforce is engaged in the informal sector, particularly in petty trade, rickshaw pulling, mechanized local transport services, and casual construction labor, reflecting typical employment patterns in major secondary cities in Bangladesh.

160. In addition to commerce, public administration, healthcare, and higher education contribute substantially to local employment in Pabna Paurashava. The presence of Pabna Science and Technology University, Edward College, a massive mental healthcare hospital complex, general clinics, and district-level government administrative offices creates consistent salaried employment opportunities for professionals, service staff, and support workers. Transport and connectivity infrastructure further enable livelihood activities, with extensive road, rail, and transit services facilitating the movement of goods and labor within the city and with surrounding rural upazilas. While economic opportunities are relatively diverse, livelihoods for low-income households remain vulnerable to market fluctuations and infrastructure constraints,

underscoring the importance of modernizing municipal utility networks to support economic resilience.

161. **Ishwardi Paurashava.** Ishwardi Paurashava is a premier, industrialized commercial center within the western region, benefiting from a unique socio-economic landscape driven by heavy manufacturing, regional trade, and strategic national infrastructure. The presence of numerous scheduled commercial banks, financial institutions, and dedicated customs clearing facilities supports large-scale industrial transactions, export-import operations, and extensive access to industrial credit. These facilities serve not only municipal residents but also a vast network of international engineers, domestic corporate managers, and cross-district traders, generating massive daily foot traffic and intense economic activity within the municipal area.

162. Heavy manufacturing and processing industries constitute the dominant economic sector within and around Ishwardi Paurashava. The municipality sits adjacent to the thriving Ishwardi Export Processing Zone (EPZ), the Rooppur Nuclear Power Plant site, and a major cluster of computerized auto-rice mills and food processing plants. Much of the processing, logistics management, heavy cargo warehousing, and transport of manufacturing goods occurs in or directly through Ishwardi Paurashava, reinforcing the municipality's role as an essential national industrial and trading hub. Unskilled and semi-skilled laborers find substantial formal and daily-wage employment within these industrial zones, though this creates high demographic pressures on local municipal services.

163. While Ishwardi Paurashava itself is highly urbanized, it remains functionally integrated with a highly productive surrounding agricultural hinterland. The region is famously known for high-intensity commercial horticulture, specializing in the mass production and regional distribution of fruits, vegetables, and dairy products. Agricultural produce from surrounding unions is collected, packaged, and distributed through urban wholesale markets within the Paurashava, supporting national food supply chains and trade-based livelihoods.

164. **Natore Paurashava.** The general livelihood conditions in Natore Paurashava reflect a high-density urban socio-economic setting closely linked to the surrounding agrarian economy, where households rely on a combination of wholesale trading, agro-logistics, public services, small-scale businesses, and wage labor. While the Paurashava functions as the administrative capital of the district, a significant proportion of residents maintain strong economic and environmental linkages with the adjacent Chalan Beel—the largest wetland depression in northwestern Bangladesh. Agricultural livelihoods remain important, particularly large-scale fish trading, paddy cultivation, and seasonal crop distribution, supported by the proximity of rich surface water bodies and fertile floodplain lands. These activities provide both direct employment and supplementary trading income, especially for lower- and middle-income households.

165. Within the municipal core, livelihoods are highly consolidated, with many residents engaged in retail trade, transport services, small and cottage food processing industries, and service sector employment. The presence of numerous markets, financial institutions, heritage-related tourism facilities, and healthcare services supports business- and service-oriented employment opportunities. At the same time, the processing of traditional food products and agro-commodities plays a noticeable role in local municipal consumption and micro-enterprise development. Despite this diversification, a segment of the population, particularly daily wage laborers, fish handlers, and informal transport workers, remains economically vulnerable to seasonal monsoon flooding, water table fluctuations, and price volatility, which is characteristic of low-lying flood-prone Paurashavas.

166. **Gopalpur Paurashava.** Although Gopalpur Paurashava is classified as an urban local government unit, it remains structurally connected to surrounding agricultural production and specialized heavy agro-industry. Major crops within the upazila include sugarcane, paddy, wheat, pulses, and extensive fruit orchards, with sugarcane acting as the absolute economic anchor of the region. The municipality functions as the primary collection, crushing, processing, and marketing point for sugarcane across the district, driven by the presence of the historic North Bengal Sugar Mills located within the municipal boundary. This intense industrial-agricultural linkage underscores the role of Gopalpur Paurashava in national sugar production and regional agricultural commercialization.

167. Fisheries, livestock, and mango/lychee orchard activities form another important component of the broader upazila economy. While the primary cultivation activities occur outside the municipal core, the marketing, input supply distribution, cold-chain transport, and service support are heavily concentrated within the Paurashava. These activities contribute to employment, nutrition, and income generation, particularly for low- and middle-income households linked to peri-urban spaces.

168. Industrial activity within Gopalpur Paurashava is dominated by this heavy sugar mill complex, alongside supporting small-to-medium enterprises like auxiliary machinery repair workshops, biomass-based fuel processing, and local transport networks. These industries are closely linked to local crop cycles and transport infrastructure, providing major seasonal employment opportunities for semi-skilled and unskilled labor. Commercial activities are heavily concentrated around the mill perimeter, transport corridors, and major town roads, reinforcing the municipality's specialized role as a regional agro-industrial center.

5. Literacy and Educational Infrastructure

169. **Pabna Paurashava.** Pabna Paurashava possesses a highly robust educational foundation, serving as the premier intellectual and academic powerhouse of the western region. The municipality hosts Pabna University of Science and Technology (PUST) and the historic Pabna Edward College, establishing the city as a major regional education hub that draws thousands of tertiary students from across the country. The urban center also accommodates Pabna Medical College, a public textile engineering college, polytechnic institutes, a law college, and vocational training centers, providing diverse professional, technical, and academic pathways.

170. At the primary and secondary tiers, the presence of renowned historic institutions like Pabna Zilla School and Pabna Govt. Girls' High School, alongside dozens of government primary schools and private kindergartens, ensures high-quality basic education. This extensive infrastructure underpins a municipal literacy rate that significantly exceeds the district average, driving local human capital development and civic readiness.

171. **Ishwardi Paurashava.** Educational attainment within Ishwardi Paurashava is highly advanced, reflecting its status as a prosperous industrial and administrative hub. While the wider upazila records an average literacy rate of around 58%, the literacy rate within the municipal borders climbs significantly higher to approximately 66%, showing well-balanced attainment across genders. The town's academic infrastructure features prominent institutions such as Ishwardi Govt. College, Paksey Railway College, and specialized technical institutes geared toward the railway, agricultural research, and industrial sectors.

172. The municipality accommodates numerous secondary high schools, primary schools, and multi-level madrasas. Notable secondary schools like Ishwardi Girls' High School and the historic engineering-linked railway schools serve as vital learning nodes for both municipal residents and families of the industrial workforce stationed at the nearby EPZ and Rooppur projects.

173. **Gopalpur Paurashava.** Education infrastructure in Gopalpur Paurashava is well-developed for a specialized, secondary-level industrial urban center. The municipality achieves a relatively high and balanced literacy rate of approximately 64%, heavily anchored by institutions originally established to support the agro-industrial workforce.

174. Prominent local institutions include the Gopalpur Degree College, Lalpur S.S. Pilot High School, and the specialized institutional schools run adjacent to the North Bengal Sugar Mills complex. The urban area is well-served by primary schools, kindergartens, and several madrasas, which collectively support human capital development and workforce readiness for the town's evolving agro-industrial and commercial sectors.

175. **Natore Paurashava.** Natore Paurashava exhibits an exceptionally strong educational profile with a municipal literacy rate of approximately 71%, which stands comfortably above national averages. Educational infrastructure in this historic Paurashava is dense and well-developed, featuring prominent institutions like the Nawab Siraj-ud-Daulah Government College, Natore Govt. Boys' High School, and Natore Govt. Girls' High School.

176. The municipality acts as the central educational clearinghouse for the district, managing dozens of primary schools, registered secondary schools, and a highly active network of madrasas offering Dakhil, Alim, Fazil, and Kamil tiers. This concentrated mix of traditional academic colleges, technical schools, and primary institutions effectively services both the urban nucleus and the peripheral communities traveling inward from the surrounding Chalan Beel floodplains.

6. Water Supply System

177. **Pabna Paurashava.** The water supply in Pabna Paurashava is currently groundwater-based, intermittent (2–12 hours per day), and heavily plagued by high concentrations of iron and manganese. Piped water reaches roughly one-third of the population, forcing the rest to rely on private tubewells or surface water bodies of questionable quality. Field investigations and pressure testing conducted at Abu Mia Road and Shadhupara Bylane revealed high inefficiencies, leakages, and structurally weak pipes, prompting the recommendation of trenchless rehabilitation methods like pipe bursting.

178. To meet the massive 2045 peak water demand of 54.47 MLD for a projected population of 279,339, Pabna will receive bulk treated surface water from the centralized Ishwardi SWTP via a dedicated transmission pipeline network in the future. At present the existing PTWs are aging, and all need continuous maintenance and some need rehabilitation before being able to produce water again.

179. **Ishwardi Paurashava.** Ishwardi Paurashava's current water supply infrastructure is entirely dependent on groundwater, delivering poor and highly intermittent service that ranges from only 2 to 12 hours per day. The existing supply covers only a portion of the population, leaving the remainder reliant on hand tubewells and alternative water sources. Furthermore, the groundwater is severely compromised by elevated levels of iron and arsenic, posing ongoing

public health risks. To address these challenges and meet a projected 2045 peak water demand of 20.82 MLD for a population of 128,132, the town is transitioning to a surface water-based system. Under the proposed regional cluster framework, a new 113 MLD Surface Water Treatment Plant (SWTP) and riverbank intake facility will be constructed approximately 8 km west of Ishwardi City near Sara Ghat on the Padma River.

180. Treated water will be routed via Ductile Iron (DI) transmission lines to local underground reservoirs and distributed across 100% of the population using High-Density Polyethylene (HDPE) pipelines. The existing PTWs need rehabilitation in some cases. Besides the distribution network of the city is divided by the rail tract and it is difficult to connect two parts of the networks on opposite sides of this rail system.

181. **Natore Paurashava.** Natore Paurashava faces a matching set of water supply constraints, characterized by a restricted, groundwater-dependent municipal system operating for only 2 to 12 hours a day. The presence of excessive iron and manganese requires a shift toward safer alternatives. By 2045, Natore's population is expected to reach 157,040, driving peak water demands up to 30.62 MLD. To support this expansion, a major transmission pipeline extension will run from Gopalpur to Natore to supply bulk treated water from the Padma River intake to newly designed municipal storage reservoirs.

182. Local operations will focus on optimizing the delivery system using HDPE pipes to achieve total population coverage. The city has two Iron Removal Plants which are not in operation for a long time due to the cost incurred to run these systems.

183. **Gopalpur Paurashava.** Gopalpur Paurashava presents the most critical deficit in the cluster, as the municipality currently does not provide any piped water supply to its population. Residents are entirely dependent on private hand tubewells, ponds, and other unprotected sources. Under the new design horizon, a targeted supply standard of 100 lpcd has been set, bringing the 2045 peak water demand to 6.61 MLD for its 40,693 residents. Piped water will be integrated into the town for the first time using bulk transmission linkages connected to the Ishwardi SWTP.

184. This Paurashava does not have any water supply infrastructure managed by the authority. People use personally owned tubewells to get water for themselves. There is no reservoirs, PTWs or distribution pipeline in the Paurashava at present.

7. Drainage System and Water Management

185. **Pabna Paurashava.** Pabna Paurashava operates an urban drainage network totaling approximately 191 kilometers, designed to manage municipal stormwater runoff and wastewater. The infrastructure is composed of a mix of materials and tiers, including 86.8 km of brick drains, 41.0 km of Reinforced Cement Concrete (RCC) drains, and 8.8 km of primary drainage channels. In addition, the municipality maintains 54.4 km of earthen drains, which are typically situated in peripheral or less built-up sections of the town.

186. The primary natural outfall system is closely integrated with the Ichamoti (Isamoti) River and its network of interconnected canals, khals, and local ponds, which act as vital storage reservoirs and pathways for stormwater conveyance. During the monsoon season, these natural features play a dual role in retaining heavy rainfall and mitigating regional flood risks.

187. Despite this extensive network, the drainage system faces substantial operational challenges. While the existing channels are generally capable of handling daily sewage flows, they are severely constrained during peak monsoon periods and cannot accommodate intense storm flows, resulting in frequent and prolonged waterlogging in many parts of the municipality. The overall efficiency of the drains is further diminished by the accumulation of solid waste, sedimentation of sludge, and uncontrolled weed growth. To alleviate these drainage congestions and improve urban resilience against localized flooding, the municipal authority requires comprehensive infrastructure upgrades, regular desilting, and strict enforcement to prevent the structural encroachment and contamination of natural waterways.

188. **Natore Paurashava.** Natore Paurashava is situated within a distinct, low-lying hydrological basin, heavily influenced by the Narad River and the extensive, ecologically vital Chalan Beel system, which fundamentally shape its surface water drainage and water management characteristics. The municipal area contains a natural drainage framework comprised of the Narad River, internal canals (khals), and local lowlands (beels) that facilitate the conveyance of stormwater during the monsoon season. While these water bodies function as natural retention basins and outfall pathways under normal weather conditions, their capacities are severely constrained during peak monsoon periods. High water levels in the receiving river networks back up into the town, causing prolonged drainage congestion and periodic waterlogging across low-lying residential and commercial zones.

189. Water management in Natore Paurashava is inextricably linked to its flat terrain and vulnerable hydrological setting. The local water bodies and wetlands play a dual role in stormwater retention and environmental balance, but rapid, unplanned urbanization and structural encroachment have increasingly compromised this natural network. Major challenges include the siltation of the Narad River, the infilling of internal canals, and the accumulation of unmanaged municipal solid waste inside the drainage lines, all of which heavily reduce overall drainage efficiency. Effective water management in the Paurashava therefore demands a comprehensive approach, including the regular desilting and restoration of the Narad River and key khals, the strict protection of remaining lowlands from land filling, and the careful integration of urban drainage planning with the regional flood dynamics of the Chalan Beel basin.

190. **Gopalpur Paurashava.** Water security and daily management in Gopalpur Paurashava rely almost entirely on localized groundwater resources extracted through private and community tubewells, as the municipality currently completely lacks a public piped water supply infrastructure. These tubewells serve all household, institutional, and commercial needs across the Paurashava. In addition to groundwater, the area features scattered local ponds and surface water bodies that are utilized for non-potable domestic purposes, local agriculture, and aquaculture, particularly in peripheral areas where deep groundwater access is limited.

191. While groundwater remains the primary source of water, the absence of a centralized, treated distribution network exposes the population to seasonal water scarcity and quality vulnerabilities. On the sanitation and environmental management front, Gopalpur currently has no functional faecal sludge management (FSM) framework or public drainage system to safely convey waste. This structural deficit leads to widespread wastewater and septage management challenges, causing severe environmental contamination in dense residential neighborhoods, which becomes heavily exacerbated by flooding and waterlogging during the monsoon season.

192. **Ishwardi Paurashava.** Ishwardi Paurashava's drainage and water management landscape is defined by its strategic proximity to the Padma River, where the municipality's new surface water intake facility is situated. While the current primary focus is on transitioning from

groundwater to a treated surface water supply to address water quality concerns, the municipal drainage network remains vital for conveying stormwater and managing urban runoff. As urban development expands, the interaction between settlement patterns and natural drainage channels requires careful oversight to mitigate the risk of waterlogging and environmental degradation. The city's proactive approach to sanitation, exemplified by its operational Faecal Sludge Treatment Plant (FSTP), provides a critical foundation for maintaining public health and enhancing long-term urban resilience within the municipality.

8. Sanitation

193. **Pabna Paurashava.** Sanitation services in Pabna Paurashava are largely restricted to localized on-site containment systems, primarily consisting of household septic tanks and pit latrines, without any centralized municipal sewerage or wastewater treatment infrastructure. Under the upcoming regional framework, Pabna's faecal sludge management (FSM) has been entirely excluded from this specific project's capital investment pool, as it has already been deferred to separate, ongoing development schemes managed directly by the Government of Bangladesh (GoB). Consequently, the municipality currently lacks a dedicated, project-funded Faecal Sludge Treatment Plant (FSTP) under this cluster framework, keeping local containment, desludging, and disposal practices fragmented and reliant on existing external or informal mechanisms.

194. Municipal involvement remains largely focused on maintaining internal water distribution under District Metering Areas (DMAs), billing, and standard urban maintenance, leaving a significant gap in the integrated regulation of wastewater and drainage pollution. Because the town's extensive drainage lines are heavily choked by the unmanaged accumulation of solid waste, sludge sedimentation, and weed growth, the overflow from these on-site sanitation systems frequently enters public channels. This creates severe environmental risks during peak monsoon periods, where drainage congestion leads to prolonged waterlogging in residential zones. Overall, Pabna Paurashava faces a complex challenge in aligning its independent water supply upgrades with separate GoB sanitation programs to establish a unified, city-wide FSM framework that protects its surrounding water bodies from ongoing contamination.

195. **Natore Paurashava.** Natore Paurashava relies predominantly on on-site sanitation systems, with septic tanks and pit latrines serving almost all households, as the town currently lacks any municipal faecal sludge management (FSM) practices or centralized sewerage infrastructure. Under the proposed regional cluster framework, Natore's long-term sanitation investments and Faecal Sludge Treatment Plant (FSTP) designs have been completely deferred to separate, overlapping Government of Bangladesh (GoB) development programs. Because this specific project focuses exclusively on major water supply distribution upgrades, the municipality currently lacks a project-funded treatment facility, leaving local containment, desludging, and disposal practices fragmented and uncoordinated. Given Natore's flat, low-lying terrain and close proximity to sensitive water bodies like the Narad River and the Chalan Beel system, this lack of formal management creates heightened environmental and public health risks from the potential discharge of untreated sludge into the regional ecosystem.

196. The Paurashava maintains basic municipal services, but these activities are not systematically integrated with sanitation or drainage management. Consequently, the unmanaged accumulation of municipal solid waste, alongside structural encroachment, heavily chokes the internal drainage lines and compromises overall environmental safety. While water supply infrastructure is set for significant expansion, transitioning to a surface water-based system to achieve total population coverage, sanitation services remain lagging and uneven.

The absence of immediate treatment facilities and formal municipal FSM arrangements within this project scope represents a critical gap in the Paurashava's overall urban environmental management, requiring careful coordination with parallel GoB schemes to safeguard the local environment.

197. **Ishwardi Paurashava.** Ishwardi Paurashava stands out as the most structurally advanced municipality within the regional cluster framework regarding environmental sanitation, already operating a functioning Faecal Sludge Treatment Plant (FSTP) within its municipal boundaries. Unlike neighboring towns where faecal sludge management (FSM) is completely non-existent or deferred to separate programs, Ishwardi has successfully integrated waste containment and treatment into its localized urban infrastructure. Households rely predominantly on on-site sanitation systems, including septic tanks and pit latrines, but the presence of the active FSTP provides a formal municipal pathway for safe desludging, transport, and treatment, preventing the unmitigated discharge of raw septage into the environment.

198. Despite these established sanitation advantages, the municipality's environmental management remains closely linked to broader infrastructure challenges. The accumulation of unmanaged solid waste and municipal runoff continues to interact with the local drainage network, which requires ongoing maintenance to prevent localized waterlogging. While the town is currently undergoing a massive capital transition to scale up its water supply system to meet a 2045 peak demand of 20.82 MLD via surface water from the Padma River, the existing FSTP provides a critical foundation for urban resilience. To maximize the impact of these combined utilities, Ishwardi must continue to strengthen its institutional capacity, ensuring that its advanced FSM practices are systematically aligned with drainage improvements and strict water quality surveillance to safeguard both public health and regional water resources.

199. **Gopalpur Paurashava.** Sanitation in Gopalpur Paurashava has historically been non-existent at a municipal level, completely dominated by uncoordinated on-site sanitation facilities where households rely heavily on basic pit latrines or septic tanks. The municipality has no sewer system, public wastewater treatment facilities, or established drainage networks to convey waste safely. Because local faecal sludge management (FSM) is entirely missing, the town presents the most critical sanitation deficit in the cluster, posing a severe threat to public health and environmental quality, a concern amplified by the community's complete, day-to-day reliance on localized groundwater and private tubewells.

200. To aggressively reverse these vulnerabilities, Gopalpur has been designated as the sole focus for extensive sanitation investments under this regional framework. A capital budget of BDT 14.49 crore has been allocated to construct a dedicated Integrated Waste Treatment Plant (IWTP) featuring a 4 cu.m./day faecal Sludge Treatment Plant (FSTP) on a 5.0-acre site at the northern edge of Ward 8. The new facility will deploy Planted Drying Beds (PDB) and Unplanted Drying Beds (UDB) for dewatering, followed by a co-composting system to safely convert treated septage into agricultural fertilizer. Additionally, the project funds the procurement of municipal vacuum trucks, the structural repair of 2 existing public toilets, the construction of 6 new public toilets outfitted with localized Decentralized Wastewater Treatment Systems (DEWATS) at major drain outfalls, and containment upgrades for 126 community toilets. Until this comprehensive FSM infrastructure and its corresponding regulatory mechanisms are fully operational, sanitation in Gopalpur will remain highly fragile, but these targeted interventions lay the groundwork to protect public health and the local environment as urban density increases.

9. Solid Waste Management

201. Solid waste management across Pabna Paurashava, Ishwardi Paurashava, Natore Paurashava, and Gopalpur (Lalpur) Paurashava is generally municipality-led but remains basic, limited, and environmentally inadequate, with notable differences in coverage, operational capacity, and upcoming infrastructure development. Within the cluster, Ishwardi and Gopalpur are positioned to transition toward more structured waste management frameworks, whereas Pabna and Natore exhibit a heavier reliance on existing, localized collection and disposal practices due to project limitations or external program alignments. Across all four towns, house-to-house collection is uneven, declining significantly in peripheral and newly developed areas, and waste is predominantly collected with minimal logistical or advanced technical support.

202. Disposal practices represent the most significant common challenge, as these towns historically rely on open or semi-controlled dumping sites without fully engineered landfill facilities or adequate leachate management. There is no systematic segregation at source, and solid waste systems are weakly integrated with drainage networks, leading to severe municipal bottlenecks. In Pabna, Natore, and Ishwardi, unmanaged municipal solid waste frequently accumulates in internal drainage lines and primary channels, causing severe sludge sedimentation and heavily choking overall drainage efficiency.

10. Public Health Services

203. **Pabna Paurashava.** Public health and sanitation services in Pabna Paurashava operate within a highly populated municipal environment. On the sanitation front, the municipality facilitates access to improved household sanitation through localized on-site containment systems like septic tanks and pit latrines, though formal public toilet infrastructure remains basic.

204. The town acts as a major healthcare hub for the district, anchored by a large government general hospital, specialized public health facilities, and a widespread network of private clinics and diagnostic centers that draw daily population inflows from surrounding areas. Primary healthcare, maternal care, and immunizations are supported through dedicated urban health centers and the national Expanded Programme on Immunization (EPI). However, because its faecal sludge management has been deferred to separate Government of Bangladesh (GoB) schemes and its drains suffer from severe solid waste accumulation, the municipal authority faces ongoing public health challenges linked to seasonal waterlogging and environmental contamination.

205. **Ishwardi Paurashava.** Public health management in Ishwardi Paurashava is tightly integrated with its progressive environmental sanitation infrastructure, being the only municipality in the regional cluster to operate a fully functioning Faecal Sludge Treatment Plant (FSTP). This advanced system actively safeguards public health by preventing the discharge of untreated septage into urban residential zones. The town's healthcare framework is supported by an Upazila Health Complex, maternal and child health clinics, and a growing network of private clinics and pharmacies that serve the municipal population.

206. Furthermore, the city's current capital transition to a treated surface water-based system aiming to deliver 20.82 MLD of safe water by 2045 represents a massive public health intervention designed to eliminate widespread community exposure to high groundwater concentrations of iron and arsenic.

207. **Gopalpur (Lalpur) Paurashava.** Gopalpur Paurashava presents a healthcare and public health framework that is currently undergoing extensive, targeted transformations to

rectify severe historical deficits. The local population relies on nearby public health facilities, including the Lalpur Upazila Health Complex and community clinics, alongside private pharmacies for primary medical needs. Because the municipality has historically suffered from a complete absence of piped water and formal sanitation, community health has been highly vulnerable to waterborne illnesses.

208. To aggressively address these public health risks, a BDT 14.49 crore capital budget is funding the construction of an Integrated Waste Treatment Plant (IWTP) and a 4 cu.m./day FSTP. This public health intervention explicitly includes the structural repair of 4 existing public toilets, the construction of 2 new public toilets equipped with localized Decentralized Wastewater Treatment Systems (DEWATS) at major drain outfalls, and containment upgrades for 126 community toilets to comprehensively secure the urban environment.

209. **Natore Paurashava.** Healthcare services in Natore Paurashava are centered around a prominent government district hospital and an Upazila Health Complex, supplemented by family welfare centers, maternal care facilities, and numerous private diagnostic clinics. While the concentration of these institutions provides critical primary and secondary medical care to residents, the city's broader public health environment faces structural constraints. The lack of active municipal faecal sludge management (FSM) under the current project, combined with the open dumping of solid waste into internal drainage lines and the Narad River, elevates public health risks across the town. This fragility is particularly evident during peak monsoon periods, where drainage congestion causes contaminated water to back up into low-lying residential and commercial zones.

11. Road Network and Transportation Infrastructure

210. **Pabna Paurashava** manages a road network totaling 213 kilometers, which forms the backbone of urban mobility and economic connectivity within this historic municipality. This network accommodates a diverse mix of motorized and non-motorized transport, commercial freight movement, and a rapidly expanding fleet of local three-wheelers, which serve as the primary public transit system for its citizens.

211. The road system is composed of multiple surface types, including 162 km of bituminous roads and 20.10 km of cement concrete roads, which typically bear the brunt of higher traffic volumes in the central business districts. In addition, 4.5 km of Herring-Bone-Bond (HBB) brick roads, 1.8 km of Water Bound Macadam (WBM) roads, and 24.60 km of earthen roads serve peri-urban and lower-traffic neighborhoods, highlighting local variations in infrastructure quality.

212. Supporting infrastructure, including major road intersections such as Traffic More, Indra More, and Nimtola More, alongside key bridges and pedestrian walkways, enhances connectivity across the town. Together, these assets enable vital commercial activities and access to public services, while presenting ongoing challenges for the municipal authority in terms of routine maintenance, traffic management, and infrastructure upgrading.

213. **Ishwardi Paurashava** benefits from exceptional multimodal connectivity, serving as a critical gateway that integrates robust road networks linking all local unions, major railway lines at the historic Ishwardi Junction, and proximity to regional transport corridors. The municipality functions as an important hub for industrial passenger movement, agricultural marketing, and logistics, driven largely by its proximity to the Ishwardi Export Processing Zone (EPZ) and the Rooppur Nuclear Power Plant project.

214. Despite this strategic connectivity, high volumes of heavy freight traffic, rapid growth in informal three-wheeler operations, seasonal drainage constraints, and heavy axle loads create challenges related to urban congestion, rapid road condition deterioration, and pedestrian safety within the municipality.

215. **Gopalpur Paurashava.** Gopalpur Paurashava is well connected to its wider district and regional trade centers through a mixed transport network. A unique feature of the municipality's multimodal system is the Azimnagar Railway Station, which provides vital rail links for local passengers and facilitates goods movement to broader regional markets. The surrounding rural-urban landscape is further linked by an extensive system of local roads that intersect at key transit nodes like Rail Gate, cementing the Paurashava's role as a localized agricultural marketing hub.

216. The road infrastructure includes both paved and unpaved networks, with a system of bridges and culverts cutting across local canals and low-lying agrarian terrain to maintain spatial connectivity. While this network successfully supports daily commuting, farming logistics, and municipal service delivery, drainage congestion and rapid road surface deterioration remain prominent challenges during the heavy monsoon season.

217. **Natore Paurashava.** Transport connectivity is a defining feature of Natore Paurashava, a historic municipality strategically positioned in the northern region of Bangladesh. The Paurashava benefits from an extensive transport network that handles high volumes of inter-district traffic, highlighted by major regional highways, a well-distributed network of paved and unpaved municipal roads, and a vital rail link that integrates the town into the national railway network. This multi-layered connectivity supports daily passenger movement, the rapid transport of regional agricultural freight—particularly from the area's massive produce and wholesale markets—and overall economic integration with neighboring districts.

218. The high volume of transport and transit activity contributes significantly to local economic vitality, reinforcing Natore's role as an important commercial crossroads. However, this heavy traffic flow also creates distinct urban challenges, including localized traffic congestion around busy intersections like Madrasa More, pedestrian safety concerns, and accelerated infrastructure wear that demands continuous maintenance from the municipal authority.

12. Cultural, Religious, and Recreational Facilities

219. **Pabna Paurashava.** Pabna Paurashava is remarkably rich in cultural, historical, and religious heritage, reflecting a diverse and deeply rooted community identity. The municipality accommodates the spiritual needs of its citizens through approximately 170 mosques, three churches, and landmark historic structures like the centuries-old Joy Kali Temple and the iconic Jor Bangla Temple. These places of worship serve as vital spaces for neighborhood interaction and social cohesion.

220. Beyond its spiritual institutions, Pabna boasts important social welfare and recreational facilities that enhance the quality of urban life. The town features community auditoriums, local playgrounds, and specialized public parks that offer open space for leisure, youth sports, and cultural festivals. These amenities altogether support the physical and mental well-being of the population, helping to build community resilience within the municipality.

221. **Ishwardi Paurashava.** Ishwardi Paurashava features a vibrant social environment molded by its status as an industrial and logistical hub. The municipality hosts a dense array of community, religious, and social institutions, including numerous mosques, eidgahs, and temples that serve as the focal points for social organization and daily interaction across its wards. These community spaces play an important role in preserving local identity and promoting social harmony among a rapidly growing urban population.

222. Given its industrial significance and the influx of diverse workforce communities, social welfare and recreational infrastructures are critical pillars of the town's public life. The Paurashava is supported by local sports clubs, community playgrounds, and cultural venues that provide essential spaces for leisure, youth engagement, and civic events. Local libraries and active non-governmental organizations (NGOs) further enrich civic life, helping to drive community development and foster civic pride.

223. **Gopalpur Paurashava:** Gopalpur Paurashava reflects a culturally cohesive and religiously diverse community environment characteristically shaped by its semi-urban, agrarian landscape. The municipality is home to many mosques, localized temples, and community shrines that cater to the deep spiritual and cultural traditions of its residents. These institutions form the backbone of social cohesion and mutual support across the municipal area, acting as centers for conflict mediation and shared communal identity.

224. Recreational and youth development needs within this Paurashava are heavily grounded in traditional community structures. The town relies on local playgrounds, school fields, and informal community clubs to host regional sports tournaments, cultural gatherings, and youth engagement activities. Combined with active local social organizations, these facilities provide valuable spaces for leisure and civic interaction, helping to strengthen community resilience in low-lying terrains.

225. **Natore Paurashava.** Natore Paurashava possesses a singularly rich cultural tapestry, historically anchored by celebrated landmarks such as the majestic Natore Rajbari (royal palace) and the surrounding historic monuments. The municipality supports its religiously diverse population through a broad network of long-standing mosques, historic temples, and traditional burning ghats, all which function as vital nodes for community interaction, cultural identity, and social organization.

226. As an old, established municipality, Natore values its public spaces for recreation, sports, and cultural preservation. The Paurashava features a central stadium, public auditoriums, and community parks that accommodate local festivities, administrative programs, and civic gatherings. These recreational spaces, alongside local libraries, sports clubs, and NGOs, greatly elevate the urban quality of life, cultivating active civic engagement and strong social unity among its citizens.

13. Cultural Heritage Sites

227. **Pabna Paurashava.** Pabna Paurashava is highly regarded for its deep historical roots and prominent architectural heritage, offering a seamless blend of colonial, ancient, and liberation-era landmarks. A centerpiece of local cultural identity is the iconic Pabna Mental Hospital—established in 1957 as the country's premier psychiatric facility—alongside the historic Anukul Chandra Satsanga Ashram in Hemayetpur. The municipality also proudly preserves the memory of the 1971 Liberation War through dedicated memorials and heritage sites that document local resistance.

228. Architectural marvels define the town's landscape, including the unique 16th-century Jor Bangla Temple, a rare example of traditional terracotta architecture, and the majestic Tarash Bhaban, a grand colonial-era palace built by the zamindars of Tarash. Additionally, the historic Pabna Edward College campus and the legacy of the legendary actress Suchitra Sen's ancestral home contribute to a strong sense of pride and collective memory, making heritage preservation a vital element in the town's urban planning frameworks.

229. **Ishwardi Paurashava.** Ishwardi Paurashava stands as a captivating intersection of early industrial engineering and historic transport infrastructure. The absolute jewel of the area's heritage is the monumental Hardinge Bridge, a majestic steel railway truss bridge opened in 1915 that spans the Padma River, alongside the adjacent Lalon Shah Bridge. The historic Ishwardi Railway Junction, one of the oldest and largest railway hubs in the country, reflects the town's deep-rooted identity as a colonial-era gateway for trade and regional mobility.

230. In addition to its industrial landmarks, Ishwardi holds profound historical and contemporary significance. The municipality and its fringes bear witness to the sacrifices of the 1971 Liberation War, commemorated through local mass graves and monuments. The region is also home to the historic Jagannath Temple in Handiyal and the expansive agricultural research facilities of BARI and BSRI, which blend historical agrarian identity with modern state development, serving as crucial reference points for the area's ongoing urban expansion.

231. **Gopalpur Paurashava.** Gopalpur Paurashava possesses a rich socio-industrial and agrarian heritage that centers around the historic North Bengal Sugar Mills, established during the British colonial era in the early 1930s. The mill complex, along with its historic residential bungalows and colonial-era administrative structures, serves as a living monument to the region's long-standing sugar production legacy. This industrial backdrop is poignantly contrasted by the Shaheed Sagar memorial—a historic mass grave and monument dedicated to the sugar mill workers and freedom fighters who were brutally martyred by Pakistani occupation forces during the 1971 Liberation War.

232. The surrounding low-lying terrain is also dotted with traditional structures, ancient ponds (dighis), and remnants of zamindar estates that showcase the region's historic rural governance. These sacred landmarks and historical assets reinforce a resilient collective memory among the residents, providing essential cultural considerations for the municipal authority when designing modern public works and conservation policies.

233. **Natore Paurashava.** Natore Paurashava is widely recognized as one of the most culturally and historically significant royal seats in northern Bangladesh. The crown jewel of the municipality is the breathtaking Natore Rajbari (also known as Uttara Gonobhaban or the Dighapatia Palace), an expansive, beautifully preserved palace complex surrounded by manicured moats, ancient trees, and majestic colonial-era architecture that serves as the official northern residence of the President of Bangladesh. Another vital landmark is the Natore Rajbari Park, the original seat of the Rani Bhabani estate, which stands as a powerful testament to the region's influential 18th-century zamindar rule.

234. Beyond its royal palaces, Natore features an array of historic ponds, traditional open-air dighis, and long-standing religious structures like the Madrasa More historical sites and old Hindu temples. The town is also globally famous for its culinary heritage, specifically the traditional Kachagolla sweetmeat, which has been crafted here for generations. These invaluable assets establish Natore as a major hub for regional tourism and education, demanding careful integration into the city's infrastructure and urban development plans.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

235. ADB SPS, 2009 requires that all subproject activities need to be carefully assessed and considered to avoid and/or minimize negative social, religious, and cultural, and environmental impacts.

236. The assessment of anticipated impacts has been undertaken using: (i) preliminary engineering information for the Ishwardi Cluster subproject; (ii) field observations and stakeholder consultations conducted during IEE preparation; (iii) baseline environmental monitoring results for air, noise, groundwater, and surface water; (iv) secondary data from government and development partner sources relevant to Ishwardi, Pabna, Gopalpur and Natore; and (v) good international industry practice, including ADB SPS 2009 and the World Bank Group Environmental, Health, and Safety Guidelines. The Bangladesh Climate and Disaster Risk Atlas identified Bangladesh as a highly climate and disaster exposed deltaic country, with frequent flooding, river erosion, cyclones, drought, salinity intrusion, and earthquake risks relevant to infrastructure planning. Therefore, the impact assessment applies a precautionary approach and requires that the final detailed design, EMP, SEMP, and O&M manuals incorporate climate resilience, source protection, water-quality assurance, construction safety, and emergency-response measures.

A. Impacts Rating System

237. The approach for the environmental assessment of this subproject involved the following steps:

- (i) Review of baseline information on the subproject area and site location;
- (ii) Initial environmental screening using ADB's Rapid Environmental Assessment (REA) checklist (Appendix 1).;
- (iii) Consultation with the design team on the proposed infrastructure design and plan;
- (iv) Site visit and consultation with project staff; and
- (v) Discussions with DPHE, community people and other stakeholders.

238. Several criteria were used for assessment. These include:

- (i) Type/nature of activities proposed;
- (ii) Subproject footprint/spatial scale of the proposed infrastructure work/magnitude of impact;
- (iii) Likelihood of the impacts from occurrence;
- (iv) Existing baseline conditions at the subproject site and within the subproject zone of influence, which in this case is up to 200 m;
- (v) Duration of the proposed activities and period of impact (short, medium, or long term); and
- (vi) Requirements for compliance with national acts, rules and regulations and compliance with ADB policies.

Table 36: Likelihood of Impacts from Occurrence

Likelihood	Definition
Certain	Occurs under typical operating or construction conditions.
Likely	Occurs under worst case (negative impact) or best case (positive impact)

Likelihood	Definition
	operating conditions.
Occasional	Occurs under abnormal, exceptional or emergency conditions.
Unlikely	Unlikely to occur.

Source: ADB training module on prediction of impacts and development of site specific EMPs. 2018.

Table 37: Parameters for Determining Magnitude

Parameter	Major	Medium/ Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 15 years)	Medium Term Lifespan of the subproject (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of potential impact	Widespread far beyond subproject boundaries	Beyond immediate subproject components, site boundaries or local area	Within subproject boundary	Specific location within subproject component or site boundaries with no detectable potential impact
Reversibility of potential impact	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal requirements	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Certain	Likely	Occasional	Unlikely

Source: ADB training module on prediction of impacts and development of site specific EMPs. 2018.

239. **Sensitivity of Receptor.** The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. Criteria for determining receptor sensitivity of the subproject's potential impacts are outlined in the following table.

Table 38: Parameters for Determining Sensitivity

Sensitivity Determination	Definition
Very severe	Vulnerable receptor with little or no capacity to absorb proposed changes
Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation
Mild	Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	Vulnerable receptor with good capacity to absorb proposed changes or/and good

Sensitivity Determination	Definition
	opportunities for mitigation

Source: ADB training module on prediction of impacts and development of site specific EMPs. 2018.

240. **Assigning Significance.** Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in the table.

Table 39: Significance of Impact Criteria

Magnitude of Potential Impact	Sensitivity of Receptors			
	Very severe	Severe	Mild	Low
Major	Critical	High	Moderate	Negligible
Medium/Moderate	High	High	Moderate	Negligible
Minor	Moderate	Moderate	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Source: ADB training module on prediction of impacts and development of site specific EMPs. 2018.

B. Summary of Impacts Rating for the Subproject

241. The subproject's potential impacts on the key environmental parameters have been assessed and their significance determined using the methodology described above. A summary of the potential impacts of the subproject on the key environmental parameters and significance of these impacts is presented in the following table.

242. Residual impact ratings are contingent on full implementation of the EMP, SEMP, sub-plans, monitoring requirements, and corrective action procedures. Where mitigation effectiveness depends on detailed design or contractor performance, the residual rating shall be treated as provisional and shall be reviewed during detailed design, SEMP approval, and semi-annual environmental monitoring. A residual rating of "negligible" shall not be assigned unless the mitigation measure fully removes the pathway of impact and monitoring confirms compliance.

Table 40: Summary of Rating of Potential Impacts

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Design and Pre-Construction phase								
Impact due to natural hazards and disasters such as earthquakes, including climate change	Long term	Local	Yes	Likely ^a	Medium	Mild	Moderate	Negligible
Impact due to sustainability – raw water availability	Long term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact due to sustainability – raw water quality	Long term	Local	Yes	Certain	Major	Severe	High	Low ^b
Impact due to competing use of water	Long term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Land subsidence	Long term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Salinization / Salt water intrusion	Long term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impacts due to disruption of existing utilities and services	Short term	Local	Yes	Likely	Minor	Mild	Moderate	Negligible
Impact due to lack of spoil disposal sites	Short term	Local	Yes	Likely	Minor	Mild	Low	Negligible
Impact due to likely presence of asbestos cement pipes in existing pipelines	Long term	Local	Yes	Likely	Minor	Mild	Moderate	Negligible
Tree Removal	Long term	Local	No	Unlikely	Minor	Mild	Negligible	Negligible
Impact on Physical Cultural Resources (internationally protected and other locally protected cultural heritage sites)	Long term	Universal	No	Unlikely	Minor	Mild	Low	Negligible
Approval of Consents, Permits and Clearances	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Compliance with ADB Loan Agreement and SPS	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impacts due to contractor mobilization	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Impacts due to construction camps or workers' accommodation	Short term	Local	Yes	Likely	Minor	Mild	Low	Negligible
Construction/Post-Construction Phase								
Sources of Materials	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to topography and aesthetics	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Impact to surface water quality and aquatic life	Long term	Local	Yes	Likely	Medium	Moderate	Moderate	Moderate
Impact to groundwater quality	Short term	Local	Yes	Certain	Minor	Mild	Moderate	Low ^c
Impact to ambient air quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to noise and vibration level	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to community health and safety	Short term	Local	Yes	Certain	High	Moderate	High	Moderate ^d
Impact to occupational health and safety	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Impact to physical cultural resources and other cultural heritage structures	Long term	Universal	No	Unlikely	Minor	Mild	Low	Negligible
Impact on local festivals and cultural practices	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Impact on ecologically sensitive areas (critical habitat, wetlands, etc.)	Long term	Local	Yes	Unlikely	Medium	High	Moderate	Low ^e
Impact on endangered species	Long term	Local	Yes	Unlikely	Negligible	Low	Negligible	Negligible
Post-construction Waste Management, Disposal and Site Restoration	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Cumulative construction impacts from distribution network	Short term	Local	Yes	Certain	High	Moderate	High	Moderate ^f
Operation Phase								
Maintenance and operation of the distribution network and sanitation facilities (Public Toilet)	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Sanitation facilities and FSM	Long Term	Local	Yes	Likely	Medium	Mild	Moderate	Low ^g
Disaster and natural hazards	Long term	Local	Yes	Likely ^a	Medium	Mild	Moderate	Negligible
Community and occupational health and safety	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Socio-economic status/livelihood	Long term	Local	Yes	Certain	Medium	Mild	Positive	Positive

^a Natural hazards/extreme events are likely to occur, but not predictable as to when these will occur.

^b The rating of "Low" assumes that the approved design ensures compliance of the treated water with the National Drinking Water Quality Standards.

^c Residual risk remains due to iron, manganese, arsenic, and microbial contamination.

^d Residual risk remains unless stop-work triggers and incident reporting are enforced.

^e Residual depends on avoidance of riverbank works during sensitive periods and no untreated discharge.

^f Residual impacts remain due to traffic, access, dust, noise, and social disruption across multiple work fronts.

^g Residual depends on safe siting, pit design, desludging, and final disposal/treatment arrangements.

243. The impact assessment has considered the potential environmental risks and impacts of the Ishwardi Cluster subproject during design, pre-construction, construction, post-construction, and operation. The assessment is based on the preliminary design information, field observations, review of existing environmental conditions, stakeholder consultations, applicable regulatory requirements, and the environmental audit of existing facilities. The significance of impacts has been evaluated in relation to their nature, magnitude, duration, reversibility, geographic extent, sensitivity of receptors, and the effectiveness of available mitigation measures.

244. During the design and pre-construction stage, key risks relate to incomplete integration of environmental requirements into engineering design, delayed statutory approvals, inadequate assessment of existing facilities, insufficient consideration of utility conflicts and traffic disruption, and weak preparation of contract-specific environmental requirements. These risks shall be addressed by incorporating the IEE and EMP into the detailed design, bidding documents, and contracts; obtaining all required environmental clearances, permits, and no-objection certificates before relevant works commence; updating the IEE and EMP if the final design changes materially; and requiring contractors to prepare site-specific EMPs before mobilization.

245. Construction-phase impacts are expected to be site-specific, temporary, and manageable. The principal impacts are likely to include dust emissions from excavation, earthworks, stockpiles, and vehicle movement; noise and vibration from construction equipment; temporary disruption of access, traffic, pedestrian movement, and local businesses; generation of excavated materials, construction debris, and domestic waste from workers; risks of sediment runoff, blocked drains, and localized waterlogging; accidental spills of fuel, oil, lubricants, or chemicals; occupational health and safety risks to workers; and community health and safety risks near active work fronts.

246. Pipe-laying and road-cutting works may cause localized inconvenience to residents, road users, shop owners, schools, health facilities, and other public service providers. These impacts shall be mitigated through construction scheduling, prior public notification, traffic management plans, safe pedestrian access, barricading and signage, phased excavation and reinstatement, coordination with utility agencies, emergency access arrangements, and rapid restoration of disturbed surfaces. Contractors shall maintain access to homes, businesses, and public facilities to the extent practicable and shall provide temporary crossings or alternative arrangements where access is disrupted.

247. Impacts on air quality will be controlled through regular water spraying, covering of stockpiles and haulage vehicles, speed control, proper maintenance of equipment, prohibition of open burning, and prompt removal or reuse of excavated materials. Noise impacts will be mitigated by restricting noisy works to reasonable hours where practicable, maintaining equipment in good working condition, using silencers or acoustic controls where needed, and providing advance notice to sensitive receptors. Waste impacts will be managed through segregation, reuse of suitable excavated materials, disposal only at approved locations, proper handling of hazardous materials, and maintenance of waste records.

248. Risks to surface water, groundwater, and drainage systems will be managed by preventing discharge of untreated wastewater, sediment-laden runoff, oils, chemicals, and solid wastes into drains or water bodies. Construction camps, storage areas, refueling points, and disposal sites shall be sited and managed to avoid contamination. Temporary drainage, silt control, spill prevention, and emergency response measures shall be provided where required.

Any dewatering, if necessary, shall be conducted in a manner that avoids erosion, flooding, contamination, or nuisance to nearby communities.

249. Occupational health and safety risks shall be addressed through a contractor health and safety plan, job hazard analysis, worker induction, toolbox talks, provision and enforcement of personal protective equipment, trench safety measures, traffic safety controls, emergency preparedness, first-aid arrangements, sanitation and drinking water facilities, incident reporting, and corrective action procedures. Community health and safety risks shall be managed through fencing or barricading of work areas, warning signs, night-time lighting where needed, safe traffic and pedestrian management, control of unauthorized access, and prompt response to public complaints.

250. Operation-phase impacts are expected to be low to moderate and manageable if the facilities are operated in accordance with approved procedures. Key operational issues include water source sustainability, energy use, chemical storage and handling where applicable, sludge or residual waste management, maintenance of pumps and treatment facilities, worker safety, emergency response, and continued compliance with environmental quality standards. The operating agencies shall implement routine monitoring, preventive maintenance, emergency response procedures, environmental recordkeeping, and periodic reporting to ensure that the facilities remain compliant and environmentally sound.

251. No critical, irreversible, or unprecedented adverse impacts are anticipated after implementation of the mitigation measures set out in the EMP. The residual impacts are expected to be minor to moderate, localized, and acceptable. The subproject is expected to deliver significant positive impacts by improving access to safe and reliable water supply and sanitation services, reducing dependence on poorly performing systems, improving public health conditions, and strengthening the environmental resilience of urban services in the Ishwardi Cluster.

C. Environmental Audit of Existing Facilities

252. In compliance with ADB SPS requirement, an environmental audit on the existing facilities relative to the scope of the subproject (Ishwardi Cluster) was undertaken. The audit identified current environmental performance, legacy issues, compliance gaps, operational constraints, and corrective actions required for facilities that will be retained, rehabilitated, replaced, or integrated into the proposed subproject. The audit complements the impact assessment by ensuring that existing environmental liabilities and operational risks are not carried forward into the improved system without appropriate corrective measures.

253. The audit reviewed the condition and performance of existing production, storage, transmission, distribution, and associated facilities, based on available information, site observations, consultations, and review of operational practices. The assessment considered water source sustainability, asset condition, maintenance arrangements, environmental compliance, sanitation and drainage conditions, waste and sludge management where applicable, worker and community safety, emergency preparedness, and institutional capacity for environmental management.

254. The findings show that the systems are largely dependent on groundwater abstraction, with aging infrastructure, intermittent service, and limited treatment practices. These conditions likely contribute to declining aquifer sustainability, water quality concerns (including iron, manganese, and arsenic contamination), and weak environmental safeguards such as lack of source protection and inadequate monitoring.

255. Overall, the audit supports the environmental justification for the subproject. It confirms that the existing systems require improvement to achieve safer, more reliable, and more sustainable water supply and sanitation services. With proper implementation of corrective actions, environmental management measures, and strengthened operation and maintenance arrangements, the proposed subproject will reduce existing risks and improve long-term environmental performance in the Ishwardi Cluster.

256. Key environmental performance issues and risks identified include the following:

- (i) Unsustainable groundwater use leading to aquifer depletion, reduced surface water flows, and potential land subsidence;
- (ii) Water quality risks due to contamination and insufficient treatment processes, posing public health concerns;
- (iii) Inefficient infrastructure with high leakage, non-revenue water, and excessive energy consumption;
- (iv) Weak environmental management practices, including poor chemical handling, lack of monitoring, and inadequate wastewater/residual disposal; and
- (v) Institutional capacity gaps affecting maintenance, regulatory compliance, and environmental oversight.

257. Overall, the audit concludes that the cumulative environmental impacts of the existing systems are significant and unsustainable in the long term. The current groundwater-based approach demonstrates poor performance in sustainability, efficiency, and resilience compared to a proposed centralized surface water supply system. The findings strongly support transitioning to this new system while ensuring that any retained infrastructure is rehabilitated in line with environmental management and mitigation measures to improve compliance and reduce risks. The environmental audit report is in Appendix 8.

D. Anticipated Impacts and Mitigation Measures During Design Phase

1. Risk of natural hazards such as earthquakes, landslides, and climate change-induced events such as floods

258. **Impact.** While the subproject area (which is falling within the medium risk seismic zone) only experiences some minor earthquakes in recent years, there is still a likelihood that the site will be impacted by a minor earthquake to its location and undulating terrains. Any earthquake/seismic events or any other extreme events such as unprecedented flooding could potentially disturb the land at the site and cause damage to subproject infrastructures such as the storage reservoirs, pump houses and distribution pipelines.

259. **Mitigation.** Mitigation measures include ensuring subproject components use materials that could withstand potential stresses during extreme events, temperatures, pressures, etc. The structural designs of the storage reservoirs and pump houses shall comply with relevant good international practice to ensure the structures can withstand earthquakes and climate-induced events in the future.¹⁹

¹⁹ Pipe selection considers all the potential climate-induced risks. This is already integrated into the design as discussed in the climate risk assessment for the overall project. Accordingly, all climate-induced hazards and adaptation measures are already integrated into the distribution network design.

2. Source Sustainability, and Raw Water Quality²⁰

260. **Impact:** The Ishwardi Cluster water supply system will rely substantially on groundwater through existing and proposed production tube wells, with selected treatment and distribution improvements. Continued or increased abstraction from production tube wells may contribute to cumulative groundwater stress if abstraction is not monitored and managed. Potential impacts include declining groundwater levels, reduced well yields, increased pumping costs, deterioration of source reliability during dry periods, and possible mobilization or concentration of naturally occurring water-quality contaminants.

261. Baseline groundwater testing for the Ishwardi Cluster indicates that key parameters such as chloride and total dissolved solids are generally within national standards, but the continued use of groundwater requires systematic monitoring to confirm long-term sustainability and quality. Water-quality risks may also arise from aging distribution systems, intermittent pressure, leakage, poor disinfection, inadequate treatment performance, and intrusion of contaminated water into pipelines during low-pressure conditions.

262. Surface water bodies and drainage channels within or near the cluster towns may also be affected indirectly by construction runoff, improper disposal of spoil, fuel or chemical spills, backwash or residual discharges, poor sanitation practices, and drainage obstruction. The Padma, Ichamoti, and other local river and drainage systems support fisheries, domestic uses, irrigation, and local livelihoods. These receptors require protection from construction and operation-related pollution.

263. Climate change introduces additional uncertainty to both groundwater and surface water conditions. Changes in rainfall distribution, drought frequency, heat stress, flooding, drainage congestion, and riverbank erosion may affect source reliability, water quality, infrastructure resilience, and operation and maintenance requirements.

264. **Mitigation.** The final detailed design shall include a groundwater source sustainability and water-quality management plan. At minimum, this plan shall: (i) confirm the number, depth, yield, and design abstraction rate of each existing and proposed production tube well; (ii) establish baseline static and dynamic water levels before commissioning; (iii) define seasonal groundwater-level monitoring, at least pre-monsoon and post-monsoon, and monthly abstraction records; (iv) include routine testing for arsenic, iron, manganese, chloride, TDS, electrical conductivity, fecal coliform, total coliform, and other locally relevant contaminants; (v) establish operational triggers for reducing or suspending abstraction where declining water levels, salinity indicators, or contaminant concentrations show deterioration; (vi) prioritize non-revenue water reduction, leakage control, and demand management before increasing groundwater abstraction; and (vii) require reporting of groundwater abstraction and quality trends in the SEMR during construction and operation.

265. All new and rehabilitated production tube wells shall include appropriate sanitary protection, wellhead drainage, flood and waterlogging protection, secure access, and monitoring points. Production wells shall not be commissioned unless water quality meets Bangladesh National Drinking Water Quality Standards after treatment and disinfection, where required.

²⁰ Analysis of impacts and identification of proposed mitigation measures for this aspect have been based on the data provided in the Feasibility Study Report prepared for Ishwardi cluster.

266. The final design shall also include water-quality assurance measures for the distribution system, including disinfection, flushing and testing of new pipelines before commissioning, maintenance of adequate residual chlorine, pressure management, leak detection and repair, prevention of cross-connections, and routine consumer-point monitoring. If treated water fails to meet required turbidity, residual chlorine, or microbiological standards, corrective actions shall be implemented before supply is continued or restored.

3. Land Subsidence Due to Groundwater Abstraction

267. The subproject involves the rehabilitation of existing Production Tube Wells (PTWs), which serve as supplementary sources of drinking water for the overall water supply system. These PTWs have been in operation for several decades, and no evidence of land subsidence has been observed at any of the existing sites to date. However, the continued long-term abstraction of groundwater may pose a potential risk of land subsidence in the area, particularly if additional PTWs are developed and operated under the subproject as supplementary water sources. To assess and manage this potential impact, a hydrological study supported by groundwater modeling has been conducted for the subproject, providing an evaluation of groundwater availability and abstraction sustainability.

268. The hydrological and source-sustainability assessment for the Ishwardi cluster indicates that the long-term water-supply strategy will shift from heavy reliance on groundwater to conjunctive use, with treated surface water serving as the primary bulk source and existing PTWs retained mainly for supplementary, peak-demand, and emergency use. This approach will reduce the need for additional groundwater abstraction and will help stabilize aquifer stress over time. Existing PTWs have already been operating for several decades in the cluster towns without observed evidence of ground settlement at the well sites or nearby infrastructure. The project does not propose large-scale expansion of groundwater abstraction as the principal source; instead, groundwater use will be progressively managed and monitored through abstraction records, groundwater-level measurements, and routine well-condition assessments. On this basis, and subject to continued monitoring during operation, the likelihood of measurable land subsidence attributable to the subproject will be barely minimum.

269. In view of the above, impact due to land subsidence is considered insignificant. No mitigation measures are required.

4. Salinization Due to Groundwater Abstraction

270. Groundwater salinization may result from both natural and anthropogenic factors. Natural sources include geogenic conditions related to local geology and, where applicable, saltwater intrusion from coastal waters into inland freshwater aquifers. Anthropogenic sources of salinity may arise from irrigation return flows, the use of saline surface water, and other human activities at ground level. Based on environmental baseline investigations conducted for the subproject, groundwater salinity indicators measured in existing deep tube wells in the project area were relatively low, chloride was from 28 mg/l to 212 mg/l and TDS from 68 mg/l to 609 mg/l. Despite several decades of groundwater abstraction from these tube wells, the results suggest that significant groundwater salinization has not occurred in the project area to date. This condition may be attributed to favorable hydrogeological characteristics, including recharge from surrounding water bodies, which provide sufficient replenishment to the groundwater aquifer and help maintain its freshwater quality.

271. The baseline groundwater quality results also support this assessment. Across the sampled locations chloride concentrations range from 15 mg/l to 100 mg/l, which is below the Bangladesh drinking water standard of 250 mg/l. TDS values range from 200 mg/l to 615 mg/l, also below the drinking water standard of 1,000 mg/l. These results indicate that the sampled groundwater remains fresh to slightly mineralized rather than saline. The observed chloride and TDS levels do not indicate present saltwater intrusion in the tested production sources. Continued monitoring of chloride, TDS, electrical conductivity, and groundwater levels is recommended, particularly during the dry season and at wells closest to major river channels, to confirm that salinity conditions remain stable as abstraction patterns change under the project.

5. Disruption of existing utilities and services

272. **Impact.** All alignment of subproject packages will pass through roads in the different parts of municipalities and *Paurashavas* of the Ishwardi cluster. There is high likelihood that these will cross, intercept and/or align with existing utilities and services, such as underground and overground cables, electricity posts, etc., already installed in these areas. Any damage to these utilities will disrupt the daily lives of the people affected.

273. **Mitigation.** Include in the design of the alignments the best options that will result in minimum impact on these utilities. Where alignments cannot avoid disrupting the operation of these utilities, include in the bidding and contract documents the mandatory task for Contractors during pre-construction phase to coordinate with relevant authorities (e.g. Bangladesh Power Development Board) regarding this potential impact. This will ensure that any interruption on utility and service operation is minimized, and that affected households or communities are properly informed in advance.

274. Further, ensure that the bidding and contract documents has the condition that Contractors will need to carry out environment friendly construction works, and the Contractors will be responsible for any damage to utilities or infrastructure such as electricity poles, cable lines, telephone booth, etc. above ground level.

6. Health Hazard from Asbestos-Containing Materials (ACMs)

275. **Impact.** Based on the assessment of the existing water distribution network within the subproject area, approximately 14.47 km of 200 mm diameter Asbestos Cement (AC) pipes remain in service as part of the 43.14 km distribution network in Natore Paurashava. Those asbestos cement pipelines installed in the 1980s are approaching or exceeding their typical service life. Available information from DPHE and municipal operators should be used to confirm whether existing water distribution networks, old buildings, roofing sheets, gaskets, insulation, pipe materials, or other legacy assets in the Ishwardi Cluster contain asbestos-containing materials. If existing records are incomplete or if portions of the network are old and undocumented, the potential presence of asbestos-containing materials shall be treated as a precautionary risk. Disturbance of suspect materials during excavation, rehabilitation, demolition, cutting, breaking, drilling, or disposal could release asbestos fibers and create health risks for workers and nearby communities.

276. **Mitigation.** Before construction, the contractor shall conduct precautionary asbestos screening of old facilities, pipe sections, and any structures or materials to be disturbed. If suspect asbestos-containing material is encountered, the contractor shall immediately stop work in the affected area, isolate and barricade the location, prohibit cutting, breaking, drilling, dry

sweeping, or uncontrolled handling, notify the PIU and PMSC, and arrange inspection by a competent asbestos specialist. Work shall resume only after the material is confirmed to be non-asbestos or after an asbestos management method statement has been prepared, reviewed, and approved.

277. Any asbestos-containing material handling, removal, packaging, transport, storage, and disposal shall follow national requirements and good international industry practice. The method statement shall include trained personnel, appropriate PPE, dust suppression, wet handling where safe, restricted access, labeling, double wrapping or sealed containers, covered transport, disposal at an approved location, waste documentation, decontamination procedures, incident reporting, and worker and community protection measures. The contractor shall maintain records of screening, chance finds, disposal, and training, and shall include any asbestos-related actions in monthly monitoring reports and SEMRs.

278. Before starting the construction, existing asbestos pipes should be identified and mapped using scanning method. New pipe layout plan should carefully put new alignment to avoid any encounter with these pipes. In case of any unavoidable encounter, an asbestos management plan (AMP) should be prepared through the support of PMSC expert/s, which should include or consider the following elements:

- (i) Development and application of a detailed procedure to protect workers and the people surrounding the excavation sites. This should comply with national and/or international standards for handling asbestos, and should include: (a) removal of all persons to a safe distance; (b) usage of appropriate breathing apparatus and protective equipment by persons assigned to handle the AC material; and (c) procedures for the safe removal and long-term disposal of all asbestos-containing material encountered;
- (ii) If AC pipes encountered are not broken, leave them in-situ as much as possible, and ensure proper protection and precautions are observed in order to avoid breaking the AC pipes during excavation or reinstatement activities;
- (iii) If encounter with AC pipe is unavoidable, ensure to use proper PPE. No compressed-air cleaning and no dry sweeping should be done and instead wet wiping and vacuum cleaners should be used. To maintain airborne fibers the pipe or debris should be kept in wet condition maintaining moisture. During removal breaking, dropping or crushing should be avoided and should be lifted carefully to the transportation;
- (iv) Before such unavoidable excavation the workers should be trained and site should be secured by restricting access and installing warning signs. Workers should use PPE and after the work should wash hands, clean equipment and remove contaminated clothing safely;
- (v) Collect all fragments, clean trenches before back filling;
- (vi) Fence work areas, control dust, schedule work to minimize public interaction; and
- (vii) Segregate asbestos waste, package and label securely, transport safely, dispose at approved facilities. Maintain records of the quantity removed, transport manifests, disposal location, and disposal certificates,

279. The Contractor should include an asbestos-related occupational health and safety measures in the SEMP that consistent with the above mitigation measures and/or the AMP if already prepared by PMSC.

280. **Impact.** The subproject is expected to generate significant amounts of spoils during the construction phase. Assuming no other uses for excess spoils, their indiscriminate or unmanaged disposal will negatively impact the environment and may also result to other forms of nuisance to surrounding communities wherever these are disposed.

281. **Mitigation.** Prior to award of contract, DPHE and/or PIU will identify a location for the disposal of excess spoils that will be generated during the construction phase. The disposal location will need to obtain clearance from relevant government agencies having jurisdiction over such location. No award of the contract shall be made until disposal location and relevant clearance are obtained.

7. Physical Cultural Resources

282. **Impact.** The four project municipalities encompass a rich array of Physical Cultural Resources (PCR), including prominent archaeological, colonial, and socio-industrial heritage sites. Within Pabna Paurashava, notable assets include the unique 16th-century terracotta Jor Bangla Temple, the colonial-era Tarash Bhaban, and the historic ancestral home of actress Suchitra Sen. Ishwardi Paurashava features the iconic Hardinge Bridge and Lalon Shah Bridge transport corridors over the Padma River, while Gopalpur (Lalpur) Paurashava hosts the British colonial-era North Bengal Sugar Mills alongside the Shaheed Sagar Liberation War memorial and mass grave. Natore Paurashava is home to nationally significant heritage landmarks, including the sprawling Natore Rajbari (Uttara Gonobhaban) palace complex, its historic moats, and the Rani Bhabani estate structures.

283. There is an extremely low likelihood that the construction activities for the implementation of the new distribution pipeline network will cause direct structural risks or long-term damage to these historic buildings and palace complexes. Because the distribution pipelines will be primarily laid along existing municipal road right-of-ways, the sites themselves will not be directly encroached upon. However, minor indirect risks could arise during the excavation phase from the surface runoff of construction waste, loose soil, debris, or accidental seepage into adjacent historic water bodies, such as the ancient dighis (ponds) and defensive moats surrounding the Natore Rajbari complex and the ancestral estates in Pabna and Gopalpur.

284. These localized, temporary environmental impacts and potential public nuisances—such as dust, vibration, and restricted access—will be confined strictly to the construction phase and can be readily mitigated through proper site management and barriers. PCR in the four municipality areas faces minimal risk of adverse long-term impacts from the pipeline project, as the major heritage sites are structurally secured, mostly protected by existing boundary walls, and positioned at safe distances from the immediate pipeline alignment zones.

285. **Mitigation.** The project must formally identify and map all known PCRs within the four municipalities during the preconstruction phase. Significant heritage landmarks—including the Jor Bangla Temple and Tarash Bhaban in Pabna, the Hardinge Bridge corridor in Ishwardi, the Shaheed Sagar memorial in Gopalpur, and the Natore Rajbari palace complex—along with their associated ancient dighis and defensive moats, must be designated as strict protection zones. Any excavation or pipeline laying activities near the catchments or boundaries of these PCRs will require robust containment measures, such as silt fencing and sediment barriers, to prevent construction runoff, debris, or wastewater seepage from impacting these heritage sites.

286. Specific "**chance find**" protocols must be enforced, requiring contractors to stop work immediately if any archaeological artifacts or historical remnants are uncovered during excavation or horizontal drilling, followed by immediate notification to the Department of Archaeology. Furthermore, local community members, public representatives, and officials from the respective Paurashavas and DPHE must be actively consulted and engaged prior to and during any construction works carried out near these historic structures, mosques, shrines, and graveyards to minimize public nuisance and preserve local sanctity.

8. Public Toilet Design for Pollution Prevention

287. **Impact.** The subproject will include construction of two public toilet facilities in strategic locations of Gopalpur *Paurashava* in the subproject area. During the operation phase of the project, these toilet facilities will be a source of potential pollution to water bodies and the immediate environment. During the operation phase, indiscriminate disposal of solid wastes may occur, and this will potentially cause land pollution and degradation of visual aesthetics in the area.

288. **Mitigation.** The design of toilet facilities will follow internationally accepted standards, which include, among others, the following:

- (i) Locate in public or government-owned lands with no or minimal/not significant negative social impacts. The area shall have sufficient space for the infrastructures, including septic tanks/chambers, and other allied components based on the detailed design;
- (ii) Septic tanks shall be designed as per national standards (e.g. two-chambered) and codes to allow for maximum retention of septage and water sealing;
- (iii) Locate where there is no overlap with or does not traverse water supply pipelines or sewer lines;
- (iv) Locate in an area where there is sufficient access to civil works contractors during construction phase, and access to maintenance providers, such as desludging service providers, during operation phase (i.e. the period when the toilets are already in use by the communities);
- (v) As much as possible, locate away from receiving bodies of water. If unavoidable, locate the toilets at least 30 meters from the banks of these water bodies;
- (vi) Sites must be at least 100m from groundwater wells;
- (vii) During construction phase, does not lead to alteration of surface water hydrology of streams/waterways that may result in increased sediment load due to erosion from construction sites;
- (viii) Provides for appropriate protection/mitigation measures to address noise impacts on adjoining communities or establishments; and
- (ix) Ensure requirements for maintenance measures are included in the responsibilities of community-based organizations, and suitable budget to ensure ongoing performance of measures.

9. Consents, Permits and Clearances

289. **Impact.** The subproject is required to comply with relevant environmental laws. Prior to any construction work, EIA will need to be undertaken, and EIA reports prepared and approved by the Department of Environment. Any delay in the preparation and approval of the EIA will potentially delay the execution of the subproject.

290. **Mitigation.** All necessary consents, permits and clearances required from local government bodies shall be obtained prior to the award of contract. Also, draft EIA will be prepared, which will then be submitted to DOE for approval. Subsequently, the ECC will be issued. No award of the contract shall be made for a specific package under the subproject until and unless ECC is obtained.

10. Compliance with ADB Loan Agreement and Safeguard Policy Statement

291. **Impact.** There is a general lack of awareness and familiarity among many Contractors with the requirements of the ADB SPS and the EMP. As a result, EHS, OHS, CHS, and other mitigation measures are often not adequately considered during bid preparation and are therefore not properly costed or incorporated into the contract price. This situation may lead to insufficient allocation of resources for EMP implementation during construction, increasing the risk of non-compliance with safeguard requirements, delayed corrective actions, and potential adverse EHS impacts during subproject implementation.

292. **Mitigation.** DPHE, through its procurement unit (or equivalent), shall ensure that the mitigation measures required under the EMP are fully integrated into the bidding and contract documents. This shall include (i) clear technical specifications and contract clauses mandating compliance with the EMP, OHS requirements, and all applicable provisions of the ADB SPS as well as relevant government laws and regulations, and (ii) explicit inclusion of the associated costs for EMP and OHS implementation in the Engineer's Estimate and Bills of Quantities, to ensure that such measures are adequately budgeted by bidders.

293. Following contract award, DPHE shall arrange and facilitate awareness and orientation training for the selected Contractor(s) prior to mobilization. The training shall cover, at a minimum, the Contractor's responsibilities for EMP and OHS implementation, applicable ADB and national safeguard requirements, site-specific environmental and safety risks, self-monitoring obligations, documentation and reporting procedures, and corrective action processes. This capacity-building measure aims to enhance Contractor understanding and compliance, ensure effective implementation of safeguard measures during construction, and reduce the risk of non-compliance arising from lack of awareness or inadequate budgeting.

E. Anticipated Impacts and Mitigation Measures During Pre-Construction Phase

1. Contractor Mobilization

294. **Impact.** Contractors' fielding of equipment and manpower to the site will likely impact baseline site conditions and potentially damage private properties and public properties, including heritage assets. Safety of both workers and the community will also be likely affected due to movements of both workers and construction equipment.

295. **Mitigation.** Immediately after award of their respective contracts, the Contractors shall undertake all pre-mobilization works in order to ensure impacts are avoided on natural environment and man-made structures specific to different sections of the subproject alignments, including any disturbance to existing customs, movements and way of life of local people in the different sections of subproject alignments. No mobilization and civil works shall be undertaken unless the following have been complied with by the Contractors:

- (i) **Conduct consultations** with the communities that will be affected by the subproject works prior to any construction activity. This will also be used as avenue

- to understand the local condition and stakeholders needed in developing the required site-specific EMP (SEMP);
- (ii) **Develop SEMP.** For subproject packages with potential impact to PCRs including internationally protected PCRs, if any; SEMP needs to be approved by PIU based on the EMP of this IEE. Sectioning of the subproject alignments shall be based on common but contiguous environmental features and attributes along said alignments;
 - (iii) **Develop a Traffic Management Plan** covering all areas along the subproject alignments, in coordination with local traffic police. Contractors shall have a traffic management plan in place prior to the excavation. As an example, and as suggested during consultations, the plan should include the identification of most efficient alternate routes should there be any road closures to ensure no disruption of traffic flow occurs during the construction period. See Appendix 7 for a common outline of TMP;
 - (iv) **Develop a Spoil Management Plan** that will include information on the government-approved disposal site and the route from subproject locations to the said site;
 - (v) **Develop a Health and Safety Plan** that will be approved by the PIU. The plan will include specific steps to manage potential spread of emerging infectious diseases; and
 - (vi) **Undergo training** conducted by DPHE, supervision consultant, and/or PIU, including training on excavation methods in sensitive areas, if any; and chance finds procedures.

2. Construction Camps or Workers' Accommodation

296. **Impact.** There may be instances under certain subproject packages where workers will be required to reside within or near construction sites for the duration of specific construction activities. In such cases, Contractors typically establish temporary construction camps or worker accommodation facilities. However, the unplanned or poorly managed establishment of these camps; particularly in the absence of adequate basic services such as safe water supply, sanitation, solid waste management, drainage, and proper living conditions; may result in social stress within host communities and contribute to localized environmental degradation. Potential impacts include pressure on local resources and services, generation of unmanaged waste and wastewater, increased health and safety risks, and adverse interactions between workers and surrounding communities.

297. **Mitigation.** The Contractor shall ensure that all construction camps or worker accommodation facilities are properly planned, sited, constructed, and managed, and provided with adequate sanitary and basic living amenities within designated areas. At a minimum, these facilities shall include safe drinking water, adequate sanitation and ablution facilities, proper drainage, solid waste management systems, lighting, ventilation, and cooking and washing areas, as applicable. In the absence of nationally prescribed standards in Bangladesh specifying minimum requirements such as the number of ablution blocks or sanitation facilities for temporary labor camps, the Contractor may apply its own internal occupational health and safety (OHS) standards for worker camps and accommodation, provided that such standards are consistent with and at least equivalent to international good practice. In particular, the Contractor shall comply with the principles and performance requirements outlined in “Workers’

Accommodation: Processes and Standards – A Guidance Note by IFC and EBRD (2009)”,²¹ as well as relevant provisions of the International Labour Organization (ILO) Workers’ Housing Standards.²²

298. Worker camps should be designed and constructed to ensure structural safety and reasonable standards of decency, hygiene, health, and comfort. Construction materials shall be durable and appropriate to local environmental conditions, taking into consideration potential risks such as flooding, waterlogging, cyclones, and landslides. Camps shall be regularly maintained and managed to prevent environmental pollution, minimize health and safety risks, and avoid adverse social impacts on surrounding communities. The camp should comply with the following as a minimum standard:

- (i) Camps should be secured/fenced, and guarded;
- (ii) Camps (including kitchen, dining, and toilets) shall avoid using CGI sheet and bamboo frames, and shall be constructed using prefabricated material or colored CGI sheet constructed on iron frame, as approved by the contractors’ health and safety officer (or equivalent);
- (iii) The camp shall have minimum headroom of 203 centimeters, and have impervious and raised floor above flood level or at least 60 centimeters;
- (iv) The camp premises shall be kept clean using concrete blocks or gravel, drainage, and flood light. Also use security camera as required on strategic locations outside the buildings;
- (v) The cabin floor area should not be less than 7.5 m² in rooms accommodating two persons; 11.5 m² three persons; or 14.5 m² accommodating four persons. The area of cabin should be at least 3.6 m² per person;
- (vi) A separate bed with proper bedding material shall be provided for each worker;
- (vii) If a double decker bed is used, the minimum clearance between lower and upper bunk shall be more than 700 centimeters, height of 168 centimeters, and headroom of 203 centimeters;
- (viii) Provide separate accommodation and toilets for male and female workers with adequate privacy;
- (ix) Provide adequate light and ventilation in the camp area and cabins. Provide safe electric plugs to charge mobile or listen to radio. Arrange light and fan;
- (x) Restrict use of heaters for cooking or heating within the cabins;
- (xi) Provide adequate supply of safe and clean water for drinking and washing/bathing;
- (xii) Provide at least one toilet, one washing basin and one shower for every six persons, and separate facility for male and female workers with sufficient privacy;
- (xiii) Provide stormwater and wastewater drainage with sump pits before discharging in open;
- (xiv) Arrange solid waste collection from camps for safe disposal. Restrict burning of waste;
- (xv) Provide locker for each worker to secure their valuable belongings;
- (xvi) Provide a common kitchen and dining room located away from cabins. Restrict individual cooking and eating meals in the cabins;

²¹ https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

²² <https://www.ilo.org/publications/workers-housing>

- (xvii) The accommodation should be kept free of rats, mice, insects and vermin. In areas where mosquitoes are prevalent, workers should be provided mosquito net;
- (xviii) Provide a separate medical room serviced by a medical worker for regular health checks and general types of treatment and emergency facilities. Also keep first aid box at easy access of workers and train a few workers to use first aid;
- (xix) Keep fire alarm system and enough fire extinguishers in the camp. Train few workers to operate fire extinguisher;
- (xx) Keep emergency evacuation details, contact number in case of emergency;
- (xxi) Keep standby vehicle for emergency evacuation or transportation to hospital;
- (xxii) Arrange recreation facilities for the workers. Restrict use of alcohol, gambling, and other unsocial activities within the camp, and any person found guilty shall be dealt with required penalty measures. Restrict workers going out of camp after 7pm. A workers' Code of Conduct shall be prepared and orientation provided during induction and on regular basis; and
- (xxiii) Restrict use of firewood for cooking and heating.

F. Anticipated Impacts and Mitigation Measures During Construction Phase

299. Potential environmental impacts expected during the construction phase are mostly due to the transport, excavation works, and other standard construction activities in urban development projects and are discussed as follows:

1. Sources of Materials

300. **Impacts.** Extraction of construction materials that will be used for the subproject (cement, sand, aggregates) can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.

301. **Mitigation.** PMU, with support from Supervision Consultant, will guide the subproject Contractor in minimizing the use of non-renewable resources and rock-based materials. The Contractor will be responsible for:

- (i) Sourcing construction materials, including aggregates, etc., from legitimate suppliers authorized by the government; and
- (ii) Maintain a construction material register at the site.

2. Impact on Topography and Aesthetics

302. Excavation, pipelaying and other construction works for the subproject packages will affect the topography and aesthetics at the sites due to accumulation of unmanaged spoils and construction debris.

303. **Mitigation.** The Contractors will need to implement the following:

- (i) Avoid storing spoils at the vicinity of excavation or construction sites for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites following the Spoil Management Plan;
- (ii) Dispose only in the designated disposal areas identified under the subproject;
- (iii) To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas;
- (iv) Ensure adequate compaction, and drainage system around the disposal areas;
- (v) Ensure disposal areas are utilized up to their capacity limit only and in accordance with the required sloping and leveling/grading specifications approved under the subproject; and
- (vi) If the disposal area reaches the limit, utilize another designated disposal area approved under the subproject.

3. Impact on Surface Water Quality

304. Excavation and construction activities may result in accidental spills of chemicals and siltation that could threaten or further deteriorate the quality of receiving bodies of water nearby the sites.

305. **Mitigation.** Contractors will need to implement the following measures:

- (i) Dispose excess spoils only in the designated disposal areas identified under the subproject;
- (ii) Avoid storing spoils at the vicinity of the site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area;
- (iii) To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas;
- (iv) Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer;
- (v) Silt traps to be provided at construction area near receiving bodies of water;
- (vi) No equipment or machinery should be operated outside the work areas;
- (vii) Avoid spillage of fuels, chemicals and lubricants. Fuel and other petroleum products are stored at storage areas away from water drainage and protected by impermeable lining and banded 110% by volume;
- (viii) Ensure that drains are not blocked with excavated soil;
- (ix) Locate stockyards away from canals or receiving bodies of water;
- (x) For effluents from construction camps and Contractors' offices, provide treatment arrangements such as retention ponds and septic tanks which should be incorporated in the facility designs. A sewage management plan has to be prepared by the Contractor and agreed with PIU;
- (xi) Clean-up of the area after the completion and prior to the onset of monsoon season; and
- (xii) Avoid scheduling excavation work during the monsoon season. Earthworks should be undertaken during dry season.

4. Impacts from Backwash Water, Sludge, and Treatment Residuals

306. **Impact.** Rehabilitation and operation of iron removal plants, groundwater treatment units, and any water treatment facilities in the Ishwardi Cluster may generate backwash water, settled sludge, iron-rich residuals, filter media waste, and treatment chemicals or residuals. If these materials are discharged directly to drains, ponds, open land, or surface water bodies without control, they may increase turbidity, sedimentation, iron staining, localized water-quality deterioration, odor, nuisance, and community complaints. Poor residuals management may also create worker exposure and unsafe housekeeping conditions at treatment facilities.

307. **Mitigation.** The final detailed design shall include a residuals and backwash management plan for each treatment facility to be rehabilitated or operated. The plan shall: (i) estimate backwash water and sludge generation under normal and peak operating conditions; (ii) provide settling, drying, dewatering, or other technically appropriate residuals management facilities; (iii) prohibit direct discharge of untreated sludge, backwash water, filter waste, or chemical residuals to drains, ponds, rivers, or open land; (iv) define effluent-quality standards and monitoring points for any treated discharge; (v) identify approved disposal or beneficial reuse options for dried residuals, subject to testing and regulatory acceptance; (vi) include worker protection measures for handling wet sludge, filter media, and chemicals; (vii) define O&M responsibilities, budget, and recordkeeping; and (viii) report residual generation, handling, and disposal in routine O&M records and SEMRs.

5. Impact on Groundwater Quality

308. Subproject packages are scheduled to be implemented from January 2027 – December 2031. With this kind of undertaking, a Contractor normally establishes their site offices, storage sites and workers' camps. Operational activities and use of these facilities during the construction period could potentially contaminate groundwater resources due to seepage of liquid waste and chemicals from the sites.

309. **Mitigation.** In addition to the mitigation measures described to prevent impact to surface waters, Contractors will need to implement the following measures:

- (i) Store fuel, oil and other chemicals in secure, managed areas with lined impervious floors and bunded with 110% by volume;
- (ii) Ensure refueling area has lining to avoid seepage of unavoidable spills during refueling. Ensure clean up spills immediately and all used cleaning materials are disposed properly;
- (iii) Ensure to provide portable toilets in all construction camps to discourage injecting septic waste into land;
- (iv) Avoid cutting down trees or vegetations within and around the construction camps and sites; and
- (v) Conduct ground water quality monitoring, particularly at sites near fuel depot or refueling site and construction camps. Ensure the conduct at least one sampling every six months. The important parameters to test are Oil and Grease, and Fecal Coliform. The results of the first sampling shall be used as reference. Any subsequent sampling bearing results above the reference, the contractor shall investigate the cause and report to PIU. Contractors shall also evaluate the effectivity of the measures being implemented at the site and ensure no seepage occurs from the facilities (fuel depot and construction camps).

6. Impacts on Aquatic Ecology and Fisheries

310. **Impact.** Although no subproject component is expected to be located within a legally protected area or critical habitat, construction near rivers, khals, ponds, drainage channels, and waterbody crossings may cause localized impacts on aquatic habitats and fisheries. Potential impacts include increased turbidity, sedimentation, accidental discharge of fuel, oil, concrete wash water, drilling slurry, backwash water, sludge, or chemicals, drainage blockage, and temporary disturbance to riparian areas. The wider Ishwardi Cluster includes riverine and wetland systems that support local fisheries and aquatic biodiversity; therefore, a precautionary approach is required even where direct impacts are expected to be limited.

311. **Mitigation.** The contractor shall: (i) avoid spoil disposal, chemical storage, refueling, equipment washing, and waste dumping near rivers, khals, ponds, drains, or wetlands; (ii) avoid in-river works unless specifically assessed, permitted, and approved; (iii) install silt traps, sediment controls, and drainage protection at waterbody and drain crossings; (iv) prevent discharge of untreated backwash, sludge, concrete wash water, drilling slurry, oil, fuel, or chemicals to water bodies; (v) schedule works near sensitive water bodies to avoid high-risk periods where feasible; (vi) consult relevant local authorities, including fisheries authorities where riverbank or fisheries-sensitive works are involved; and (vii) report any fish mortality, visible pollution, major spill, or aquatic-habitat incident through the incident reporting system and SEMR.

7. Impact on Ambient Air Quality

312. Excavation and construction activities will result in generations of dust that could remain airborne within and around the subproject sites. Operation of heavy construction equipment and vehicles will also result in the release of emissions. Dust and emissions are significant factors that could degrade the ambient air quality in the area, which in turn affects the general well-being of the residents in households or establishments nearby.

313. **Mitigation.** Contractors will need to implement the following measures:

- (i) Conventional dust control measures such as use of water sprays and minimizing hauling and vehicle movements during windy times of the day or night;
- (ii) Proper covering (e.g. tarpaulin) of hauling equipment such as dump trucks during transport of materials or spoils;
- (iii) Provide temporary barriers or covers around active site excavation areas;
- (iv) Limit vehicles speed at work sites enough to not cause vigorous suspension of dust;
- (v) Prohibits idling heavy equipment or vehicles for a long time;
- (vi) Regular maintenance of heavy equipment and vehicles to ensure compliance with national vehicle emissions standards;
- (vii) Prohibit burning any liquid or solid waste;
- (viii) Conduct regular visual inspections to identify and address other potential sources of dust emissions; and
- (ix) Conduct ambient air quality monitoring at strategic locations at least once every six months. Ensure that sampling locations are at the nearest establishment (residential, commercial, institutional) based on the wind and dust/smoke dispersion direction at the site.

8. Impact on Noise and Vibration Level

314. Excavation and construction activities will result in generation of noise that could disturb the construction workers, staff, and community people. Use of machinery for excavation and compaction will also result in vibration that could damage sensitive and old structures at the subproject sites.

315. **Mitigation.** Contractors will need to implement the following measures:

- (i) Provide prior information of the scheduled work to nearby residents;
- (ii) Use silencers for all equipment;
- (iii) Avoid delivery of raw construction materials during nighttime;
- (iv) Avoid noise-intensive activities at nighttime;
- (v) Horns should not be used unless it is necessary to warn others or animals of the vehicle's approach and prevent any potential accident;
- (vi) Minimize drop heights during delivery and stacking of raw construction materials;
- (vii) Use sound barriers to lessen the noise from sites;
- (viii) Maintain maximum of noise level of 45 dB(A) at the nearest residence relative to the specific worksites;
- (ix) Conduct noise level monitoring. Ensure the conduct at least one sampling every six months and when construction activities are at peak. Important areas to test are at the nearest establishments (residential, commercial, institutional) and construction camps;
- (x) Use pumping equipment with low level noise generation;
- (xi) If using generators, ensure generators complies with the noise standards; and
- (xii) Ensure generator set has an acoustic enclosure and silencer (if necessary) in the exhaust muffler.

9. Impact on Overground Physical Cultural Resources

316. **Impact.** While the protected cultural heritage sites and PCRs are avoided based on mitigation measures considered during the design phase, other locally important PCRs (i.e. those without protection status) are still found in some alignments. These include mosques, temples, etc. Due to the proximity to the alignments, the PCRs may be directly impacted by the pipelaying works. The foundation of these structures could be damaged due to vibration or collapse of excavated trench.

317. **Mitigation.** Excavation shall be avoided during rainy days and seasons all along the subproject area. For excavation of more than 1m depth or depending on site condition, shoring shall be applied to avoid any sort of collapse and maintain safety of lives and property. Proper barricade and signage boards shall be installed during excavation to avoid unauthorized person entering the construction site. Shoring shall be in place in each excavated trench along the alignment. Excavated materials shall be handled properly; which shall be loaded to dump truck and shall be taken to temporary storage area (spoils to be used for backfilling or reinstatement works) or disposal site (for the excess spoils). The excavated material shall not be stored along the excavated trench.

10. Impact on Underground Physical Cultural Resources

318. **Impacts.** Bangladesh is home to many old and ancient structures and there is a possibility that chance finds such as underground relics or structures considered as physical cultural resource (PCR) will be encountered and impacted during excavation at the subproject sites.

319. **Mitigation.** As a precautionary approach, the Contractors will need to strictly implement the following chance finds protocol:

- (i) Require the Contractors to coordinate immediately with DPHE, PIU and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works;
- (ii) Stop working immediately to allow further investigation if any finds are suspected; and
- (iii) Request authorized person from the Bangladesh Department of Archaeology to observe when excavation resumes for the identification of the potential chance finds and comply with further instructions.

11. Community Health and Safety

320. **Impacts.** A range of community health and safety risks may arise in the vicinity of subproject sites, including construction areas, material storage camps or yards, and workers' camps. Inadequate site control and unrestricted access may allow pedestrians, children, livestock, and other community members to enter active work areas. Such exposure could subject them to safety hazards associated with construction activities, including moving heavy equipment and vehicles, open excavations, falling materials, and electrical installations, potentially leading to injury or fatal accidents. In addition, unprotected trenches and excavated areas may pose a risk of accidental falls for both community members and animals, particularly during nighttime or poor visibility conditions.

321. There is also a risk of transmission of communicable diseases to communities surrounding the subproject sites due to interactions between Contractors' staff, construction workers, and residents. Outbreaks of infectious diseases may occur if appropriate prevention and control measures are not implemented. Such transmission could pose serious public health risks, including illness and potential loss of life, especially among vulnerable community groups.

322. **Mitigation.** Contractors will need to implement the following measures:

- (i) Appoint full-time EHS officer per contract requirement;
- (ii) Install warning signs, warning tapes, hard barricades, and notices around the work site perimeter to avoid unauthorized entry. For excavated sections that cannot be isolated or enclosed due to access issues for the community or residents, ensure to cover these with steel planks or durable wood planks during off-work hours. If during work hours that these excavated sections, especially the deep trenches, cannot be covered entirely, provide steel planks or durable wood planks with handrails that can be used by pedestrians;
- (iii) Install sturdy fences around storage camps or yards and workers' camps;
- (iv) Assign guards around the subproject sites, including storage camps or yards and workers' camps, on a 24/7 basis;

- (v) Provide lighting all around the subproject site, including storage camps or yards and workers' camps, to ensure the perimeter is well-lit at nighttime;
- (vi) Follow a code of conduct for workers, which should include restricting workers in designated areas, no open defecation, no littering, no firewood collection, no setting of fire except when needed but in designated places, no trespassing, no unauthorized overstaying at construction sites, and no obligation to undertake potentially dangerous work without the use of proper personal protective equipment, among others;
- (vii) Follow International best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities;²³
- (viii) Follow the established community and occupational health and safety protocol on emerging infectious diseases;
- (ix) Establish and implement a community awareness program so that the community people are apprised of the developments on the construction works on a regular basis;
- (x) Maintain a complaint logbook at the site and act promptly of complaints;
- (xi) Schedule transport and hauling activities by avoiding peak traffic periods;
- (xii) Clean wheels and undercarriage of haul trucks prior to leaving construction sites;
- (xiii) Educate drivers and advise to limit speed between 20-25 km/h while traversing settlement areas and avoid use of horn unless necessary to prevent accidents; and
- (xiv) Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement.

12. Occupational Health and Safety

323. **Impacts.** Occupational health and safety (OHS) risks are inherent in construction activities and are of concern for all subproject components. Construction workers may be exposed to health risks and safety hazards arising from the storage, handling, and transportation of hazardous materials, including fuels, chemicals, and construction materials. Workers are also vulnerable to accidents associated with moving vehicles, heavy machinery, lifting operations, excavation works, and other construction-related activities at active worksites. In addition, workers may be exposed to elevated levels of environmental pollution during construction, including dust emissions, exhaust fumes from vehicles and construction equipment, and excessive noise, which may cause respiratory illnesses, hearing impairment, and other adverse health effects if not properly controlled. Extended working hours, inadequate rest periods, and high work intensity may further increase the risk of accidents and injuries due to worker fatigue, reduced alertness, and human error.

324. There is additional occupational health concerns related to communicable and infectious diseases among construction workers. Outbreaks of diseases and other public health threats may pose serious risks to worker health and safety. Clustering, close interaction, and gathering of workers at worksites or during transportation can facilitate disease transmission. The risk may be further elevated within construction camps or worker accommodation facilities due to high occupancy density, shared facilities, and potentially inadequate hygiene and sanitation

²³ IFC World Bank Group. 2007. [*Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning.*](#)

conditions. If not properly managed, such situations could result in illness outbreaks among workers, work stoppages, and, in severe cases, loss of human life.

325. **Mitigation.** The Contractors will need to implement their respective health and safety protocols approved by PMU. This will contain normal internationally accepted procedures in relation to the risks imposed by the nature of the work to be undertaken, including risks associated with emerging infectious diseases. The Contractors shall ensure all authorized persons present on all sites, be they own staff, representatives of the implementing agency or the construction manager, or other visitors, are aware of any site-specific safety requirements and are supplied with hard hats and other protective clothing appropriate for the work being undertaken, including other precautionary measures against infectious diseases.

326. The Contractors shall implement their respective SEMP in accordance with its internal health and safety protocols, subject to review and approval by PIU prior to commencement of works. The OHS protocols shall incorporate internationally accepted good practice relevant to the nature and scale of construction activities, including measures addressing risks associated with hazardous materials, working at heights, moving vehicles and machinery, confined spaces, and other construction-related hazards. The plan shall also include specific preventive and response measures for emerging and communicable diseases, and similar public health threats.

327. The Contractor shall ensure that all authorized personnel present at construction sites, including its own workforce, subcontractors, representatives of the implementing agency, supervision consultants, and other approved visitors, are fully informed of applicable site-specific safety rules and procedures. All such personnel shall be provided with, and required to use, appropriate personal protective equipment (PPE), including safety helmets, high visibility clothing, safety footwear, and task-specific protective gear, commensurate with the activities being undertaken. In addition, the Contractor shall implement necessary precautionary measures to minimize health risks related to infectious diseases, including worker health screening where applicable, hygiene and sanitation provisions, physical distancing measures as required, and awareness briefings. These measures are intended to protect workers and site visitors, ensure compliance with national regulations and ADB safeguard requirements, and reduce the risk of occupational accidents, injuries, and disease transmission during subproject implementation.

328. In particular, the Contractors shall implement the following mitigation measures:

- (i) Appoint full-time EHS officer per contract requirement;
- (ii) All relevant provisions of the Bangladesh Labor Law and relevant WHO guidelines will be adhered to, concerning the provision of adequate measures to avoid contracting and/or spreading diseases during construction phase;
- (iii) Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities,²⁴ which include the following elements, whichever are applicable:
 - a. Communication and Training
 - i Training of all workers on occupational health and safety prior to construction works;
 - ii Conduct of daily toolbox talks;

²⁴ IFC World Bank Group. 2007. [Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning](#).

- iii Conduct of orientation to visitors on health and safety procedures at work site;
- iv Signages strategically installed to identify all areas at work site, including hazard or danger areas;
- v Proper labeling of equipment and containers at construction and storage sites; and
- vi Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; firefighting equipment; and
- vii communication with nearest fire brigade station;
- b. Physical Hazards
 - i. Use of personal protective equipment (PPE) by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
 - ii. Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
 - iii. Use of bracing or trench shoring on deep excavation works;
 - iv. Adequate lighting in dark working areas and areas with night works;
 - v. Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;
 - vi. Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
 - vii. Use of air pollution source equipment and vehicles that are well maintained and with valid permits;
- c. General Facility Design and Operation
 - i. Regular checking of integrity of workplace structures to avoid collapse or failure;
 - ii. Ensuring workplace can withstand severe weather conditions;
 - iii. Enough workspaces available for workers, including exit routes during emergencies;
 - iv. Fire precautions and firefighting equipment installed;
 - v. First aid stations and kits are available. Trained personnel should always be available who can provide first aid measures to victims of accidents;
 - vi. Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
 - vii. Good working environment temperature maintained;
 - viii. Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and

- ix. Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent any recurrence of accidents that may occur.
- (iv) Provide regular health check-ups, sanitation and hygiene, health care, and control of diseases for the workforce;
- (v) Provide at cost all labor and materials and construct/install and maintain site safety, hard barricading, flexible green net, signboards, and lightings throughout the construction site;
- (vi) Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards;
- (vii) Make available ambulance facility at the construction site and camp site, if any;
- (viii) Compensation for the loss of life (a zero tolerance to loss of life policy should be developed and implemented) or for any type of injuries; and
- (ix) Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.

329. The PMSC and PIU may issue immediate stop-work instructions where there is imminent danger to workers, road users, pedestrians, or nearby communities. Stop-work triggers shall include, but not be limited to: unprotected or unbarricaded open trenches; excavation deeper than 1 meter without appropriate shoring where soil conditions require support; unsafe work near schools, hospitals, markets, mosques, or dense pedestrian areas; absence of approved traffic and access controls; unsafe night works; energized electrical hazards; unsafe lifting or work-at-height activities; uncontrolled fuel or chemical spills; lack of signage, lighting, or pedestrian crossings; and repeated community complaints indicating unresolved safety risks.

330. Work shall resume only after corrective action is implemented and verified by the PIU and PMSC. Serious incidents, including fatalities, lost-time injuries, major spills, fires, structural collapse, electric shock, significant traffic accidents, or community accidents, shall be reported to the PMU and ADB within the required timeframe. A root-cause analysis and corrective action plan shall be prepared and implemented for all serious incidents.

13. Impact on Local Festivals and Cultural Practices

331. For various times of the year, festivals, rituals, and cultural practices are held within and around the subproject area. Construction activities may disturb the organization of these festivals.

332. **Mitigation.** Contractors follow the festival calendar to avoid impact upon local festivals. Construction works need to be avoided or minimized during the festivals. If excavation works or construction works have been done but remain unrestored approaching a certain festivity, alternative access to temples, shrines, and other important sites must be considered or set up. For resuming construction works after the festivities or festival, Contractors shall duly inform the affected community people.

14. Cumulative Impacts of Distribution Network Works

333. **Impact.** Construction of approximately 760 km of distribution and secondary mains across the four Ishwardi Cluster towns may create cumulative impacts beyond individual work fronts. These include repeated traffic disruption, restricted access to homes and businesses, dust, noise, open trenches, utility disruption, spoil stockpiling, market disruption, reduced pedestrian safety, and community fatigue. The impact may be particularly significant in dense urban areas, markets, transport nodes, schools, hospitals, mosques, narrow roads, and areas where multiple contractors or work fronts operate simultaneously.

334. **Mitigation.** The contractor shall prepare a work-front sequencing and cumulative impact management plan. The plan shall: (i) divide the network works into manageable DMA-, ward-, or road-section-based work fronts; (ii) limit the maximum length of open trench at any one time; (iii) require same-day backfilling or safe temporary covering wherever feasible; (iv) prohibit simultaneous closure of parallel access routes serving the same neighborhood; (v) maintain pedestrian, business, household, school, hospital, market, mosque, and emergency vehicle access at all times; (vi) coordinate work schedules with schools, hospitals, markets, transport operators, local authorities, and religious institutions; (vii) provide at least 48–72 hours' advance public notice before excavation or access restriction; (viii) require rapid reinstatement of roads, drains, and access points; and (ix) review grievances weekly to identify cumulative disturbance hotspots.

335. If repeated complaints, accidents, access problems, or traffic congestion occur in a ward or DMA, the contractor shall slow, suspend, or resequence works and implement corrective actions before opening additional work fronts. The PIU and PMSC shall monitor cumulative impacts through field inspections, complaint records, construction schedules, incident reports, and SEMRs.

G. Anticipated Impacts and Mitigation Measures During Post-Construction Phase

336. **Impact.** The activities of the subproject will result in sorts of construction and demolition of debris wastes after the construction period. These include excess spoils that were generated at the end of the construction period, various scraps from distribution pipelaying, and PTW and storage tank rehabilitation works, debris from demolition of structures in the temporary facilities such as workers and storage camps, etc. Due to the volume and hazardous nature of some of these wastes, indiscriminate disposal or ignoring their proper disposal could be dangerous to the environment and the people in the vicinity of the subproject sites.

337. **Mitigation.** Immediately within one week after construction phase, the Contractor shall collect all the wastes at the different sites and implement the following. Contractor may opt to outsource this to qualified entities in the subproject area, if Contractor's EHS personnel strictly supervise the cradle-to-grave management of all these wastes. All costs related to management of these wastes shall be borne by the Contractor, or as per agreement in the contract documents.

- (i) Segregate or sort all waste according to nature (recyclable, non-recyclable, hazardous, non-hazardous or any combination);
- (ii) Ensure to handover (or sell as the case may be) recyclable wastes to authorized recycling entities in Bangladesh. Contractor shall coordinate this action with DPHE through the PMU;
- (iii) Ensure to dispose non-recyclable and non-hazardous waste to appropriate disposal sites. These may be collected, transported, and disposed similar to how solid waste in the city is managed. Thus, Contractor shall coordinate with DPHE through the PMU in this regard;

- (iv) Ensure to transport and dispose hazardous wastes using authorized hazardous waste transporters and treaters in Bangladesh. Contractor shall coordinate all actions for these wastes with DPHE through the PMU; and
- (v) Ensure the sites are cleared with all wastes disposed accordingly, and compliance with this measure shall be included as one of the conditions for payment to the Contractor.

H. Anticipated Impacts and Mitigation Measures During Operation Phase

338. Anticipated impacts of subproject during operation and maintenance (O&M) will be related to repair of leaks, pipe bursts, and pipe replacement. These are likely to be not significant, as proper design and selection of good quality pipe material shall mean that leaks are minimal. However, any repair works may still create impacts on both the environment and the people, such as those related to increasing noise levels in repair sites, and risks of accidents to community people and workers during repairs.

339. **Mitigation.** DPHE shall develop an O&M Manual that should be followed by PIUs on managing the water supply and sanitation facilities. Include in the O&M Manual the following measures during maintenance works:

- (i) The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Recurrence of pipe bursts and leakage problems can be managed by leak detection, rectification, and water auditing surveys. The operator of the facility will be required to ensure that the leak detection and rectification time is minimized;²⁵ and
- (ii) For any excavation works related to these O&M issues, the methodologies and protocols developed for the construction phase shall be strictly followed;
- (iii) Noise abatement measures developed for the construction phase shall be strictly followed; and
- (iv) All relevant and applicable community and occupational health and safety measures developed for the construction phase shall be strictly followed.

340. The residents will be the major beneficiaries of the improved water supply system and sanitation, as they will be provided with a constant supply of better-quality water into their homes at the appropriate pressure, and the provision of sanitation facilities such as public toilets. The subproject will improve the overall health condition of the target areas in the city as water borne diseases will be reduced, so people would spend less on healthcare and lose fewer working days due to illness, thus improving their overall health, economic status, and better quality of life. This will also improve the environment in these areas.

1. Chemical Handling and Disinfection Safety

341. **Impact.** Operation of treatment units, iron removal plants, disinfection systems, and associated facilities may involve storage, handling, dosing, and transport of chemicals such as chlorine-based disinfectants, coagulants, cleaning chemicals, or other treatment chemicals.

²⁵ DPHE should ensure that this concern is given attention during the detailed design. DPHE should ensure that the Contractors undertake checking and validation of structural integrity of the subproject components, during detailed design stage and prior to construction.

Poor chemical storage, incompatible handling, lack of spill containment, inadequate ventilation, weak dosing control, inadequate PPE, or untrained operators may cause worker exposure, accidental releases, unsafe dosing, corrosion, interruption of disinfection, or community health concerns.

342. **Mitigation.** Each treatment facility shall prepare and implement a chemical management and disinfection standard operating procedure before commissioning. The SOP shall include: (i) inventory and safety data sheets for all chemicals; (ii) bunded, ventilated, labeled, and access-controlled chemical storage areas; (iii) segregation of incompatible chemicals; (iv) PPE requirements; (v) spill kits and emergency eyewash or washing arrangements where appropriate; (vi) dosing calibration and recordkeeping; (vii) routine residual chlorine monitoring at treatment outlet, storage facilities, and distribution points; (viii) emergency response procedures for spills, over-dosing, under-dosing, and accidental exposure; and (ix) operator training and certification records. Liquid hypochlorite systems, where used, shall be protected from heat and sunlight and shall be checked regularly for concentration loss.

2. Sanitation Facilities and Fecal Sludge Management

343. **Impact.** The construction of household twin-pit latrines and public toilets in the Ishwardi Cluster will improve sanitation access but may create localized environmental and public-health risks if facilities are poorly sited, poorly designed, not flood-resilient, or not linked to safe emptying and final disposal. Potential risks include contamination of shallow groundwater, seepage to nearby drains or ponds, overflow during flooding or waterlogging, odor, vector breeding, unsafe manual emptying, uncontrolled fecal sludge disposal, and inadequate O&M of public toilets.

344. **Mitigation.** Before construction, the PIU and contractor shall prepare a sanitation siting and FSM checklist for each public toilet and representative household latrine location. The checklist shall verify: (i) land ownership and absence of involuntary displacement; (ii) flood and waterlogging risk; (iii) groundwater depth and required vertical and horizontal separation distances; (iv) minimum distance from drinking-water wells, ponds, drains, and watercourses; (v) soil permeability and need for lining or sealed containment; (vi) safe access for desludging equipment; (vii) gender-responsive and disability-inclusive design; (viii) lighting, security, and menstrual hygiene management waste arrangements for public toilets; (ix) handwashing and water supply; (x) drainage and greywater management; and (xi) identification of a lawful fecal sludge collection, transport, treatment, or disposal route.

345. Public toilets shall not be commissioned until an O&M arrangement, cleaning schedule, desludging plan, responsible operator, tariff or fee arrangement, water supply, lighting, cleaning supplies, and GRM signage are in place. Desludging shall be undertaken only by trained personnel using safe equipment and shall not involve direct discharge of fecal sludge to drains, ponds, rivers, open land, or agricultural land unless treated and approved in accordance with applicable requirements.

VI. CONSULTATION, INFORMATION DISCLOSURE AND GRIEVANCE REDRESS MECHANISM

A. Consultation and Information Disclosure

346. Meaningful stakeholder consultation and participation are integral parts of the subproject preparation and devising implementation process. Consultation and participation will ensure that information is provided, and feedback is obtained and considered in the implementation of the

subproject. Affected persons will be consulted at various stages of subproject preparation to ensure: (i) incorporation of views/concerns of affected persons, particularly the vulnerable, on environmental impacts and mitigation measures; (ii) identification of any help required by affected persons during rehabilitation; and (iii) avoidance of potential conflicts for smooth subproject implementation.

347. Meaningful consultation will also provide adequate opportunities for participation of all stakeholders and inclusion of the vulnerable in subproject process. This is also the avenue where relevant information on any major changes to the subproject will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

1. Objective and Purpose

348. The objectives of the consultations are to inform the project-affected people about the subproject, the present status of environmental, social and ecological condition in the area, potential impacts of the proposed subproject, suggested measures to mitigate these impacts, and at the same time to seek other possible solutions to these impacts from them. The consultations are also an avenue to reduce conflict through the early identification of controversial issues about the subproject and work with the stakeholders to find acceptable solutions; increase public confidence about the proponent, reviewers and decision makers, and develop a proposal which is truly sustainable which will be integrated into the subproject design.

2. Identification of Stakeholder

349. Stakeholders' identification is critical exercise to mapping who has a vested interest in, or will be impacted by, the CTWSSP. Identifying these individuals or groups early allows project managers to secure crucial buy-in, anticipate risks, avoid costly delays, and tailor communication to ensure long-term, sustainable success. The stakeholder identification process also helps devise participation and engagement of the players with the subproject at various phases of project life. Main stakeholders of the CTWSSP, particularly for Ishwardi cluster, are the *Paurashavas* of Pabna, Ishwardi, Gopalpur and Natore, DPHE offices at the district and upazila level, and consumers and beneficiaries of the project. Stakeholders also may include various offices like local leaders, schools, hospitals, community leaders and residents who help plan to regulate and deliver services.

350. The main stakeholders who have a lot of influence and interest in the CTWSSP with respect to environmental and social impact identification and mitigation measures are:

- (i) Government institutions like the CuCC and the *Paurashavas* of Pabna, Ishwardi, Gopalpur and Natore ; and the DPHE offices in Pabna, Ishwardi, Gopalpur and Natore.
- (ii) Regulatory bodies like the Department of Environment (DOE).
- (iii) Development partners and donors like the Asian Development Bank (ADB).
- (iv) The people who are directly affected by the proposed project, like local consumers, like households of the cluster towns.
- (v) The commercial entities (markets, shops, etc.), service sectors (hotel, restaurants, transport hubs, etc.) and community institutions (hospital, schools, mosque, madrasa, shrines, *mandir*, temple, etc.).
- (vi) NGOs involved with water supply and sanitation, and hygiene related community awareness activities.

3. Summary of Consultations Conducted

351. A total of four stakeholder meetings and approximately twenty 25 consultation meetings were conducted by the environmental and social safeguards team across the four cluster towns of the Ishwardi Cluster— Pabna, Ishwardi, Gopalpur and Natore *Paurashava*—to collect feedback on existing water supply and sanitation services, as well as to identify potential environmental and social impacts associated with the proposed subproject. The stakeholder meetings were attended primarily by officials and staff of the city corporation and *Paurashavas*, while the public consultation meetings were arranged at short notice in different locations within each cluster town and involved local people. As part of this process, the CTWSSP office of DPHE Head Office organized an environmental public consultation meeting on 3 June 2026 at Pabna *Paurashava*, bringing together residents from various wards to participate in identifying potential environmental impacts and discussing appropriate mitigation measures. During the meeting, participants were informed about the proposed subproject activities and the likely inconveniences, disturbances, and temporary hardships that nearby communities might experience during the construction phase. Findings from both stakeholder and public consultations highlighted several common concerns, issues, and expectations as stated below:

- (i) Inadequate and Unreliable Water Supply. Community members consistently reported that the existing water supply system is insufficient to meet daily household demand. Many areas do not receive continuous water supply, and several households remain outside the existing service coverage despite applying for new connections. Seasonal shortages further worsen the situation, particularly during dry periods.
- (ii) Low Water Pressure and Uneven Distribution. Low water pressure was identified as a major concern in most consultation areas, especially households located at the tail-end of the distribution network. The weak flow limits access to sufficient water and affects regular household activities.
- (iii) Poor Water Quality and Health Concerns. Participants repeatedly expressed concern regarding poor water quality, commonly due to excessive concentration of iron in supplied water, which was explained as dirty, turbid, and discolored. Communities also feared contamination of arsenic and other pollutants, creating significant public health concerns.
- (iv) Old and Damaged Distribution Network and Poor Functioning Infrastructures. The existing pipeline network was widely described as old, weak, fragile, and poorly maintained. Frequent leakages were reported, which not only reduces supply efficiency but also allows external contamination to enter the system. Delayed repair and poor maintenance practices were also highlighted.
- (v) Excessive Indirect Costs. Supplying poor quality water, particularly high concentration of iron in the supplied water frequently chokes water pipelines and causing maintenance 3-4 times of the year. This may incur an additional 2000-4000 Tk annually for households. Also, poor quality water increases skin problems and other water borne diseases that lead to additional healthcare costs of the people. Many participants mentioned that despite insufficient or even 'no supply', authorities are charging as per their billing policy. Consequently, water users are paying for services that are either inadequate or unavailable.
- (vi) Disproportionate Pressure of Female Family Members. In areas without household water connections, women spend considerable time fetching water from neighboring sources or public hydrants. Waterborne diseases on any family member resulting from unsafe water increase women's caregiving responsibilities and stress. While construction-related environmental impacts will affect all

community members equally, temporary disruptions such as excavated roads may create greater mobility challenges for women. The subproject may create limited employment opportunities for women in workers' camps, although participation in core construction activities is unlikely.

- (vii) Need for Improved Sanitation Awareness. Many community members demonstrated limited knowledge regarding improved sanitation systems, sewerage management, and waste management practices. Participants emphasized the need for community awareness and hygiene promotion programs alongside infrastructure development.
- (viii) Positive Community Support for the Project. Despite existing hardships and anticipated temporary inconvenience during construction, the majority of participants expressed strong support for the proposed subproject. Communities acknowledged the long-term benefits of improved water supply and sanitation services and showed willingness to cooperate during implementation.

352. Overall, the consultation meetings reflected strong public demand for improved, reliable, and safe water supply services. Communities demonstrated positive attitudes toward the proposed project and expressed readiness to tolerate temporary construction-related disturbances in anticipation of long-term benefits. At the same time, stakeholders emphasized the importance of ensuring proper mitigation of environmental and social impacts, timely implementation, fair compensation, improved maintenance systems, and inclusive community engagement throughout project execution.

4. Follow up Consultations²⁶

353. The social safeguards team conducted 18 public consultation meetings across the Ishwardi cluster towns. The consultations revealed findings similar to those of the environmental team regarding water supply and sanitation conditions, water quality, service coverage, improvement potential, and community perceptions of development-related inconveniences. Key social impact observations included:

- (i) Temporary livelihood and access disruptions. Construction activities may temporarily affect squatters, small vendors, CNG drivers, and roadside businesses due to restricted access, traffic congestion, and reduced customer flow. Participants stressed the need for appropriate mitigation and support measures for faster completion of construction activities.
- (ii) Demand for local employment. Community members expressed strong interest in project-related jobs and requested priority employment opportunities for local skilled and unskilled workers.
- (iii) Land acquisition and compensation. Affected landowners generally supported the project and were willing to cooperate with land acquisition for public benefit, provided that fair compensation and adequate assistance are ensured in line with government regulations and resettlement policies.

5. Information Disclosure

354. Subproject information was disclosed through the different consultations organized by the DPHE, city corporation, and the involved *paurashavas*. The ADB and the DPHE, as an executing agency, will disclose the IEE report more formally by making written documents and

²⁶ Consultations conducted with support from the social safeguards team of the subproject.

other materials in suitable form and at locations which can be easily accessed by the stakeholders. This also includes drafting summary reports in the local language and posted at public locations in municipality/*Paurashava* wards and important public areas of cluster towns. The aim is to provide wider reach and means for the receipt of comments from the general public. All documents will be disclosed on ADB and DPHE websites. A copy of this IEE report will also be disclosed on the ADB and DPHE websites for final review by the public interested in participating through their comments and input.

B. Future Consultations and Communication Plan

355. Meaningful consultations with stakeholders will continue throughout subproject implementation as necessary to address issues related to environmental assessment. The consultation process will continue and expand during the subproject implementation to ensure stakeholders participate fully in subproject execution, as well as to implement a comprehensive information, education, and communication plan.

356. For the benefit of the community, the IEE report will be made available at (i) offices of executing and implementing agencies, (ii) municipality and ward offices; and (iii) Contractors' offices at their respective subproject sites. It will be ensured that the hard copies of the IEE report are kept at places which are conveniently accessible to people, as a means to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE report will be placed in the official website of DPHE and the ADB website after clearance of the IEE by ADB. Moreover, all semi-annual environmental monitoring reports during subproject implementation will be available at both DPHE and ADB websites.

357. Future consultation and disclosure activities shall include the following:

(i) Consultations During Construction Phase

- a. Public meetings with affected communities to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and
- b. Small group meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and to provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

(ii) Information Disclosure

- a. Public information campaigns (via newspaper, flyers, and media) to explain the subproject to the wider population of the subproject area and prepare them for disruptions they may experience once construction activities are underway;
- b. Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in local language;
- c. Formal disclosure of completed subproject reports by making copies available at convenient locations in the subproject area, and informing the public of their availability; and
- d. Providing a mechanism through which comments can be made.

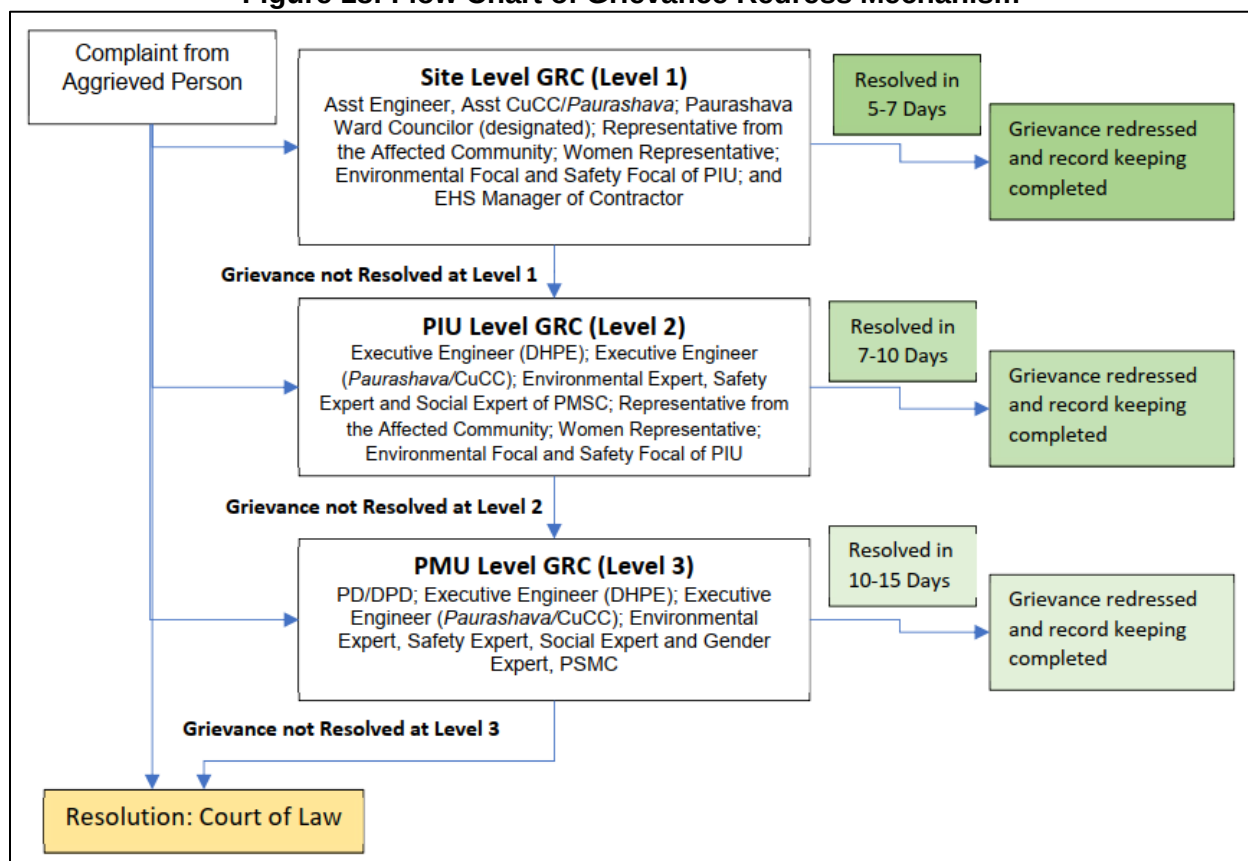
C. Grievance Redress Mechanism

358. A common GRM will be in place to redress social, environmental or any other project related grievances. The GRM has been developed in consultation with the stakeholders. As per

this, affected persons will have the flexibility of conveying grievances/suggestions at various levels depending on the nature of the grievance. The GRM shall provide for a time-bound and transparent mechanism to redress them. The aim of GRM is to provide an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A three-tier GRM is proposed: one, at the field/site level, second at the PIU Level and the third at the PMU Level.

- (i) **Site Level GRM (Level 1):** In case of grievances that are immediate and urgent in the perception of the complaint, concerned officer of PIU will direct the contractor to resolve the complaint and ensure that it is resolved. The contractor in discussion with the Assistant Engineer, DPHE, representative from *Paurashava/City Corporation* as nominated, will make efforts to resolve the complaint at the site level. Efforts will be made to resolve all grievance within 5-7 days from the date of receipt of a complaint/grievance. If the grievance is not at the field/site level, then it will be escalated to second level.
- (ii) **PIU Level GRM (Level 2):** Grievances that can't be redressed at first level within 5-7 days will be brought to the notice of PIU. The head of the respective PIU will try to resolve the grievance/complaint within a timeframe of 7-10 days of receiving the complaint from the first level with the support of Social/ Environmental Safeguard Officers, PIU, *Paurashava/City Corporation* Ward Councilor where the project will be implemented can be consulted as and when required. Any unresolved complaint at the second level will be taken up to the third level.
- (iii) **PMU Level GRM (Level 3):** All grievances that can't be redressed within 10-15 days at PIU level will be brought up to the PMU level. The PMU safeguards team will refer any unresolved/major issues to the PMU level grievance redress team, that headed by the Project Director/ Deputy Project Director of PMU will resolve the complaints/grievance within 15 days.

Figure 18: Flow Chart of Grievance Redress Mechanism



359. Documentation shall be an important part of the GRM. Under this, the name of the complainant, date of receipt of the complaint, address/contact details of the person, nature of grievance, and location of problem area, and later details of resolution of grievance shall be recorded. Depending on the complexity of the grievance, the PIU/PMU with support from the PMSC consultants will be required to undertake follow-up activities and periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

360. A public awareness campaign will be conducted to ensure that awareness on the project, GR Mechanism and grievance redress procedures is created. The campaign will specifically ensure that the poor, vulnerable and others are made aware of grievance redress procedures.

361. The contractor supports GRM implementation and may assign staff internally, but the overall responsibility for staffing and oversight of the GRM system rests with the PMU/DPHE.

362. **ADB Accountability Mechanism.** If the established GRM is not able to resolve a grievance, the affected person can also use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at ADB headquarters or the ADB Bangladesh Resident Mission (BRM). Before submitting a complaint to the Accountability Mechanism, affected/aggrieved person/s should make a good faith effort to solve the problem by working with the concerned ADB operations department and/or BRM. Only after doing that, and if they are still dissatisfied, will the Accountability Mechanism consider the complainant eligible

for review.²⁷ The complaint can be submitted in any of the official languages of ADB's developing member countries. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

363. Consultation arrangements and information dissemination. Proposed GRM will adopt a consultative and participatory approach to grievance resolution which in cases may require one to one consultation with individual complainant or the aggrieved community. Further, project implementation agencies and the PIU/DPHE and supervision consultants will be responsible for information dissemination to affected persons on grievance redressal procedure and also ensuring that host community are assisted to understand the grievance redress process as well as for encouraging them to register complaints. Adequate consultations/meetings/public awareness campaign will be conducted to achieve this objective. Information on grievances received, and responses provided will be documented and reported back to the affected persons. The number of grievances recorded, resolved and the outcomes will be displayed/disclosed on notice boards at PIU/DPHE offices, concerned *Paurashava* office notice boards and on the web. All grievances will be treated with utmost confidentiality and identity of complainant will not be disclosed. A Sample Grievance Registration Form is provided in Appendix 5.

364. Record Keeping. Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were taken and final outcome will be maintained by the PIU (with the support of PIU/DPHE and supervision consultant) and submitted to DPHE. As part of record keeping and reporting practice, information will also be maintained on grievance tracking. Grievance reporting by PIUs at their respective levels will provide information both for the reporting period and a cumulative grievance redress tracking data (on select parameters such as total grievances received, redressed, pending etc. i.e., cumulative information on these parameters since project start). Summarized information will be included as part of periodic reporting by PIUs (with support from consultant) to ADB.

365. Periodic review and documentation of lessons learned. DPHE will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the DPHE's ability to prevent and address grievances.

366. Costs. Contractors are required to allocate budget for pamphlets and billboards as part of the EMP. All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the DPHE and/or PIUs.

367. Sexual Exploitation, Abuse and Harassment (SEAH). The project will adopt the SEAH Good Practice Note (GPN) to address risks of SEAH in ADB-financed operations with a specific focus on sovereign projects with civil works.²⁸ The reporting requirements and grievance redressal mechanism of the government (for SEAH) will be fully adhered by DPHE, the project consultants and works contractors, in line with the national legislation framework of the Government of Bangladesh.

²⁷ Accountability Mechanism. <http://www.adb.org/Accountability-Mechanism/default.asp>.

²⁸ ADB. 2023. [The Good Practice Note on Addressing Sexual Exploitation, Abuse, and Harassment in ADB-Financed Projects with Civil Works](#). Manila.

368. In case a SEAH in workplace related complaint is received, the following process will be followed: (i) each PIU will nominate a senior staff as SEAH Manager (Focal Person); (ii) all project entities (PIU staff, consultants, contractors) can access the GRM for SEAH in workplace complaints; (iii) the project GRC members will be trained to handle SEAH in workplace complaints and on the requirements and processes as per GoB law. The first level and project GRC will include at least one female member each; (iv) the SEAH Manager will explain to the complainant the provisions of the law and the actions taken / proposed to be taken by the GRC; and (v) the complainant is free to approach the national legal system, in line with national law.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

1. Purpose

369. The purpose of this EMP is to provide a framework that outlines how DPHE, other implementing units, and any Contractor appointed will manage and where practicable, minimize negative environmental effects during the design, construction and operation of the proposed subproject. Construction is considered to include all site preparation, enabling works, demolition, materials delivery, materials and waste removal, construction activities and associated engineering works.

370. This EMP identifies the minimum requirements with regard to the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout design, construction and operation periods of the project. Compliance with this EMP does not absolve the contractors or their subcontractors (during construction phase) from compliance with all laws, rules and regulations applicable during construction phase and operation phase activities.

371. This IEE and EMP will form part of the bidding and contract documents. The PMU will verify that all relevant EMP mitigation, monitoring, staffing, reporting, and budget requirements are included in the technical specifications, Bills of Quantities, and contract conditions. No works will commence until: (i) the final ADB-cleared IEE and EMP have been provided to the contractor; (ii) all applicable statutory clearances, including the Environmental Clearance Certificate, have been obtained; and (iii) the contractor's SEMP and required sub-plans have been reviewed and approved by the PMU/PIU with support from the PMSC.

2. Approach

372. This EMP provides a framework to:

- (i) Describe the subproject for environmental management during design, construction and operation phases;
- (ii) Implement those monitoring and mitigation measures identified in this IEE;
- (iii) Outline the principles and minimum standards required of the contractors during the development of their respective site-specific EMPs (SEMPs);
- (iv) Identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- (v) Outline the procedures for communicating and reporting on environmental aspects of the proposed subproject throughout all phases of subproject implementation.

B. Institutional Arrangement

1. Overall Project Implementation Arrangement

373. The Department of Public Health Engineering (DPHE) on behalf of the Government of Bangladesh, will be the Borrower for the project. DPHE will be the executing agency (EA) of the project which will also act as the implementing agency responsible for designs, procurement,

and contract management. A project steering committee will be established at the Local Government Division, which will serve as the oversight body of the project. A project management unit (PMU) will be established in DPHE to perform the project management function for the proposed project and provide support to all implementing agencies. Project implementation units (PIUs) will be established at each selected city corporation and Paurashavas. The overall implementation arrangement of the project is summarized in the following table.

Table 41: Overall Implementation Arrangements

Aspects	Arrangements
Implementation period	January 2027–December 2031
Estimated completion date	31 December 2031
Estimated loan closing date	30 June 2032
Management	
(i) Oversight body	Project steering committee at LGD, MLGRDC Chair: Senior secretary/secretary, LGD, MLGRDC Members: (i) Director general, LGD (ii) Additional secretary (water supply), LGD (iii) Chief Engineer, DPHE (iv) Representative of Finance Division (v) Representative of Economic Relations Division (vi) Joint chief, Physical Infrastructure Division, Planning Commission (vii) Joint secretary (planning), LGD (viii) Joint secretary (water supply), LGD (ix) Representative of Executive Committee of the National Economic Council and Coordination Wing of the Planning Division (x) Representative of General Economic Division, Planning Commission (xi) Representative of Implementation Monitoring and Evaluation Division, Planning Commission (xii) Representative of the Programming Division, Planning Commission (xiii) Project director, Cluster Towns Water Supply and Sanitation Project, DPHE (xiv) Senior assistant secretary/deputy secretary (Planning Section-2), LGD (member-secretary)
(ii) Executing agency	DPHE
(iii) Key implementing agency	Cumilla City Corporation and the Paurashavas of Hajiganj, Chandpur, Laksam, Ishwardi, Pabna, Natore, and Gopalpur. <u>DPHE will implement consulting services, goods, and works packages under Paurashavas in coordination with above IAs.</u>
(iv) Implementation unit	Project management unit (DPHE, Dhaka); project implementation units: Cumilla city corporation and the Paurashavas of Hajiganj, Chandpur, Laksam, Ishwardi, Pabna, Natore, and Gopalpur

ADB = Asian Development Bank; DPHE = Department of Public Health Engineering; LGD = Local Government Division; MLGRDC = Ministry of Local Government, Rural Development, and Cooperatives.

2. Environmental Safeguards

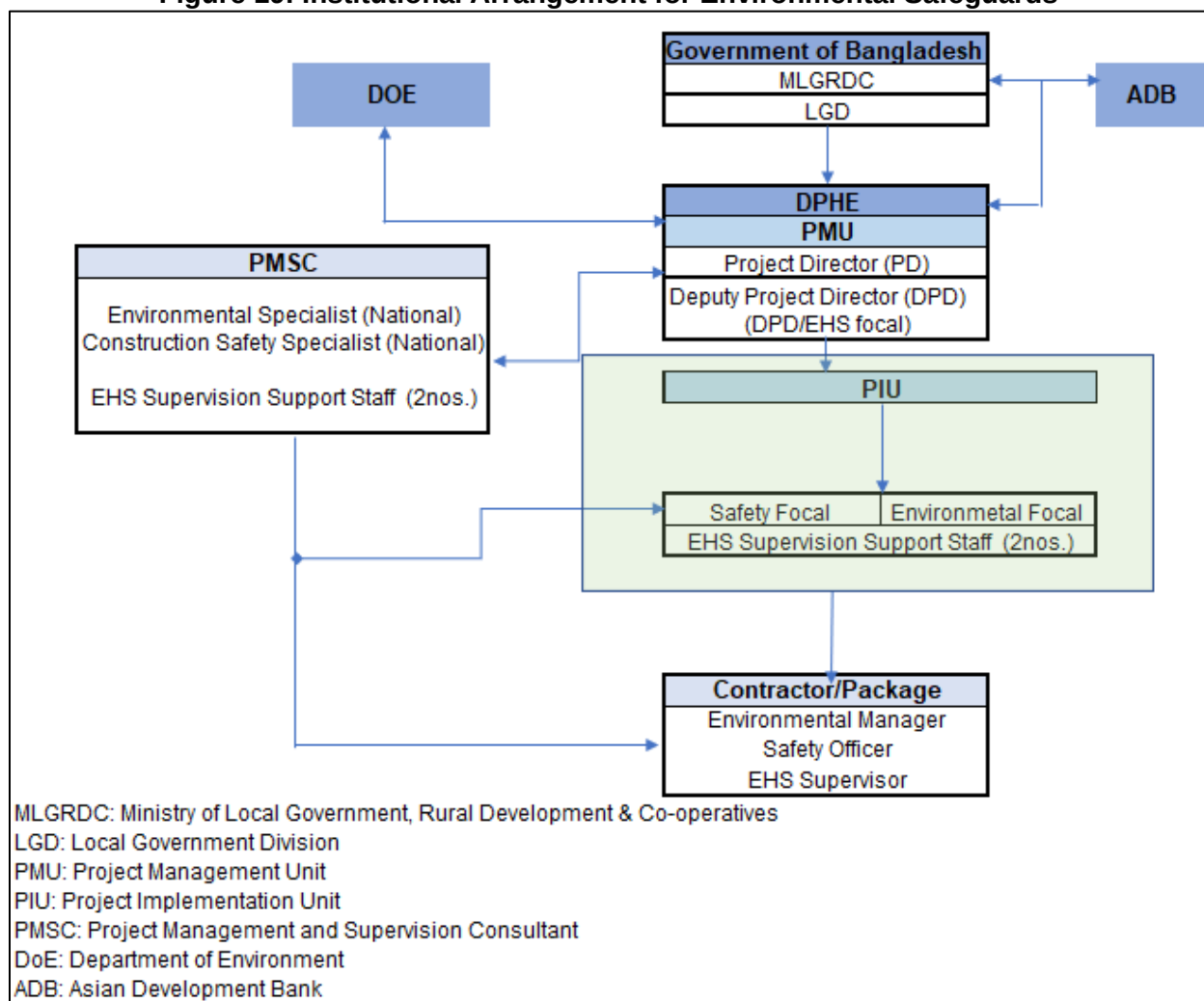
374. DPHE agreed to assign adequate staff and consultants to oversee the project performance, environmental and social safeguards, and financial management compliance. The PMU will have staff such as project director, environment specialist, health and safety specialist,

social specialist, procurement specialist, and financial specialist. Consultants may also be recruited by DPHE to support PMU functions.

375. For the subproject covered by this IEE, the Paurashavas of Pabna, Ishwardi, Gopalpur and Natore will be the PIUs. PIU staff members will include a 1-environmental safeguards focal, 1-safety focal, and 2-EHS supervision support staff.

376. Project management and supervision consultant (PMSC) (firm) will support the PMU and PIUs in implementing the project.

377. For the implementation of environmental safeguards, concerned staff from PMU and PIUs will work together with support from PMSC. The roles and responsibilities of these key players are defined below. An overall diagram showing the implementation arrangement for environmental safeguards under the project is depicted in the following figure.

Figure 19: Institutional Arrangement for Environmental Safeguards

378. **Project Management Unit (PMU).** The PMU, established within the DPHE and led by a Project Director, will be responsible for the overall planning, management, coordination, supervision, and progress monitoring of the project. The PMU will be supported by a Deputy Project Director, who will serve as the EHS focal point and lead the implementation of environmental safeguards. With the support of the Project Management and Supervision Consultant, the PMU will be responsible for the following environmental safeguard functions:

- (i) ensure project compliance with government requirements and ADB SPS;
- (ii) establish a system to ensure environmental safeguards compliance with the project, including monitoring and reporting formats used by project implementation unit (PIU), consultants, and contractors;
- (iii) ensure that the draft IEE reports are included in the bidding and contract documents;
- (iv) ensure bidding and contract documents include specific provisions requiring contractors to comply with (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value

- regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the subproject site;
- (v) review and confirm draft IEE reports are finalized by the PMSC based on final detailed designs;
 - (vi) ensure that no civil work commences until the corresponding final IEE report is cleared by ADB;
 - (vii) review and provide recommendations on the approval of SEMP of the contractors;
 - (viii) provide oversight on environmental management aspects of the projects, and ensure the SEMP and EMP are implemented by the contractors;
 - (ix) establish a system to monitor environmental safeguards of the subprojects including monitoring the indicators set out in the monitoring plans of the EMPs;
 - (x) facilitate and confirm overall compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant;
 - (xi) review, monitor and evaluate effectiveness with which the SEMP and EMP are implemented, and recommend necessary corrective actions to be taken;
 - (xii) with support from design and supervision consultants, consolidate monthly environmental monitoring reports from the contractors and submit semi-annual environmental monitoring reports to ADB;
 - (xiii) ensure timely disclosure of documents (IEE report and monitoring reports) in project website and in a form understandable and accessible to the public;
 - (xiv) address any grievances brought about through the GRM in a timely manner;
 - (xv) undertake regular review of safeguards-related loan covenants, and the compliance during program implementation; and
 - (xvi) with support from PMSC, organize periodic capacity building and training programs on safeguards for DPHE, PIU, supervising engineers, and contractors.

379. Project Implementation Unit (PIU). A PIU will be established at each Paurashava under the guidance of the PMU, jointly constituted by DPHE and the Paurashava. The PIU will serve as the field-level entity responsible for implementing the EMP and occupational health and safety (OHS) measures, under the supervision of the DPD/EHS focal of PMU, and with support from PMSC specialists. Each PIU will designate environmental and safety focal points from the Paurashava and DPHE, respectively, and engage EHS support staff for field implementation and supervision. In addition to overseeing subproject execution, the PIU will ensure compliance with environmental and social safeguards and manage stakeholder engagement and grievance redress.

380. Roles and responsibilities of PIU Safety Focal:

- (i) with the support of PMSC, establish and maintain overall project's health and safety systems, promote safe work culture, establish industry specific health and safety performance indicators, and assist safety committee in performance reviews, and follow up actions;
- (ii) ensure the subprojects comply with all relevant national laws, rules, and regulations on health and safety;
- (iii) ensure the bidding and contract documents require contractors to develop or prepare appropriate health and safety management plan following internationally best practices and/or safety standards in water supply infrastructure projects,

- including the mandatory requirement to employ qualified and experienced health and safety officers; and
- (iv) with support from the PMSC health and safety experts, lead the following:
 - a. review of health and safety management plans prepared by contractors;
 - b. supervise and monitor the health and safety management plan implementation in subprojects;
 - c. provide training to relevant staff, contractors, and workers on health and safety at the workplace, including emergency preparedness;
 - d. ensure that contractors have their corresponding health and safety management plans approved by PMU and in place prior to commencement of works; and
 - e. any other tasks may be necessary to ensure all community and occupational health, and safety measures are always implemented in the project.

381. Roles and responsibilities of PIU Environmental Focal:

- (i) overseeing environmental management aspects of the project and ensuring effective implementation of the EMP by contractors;
- (ii) establishing and maintaining a system to monitor environmental safeguards, including indicators specified in the EMP monitoring plan;
- (iii) facilitating and ensuring compliance with all applicable government rules and regulations related to environmental clearances and site approvals;
- (iv) reviewing, monitoring, and evaluating the effectiveness of EMP implementation, and recommending corrective actions to the PMSC, as necessary;
- (v) consolidating monthly environmental monitoring reports from the contractors and submitting them to PMSC;
- (vi) maintaining proper documentation and records of environmental safeguards compliance; and
- (vii) addressing grievances received through the Grievance Redress Mechanism (GRM) in a timely manner.

382. **Project Management and Supervision Consultant (PMSC).** The PMSC will support the PMU in project implementation, including review and approval of contractor submissions, construction programs, and work methods; supervision of works; quality assurance; and day-to-day contract management. The PMSC will also oversee the implementation of the EMP and ensure compliance with ADB and government environmental safeguard requirements through document preparation and review, site monitoring, corrective actions, reporting, capacity building, training, consultation, and disclosure. The team will include a National Environmental Specialist, a Construction Safety Specialist, and EHS supervision support staff. Key environmental safeguard responsibilities of the PMSC include, but are not limited to, the following:

- (i) assist PMU and PIU in all environmental safeguard's tasks related to the project to ensure project compliance with ADB SPS and government rules and regulations;
- (ii) assist in developing and adapting standard reporting formats, checklist at levels – contractor, PMSC, PMU, and PIU levels;

- (iii) work closely with PMU and PIU, PMSC and contractor technical teams to ensure that environmental considerations as per EMP are duly considered in the final designs and implementation;
- (iv) identify statutory clearances / permissions / approvals required for the project and assist the PMU and PIU in obtaining the same;
- (v) update the draft IEE and EMP based on the final detailed design;
- (vi) assist in including standards/conditions of regulatory clearances and consents, if any, in the project design, construction and operation;
- (vii) approve environmental monitoring locations (air, noise, etc.) of the contractor; ensure conduct of baseline and periodic environmental monitoring as per environmental monitoring plan;
- (viii) assist PMU and PIU in reviewing and approving contractor SEMP, health and safety plans, traffic management plans and any other associated plans as required;
- (ix) carry out site verification and monitoring of EMP/SEMP implementation on a regular basis, monitor the implementation of EMPs/SEMPs and ensure compliance;
- (x) provide guidance on resolving issues, if any arise, pertaining to effective and efficient implementation of proposed environmental mitigation measures per EMPs/SEMPs during construction phase. Identify, non-compliance or unanticipated impacts, if any, and initiate corrective actions in consultation with PMU and PIU;
- (xi) assist in public consultations, documentation and include inputs from the public consultation in the project design and EMP, and implementation;
- (xii) assist in disclosing relevant information on safeguards to affected people and relevant stakeholders;
- (xiii) assist the PMU and PIU in the review and approval of monthly monitoring reports submitted by contractor;
- (xiv) assist PMU and PIU in preparing semiannual environmental monitoring reports (SEMR) for submission to ADB;
- (xv) identify training needs and implement capacity development activities on environmental safeguards for the PMU and PIU, contractors, and other stakeholders.
- (xvi) assist PMU and PIU in establishing GRM for the project;
- (xvii) assist PMU and PIU in grievance redress, advise the contractor on appropriate actions on grievances, ensure timely resolution and proper documentation; and
- (xviii) support all other environmental safeguards-related activities and tasks of the PMU and PIU as may be needed.

383. PMSC's roles and responsibilities in health and safety management:

- (i) establish and maintain overall project's health and safety systems, protocols; project performance through industry specific health and safety indicators; work permit methods and communication structures; expert will be responsible for ensuring safety culture at project sites;
- (ii) ensure work site safety is one key responsibility of PMSC in design, implementation, commissioning, and operation of the project;
- (iii) ensure that the designs assess risks to worker and public safety and specifications are included in the bid documents to mitigate any potential impacts, which should be adequately costed in the bills of quantities. Sufficient competent staff input and qualifications must be included in the bid documents;

- (iv) establish occupational and community health and safety requirements for contractors following provisions of the respective contracts, legal provisions, and project requirements;
- (v) ensure competent staff are appointed by contractors for health and safety tasks. Review and consent to appointment of health and safety related experts/staff proposed to be provided by the contractors as per provision of the contracts;
- (vi) ensure that site-specific health and safety plan is developed and implemented by all contractors in accordance with legal and contractual requirements which must include method statements. Such plan shall be prepared by contractors and be reviewed and approved by PMSC prior to commencement of works;
- (vii) develop and implement a health and safety training program. This should include health and safety orientation for the contractor personnel, and any health and safety designated focal point must be confirmed to have taken the orientation prior to starting their work. The training curriculum should include regular sessions on practical topics concerning the life of the construction contracts;
- (viii) During the construction, supervise contractors' performance of the works on a day-to-day basis, particularly regarding execution of work as per approved construction methodology ensuring work site safety, safe removal and/or relocation of utilities and compliance with health and safety plan;
- (ix) ensure work site safety, safety of workers, staff and other personnel, road users and communities living around. If PMSC determines that there is a risk and no adequate arrangements for ensuring safety are made or that any work is being carried out in a manner that threatens the safety and/or hampers the progress of the work, PMSC shall notify the contractor concerned on suspension of whole or part of the works for ensuring safety. PMSC shall promptly communicate such notices to the PIU and PMU. The suspension shall be lifted by the PMSC, only upon its determination that the conditions which caused the suspension to have been removed or remedy sufficiently, in the PMSC's professional judgment and following its subsequent inspection of the works;
- (x) plan and ensure that contractors carry out drills and exercises on managing emergency situations;
- (xi) conduct investigations into accidents and incidents and prepare reports on findings;
- (xii) submit a monthly progress report that includes a section on review of all health and safety aspects during the month including reports on all accidents and actions proposed to prevent further occurrence;
- (xiii) promptly report on any such event which has affected or is likely to affect the work site safety; and
- (xiv) engage with local communities to raise awareness about the project's health and safety impacts. Address community concerns related to project activities.

384. Roles and Responsibilities of Contractors. Contractors shall be responsible for implementing all environmental mitigation and monitoring measures stipulated in the contract and shall undergo safeguards orientation during the pre-construction phase. Each contractor should appoint a full-time Environmental Manager, Safety Officer, and EHS Supervisor to ensure effective EMP implementation during civil work. Prior to commencement of works, contractors shall prepare and submit a site-specific Environmental Management Plan (SEMP) for PIU and PMU approval, including site layouts, mitigation measures aligned with the approved IEE/EMP, monitoring program, and implementation budget; no works shall commence until approval is obtained. Contractors shall conduct routine monitoring of SEMP implementation, submit monthly reports to the PIU, and always maintain approved EMP/SEMP

documents on-site. Any non-compliance or deviation shall trigger corrective actions. The IEE and EMP will form part of the contract, and contractors shall ensure full compliance, including worker orientation on environmental awareness prior to site deployment. Key responsibilities of contractors' EHS personnel include, but are not limited to, the following:

- (i) prepare SEMP including site-specific occupational health and safety plan and submit to PIU and PMU for approval prior to start of construction;
- (ii) ensure implementation of SEMP and report to PIU and PMU, and/or PMSC on any new or unanticipated impacts;
- (iii) ensure that necessary pre-construction and construction permits are obtained timely;
- (iv) supervise work site safety, and provision and use of personnel protection equipment, among others;
- (v) carry out site inspections on a regular basis and prepare site-inspection checklists and/or reports;
- (vi) record EHS incidents and undertake remedial actions;
- (vii) conduct environmental monitoring (air, noise, among others) as per the monitoring plan;
- (viii) ensure that appropriate worker facilities are provided at the workplace and labor camps as per the contractual provisions;
- (ix) ensure compliance with all applicable laws and regulations relating to EHS;
- (x) ensure compliance with all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; (c) no discrimination in respect of employment and occupation; (d) allow freedom of association and effectively recognize the right to collective bargaining; and (e) elimination of forced labor; and with (f) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites;
- (xi) reinstate pathways, and other local infrastructure etc. to at least their pre-project condition upon the completion of construction;
- (xii) conduct training, orientation, and daily briefing sessions to workers on EHS;
- (xiii) prepare monthly EMP monitoring reports and submit to PIU and PMU, and/or PMSC;
- (xiv) provide proper information to communities and ensure communities are aware of project-related impacts, mitigation measures, and GRM;
- (xv) ensure that any complaints and grievances brought about by community and affected persons are received and recorded properly; and
- (xvi) coordinate with the PIU, PMU, and PMSC on any grievances received and ensure that these are addressed in an effective and timely manner.

385. A copy of the EMP/approved SEMP will be always kept on-site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP/SEMP constitutes a failure in compliance and will require corrective actions.

Table 42: The Activities and Responsible agency

Activities	Responsible Agency / Unit
Disclosure of proposed project and anticipated social and environmental impacts on the ADB website	ADB & DPHE
Disclosure of proposed project, social/environmental impacts, and proposed mitigation measures in local languages	DPHE
Disclosure of grievance redress mechanism/process	DPHE, PMU, PIU
Updating of safeguard documents based on detailed design	PMU
Review of updated IEE/EIA and send to ADB for approval before contract award	DPHE PMU
Clearance and disclosure of updated safeguard documents	DPHE, ADB
Acquire required permits, NOC, and clearances	DPHE, PMU, PMSC
Conducting meetings at the community/household level with affected persons (APs)	PMSC, PIU and Contractor
Categorization of APs for finalizing entitlements	PMU, INGO
Implementation of mitigation and rehabilitation measures	DPHE, PMU, PMSC, PIU and Contractor
Consultations with APs during rehabilitation activities	PMU, PMSC, PIU Contractor and INGO
Grievance Redressal	GRC, DPHE, PMU, PIU, and Contractor
Internal monitoring	PMU, PIU and PMSC

386. The Environmental Management Plan (EMP) covers the design, pre-construction, construction, post-construction, and operation phases of the Ishwardi Cluster subproject. It translates the mitigation, monitoring, institutional, reporting, and corrective-action requirements identified in this IEE into implementable obligations for DPHE, the PMU, PIUs, PMSC, contractors, and participating Paurashavas. The EMP will be read together with the Environmental Monitoring Plan (EMoP), contractor Site-specific Environmental Management Plans (SEMPs), and required sub-plans, including traffic management, spoil and excavated material management, waste management, utility protection, occupational and community health and safety, chance-find procedure, emergency response, chemical handling, and camp management plans.

Table 43: Summary Environmental Impacts and Mitigation Measures

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
DESIGN AND PRE-CONSTRUCTION PHASE					
1	Design consideration of likelihood of natural disasters on the subproject	Impact due to natural hazards and disasters such as earthquakes, including climate change may cause damage of the subproject	- Materials and equipment and machinery to be used should withstand potential stress during extreme events, temperatures, pressures, etc. - Structural designs of OHT and PTW should comply with relevant good international practice to ensure the structures can withstand earthquakes and future climate-induced events.	DPHE	DPHE
2	Groundwater (GW) abstraction	- Abstraction of GW to meet current and future urban water demand poses a significant sustainability risk - Climate change may impose additional uncertainty to groundwater availability - changes in rainfall intensity and distribution can affect groundwater recharge rates, exacerbate dry season deficits.	- Subproject will adopt a conjunctive use approach to supply both treated surface water as the primary bulk water source, while GW is reserved for supplementary, peak demand, and emergency supply. - Gradual reduction in abstraction of GW will help stabilize groundwater levels and reduce long-term aquifer stress. - Conduct systematic monitoring of groundwater levels and abstraction rates. - Conduct demand-side management measures such as non-revenue water reduction, metering, and water conservation programs. - Adequate study on groundwater abstraction and depletion must be completed prior to	DPHE	DPHE
3	Water quality of groundwater	Unsustainable groundwater abstraction may impose risk of	Plan to use groundwater for short-term only, and prevent over-extraction reduce chance of	DPHE	DPHE

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		mobilizing naturally occurring contaminants such as iron, As and, in deeper formations, salinity. Poor groundwater quality may increase cost of treatment and raise costs for water utilities and consumers and reduce public confidence in piped water supply systems.	mobility of Fe, As and other contaminants. - Conduct routine monitoring of groundwater quality to determine concentration of iron, salinity, and other location-specific indicators. - Conduct periodic rehabilitation of PTWs, and, if required, localized treatment to ensure compliance with the national drinking water quality standards. - Ensure data-driven management to support informed decision-making on sustainable abstraction limits.		
4	Land subsidence	Long-term continued abstraction of groundwater may pose a potential risk of land subsidence, particularly if additional PTWs are operated as supplementary water sources.	- Conduct hydrological study supported by groundwater modeling to assess and manage this potential impact, providing an evaluation of groundwater availability and abstraction sustainability. - As the subproject is designed, water-supply will shift from heavy reliance on groundwater to conjunctive use, with treated surface water to reduce the risk of land subsidence. - In view of the above, impact due to land subsidence is considered insignificant. No mitigation measure is required.	DPHE	DPHE
5	Salinization / Salt water intrusion	There exists no evidence of salinity in groundwater, despite several decades of groundwater abstraction.	Ensure continued monitoring of chloride, TDS, and electrical conductivity, particularly during the dry season at wells closest to major river channels to confirm that salinity conditions remain stable as abstraction patterns	DPHE	DPHE

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			change under the project. - As the subproject is designed, water-supply will shift from heavy reliance on groundwater to conjunctive use, with treated surface water to reduce the risk of saline contamination of the aquifers. - No mitigation measure is required.		
6	Disruption of existing utilities and services	Water pipeline network that will pass through roads of the city corporation and <i>Paurashavas</i> cross, intercept and/or align with existing utilities and services. Any damage to these utilities will disrupt the daily lives of the people affected.	- Adopt best options that will have minimum impact to the existing e utilities. - Ensure immediate corrective measures where alignments cannot avoid disrupting the operation of the existing utilities, and this responsibility must be included in the bidding and contract documents as the mandatory task for Contractors during pre-construction phase to coordinate with relevant authorities. - Ensure minimum interruption on utility and service operation that affected households. - Inform affected communities in advance about possible shutdown of utility service.	DPHE	DPHE
7	Lack of spoil disposal sites	Negative environmental impacts may be caused due to generation significant amounts of spoils during construction phase. Assuming no other uses for excess spoils, their indiscriminate or unmanaged disposal will negatively	- Ensure dedicated location for disposal of excess spoils that will be generated during the construction phase. - Confirm that the disposal location obtains clearance from relevant government agencies having jurisdiction over such location.	DPHE	DPHE

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		impact on the environment and may also result to other forms of nuisance to surrounding communities wherever these are disposed.	No award of the contract shall be made until disposal location and relevant clearance are obtained.		
8	Tree Removal	There will be no tree removal during Phase-I of the subproject.	No mitigation measures are required	DPHE	DPHE
9	Physical Cultural Resources (PCR) (internationally protected and other locally protected cultural heritage sites)	- There is minimum likelihood that existing PCR in the cluster towns will be impacted by the subproject as sites are secured and mostly protected with existing boundary walls, and apart from the PCR. - Rehabilitation of IRPs in Natore will not hamper environmental degradation of PCR, as all existing infrastructures are already built and confined with own boundaries.	- Identify all PCRs existing in the cluster towns during preconstruction phase, and any excavation or construction related activities nearby the catchment of these PCR will allow the <i>business-as-usual</i> operations of all PCR. - Adopt specific implementing protocols to stop work immediately if archaeological artifacts are discovered during excavation or horizontal drilling, and alternative protocols will be considered immediately. - Consult, and if necessary, engage local concerned officials from city corporation, <i>Paurashava</i> and DPHE during construction works nearby the PCR.	DPHE	DPHE
10	Approval of Consents, Permits and Clearances	Any delay in the preparation and approval of the IEE/EIA will potentially delay the execution of the subproject.	- Obtain all necessary consents, permits and clearances required from local government bodies prior to the award of contract. - No award of the contract shall be made for a specific package under the subproject until and unless ECC is obtained.	DPHE	DPHE
11	Compliance with ADB	EHS, OHS, CHS, and	EA must ensure that	DPHE	DPHE

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
	Loan Agreement and SPS	other mitigation measures are often not adequately considered during bid preparation and are therefore not properly costed or incorporated into the contract price leading to insufficient allocation of resources for EMP implementation during construction, increasing the risk of non-compliance with safeguard requirements, delayed corrective actions, and potential adverse EHS impacts on local environment.	mitigation measures required under the EMP are fully integrated into the bidding and contract documents. • Include (i) clear technical specifications and contract clauses mandating compliance with the EMP, OHS requirements, and all applicable provisions of the ADB SPS as well as relevant government laws and regulations, and (ii) explicit inclusion of the associated costs for EMP and OHS implementation in the Engineer's Estimate and Bills of Quantities, to ensure that such measures are adequately budgeted by bidders.		
12	Contractor mobilization	• Mobilization of contractors' equipment and manpower to the site likely impact baseline site conditions and damage private and public properties, including heritage assets. • Safety of workers and community are likely to be affected due to movements of both workers and construction equipment.	• Upon awarding contract, contractor must undertake all pre-mobilization works to avoid impacts on natural environment and man-made structures. • Ensure no mobilization and civil works unless following items have been complied with: - Conduct consultation with communities - Develop SEMP and get approved by PMU - Develop a Traffic Management Plan and get approved - Develop a Spoil Management Plan and get approved by the PMU - Develop a Health and Safety Plan and get approved by the PMU - Conduct training on excavation method sensitive areas.	DPHE	DPHE

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
13	Construction camps or workers' accommodation	• Unplanned or poorly managed construction camps may cause environmental degradation, environmental degradation and social stress on the host communities. • Potential impacts including pressure on local resources and services could be generated. • Pollution due to unmanaged waste and wastewater leads to increased health and safety risks. • Emergence of adverse interactions between workers and surrounding communities.	• Make sure construction camps are properly planned, sited, constructed, and managed, and are provided with adequate sanitary and basic living amenities within designated areas. • Provide adequate safe drinking water, sanitation and ablution facilities, proper drainage, solid waste management systems, lighting, ventilation, and cooking and washing areas, as applicable. • Comply with the National Labor Act 2006 and National Labor Rules 2015 as well as relevant provisions of the International Labour Organization (ILO) Workers' Housing Standards. • Worker camps shall be designed and constructed to ensure structural safety and reasonable standards of decency, hygiene, health, and comfort, and construction materials shall be durable and appropriate to local environmental conditions, taking into consideration potential risks such as flooding, waterlogging, cyclones, and landslides.	Contractor	DPHE
14	All existing, rehabilitated, and proposed PTWs in Ishwardi, Pabna, Natore, and Gopalpur	Unsustainable abstraction of groundwater; declining groundwater levels; deterioration of groundwater quality; increased treatment requirements; risk to long-term water source reliability	Final detailed design shall include a groundwater source sustainability and water-quality management plan for all existing, rehabilitated, and proposed PTWs. The plan shall confirm the number, depth, yield, design abstraction rate, and operating regime of each PTW; establish	DPHE/ design consultant during detailed design; contractor where PTW rehabilitation or construction is included; DPHE/ Paurashava operator during operation	PMU, PIU, PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			baseline static and dynamic water levels before commissioning; define seasonal groundwater-level monitoring, at least pre-monsoon and post-monsoon; maintain monthly abstraction records; test arsenic, iron, manganese, chloride, TDS, electrical conductivity, fecal coliform, total coliform, and other locally relevant parameters; and establish operational triggers for reducing or suspending abstraction where declining water levels, salinity indicators, or contaminant concentrations show deterioration.		
CONSTRUCTION AND POST-CONSTRUCTION PHASE					
1	All construction packages and work fronts before mobilization	Inadequate contractor planning, weak implementation of EMP, and commencement of works without approved site-specific safeguards controls	No civil works shall commence until the contractor's SEMP and required sub-plans have been reviewed and approved by the PMU/PIU with support from PMSC. The SEMP shall include site layout, work-front locations, construction camps, storage areas, disposal areas, access routes, stockpile areas, utility protection, traffic management, spoil and waste management, occupational and community health and safety measures, chance-find procedures, ACM chance-find procedure, emergency response, monitoring checklists, EHS staffing, budget, and reporting arrangements.	Contractor	PMU, PIU, PMSC
2	Sourcing of construction materials	Extraction of construction materials (cement, sand, aggregates) can disrupt natural land contours and	Minimize use of non-renewable resources and rock-based materials in construction activities.	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	• Purchase/source construction materials, including aggregates, etc., from legitimate suppliers authorized by the government • Maintain a construction material register at the site.		
3	Topography and Aesthetics	• Subproject activities, such as excavation, pipelaying and other construction works will affect the topography and aesthetics at the sites due to accumulation of unmanaged spoils and construction debris.	• Avoid storing spoils at the vicinity of excavation or construction sites for a long period of time. • Dispose only in the designated disposal areas identified under the subproject. • Use spoils for beneficial purposes, such as reuse in other construction activities, or to raise the level of low-lying areas. • Ensure disposal areas are utilized up to their capacity limit only, and if necessary, utilize another designated disposal area approved under the subproject.	Contractor	PMU with support from PMSC
4	Surface Water Quality	• Excavation and construction activities may result to accidental spills of chemicals and siltation that could threaten or further deteriorate the quality of receiving bodies of water near the sites.	• Dispose excess spoils only in the designated disposal areas identified under the subproject; • Avoid storing spoils at the vicinity of site for a long period of time. • Use spoils for beneficial purposes, such as reuse in other construction activities, or to raise the level of low-lying areas. • Ensure proper compaction of refilled soil and ensure no loose soil particles on the top • Silt traps to be provided at construction area near receiving bodies of water. • No equipment or machinery should be operated outside the work areas. • Avoid spillage of fuels,	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			chemicals and lubricants. • Ensure that drains are not blocked with excavated soil. • Locate stockyards away from canals or receiving bodies of water. • Provide treatment arrangements such as retention ponds and septic tanks for workers camps. • Prepare and get approval of a sewage management plan by the PMU. • Clean up of the area after the completion and prior to the onset of monsoon season. • Undertake earthworks during dry season, avoid monsoon as much as possible.		
5	Rehabilitated IRPs and associated backwash/sludge handling areas	Uncontrolled discharge of backwash water, iron-rich sludge, spent filter media, or treatment residuals to drains, khals, ponds, agricultural land, or low-lying areas	For rehabilitated iron removal plants, the operator shall implement residuals, sludge, filter media, and backwash management procedures. Backwash water and iron-rich sludge shall not be discharged untreated to drains, khals, ponds, agricultural land, or low-lying areas. The operation manual shall include settling, drying, containment, reuse or disposal options, safe handling procedures, cleaning frequency, worker PPE, and records of sludge/backwash disposal.	DPHE/Paurashava operator; contractor during commissioning where applicable	PMU, PIU, PMSC
6	Groundwater quality	• Groundwater resources can be contaminated due to seepage of liquid wastes and chemicals from the workers 'camps.	• In addition to the mitigation measures described to prevent impact on surface waters, Contractors will need to implement the following measures: • Store fuel, oil and other	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			chemicals in secure, managed areas with lined impervious floors and bunded with 110% by volume; • Ensure refueling area has lining to avoid seepage of unavoidable spills during refueling. Ensure clean up spills immediately and all used cleaning materials are disposed properly; • Ensure to provide portable toilets in all construction camps to discourage injecting septic wastes on land; • Conduct ground water quality monitoring, particularly at sites near fuel depot or refueling site and construction camps.		

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
7	Ambient Air Quality	- Excavation and construction activities will result to generations of dust that could remain airborne within and around the subproject sites. - Increase of vehicular emission during operation of heavy construction equipment and vehicles. - Dust and emissions are significant factors that could degrade the ambient air quality in the area, which in turn affect the general well-being of the residents.	- Use water sprays and minimize hauling and vehicle movements during windy times of the day or night; - Cover hauling equipment such as dump trucks during transport of materials or spoils; - Provide temporary barriers or covers around active site excavation areas; - Limit vehicles speed at work sites enough to not cause vigorous suspension of dust; - Prohibits idling heavy equipment or vehicles for a long time; - Regular maintenance of heavy equipment and vehicles to ensure compliance with national vehicle emissions standards; - Prohibit burning of any liquid or solid waste; - Conduct regular visual inspections to identify and address other potential sources of dust emissions; and - Conduct ambient air quality monitoring at selected locations at least quarterly.	Contractor	PMU with support from PMSC
8	Noise and Vibration	- Excavation and construction activities will result to generation of noise that could disturb the construction workers, staff, and community people. - Use of machinery for excavation and compaction will result in vibration that may damage sensitive and old structures at the subproject sites.	- Provide prior information of the scheduled work to nearby residents; - Use silencers for all equipment; - Where possible, avoid delivery of raw construction materials during nighttime; - Avoid noise-intensive activities at nighttime; - Avoid horns near sensitive receptors; - Minimize drop heights during	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			delivery and stacking of raw construction materials; • Use sound barriers to lessen the noise from sites; • Maintain maximum of noise level of 45 dB(A) at the nearest residence relative to the specific worksites; • Conduct noise level monitoring at least quarterly; • Use generator set complies with the noise standards; and • Ensure generator set has acoustic enclosure and silencer (if necessary) in the exhaust muffler.		
9	Overground Physical Cultural Resources	• Avoid protected cultural heritage sites and PCRs during the design phase. • Locally important PCRs, including mosques, temples, etc. are still found in some alignments. • The foundation of PCR located proximity to the alignments may be directly impacted due to vibration, or collapse of excavated trench.	• Excavation shall be avoided during rainy days along the subproject area. • Apply shoring for excavation of more than 1m depth or depending on site condition to avoid any sort of collapse and maintaining safety of lives and property. • Install proper barricade and signage boards during excavation to avoid access of unauthorized person into the construction site. • Place shoring in each excavated trench along the alignment. • Avoid storing excavated material along the excavated trench.	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
10	Underground Physical Cultural Resources	Bangladesh is home to many old and ancient structures and there is a possibility that chance finds such as underground relics or structures considered as physical cultural resource (PCR) will be encountered and impacted during excavation at the subproject sites.	As a precautionary approach, the subproject will need to strictly implement the following chance finds protocol: - require coordinating immediately with DPHE, PIU and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works; - Stop working immediately to allow further investigation if any finds are suspected; and - Request authorized person from the Bangladesh Department of Archaeology to observe when excavation resumes for the identification of the potential chance finds and comply with further instructions.	Contractor	PMU with support from PMSC
11	Community Health and Safety	- Inadequate site control and unrestricted access may allow pedestrians, children, livestock, and other community members to enter active work areas leading to accidents. - In addition, unprotected trenches and excavated areas may pose a risk of accidental falls for both community members and animals, particularly during nighttime or poor visibility conditions. - There is also a risk of transmission of communicable diseases to communities due to interactions between Contractors' staff, construction workers, and	- Appoint full-time EHS officer to monitor health-safety issues; - Install warning signs, warning tapes, hard barricades, and notices around the work site perimeter to avoid unauthorized entry. - For excavated sections that cannot be isolated or enclosed due to access issues for the community or residents, ensure to cover these with steel planks or durable wood planks during off-work hours. - If during work hours that these excavated sections, especially the deep trenches, cannot be covered entirely, provide steel planks or durable wood planks with handrails that can be used by pedestrians; - Install sturdy fence around	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		residents.	storage camps or yards and workers' camps; • Assign full-time (24x7) guards around the subproject sites; • Illuminate all subproject sites, including storage camps or yards and workers' camps; • Follow International best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities; • Follow the established community and occupational health and safety protocol on emerging infectious diseases; • Schedule transport and hauling activities by avoiding peak traffic periods; • Clean wheels and undercarriage of haul trucks prior to leaving construction sites; • Educate drivers and advise to limit speed between 20-25 km/h while traversing settlement areas and avoid use of horn unless necessary to prevent accidents; and Earmark parking places for construction equipment and vehicles when idling; no parking shall be allowed on the roads.		

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
12	Roads, markets, schools, hospitals, mosques, transport stands, residential and commercial areas along pipeline alignments	Traffic disruption; restricted pedestrian and vehicle access; increased community safety risks; temporary business disturbance	The contractor shall maintain safe and continuous access to residences, shops, schools, hospitals, mosques, markets, and transport stands. Temporary pedestrian bridges or steel/wooden plates with handrails shall be provided across trenches where access is required. Work near schools, hospitals, markets, and religious facilities shall be scheduled in consultation with facility managers and communities. Where temporary business access disruption is unavoidable, the contractor shall provide advance notice, minimize the duration of obstruction, maintain signage, and restore access immediately after pipe installation.	Contractor	PIU, PMSC, Paurashava, local traffic police
13	Excavation sites, stockpiles, haul routes, disposal areas, drains, khals, ponds, riverbank areas, and low-lying areas	Improper spoil disposal; drainage blockage; dust; sediment runoff; nuisance to communities; pollution of water bodies or agricultural land	The contractor shall prepare and implement a Spoil and Excavated Material Management Plan before mobilization. The plan shall identify expected spoil volumes by package, reuse opportunities for trench backfilling and site restoration, temporary stockpile locations, haul routes, final disposal sites, landowner and authority permissions, erosion and sediment controls, dust suppression, drainage protection, and traffic safety requirements. Spoil shall not be placed in wetlands, khals, ponds, drains, riverbanks, obstructed road shoulders, agricultural land without consent, or flood-prone or erosion-prone areas. Stockpiles shall be protected by covers, toe	Contractor	PIU, PMSC, PMU, Paurashava

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			bunds, drainage channels, and silt traps where needed.		
14	Occupational Health and Safety	- Construction workers may be exposed to health risks and safety hazards arising from the storage, handling, and transportation of hazardous materials, including fuels, chemicals, and construction materials. - Workers are also vulnerable to accidents associated with moving vehicles, heavy machinery, lifting operations, excavation work, and other construction-related activities at active worksites. - Workers may be exposed to excessive levels of environmental pollution during construction, including dust emissions, exhaust fumes from vehicles and construction equipment, and excessive noise, which may cause respiratory illnesses, hearing impairment, and other adverse health effects if not properly controlled. - Extended working hours, inadequate rest periods, and high work intensity may further increase the risk of accidents and injuries due to worker fatigue, reduced alertness, and human error. - Outbreaks of diseases and other public health threats may pose serious risks to worker health and	- Implement health and safety protocols approved by PMU. - Ensure implementation of approved SEMP in accordance with its internal health and safety protocols. - Adopt internally acceptable OHS plan including specific preventive and response measures for emerging and communicable diseases, and similar public health threats. - Allow only authorized personnel to be present at construction sites and they must be fully informed of applicable site-specific safety rules and procedures. - Provide with, and required to use, appropriate personal protective equipment (PPE) that commensurate with the activities being undertaken. - Ensure implementation of necessary precautionary measures to minimize health risks related to infectious diseases, including worker health screening where applicable, hygiene and sanitation provisions, physical distancing measures as required, and awareness briefings. - Comply with all relevant provisions of the Bangladesh Labor Law and relevant WHO guidelines concerning the provision of adequate measures to avoid contracting and/or spreading diseases during	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		safety. • High occupancy density, shared facilities, and potentially inadequate hygiene and sanitation conditions may elevate risk of disease transmission.	construction phase. • Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities,		
15	Existing pipeline areas, old pipe corridors, excavation sites, and rehabilitation/demolition areas	Exposure of workers and communities to asbestos-containing materials if asbestos cement pipes or other suspect ACMs are encountered	Where existing pipelines are known or suspected to include asbestos cement pipes, the preferred approach shall be abandonment in place and avoidance of disturbance. If suspect ACM is encountered, the contractor will immediately stop work, isolate and barricade the area, prohibit cutting, breaking, drilling, or dry handling, prevent dust generation, notify the PIU/PMSC, and arrange inspection by a competent person. Work will resume only after the material is confirmed non-ACM or after an ACM management method statement is approved. Any ACM handling, removal, packaging, transport, and disposal follow national requirements and good international industry practice, including PPE, wet methods, labeling, covered transport, disposal at an approved site, and documentation.	Contractor; competent ACM specialist where required	PIU, PMSC, PMU
16	All construction sites, camps, storage areas, active work fronts, and operation facilities	Serious environmental, health, safety, or community incidents; delayed response and weak corrective action	The contractor shall immediately stop work and notify the PIU/PMSC in the event of discovery of suspect ACM; chance find of cultural or archaeological material; serious injury or fatality; major spill; damage to critical utilities;	Contractor during construction; DPHE/Paurashava operator during operation	PIU, PMSC, PMU

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			uncontrolled discharge to water bodies; trench collapse; community safety incident; or any event likely to cause significant environmental harm. Serious incidents shall be reported to PMU and ADB in accordance with project reporting requirements, with initial notification within 48 hours, followed by root-cause analysis and corrective action plan.		
17	PTWs, IRPs, OHTs, chlorination/dosing points, chemical storage areas, and distribution system	Chemical spills, unsafe chemical storage or dosing, worker exposure, over- or under-disinfection, public health risk	All treatment and disinfection chemicals, including chlorine compounds, alum, lime, or other chemicals used at PTWs, IRPs, OHTs, or distribution systems, shall be stored, handled, dosed, and disposed of under a Chemical Handling and Emergency Response SOP. The SOP shall require secure and ventilated storage, secondary containment, labeling, safety data sheets, trained operators, PPE, spill kits, emergency wash facilities where needed, dose calibration, residual chlorine testing, and reporting of spills or dosing incidents.	DPHE/Paurashava operator; contractor during commissioning where applicable	PMU, PIU, PMSC
18	Local Festivals and Cultural Practices	Construction activities may disturb festivals, rituals and cultural practices that are held within and around the subproject area various times of the year.	- Follow festival calendar, if possible, to avoid or minimize construction works during the festivals. - Set up an alternative access to mosque, temples, shrines, or any other important sites, if there exists any unrestored construction site but approaching a festivity. - Contractors shall duly inform the affected community people	Contractor	PMU with support from PMSC

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			for resumption of construction works after the festivities or festival.		
19	Clearing Construction Sites	The subproject will result to sorts of construction and demolition debris including excess spoils, various scraps from distribution pipelaying, and PTW and storage tank rehabilitation works, debris from demolition of temporary structures (e.g. workers and storage camps, etc.) may impose risk to environment and the people in the vicinity of the subproject sites through indiscriminate disposal or ignoring their proper disposal.	- Ensure removal of all wastes at the different sites within one week after construction works are completed. - Segregate or sort all waste according to nature (recyclable, non-recyclable, hazardous, non-hazardous or any combination). - Ensure to handover (or sell as the case may be) recyclable wastes to authorized recycling entities in Bangladesh in consultation with the PMU. - Ensure to dispose non-recyclable and non-hazardous wastes to appropriate disposal sites. - Ensure to transport and dispose hazardous wastes using authorized hazardous waste transporters and treaters in Bangladesh. - Ensure the sites are cleared with all wastes disposed accordingly, and compliance with this measure shall be included as one of the conditions for payment to the Contractor.	Contractor	PMU with support from PMSC
20	Excavation, HDD, drilling, road cutting, and pipe-laying areas across the distribution network	Damage to existing utilities and services; disruption to households, businesses, institutions, traffic, drainage, electricity, telecommunications, gas, water supply, sewerage, road, or railway services	Before excavation, HDD, drilling, or road cutting, the contractor shall prepare and implement a Utility Identification and Protection Plan. The plan shall include review of available utility drawings, joint verification with DPHE, Paurashava, electricity, telecommunications, gas, road, railway, drainage, and other relevant authorities; trial pits or	Contractor	PIU, PMSC, PMU

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			non-destructive detection in congested corridors; on-site marking of utilities; permit-to-dig procedures; emergency contact list; advance notice to affected households and businesses; and reinstatement procedures for contractor-caused damage. No excavation or HDD shall commence until utility clearance is documented and approved by the PIU/PMSC.		
21	Approximately 760.3 km distribution network across Ishwardi, Pabna, Natore, and Gopalpur	Cumulative construction disturbance; prolonged access restriction; traffic congestion; repeated community disruption; delayed reinstatement	Construction shall be sequenced to minimize cumulative disturbance across wards and municipalities. The contractor shall limit active work-front lengths, avoid simultaneous works on parallel access routes serving the same community, complete pipe laying and reinstatement promptly, and coordinate schedules with traffic police, schools, hospitals, markets, religious institutions, and local authorities. The SEMP shall include a work-front sequencing plan showing active fronts, expected duration, reinstatement schedule, access arrangements, community notification, and emergency access provisions.	Contractor	PIU, PMSC, PMU, Paurashava
OPERATION PHASE					
1	Operation and Maintenance	There will be insignificant risks anticipated during operation and maintenance (O&M), including repair of leaks, pipe bursts, and pipe replacement, as the subproject will deploy proper	- Develop an O&M Manual that should be followed by PIUs on managing the water supply and sanitation facilities, including following measures during maintenance works: - The stability and integrity of	Utility Operator (CuCC, and Paurashavas)	DPHE /PMU/City Corporation/Paurashava

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
		design and selection of good quality pipe material having strong resistance against leaks. There would be necessity of repair works that may create impacts to both environment and the people, such as those related to increase of noise level in repair sites, and risks of accidents to community people and workers during repairs.	the system will be monitored periodically to detect any problems and allow remedial action if required. The operator of the facility will be required to ensure that the leak detection and rectification time is minimized; - For any excavation works related to these O&M issues, the methodologies and protocols developed for the construction phase shall be strictly followed; - Noise abatement measures developed for the construction phase shall be strictly followed; - All relevant and applicable community and occupational health and safety measures developed for the construction phase shall be strictly followed.		
2	Source water, treated water, OHTs, distribution network, DMAs, and consumer taps	Non-compliance with drinking water quality standards; contamination in network; low residual chlorine; public health risk	DPHE/Paurashava shall implement a Water Safety and Distribution-System Monitoring Program covering source water, treated water, storage points, network points, and consumer taps. Minimum operational monitoring shall include turbidity, residual chlorine, pH, pressure, and visible contamination indicators; periodic laboratory testing shall include fecal coliform, total coliform, arsenic, iron, manganese, chloride, TDS, and other parameters required by Bangladesh drinking water standards. Non-compliant results shall trigger investigation,	DPHE/Paurashava operator	PMU, PIU

No.	Activities/Risks	Potential Environmental Impacts	Measures to Mitigate Impacts	Implementing Responsibility	Supervision Responsibility
			flushing, repair, disinfection, public notification where required, and follow-up testing.		
3	400 pit latrines, 2 public toilets, desludging routes, and fecal sludge treatment/disposal locations	Groundwater or surface water contamination; odor; leakage; unsafe desludging; poor sanitation performance; public health risk	All household pit latrines and public toilets shall be screened before construction and managed during operation to confirm safe siting, flood risk, groundwater sensitivity, distance from wells, proximity to drains and water bodies, access for users and desludging, and inclusive design. Pits/septic systems shall be watertight where required by site conditions, raised or protected in flood-prone locations, and designed to prevent direct discharge to drains, ponds, khals, or groundwater. A fecal sludge management arrangement shall be established before operation, covering safe emptying, transport, treatment/disposal, operator PPE, records, and user awareness.	Contractor during construction; Paurashava/operator/service provider during operation	PIU, PMSC, PMU, Paurashava

C. Capacity Building

387. To ensure effective implementation, supervision, and monitoring of the EMP, it is essential that all key implementation stakeholders possess adequate institutional capacity, technical knowledge, and awareness of the requirements of the ADB SPS and applicable national environmental laws, rules, and regulations of the Government of Bangladesh. The Environmental Specialist of the Supervision Consultant will take the lead role in strengthening the capacity of key stakeholders, particularly the PMU in the DPHE and PIUs in participating municipalities or *Paurashavas*, through targeted training, on-the-job guidance, and technical assistance throughout subproject implementation.

388. The proposed capacity-building program will focus on strengthening awareness, skills, and institutional arrangements for environmental management and compliance. The program will include, but not be limited to, the following key components:

- (i) Sensitization and awareness raising of PMU staff and other relevant stakeholders on environmental management principles, including the requirements of ADB SPS and applicable national environmental legislation, rules, and standards;
- (ii) Capacity development interventions to enhance the capability of environmental personnel at all levels to effectively implement, supervise, and monitor EMP mitigation measures and environmental performance of contractors; and
- (iii) Specialized training programs on key environmental issues relevant to the subproject, including asbestos management, PCR management, environmental monitoring, reporting, compliance verification, and quality monitoring.

389. The Supervision Consultant's Environmental Specialist will provide both basic and specialized training tailored to the nature of the subproject and the roles and responsibilities of participating institutions. Initial training will focus on general environmental awareness and safeguard requirements, followed by technical modules related specifically to infrastructure improvement works and their environmental implications. Training modules will be customized based on an assessment of the existing skill levels of participants and the specific requirements of the subproject. Overall, the training program will cover the fundamental principles of environmental assessment and management, EMP and mitigation planning, implementation techniques, environmental monitoring methods, reporting requirements, and use of relevant tools and checklists. An indicative capacity-building and training program, including proposed frequency of sessions, is presented in the table below.

Table 44: Training Modules for Environmental Management

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
Introduction and sensitization to environment issues	Sensitization on Environmental concerns Environmental impacts of water supply projects Environmental regulations of the Government	PMU and PIU engineers / management team, officials responsible for implementing the subproject, and other DPHE Officials and PMU Environmental	Workshop	One-day workshop during construction	Supervision Consultant Environmental Specialist

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
	and ADB environmental regulations Coordination between departments for implementation of environmental issues.	Safeguards Officer Contractors			
Subproject training on hazards, health, safety and environmental issues pertaining to the subproject	Sensitization and training for engineering and management professionals, to be involved in on-site execution and operation of the proposed distribution network and sanitation facility. Special training on handling and disposal of asbestos-containing materials such as asbestos cement pipes.	PMU and PIU engineers/ Management Team, PMU Environmental Safeguards Officer Contractors	Workshops, site visits	Two days before and during construction	Supervision Consultant Environment Specialist and Health and Safety Specialist Asbestos Expert (may be hired by the Supervision Consultant as resource person during the preparation of ACM Management Plan and training)
EMP implementation	Implementation of EMP Identification of environment impacts Monitoring and reporting for EMP Public interactions and consultations Coordination for consents with various departments Monitoring formats, filling	PMU and PIU engineers, officials responsible for implementing the subproject, and other DPHE and PIU Staff Contractors	Lectures and field visit	Two-day session at construction stage	Supervision Consultant Environment Specialist

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
	and review of impacts.				

VIII. MONITORING AND REPORTING

390. PMU will monitor the progress of EMP implementation. The PMU and PIUs, with support from Supervision Consultant, will undertake site inspections and document review to verify compliance with the EMP and progress toward the outcome. The Contractor will conduct day-to-day implementation of the SEMP.

391. The Contractors will submit their respective monthly reports to the PIU. The monthly reports will include a compilation of copies of monitoring sheets accomplished and duly signed by the Contractors' EHS officers (or equivalent) daily. A sample daily monitoring sheet which can be used by the Contractors is in Appendix 2. This monitoring sheet is indicative, which can be further enhanced depending on the actual situations at construction sites.

392. PMU, with support from Supervision Consultant, shall also conduct its own monitoring activities consistent with the indicators in the EMP to confirm that all environmental safeguard measures are properly implemented at the subproject sites. A sample monitoring sheet which can be used by PMU and Supervision Consultant is in Appendix 3. Similarly, this monitoring sheet is indicative which can be further enhanced depending on the actual situations and other needs of information during the implementation phase.

393. PMU, with support from Supervision Consultant, shall consolidate its own findings with the reports from the Contractors. Based on consolidated information, PMU shall accomplish semi-annual environmental monitoring reports (SEMRs), which shall be submitted to ADB for review and disclosure on ADB website. Submission of SEMR will continue until ADB issues a Project Completion Report. The template for the SEMR is attached as Appendix 4.

394. ADB will carry out the following monitoring actions to supervise the subproject:

- (i) On a need basis, conduct visits when potential adverse environmental or social impact exists;
- (ii) Conduct supervision missions with detailed review by ADB's environment/social safeguard specialists and/or officers and/or consultants for components with adverse environmental and social impacts;
- (iii) Review the SEMRs submitted by PMU to ensure that adverse impacts and risks are mitigated as planned in the EMP;
- (iv) Work with PMU to rectify to the extent possible any failures to comply with its environmental safeguard commitments, as covenanted in the loan agreement and elaborated in all environmental safeguard documents; and formulate and implement a corrective action plan to re-establish compliance as appropriate; and
- (v) Prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, considering the baseline conditions and the results of monitoring.

395. ADB's monitoring and supervision activities are carried out on an on-going basis until a project completion report is issued. ADB issues completion report within 1-2 years after the project is physically completed and in operation.

Table 45: Environmental Quality Monitoring Plan^a

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
1. Design / Pre-Construction Phases							
1.1	Air Quality Sampling	PM2.5, PM10, SOx, NOx, CO	Subproject sites (PTWs, OHTs, distribution network alignments)	At least once for each site	National Ambient Air Quality Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	PMU, PIU, Supervision Consultant
1.2	Noise Level Measurement	Noise levels at daytime and night time in dBA	Subproject sites (PTWs, OHTs, distribution network alignments)	At least once for each site	National Noise Level Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	PMU, PIU, Supervision Consultant
1.3	Groundwater quality	pH, EC, TDS, chloride, arsenic, iron, manganese, fecal coliform, total coliform, and locally relevant contaminants	Representative PTWs and nearby monitoring points in each Paurashava	Baseline; semi-annually during construction where PTWs are rehabilitated or commissioned; semi-annually during first year of operation; thereafter as per O&M/regulatory plan	Bangladesh National Drinking Water Quality Standards; applicable ECR 2023 standards	Contractor during construction where relevant; DPHE/Paurasha va operator during operation	PIU, PMSC, PMU
2. Construction Phase							
2.1	Ambient air quality and dust	PM10, PM2.5 where feasible, visible dust, water spraying records, covered haulage, equipment emissions	Active excavation sites, haul routes, stockpiles, and sensitive receptors	Baseline; monthly during dry season or active dusty works; whenever complaints are received	Air Pollution Control Rules 2022; WHO/WBG EHS guideline values where more stringent	Contractor	PIU, PMSC
2.2	Noise Level Measurement	Noise levels at daytime and nighttime in dBA	Subproject sites and vicinities (relative to active construction areas)	At least once every six months with daytime and night time readings, throughout the construction period.	National Noise Level Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	PMU, PIU, Supervision Consultant

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
2.3	Groundwater quality (for construction and drinking purposes)	Groundwater level, All drinking water quality standards	Groundwater source at the subproject sites (if any) (active construction areas)	At least once every six months throughout the construction period	National Drinking Water Quality Standard	Contractor or through a nationally recognized laboratory sourced by Contractor	PMU, PIU, Supervision Consultant
2.4	Surface water protection near crossings and drainage channels	Visual turbidity, sedimentation, oil/grease sheen, waste/debris, pH, turbidity, TSS, BOD/COD if pollution is suspected	River, khal, pond, drain, and low-lying area crossings or nearby works	Baseline where works are near water bodies; monthly during active works near water bodies; after major rainfall or spill incident	Bangladesh Inland Surface Water Standards; ECR 2023; EMP requirements	Contractor	PIU, PMSC
	Noise and vibration at sensitive receptors	Daytime and nighttime noise levels, vibration where heavy equipment is used, complaint records, equipment maintenance logs	Schools, hospitals, mosques, markets, densely populated residential areas, and work fronts using heavy equipment	Baseline; monthly during construction; whenever complaints are received	Noise Pollution Control Rules 2006; applicable WHO/WBG EHS guideline values where more stringent	Contractor	PIU, PMSC
3. Operation Phase							
3.1	Air Quality Sampling	PM2.5, PM10, SOx, NOx, CO	Subproject sites and vicinity where O&M is being undertaken	As needed	National Ambient Air Quality Standards	DPHE/PMU/ PIU or through a nationally recognized laboratory sourced by operator	DPHE, PIU, Supervision Consultant (if still onboard)
3.2	Noise Level Measurement	Noise levels at daytime and night time in dBA	Subproject sites and vicinity where O&M is being undertaken	As needed	National Noise Level Standards	DPHE/PMU/ PIU or through a nationally recognized laboratory sourced by operator	DPHE, PIU, Supervision Consultant (if still onboard)
3.3	Groundwater quality	Groundwater level, All drinking water quality standards	All PTWs	At least once every six months throughout the operation period	National Standard for Drinking water	DPHE/PMU/ PIU or through a nationally recognized laboratory sourced by	DPHE, PIU, Supervision Consultant (if still onboard)

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
						operator	

^a All environmental quality sampling should follow methodologies and sampling periods per relevant rules and/or guidelines (ambient air quality, noise level, and water quality)

Table 46: EMP Implementation Monitoring Plan

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
1. Design / Pre-Construction Phases							
1.1	Design measures addressing risks of climate change	Design elements included to ensure infrastructure can withstand seismic events, flooding, landslides, etc. On PTWs, siting and depths considered climate change.	PMU / PIU / Supervision Consultant Office	Once after final detailed design is completed	Bangladesh National Building Code	DPHE Design Engineers / Supervision Consultant /	PMU / PIU
1.2	Raw Water Source Quality Sustainability	All required raw water quality parameters per national regulations	PMU / PIU / Supervision Consultant Office	Once after final detailed design is completed	Final detailed design	DPHE Design Engineers / Supervision Consultant /	PMU / PIU
1.3	Design phase consideration for an environmentally effective and efficient operation	O&M Manual preparation is initiated and/or prepared	PMU / PIU / Supervision Consultant Office	Ongoing basis during detailed design phase	O&M Manual draft	DPHE Design Engineers / Supervision Consultant /	PMU / PIU
1.4	Disruption of Public Utilities/services	Ensure that the respective authority of utility service providers and consumers are informed in time; and Inspect that utilities are being relocated at the designated site maintaining proper safety measures	Subproject sites	Monthly – prior to start of construction	Utility relocation plan	Contractor (together with relevant utility authority)	PMU, PIU, Supervision Consultant
1.5	Spoil disposal site identification	Spoil disposal site identified and corresponding clearance (or equivalent) is obtained.	PIU Office	On ongoing basis prior to contract award	Written confirmation of disposal site location. Clearance (or equivalent) issued.	PIU	PMU, Supervision Consultant

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
1.6	Physical cultural resources	Condition for Contractor to follow the chance finds protocol as discussed in the EMP/IEE are included in the bidding and contract documents.	PMU Office,	On ongoing basis prior to floating of bidding documents On ongoing basis prior to contract award	Bidding Documents Contract Documents	PMU, Supervision Consultant	PMU
1.7	Tree Removal	Check whether trees were preserved at the sites	For all the subproject areas	On an ongoing basis from start of mobilization to construction phase.	IEE requirement (avoidance of cutting of trees)	Contractor	PMU, PIU, Supervision Consultant
1.8	Consents, Permits, NOCs, Clearances, etc.	All valid permits, clearances and NOCs, are in place during the detailed design or pre-construction phase at the latest.	PMU / PIU Offices, Contractor office or site office	Ongoing basis; prior to start of construction	Copies of permits, clearances and NOCs.	PIU, Contractor	PMU, Supervision Consultant
1.9	Updating of IEE and Preparation of SEMP and all pre-construction sub-plans	Updated IEE based on final detailed design has been done. SEMP and all sub-plans per EMP/IEE requirements have been prepared by Contractor and approved by PMU/ PIU/ Supervision Consultant	PMU Office / Contractor Office	On ongoing basis during detailed design phase	Updated IEE report Approved SEMP Approved sub-plans	PMU, Supervision Consultant Contractor	PMU/ Supervision Consultant
1.10	Construction camps or workers' accommodation	Construction camps are established or built following standard requirements and recommendations in the EMP/IEE.	Construction camp sites	At least weekly or may be needed	EMP (including standards per IFC, ILO, and EBRD)	Contractor	PMU, PIU, Supervision Consultant
1.11	OHS and CHS implementation	PPE use, trench barricading/shoring, first aid, toolbox talks, emergency access, worker training, incidents, near misses, community complaints	All active construction sites, camps, storage areas, traffic diversion locations, and public interface areas	Daily site checks; weekly formal inspection; incident-based monitoring	Approved OHS/CHS plan; Bangladesh labor and OHS requirements; WBG EHS Guidelines	Contractor	PIU, PMSC, PMU

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
1.12	Community awareness	Continuing consultations done per EMP requirements	Contractor Office	On ongoing basis during detailed design phase	Reports of consultations done	Contractor	PMU, PIU, Supervision Consultant
1.13	EMP Implementation Training	EMP implementation training to Contractors, workers and DPHE and PIU personnel has been conducted prior to construction works.	Supervision Consultant Office	On ongoing basis during detailed design phase/pre-construction phase	Reports of training done	Supervision Consultant	PMU
2. Construction Phase							
2.1	Construction camps or workers' accommodation	Construction camps are maintained based on the EMP/IEE requirements.	Construction camp sites	At least weekly or may be needed	EMP (including standards per IFC and EBRD; and Sewage Facility Design)	Contractor	PMU, PIU, Supervision Consultant
2.2	Sources of Materials	Materials are sourced per EMP requirements	Storage areas at the different subproject sites	At least once every 6 months for Supervision Consultant throughout the construction period.	Materials register or record of purchase by Contractor	Contractor	PMU, PIU, Supervision Consultant
2.3	Spoil, waste, and drainage protection	Stockpile management, covers, toe bunds, silt traps, drainage blockage, haul route cleanliness, approved disposal records, reuse records, dust suppression	Excavation sites, stockpiles, haul routes, disposal areas, drains, khals, ponds, riverbank areas, and low-lying areas	Daily during excavation and hauling; after rainfall events	Approved Spoil and Excavated Material Management Plan; ECR 2023; applicable local authority requirements	Contractor	PIU, PMSC, PMU
2.4	Excavation and other construction activities	All mitigation measures for potential impacts arising from excavation and other construction activities as defined in the EMP are implemented effectively and efficiently (see EMP: - Land topography and aesthetics - Terrestrial flora and	Construction camps, work sites (active construction areas)	Daily by Contractor throughout the construction period. At least once every 6 months for Supervision Consultant throughout the construction period.	SEMP and other sub-plans, EMP; Complaints register Contractor monthly monitoring reports	Contractor	PMU, PIU, Supervision Consultant

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
		fauna resources - Surface water quality - Groundwater quality - Ambient air quality - Noise level at site and vicinity - Chance finds - Community and occupation health and safety - Local festivals and cultural practices - Grievances/ complaints					
2.5	Work-front sequencing and cumulative construction disturbance	Active work-front length, number of simultaneous work fronts, reinstatement status, community notification, emergency access, access restoration	All pipe-laying fronts across approximately 760.3 km distribution network	Weekly planning review; daily site inspection during active works	Approved SEMP; approved work-front sequencing plan; traffic management plan	Contractor	PIU, PMSC, Paurashava
2.6	Socioeconomic benefit	Local labor employment, income level status	Subproject sites	At least once in six months during the construction period.	Primary survey and consultations	Supervision Consultant (to be led by the Social Safeguard Officer)	PMU, PIU, Supervision Consultant
2.7	Community awareness and consultation	Progress of continuing community awareness and consultation	At the community areas and/or subproject sites (active construction areas)	At least once every six months	Minutes of meetings Record of attendees list Photolog	Contractor, Supervision Consultant	PMU, PIU, Supervision Consultant
2.8	Approved utility clearance, utility marking, permit-to-dig, trial pit/non-destructive detection records, utility damage incidents	Excavation, HDD, drilling, road cutting, and pipe-laying work fronts	Before work starts at each work front; daily during active excavation/HDD	Approved Utility Identification and Protection Plan; permit conditions; requirements of relevant utility authorities	Contractor	PIU, PMSC	Approved utility clearance, utility marking, permit-to-dig, trial pit/non-destructive detection records, utility damage incidents

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
2.9	ACM/asbestos chance-find control	Suspect ACM identification, stop-work record, barricading, competent person inspection, ACM method statement, PPE, disposal manifest if applicable	Existing pipeline replacement areas, old pipe corridors, excavation sites, rehabilitation/demolition areas	Continuous visual monitoring during excavation and demolition; immediate inspection upon chance find	National requirements; approved ACM method statement; good international industry practice	Contractor; competent ACM specialist where required	PIU, PMSC, PMU
2.10	Traffic, pedestrian access, and community safety	Barricades, signage, lighting, flag persons, temporary crossings, trench plates/bridges, emergency access, complaint records	Roads, markets, schools, hospitals, mosques, transport stands, residential and commercial areas along pipeline alignments	Daily during active works; peak-hour checks at congested locations; whenever complaints are received	Approved traffic management plan; national road safety requirements; community health and safety provisions in EMP/SEMP	Contractor	PIU, PMSC, Paurashava, local traffic police
3. Post-Construction Phase							
3.1	Post-construction site clean up	All post-construction site cleanup activities per EMP requirements have been done effectively	All subproject sites	At least once after construction phase but prior to final payment related to construction activities completed.	Contractor monthly reports Related Contractor activity reports	Contractor	PMU, PIU, Supervision Consultant
4. Operation Phase							
4.1	Surface water quality	All mitigation measures related to protection of surface water body, per O&M Manual (and EMP) are implemented effectively and efficiently	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.2	Groundwater quality	All mitigation measures related to protection of groundwater per O&M Manual (and EMP) are implemented effectively and efficiently	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.3	Groundwater source sustainability	Static water level, dynamic water level, pumping hours, abstraction volume, yield, signs of declining	All existing, rehabilitated, and proposed PTWs in Ishwardi, Pabna, Natore, and	Baseline before commissioning; monthly abstraction records during operation;	Bangladesh drinking water standards for water quality; design abstraction limits; operational triggers	DPHE/design consultant during baseline; DPHE/Paurashava operator	PMU, PIU, PMSC

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
		aquifer response	Gopalpur	groundwater level monitoring at least pre-monsoon and post-monsoon; more frequent if declining trend is observed	established in groundwater sustainability plan	during operation	
4.4	Ambient air quality	All mitigation measures related to avoidance or minimization of air pollution per O&M Manual (and EMP) are implemented effectively and efficiently	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.5	Noise level	All mitigation measures related to avoidance or minimization of noise pollution per O&M Manual (and EMP) are implemented effectively and efficiently	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.6	Waste Management	Check storage, transportation, disposal, handling of all types of wastes (e.g., packaging materials, engine filters, other garbage, etc.) at the worksites.	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.7	Community and Occupational Health and Safety	Complaints, Accident/Incident Records	All active O&M sites	As needed	O&M Manual; EMP; Complaints register	DPHE/ PIU (after turnover of facilities to Municipality or Paurashava)	DPHE, PIU, Supervision Consultant (if still onboard)
4.8	IRP backwash, sludge, and residuals management	Backwash water handling, sludge volume, sludge drying/containment, filter media disposal, disposal records, worker PPE, absence of direct discharge	Rehabilitated IRPs and associated sludge/backwash handling areas	Monthly during first year of operation; quarterly thereafter; after major maintenance events	ECR 2023 effluent/discharge standards; approved O&M manual; EMP requirements	DPHE/ Paurashava operator	PMU, PIU

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards or Methods	Responsibility	
						Implementation	Monitoring
4.9	Treatment chemical and disinfection safety	Chemical inventory, SDS availability, storage condition, secondary containment, PPE, spill kits, dosing calibration, residual chlorine records, spill/incident log	PTWs, IRPs, OHTs, chlorination/dosing points, chemical storage areas	Monthly inspection; immediate monitoring after spill or dosing incident	Chemical Handling and Emergency Response SOP; Bangladesh drinking water standards for residual chlorine; applicable safety requirements	DPHE/Paurashava operator	PMU, PIU
4.10	Drinking water quality	Residual chlorine, turbidity, pH, fecal coliform, total coliform, arsenic, iron, manganese, chloride, TDS, EC, corrective action and retesting records	PTWs, IRP outlets, OHTs, network points, DMAs, and representative consumer taps in each Paurashava	Operational checks daily/weekly for residual chlorine and turbidity where applicable; laboratory testing at least monthly during first year of operation and thereafter as per O&M/regulatory plan	Bangladesh National Drinking Water Quality Standards; WHO guideline values where more stringent and applicable	DPHE/Paurashava operator	PMU, PIU
4.11	Distribution system integrity and contamination risk	Pressure, leaks, repair records, flushing/disinfection records, low-pressure events, customer complaints, follow-up water quality tests	DMAs, low-pressure zones, leak-prone areas, repaired sections, consumer complaint locations	Monthly; after pipe repair, pressure loss, flooding, or contamination complaint	Approved O&M plan; Bangladesh drinking water standards; EMP requirements	DPHE/Paurashava operator	PMU, PIU
4.12	Public toilets, pit latrines, and FSM performance	Overflow, leakage, odor, vector nuisance, safe emptying records, PPE, desludging transport and disposal records, user complaints, protection from wells and drains	400 pit latrines, 2 public toilets, desludging routes, and treatment/disposal locations	Quarterly inspection; during and after desludging; after flood events; whenever complaints are received	National sanitation requirements; ECR 2023; approved FSM arrangement; EMP requirements	Paurashava/operator/service provider	PMU, PIU, PMSC
4.13	Accident/Incident	Serious incident notification, root-cause analysis, corrective action register, closure evidence, recurrence prevention	All project sites and operation facilities	Immediate notification; incident reporting within 48 hours for serious incidents; follow-up until closure	ADB reporting requirements; EMP/SEMP; approved incident reporting procedure	Contractor during construction; DPHE/Paurashava operator during operation	PIU, PMSC, PMU

A. Environmental Budget

396. Costs for implementing the EMP in this IEE report include monitoring costs during construction and capacity building costs on environmental management, which are absorbed into the Contractor's work contract. The costs for training proposed include the costs incurred toward site visits, travel to the training program by participants, printing of training materials, and other logistic arrangements. The costs involved towards preparation of training material and training are covered in the consultancy budget for the Supervision Consultant. These costs are presented in table below.

397. The cost estimates mentioned in table below are indicative amounts. These shall be reviewed by the Contractor, and assessed if enough for implementing the EMP. Any budget shortfall, including other necessary measures identified during the implementation phase, shall be supplemented from the provisional sum of the Contractor's contract.

398. As such, these costs must be included in the Contract documents along with a copy of IEE. The EMP implementation shall be integrated into the Project Administration Manual (PAM).

Table 47: Indicative Cost Estimates to Implement the EMP*(This set of indicative cost estimates is intended for each package under the subproject)*

Particulars	Stage	Unit	Total number	Rate	Cost	Costs covered by
				(BDT)	(BDT)	
Mitigation Measures						
Environmental mitigation / enhancement measures integrated into the designs and costs included as part of civil works, including procurement of PPE and OHS measures ^b	Pre-construction / Construction	Number/ Package	LS	1,500,000	1,500,000	Contractor
Barricading sites for public safety, Implementing traffic management plans, Emergency preparedness and contingency Worker health and safety Community disruptions, Support Fiber-Reinforced Plastic (FRP) Mobile Toilet, Provision of alternative access routes and safety measures. Restoration of construction sites	Pre-construction/ Construction	Per Package	LS	1,000,000	1,000,000	Contractor
Sub-Total (A)					2,500,000	
Monitoring Measures						
Air Quality monitoring	Pre-Construction: Once	Per Package	5	25,000	125,000	Contractor
Air Quality monitoring	Construction: Twice/Year for 4 years	Per Package	23	25,000	575,000	Contractor
Noise level	Pre-Construction: Once for day time and night time	Once Per Package	55	2,000	110,000	Contractor
Noise level	Construction: Twice/Year for 4 years for day time and night time	Once Per Package	248	2,000	496,000	Contractor

Particulars	Stage	Unit	Total number	Rate	Cost	Costs covered by
				(BDT)	(BDT)	
Water quality (Pre-Construction)	Pre-Construction: Once	Per Package	5	12,000	60,000	Contractor
Water quality (Construction)	Construction: Twice/Year for 4 years	Per Package	30	12,000	360,000	Contractor
Various Monitoring (Adequacy of solid waste management system, chemical waste disposal, implementation of community and occupational health and safety measures) ^d	Construction, Post construction and operation	Per visit	8	50,000	400,000	PMU, Supervision Consultant
Socioeconomic monitoring	Construction, Post construction and operation	Per visit	8	50,000	400,000	PMU, Supervision Consultant
Sub-Total (B)					2,526,000	
Health Safety and Medical Facilities, including Medical Equipment, Industrial First Aid Box, Foldable Emergency Stretcher, Spine Board (Backboard Stretcher), Digital BP Monitor & Thermometer, Oxygen Cylinder (Portable - 2L), Consumables & Refills, PPE for First Aiders (Gloves, Masks, Aprons), Personnel & Logistics, Medicines, Medical consumables (Bandages, Gauze, Savlon, ORS, Cotton), Ambulance rental	Pre-construction / Construction	Monthly/Pack age	54	35,000	1,890,000.00	Contractor
Sub-Total (C)					1,890,000.00	
Public Consultation and Information Disclosure						
Information disclosure and consultations including a public awareness campaign, rally, special day celebration, media coverage, etc.	Pre-construction / Construction	Nos/Packag e	18	5,000	90,000	Contractor
Sub-Total (D)					90,000	
Capacity Building						
Introduction and sensitization to environmental issue	Preconstruction	LS	1	40,000	40,000	Supervision Consultant
Subproject training on hazards, health, safety, and environmental issues	Preconstruction	LS	1	40,000	40,000	Supervision Consultant

Particulars	Stage	Unit	Total number	Rate	Cost	Costs covered by
				(BDT)	(BDT)	
EMP implementation	Construction	LS	16	10,000	160,000	Contractor
Sub-Total (E)					240,000	
Total (A+B+C+D+E)					7,246,000	
Any unanticipated impact due to project implementation (F)					200,000	Contractor
Total Budget for EMP implementation Per Package					7,446,000	
Total (in USD) @ BDT 123 per USD					60,537	

IX. CONCLUSIONS AND RECOMMENDATIONS

399. This IEE has been prepared based on review of the environmental condition of the subproject area where the subproject sites are located, the immediate surrounding communities, possible biodiversity areas near the sites, preliminary technical information on the proposed distribution network and sanitation packages, consultation with the stakeholders, and other primary and secondary information of the site and its surroundings. The overall findings of this IEE are:

- (i) The subproject will be a beneficial undertaking because it will improve the quality of life of the people of the *Paurashavas* Pabna, Ishwardi, Gopalpur and Natore through provision of 24/7 drinking water source;
- (ii) The IEE identifies substantial risks relating to: groundwater sustainability; non-revenue water; rehabilitation of aging infrastructure; institutional O&M capacity; and treatment unit performance. Achievement of continuous ("24/7") supply will depend on final design adequacy, sustainable source management, treatment performance, operational efficiency, and long-term asset management;
- (iii) The environmental assessment indicates that no significant irreversible or unprecedented impacts are anticipated. However, moderate environmental risks remain associated with raw-water quality, construction activities, management of treatment residuals, community health and safety, and long-term source sustainability. These impacts are expected to be reduced to acceptable levels through implementation of the EMP, monitoring program, and adaptive management measures;
- (iv) Although project facilities are located primarily within existing urbanized areas and outside legally protected areas and designated critical habitats, environmentally sensitive receptors remain present, including rivers, drainage channels, aquatic ecosystems, and community water resources. Appropriate mitigation measures have therefore been incorporated into the EMP to avoid or minimize indirect impacts on these receptors;
- (v) No significant permanent social impacts relating to land acquisition, physical displacement, loss of productive land, or long-term loss of livelihood are anticipated. However, temporary disruptions to access, mobility, and commercial activities may occur during construction and shall be managed through traffic management, stakeholder engagement, and grievance redress measures;
- (vi) During construction and operations, the subproject will not have significant adverse environmental impacts and potential adverse impacts are manageable through the effective implementation of the EMP;
- (vii) The subproject sites are in the built-up and developed urban area of Bangladesh. These are far from any environmentally sensitive areas, and potential impacts to these sensitive areas are not expected; and
- (viii) The IEE also confirmed that there are no significant social impacts pertaining to land loss, physical displacement, loss of income, and loss of productive land as a result of implementing the subproject.

400. While individual construction impacts are generally localized and temporary, cumulative impacts arising from simultaneous construction activities, traffic disruption, access restrictions, and community disturbance across multiple work fronts require careful management through

construction sequencing and strict implementation of the EMP. It is therefore recommended that the subproject be supported, subject to the implementation of the commitments contained in the EMP and allocation of appropriate technical, financial and human resources by the implementing agency DPHE.

401. **Recommendations.** During the finalization of the design, the DPHE technical design team shall ensure sustainability of the subproject in terms of the supply and quality of raw water, including the quality of treated water which should comply with the Bangladesh National Drinking Water Quality Standards. In view of the environmental audit conducted on the existing facilities, the following corrective actions are recommended for consideration in conjunction with other environmental safeguard measures in the final detailed design and operations of the future water supply system.

**Table 48: Suggested Corrective Actions for Environmental Issues in Existing Facilities
(For Consideration in the Final Detailed Design)**

Issue	Mitigation Measures	Responsible Agency
Unsustainable dependence on groundwater; heavy metals (iron, manganese, arsenic) contamination	• Install iron/manganese removal units and arsenic-safe treatment technologies. • Diversify sources by shifting to surface water. • Introduce demand management (metering, leakage reduction, tariffs). • Regular monitoring against Bangladesh National Drinking Water Standards.	DPHE
Non-compliance with national drinking water quality standards	• Upgrade treatment plants to meet Bangladesh National Drinking Water Quality Standards. Upgrade designed for worst case water quality of Padma River in the medium to long term. This may include, among others, additional coagulation, sedimentation, filtration and disinfection units. • Introduce standard operating procedures for chemical dosing, monitoring, and emergency handling. • Implement wellhead protection zones to prevent contamination.	DPHE
Distribution network leakage and non-revenue water	• Replace aging PVC pipelines with HDPE/ductile iron. • Implement DMAs. • Prioritize repair of high-leakage zones.	DPHE
Inadequate manpower and institutional capacity	• Provide consultant support in the interim. • Build staff capacity for monitoring, preventive maintenance, record-keeping. • Training on safeguards and occupational safety.	Paurashavas, supported by DPHE/ADB

402. During pre-construction phase, the contractor/s shall prepare the following required work plans and submit to PIU, through the PMU or PMSC, for approval. No works shall commence until any relevant or required work plan is approved, which include, among others, the following:

- (i) Site-Specific Environmental Management Plan (SEMP);
- (ii) Emergency Preparedness and Response Plan;
- (iii) Utility Protection and Relocation Plan;
- (iv) Spill Prevention and Response Plan;
- (v) Camp Management Plan (if camps used);
- (vi) Traffic Management Plan;
- (vii) Spoil Management Plan;
- (viii) Waste Management Plan; and
- (ix) Health and Safety Management Plan (Community and Occupational).

403. This IEE needs to be updated during the detailed design phase to reflect the final design ensuring compliance with the design measures suggested in this document, including measures to ensure sustainability of the drinking water supply system. The updated IEE shall be submitted to ADB for review, clearance and disclosure during detailed design phase but prior to start of construction. The cleared updated IEE shall be treated as the final IEE. No works can commence until (i) the final IEE cleared by ADB is provided to the contractor/s, and (ii) the SEMP, including other work plans, prepared by the contractor, is approved by PMU. If circumstances would require, the IEE will be further updated for ADB's review during the implementation period. In the event of unanticipated impact and/or any design change and/or non-compliance during subproject implementation period, the IEE shall be updated to include (i) assessment of the unanticipated impact and corresponding mitigation measures; and/or (ii) information on the design change and assessment of associated environmental impacts, if any; and/or (iii) corrective actions, associated cost and schedule; respectively. Further, the PMU shall:

- (i) Include this IEE in the bidding and contract documents;
- (ii) Obtain all statutory clearances and ensure relevant conditions or requirements are incorporated in the detailed design;
- (iii) Update/revise this IEE based on final detailed design that ensures sustainability and/or if there are unanticipated impacts or significant change in scope in any component of the subproject;
- (iv) Conduct safeguards induction to the contractor/s after award of contract;
- (v) Ensure contractor/s appoint/s qualified environment, health and safety (EHS) officer prior to start of works;
- (vi) Disclose information and establishment of GRM in a timely manner;
- (vii) Strictly supervise EMP implementation;
- (viii) Continue consultations with stakeholders;
- (ix) Monitor and report status of implementation of the EMP on a regular basis as indicated in the IEE; and
- (x) Report serious environmental, health, safety, or community incidents to ADB in accordance with applicable reporting requirements and implement corrective actions.

404. The Category B classification is confirmed because anticipated impacts are generally site-specific, temporary, reversible, and readily mitigated through known measures. No significant irreversible, diverse, unprecedented, or transboundary impacts are expected, and no project component is located within a protected area or critical habitat. Nevertheless, the project requires careful management of cumulative construction impacts, source sustainability risks, water-quality risks, and community health and safety risks.

Appendix 1: Rapid Environmental Assessment Checklist of the Subproject

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Policy and Technical Services (OSPT) team of the Office of Safeguards.
- (ii) This checklist focuses on environmental issues and concerns and includes an asbestos screening tool. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and indigenous peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.
- (iv) If multiple checklists are submitted, do not fill out duplicated sections, such as project siting and the asbestos screening tool.

Country/Project Title: BAN: Cluster Towns Water Supply and Sanitation Project

Sector Division: SD2-WUD

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area:			
▪ Densely populated?		☐	Population density varies between 1300 to 6700 persons/sq.km
▪ Heavy with development activities?		☒	Some households and industry may have limited infrastructure development in these areas.
▪ Adjacent to or within any of the following environmentally sensitive areas?			
• Cultural heritage site	☒		Each municipality have their own local cultural and heritage sites, but those are not enlisted internationally.
• Legally protected area (core zone or buffer zone)		☐	No such area reported.
• Wetland	☒		There are some rivers and water bodies around the project sites, Besides, there are irrigated rice/crop fields. According to the definitions, these fall under the wetland category.
• Mangrove		☐	No saline water bodies or mangroves in these areas.

Screening Questions	Yes	No	Remarks
• Estuarine		o	More than 200 km away from the sea.
• Special area for protecting biodiversity		o	No protected biodiversity zones in or around the municipal areas.
• Bay		o	More than 200 km away from the sea.
B. Potential Environmental Impacts Will the project cause:			
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		o	This project does not include such surface water prone to such pollution.
▪ impairment of historical/cultural monuments/areas and/or loss/damage to these sites?		o	Such sites are rare. Some minor areas may need water connections which shall not run through those sites.
▪ land subsidence caused by excessive ground water pumping?		o	The sites already are dependent on groundwater and no such reports of subsidence.
▪ social conflicts arising from displacement of communities?		o	Water transmission and distribution mains shall run through the right of way of the existing roads.
▪ conflicts over water supply with other beneficial water uses due to abstraction of raw water?		o	Some of the agricultural use of groundwater may compete, but the volume involved in the planned water supply is far smaller than that of irrigation.
▪ unsatisfactory raw water supply (e.g., excessive pathogens or mineral constituents)?		o	On the contrary, this project will make sure of a better quality of water.
▪ delivery of unsafe water to distribution system?		o	Selected sources are proven to be safe sources. Besides, the existing water treatment plants shall be restored.
▪ inadequate protection of intake works or wells, leading to pollution of water supply?	o		This phase of the project does not involve any intake work. Protection of wells is a standard process and may need extra care and supervision in this aspect.
▪ over pumping of ground water, leading to salinization and ground subsidence?	o		Even though the water volume is much less than that of irrigation of surrounding agricultural land, the possibility is not ruled out.
▪ excessive algal growth in storage reservoir?		o	

Screening Questions	Yes	No	Remarks
▪ increase in production of sewage beyond capabilities of community facilities?	o		A better water supply will lead to increased wastewater flow and may increase the volume of sewage.
▪ inadequate disposal of sludge from water treatment plants?	o		IRP's shall produce sludge and previous failures were caused by the lack of capacity to maintain those facilities.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect these facilities?		o	These pumps and other moving parts do not produce such noise nuisances.
▪ impairments associated with transmission lines and access roads?	o		During the construction phase some access roads will face this problem.
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		o	Such hazardous chemicals are not involved in this project.
▪ health and safety hazards to workers from handling and managing chlorine, contaminants, and/or biological and physical hazards during project construction and operation?	o		Safety hazards for the people caused by unprotected open cut trenches.
▪ dislocation or involuntary resettlement of people?		o	No resettlement issue arises as the water transmission and distribution mains shall run through the right of way of the existing roads.
▪ disproportionate impacts on the poor, women and children, indigenous peoples, or other vulnerable groups?		o	On the contrary, this project shall improve the livelihoods of these people.
▪ noise and dust from construction activities?	o		It is a common problem during construction.
▪ increased road traffic due to interference of construction activities?		o	This type of work does not warrant its own heavy traffic during construction.
▪ soil erosion/silt runoff from construction?		o	Soiling of roads might be a problem but that should not induce erosion.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulation in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		o	GW supply generally less likely to produce such a problem.
▪ delivery of water to distribution system that is corrosive due to inadequate attention to feeding of corrective chemicals?		o	Corrosive chemicals are not prescribed for any process that may cause corrosion.
▪ accidental leakage of chlorine gas?		o	

Screening Questions	Yes	No	Remarks
▪ excessive abstraction of water affecting downstream water users?		0	
▪ increased sewage flow due to increased water supply?	0		
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant?	0		Sullage will increase due to increased water usage.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		0	Construction is mostly mechanized and not labor intensive to cause large population influx.
▪ social conflicts if workers from other regions or countries are hired?		0	Less likely
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		0	Use of such materials are most unlikely during this project.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning?	0		Open trenches and the pit for HDD should be secured with protective fencing and retro reflective paints. HDPE pipe rolls should be securely stored.

ASBESTOS SCREENING TOOL

Screening Questions	Yes*	Maybe*	No	Remarks *For those with answers of YES and MAYBE , document the potential likelihood of asbestos being encountered.
Does the proposed project involve, or potentially involve, any of the following activities that are commonly associated with asbestos use:				
• Construction/commissioning of a new asset?			0	
• Refurbishment/demolition of an existing asset?			0	
• Post-disaster response, involving reconstruction, repair, or removal of damaged assets?			0	
• Maritime activities?			0	
• Water supply, sanitation, wastewater, sewerage, or water hygiene initiatives?			0	
• Earthworks, remedial activities, or solid waste management?		0		Some parts of the buried pipe may be blasted through.
• Power, telecommunications, or energy supply infrastructure?			0	
• Maintenance, demolition, transportation, or disposal of waste associated with the above activities?		0		If blasted through, spoils need to be disposed.

Note: If you answered YES or MAYBE to the above questions, assume that the project is likely to encounter asbestos as a direct or indirect result of project-related activities and proceed to the toolkit for screening asbestos risks in new ADB-supported projects Part B – Screening Tools and Checklists

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: BAN: Cluster Towns Water Supply and Sanitation Project

Sector: Water and other urban infrastructure and services

Subsector: Urban policy, institutional and capacity development

Division/Department: DPHE

Screening Questions		Score	Remarks ²⁹
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed, etc.)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	Extreme temperature difference will affect durability.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	Flooding affects maintenance of buried pipes
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g., hydro-power generation facilities) throughout their design lifetime?	1	GWT can be affected by aquifer recharge, i.e. rainfall.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result in a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned to a medium risk category. A total score of 5 or more (which includes providing a score of 1 in all responses) or a 2 in any single response, will be categorized as Medium risk project.

Result of Initial Screening (Low, Medium, High): 3

²⁹ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Other

Comments: _____

Prepared by: _____

Appendix 2: Sample Daily Environmental and Health-Safety Monitoring Form Contractors.

Name: Cluster Town Water Supply and Sanitation Project

WP:

Name of EMO:, Mobile #

Date of Visit: Time: Location #

1. Please check the construction items you visited:

☐ Site clearing/grabbing activity ☐ Earth works and compaction ☐ Piling works ☐ Distribution Network ☐ OHT Construction site ☐ PTW rehabilitation work ☐ Surface Water Plant work	☐ Concrete batching plant ☐ Crushing plant ☐ Brick crushing plant ☐ Oil dispensing system ☐ Lubricants/chemical materials storage ☐ Please mention any other.....
--	--

2. Please tick the status of environmental and health safety level you observed during your visit:

	Worst	←	→	Best
Environmental issues				
☐ Dust / Air pollution	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Noise/Sound	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Water pollution	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Solid waste/construction debris	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Hazardous Waste	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Sewage leakage	☐ High	☐ Medium	☐ Low	☐ Zero
☐ Spills / Site contamination	☐ High	☐ Medium	☐ Low	☐ Zero
 Health & Safety Issues				
☐ PPE use	☐ Poor	☐ Moderate		☐ Good
☐ Fence/barricade/Safety Signage	☐ Poor	☐ Moderate		☐ Good
☐ Housekeeping/Tidiness	☐ Poor	☐ Moderate		☐ Good
☐ First aid and medical support	☐ Poor	☐ Moderate		☐ Good

Note: Please provide detail information for the environmental issues marked 'High' and 'Medium', and Health-Safety Issues with 'Moderate' and 'Poor' in relevant sections as follows.

3. Air Emission

- a. Please mention which location is observed with air emission/dust pollution.
- b. Are there any sensitive receptors exposed to air pollution? If so, please give detail. (Distance from the source of pollution, type of receptor, number of exposed persons, etc.).
- c. What measures are taken at site to control air quality? Please discuss with evidence, i.e., data, pictures, etc.
- d. Specify what mitigation measures need to be implemented further to control air quality level within the DOE standards. Who is responsible?

4. Noise/Sound Pollution

- a. What are the sources of noise/sound?
 1. o Generator, o Metal Cutting Machine, o Grinding machine, o Vibrator,
 2. o Crushing Machine, o Hauling trucks, o Existing Highway Traffic, o HDD Equipment
 3. o Others, please mention _____
- b. Are there any sensitive receptors exposed to noise? If yes, please give detail. (Distance from the source of noise, type of receptor, number of exposed person, etc.)
- c. What measures are taken at site to control noise? Please discuss with evidence i.e., data, pictures etc.
- d. Specify, what mitigation measures need to be implemented further to control noise level within the DOE standards. Who is responsible?

5. Waste Management

What kinds of waste did you observe during site visit?

o Spoil, o Construction debris, o Mud, o Any other, please mention _____

Volume of wastes (M³): _____ approx.

Location: _____, Number of days dumped here: _____ day

Please mention by when waste will be disposed of properly:

- a b. Are there any wastes creating unhygienic and filthy environment at the camp site?
 4. o Yes o No
 - If so, please explain _____
- c. Are solid/hazardous wastes stored for reuse, recycle or disposal labeled properly for identification?
 - o Yes o No, Please mention in detail _____
- d e. Is there any drainage congestion due to waste/sediment disposal to drains or in runoff channel that cause localized inundation or stagnation?
 5. o Yes o No
 - If yes, location and problem caused in detail:

6. Storage of Chemicals/Oil/Hazardous Materials

Check the types of chemicals/ hazardous materials stored with approx quantity.

o ChlorineKg

o Chemical admixture Ltrs

o PaintsLtrs

o Oil Ltrs

o Potash Alum Kg

o Lubricants Ltrs

o Others, please mentioned Ltrs

a. Check whether all primary containers are enclosed in secondary containments to prevent release of the chemicals/hazardous materials to environment?

☐ Yes ☐ No

If no, please mention in detail _____

b. Is there contamination of soil/water due to leakage/spillage of oil, bitumen and other chemicals?

☐ Yes ☐ No

If yes, please mention _____

c. Please mark whether chemical & hazardous materials are

- Labeled properly in Bangla for identification. ☐ Yes ☐ No
- Stored with safety instructions properly on the storage container for handling. ☐ Yes ☐ No
- Managed by trained staff. ☐ Yes ☐ No

If no, please mention _____

d. Are emergency response procedures (fire extinguishers, PPE, solvents, etc.) in place to address any accidents? ☐ Yes ☐ No

If no, please mention by when to be addressed

7. Spills / Site Contamination

a. What materials did spill out or be released?

6. ☐ Oil, ☐ Chemicals, ☐ Lubricants, ☐ Hazardous materials, ☐ Sewage sludge

Location: _____ When did spill? _____

b. What environmental media was contaminated by the spill or release of chemical or hazardous materials?

☐ Soil, ☐ Surface water, ☐ Ground water, ☐ Air, ☐ Other _____

Location incident happened: _____

c. What measures did the contractor take to clean-up or remediate the site?

7. Please mention: _____

If no, please get the plan of site remediation. _____

8. Occupational Health and Safety

- a. Is there health risk due to unsafe working conditions (e.g. improper PPEs, unprotected construction site, dust pollution, high noise, etc.)?
 - ☐ Yes ☐ No
 - If so, what poses health risk:
 - Location:
 - By when to be addressed:
- b. Is there proper safety barrier to control trespassing and traffic management at construction site?
 - ☐ Yes ☐ No
 - If no, please mention location:
 - By when safety barrier will be erected:
- c. Are the instructions given in the Traffic Management Plan followed for proper traffic flow?
 - ☐ Yes ☐ No
 - If no, please mention which location
 - What specific traffic management problem was observed:
 - What and by when measures will be taken
- d. Are there adequate safety signs and symbols to be aware and educate pedestrians and existing traffic about construction activities and their safety precautions?
 - ☐ Yes ☐ No
 - If no, by when necessary, safety signboards and signage will be placed:
- e. Are construction sites provided with first aid and medical support services?
 - ☐ Yes ☐ No
 - If yes, please specify to what level:
 - If no, please mention by when first aid and emergency medical support service will be developed:
- f. Please provide a number of incidents/accidents that took medical support or first aid with necessary evidence. Please mention briefly about the incidents

9. Personal Protective Equipment

- a. Do contractors provide adequate PPEs of proper quality?
 - ☐ Yes ☐ No
8. If no, mention reason:
- b. Do you maintain a PPE register:
 - ☐ Yes ☐ No
 - If yes, please mention present stocktaking, last issue date, change request, etc.
- c. Do workers and employees use PPE properly?
 - ☐ Yes ☐ No
 - If no, write workers' names and designation not using PPEs.
- d. Corrective Action. Take specific date by when proper PPE will be used properly.

10. General Housekeeping

- a. Check whether construction materials (stones, bricks, bitumen, rods, etc) are stocked/piled in the designated area with proper labeling?
 - ☐ Yes ☐ No

If no, please mention by when housekeeping will be improved:

- b. Are base camp and workers' shed premises clean?

☐ Yes ☐ No

Is there a dedicated person to cleaning premises?

How frequently cleaned:

- c. Are there separate waste collection bins for disposal of different types of waste (kitchen, paper, plastic waste, construction debris, etc.)?

☐ Yes ☐ No

If no, please mention by when bins will be placed:

Note: *To substantiate your observations, relevant pictures and documents are to be attached as evidence.*

Signature of the EMO

Date

Appendix 3: A Sample Environmental Monitoring Form

(To be used by PMU and Supervision Consultant)

Project Name: Cluster Town Water Supply and Sanitation Project (CTWSSP)

WP:

Name: _____ Date: _____

Title: _____

Location: _____

Site Visit/Inspection

Emissions	
Air Quality, Dust condition	
Noise pollution	
Hazardous Substances	
Waste Minimization initiatives	
Reuse and Recycling initiatives	
Condition of trees and Vegetation at around the site	
☐ Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s	
☐ Identify muddy water was escaping site boundaries, or muddy tracks were seen on adjacent roads.	
☐ Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures.	
☐ Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Use photographs of each area.	
☐ Confirm spill kits on site and site procedure for handling emergencies.	
☐ Identify any chemical stored on site and provide information on storage conditions. Use photographs for evidence.	
☐ Describe management of stockpiles (construction of materials, excavated soils, spoils, etc.). Use photographs.	
☐ Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Use photographs.	
☐ Provide information on barricades, signages, and on-site boards. Use photographs.	
☐ Describe conditions of hauling vehicles/cranes/equipment operating.	
☐ Describe performance of batching plants, crushing plants/concrete mixer machine.	

INCIDENT:

Nature of incident: _____

Intervention Steps: _____

Incident Issues

Resolution

Project Stage	Design	
	Pre-construction	
	Construction	
	Operation	
	Guarantee Period	

Site Restored to Original Condition

Yes

☐

No

☐

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

Signature

Appendix 4: Template for the Semi-Annual Monitoring Report (SEMR)

Preamble: The Environmental Monitoring Report template is recommended based on common practice of environmental monitoring and reporting of urban infrastructure development projects. The practitioners of this template will use their own judgment to customize their monitoring report considering the nature of the project and its environmental issues and impacts. Moreover, the environmental impact significance of any project/sub-project activity varies with environmental settings of that site/area. Site specific consideration is very important during EMR reporting.

Executive summary

INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009, Environmental category of each subproject as per national laws and regulations
- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/ List of Works	Status of Implementation (Pre-construction/ Construction/ Operation)	Status of Environmental Approval*	SEMP prepared and Approved by PMU (Y/N)	If On-going Construction ³⁰	
					% Physical Progress	Expected Completion Date

*Provide specific response from list below:

- Not yet due (detailed design not yet completed)
- IEE/EIA report prepared and shared with ADB for comments
- IEE submitted to DOE for clearance
- Environmental clearance obtained (provide date) and Valid
- Submitted to ADB (Provide Date of Submission)

- Identify the role/s of the Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including signed monthly environmental site inspection reports prepared by consultants and/or contractors.
- Substantiate compliance and non-compliance statements with relevant photographs.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

List of works completed during reporting period

³⁰ If on-going construction, include %physical progress and expected date of completion.

Scope of the EMR

- Scope of monitoring report in the reporting period
- Emphasize on the works that have been implemented during the reporting period and having high potentiality of environmental impacts
- Monitoring requirements including frequency of submission as agreed upon in EMP.

9.

Changes in project scope (if any) and adjusted environmental safeguard measures, if applicable.

Project Safeguard Steam

Name	Designation/Office	Email Address	Contact Number
(i) PMU			
PIUs			
Contractor			

Compliance status with National/ statutory environmental requirements³¹

Package No.	Subproject Name	Statutory Environmental Requirements ³²	Status of Compliance ³³	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish ³⁴

Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

Approach and methodology for environmental monitoring of the project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project
 - Monitoring environmental components (soil, air, water, etc.) with parameters

³¹ All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

³² Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

³³ Specify if obtained, submitted and awaiting approval, application not yet submitted

³⁴ Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

- Frequency of Monitoring
- Location of monitoring

Compliance status with the environmental management plan (refer to EMP TaBLES in APPROVED IEE/s)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Project activity conducted during reporting period	Potential Impacts	Proposed mitigation measures as per EMP	Actual Implementation	Recommendations	Compliance status

Non-compliance issues identified during the reporting period have been presented below with implementation timeline:

Description of non-compliance	Corrective Actions recommended	Responsible Person	Timeline for Action

Grievance Redress Mechanism (complaints Received during the Reporting Period.)

10. Provide information on the number, nature, and resolution of complaints received during the reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

Complaints log

Log Ref	Complainant/ Date of Contact	Location	Details of Complaint	Investigation/ Mitigation Action	Resolution Status

Environmental Monitoring Activities

Summary of Environmental Monitoring Activities (for the Reporting Period)³⁵

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

Monitoring reports should be attached with the EMR. If test reports are too many, then sample reports may be attached from each category (water, soil, air, noise etc.)

³⁵ Attach Laboratory Results and Sampling Map/Locations

Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum, the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (µg/m ³)					
			SPM	PM _{2.5}	PM ₁₀	SO ₂	NO ₂	CO
Government Standards			-	65	150	80	80	5

Groundwater Quality Results

Site No.	Date of Sampling	Site Location	Parameters							
			pH	EC	TDS	Chloride	Fluoride	Hardness	Arsenic	Iron
Government Standards			6.5 – 8.5	(µS/cm)	1000mg/Lt	250mg/Lt	1.0mg/Lt	500mg/Lt	0.05mg/Lt	0.3-1.0mg/Lt

Surface Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters								FC	TC
			pH	DO	BOD	TDS	Turbidity	Salinity	Nitrate	Phosphate		
Government Standards			6.5 – 8.5	>6 mg/Lt	<2mg/Lt	10mg/Lt	NTU	mg/Lt	7mg/Lt	mg/Lt	cfu/100ml	>100cfu/100ml

Noise Quality Results

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Monitoring Results)			
			Commercial Day Time	Commercial Night Time	Mixed Day Time	mixed Night Time
Government Standard			70dBa	60dBa	60dBa	50dBa

Describe/explain if there is any non-compliance or higher test results observed for the parameters.

SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- BOQ
- Other

Appendix 5: Grievance Registration Form

Aggrieved party details		
Name (optional)		
Company/Entity (optional)		
Contact details (optional; if no details are provided, it will not be possible to provide acknowledgment or details of the resolution)		
Anonymity (If applicable, state whether your identity can be disclosed).	☐ Yes	☐ No
Date of submission		
Grievance details		
Description of grievance (describe exactly who, what, where, when, how the event occurred?)		
If applicable, date and/or duration of the incident that led to the complaint.		
Has this grievance been raised previously?	☐ Yes	☐ No
	Date:	Place:
List any attached documents, witness names, emails, photos, or physical evidence that support your complaint.		
Suggestions for how the grievance could be resolved?		

Appendix 6: Photos and Some Attendance Sheets of the Stakeholder and Public Consultation Meetings



Photo 1: Public Consultation meeting at Natore Paurashava.



Photo 2: Visiting FSTP site at Natore Paurashava.



Photo 3: Visiting PTW site at Ishwardi Paurashava.



Photo 4: Stakeholder Meeting at Gopalpur Paurashava



Photo 5: Stakeholder discussion at Natore DPHE



Photo 6: Stakeholder Meeting at Pabna, DPHE.



Photo 7: Visited PTW site at Pabna



Photo 8: Discussion with people at Gopalpur.



Photo 9: Consultation meeting at Pabna Paurashava.



Photo 10: Public consultation meeting at Pabna.

Attendance sheets of Some of the Public Consultation Meetings held in Ishwardi Cluster.

Department of Public Health Engineering
Cluster Towns Water Supply and Sanitation Project (CTWSSP) Phase I
Exchange of views with locals on environmental issues and other issues
(পরিবেশগত বিষয়াদি সহ অন্যান্য বিষয়ে স্থানীয়দের সাথে মতবিনিময়)

Name of Paurashava: Pabna Paurashava

Date:

Attendance Sheet

Sl.No	Name of Participants	Designation	Mobil Number	Signature
১	শ্রী: হুমায়ুন হোসেন			
২	শ্রী: জাতিহীন হোসেন			
৩	শ্রী: জাতিহীন হোসেন			
৪	শ্রী: নাজিমুল হক			
৫	শ্রী: মোহাম্মদ মুন্সির (মুন্সির)			
৬	শ্রী: মোহাম্মদ মুন্সির			
৭	শ্রী: জাতিহীন হোসেন			
৮	শ্রী: জাতিহীন হোসেন			
৯	শ্রী: জাতিহীন হোসেন			
১০	শ্রী: জাতিহীন হোসেন			
১১	শ্রী: জাতিহীন হোসেন			
১২	শ্রী: জাতিহীন হোসেন			
১৩	শ্রী: জাতিহীন হোসেন			
১৪	শ্রী: জাতিহীন হোসেন			
১৫	শ্রী: জাতিহীন হোসেন			
১৬	শ্রী: জাতিহীন হোসেন			
১৭	শ্রী: জাতিহীন হোসেন			
১৮	শ্রী: জাতিহীন হোসেন			
১৯	শ্রী: জাতিহীন হোসেন			
২০	শ্রী: জাতিহীন হোসেন			

Department of Public Health Engineering
 Cluster Towns Water Supply and Sanitation Project (CTWSSP) Phase I
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 (পরিবেশগত বিষয়াদি সহ অন্যান্য বিষয়ে স্থানীয়দের সাথে মতবিনিময়)

Name of Paurshava: Pabna Paurashava

Date:

Attendance Sheet

Sl.No	Name of Participants	Designation	Mobil Number	Signature
১৯	শ্রীমতী সত্যজিৎ দেবী			
২০	শ্রীমতী সত্যজিৎ দেবী			
২১	শ্রীমতী সত্যজিৎ দেবী			
২২	শ্রীমতী সত্যজিৎ দেবী			
২৩	শ্রীমতী সত্যজিৎ দেবী			
২৪	শ্রীমতী সত্যজিৎ দেবী			
২৫	শ্রীমতী সত্যজিৎ দেবী			
২৬	শ্রীমতী সত্যজিৎ দেবী			
২৭	শ্রীমতী সত্যজিৎ দেবী			
২৮	শ্রীমতী সত্যজিৎ দেবী			
২৯	শ্রীমতী সত্যজিৎ দেবী			
৩০	শ্রীমতী সত্যজিৎ দেবী			
৩১	শ্রীমতী সত্যজিৎ দেবী			
৩২	শ্রীমতী সত্যজিৎ দেবী			
৩৩	শ্রীমতী সত্যজিৎ দেবী			
৩৪	শ্রীমতী সত্যজিৎ দেবী			
৩৫	শ্রীমতী সত্যজিৎ দেবী			
৩৬	শ্রীমতী সত্যজিৎ দেবী			

- ୨୭। (କି): ମୁହମ୍ମଦ ଆମିନୁଲ୍ଲାହ - ଚାନ୍ଦି
 ୦୮। (କା): ଗୋପାଳ ଚନ୍ଦ୍ର ମହାପାତ୍ର - ୨୩
 ୦୯। ମିଶ୍ର - ଚାନ୍ଦି
 ୧୦। (କା): ଗୋପାଳ ଚନ୍ଦ୍ର ମହାପାତ୍ର - ଚାନ୍ଦି
 ୧୧। ଶିଂହ (କା): ବଡ଼ ଗୋପାଳ - ୦୨
 ୧୨। (କା): ଗୋପାଳ ଚନ୍ଦ୍ର ମହାପାତ୍ର - ୦୩
 ୧୩। (କା): ମହମ୍ମଦ ଇମ୍ଲାହ ଶିଂହ - ୦୪
 ୧୪। (କା): ମହମ୍ମଦ ଇମ୍ଲାହ - ୦୫
 ୧୫। (କା): ଚାନ୍ଦି - ୦୬
 ୧୬। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି
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 ୧୯। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି
 ୨୦। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି

- ୨୧। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି
 ୨୨। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି
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 ୨୬। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି
 ୨୭। (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି (କା): ଚାନ୍ଦି

Appendix 7: A Common Traffic Management Plan

1.0 TRAFFIC MANAGEMENT PLAN

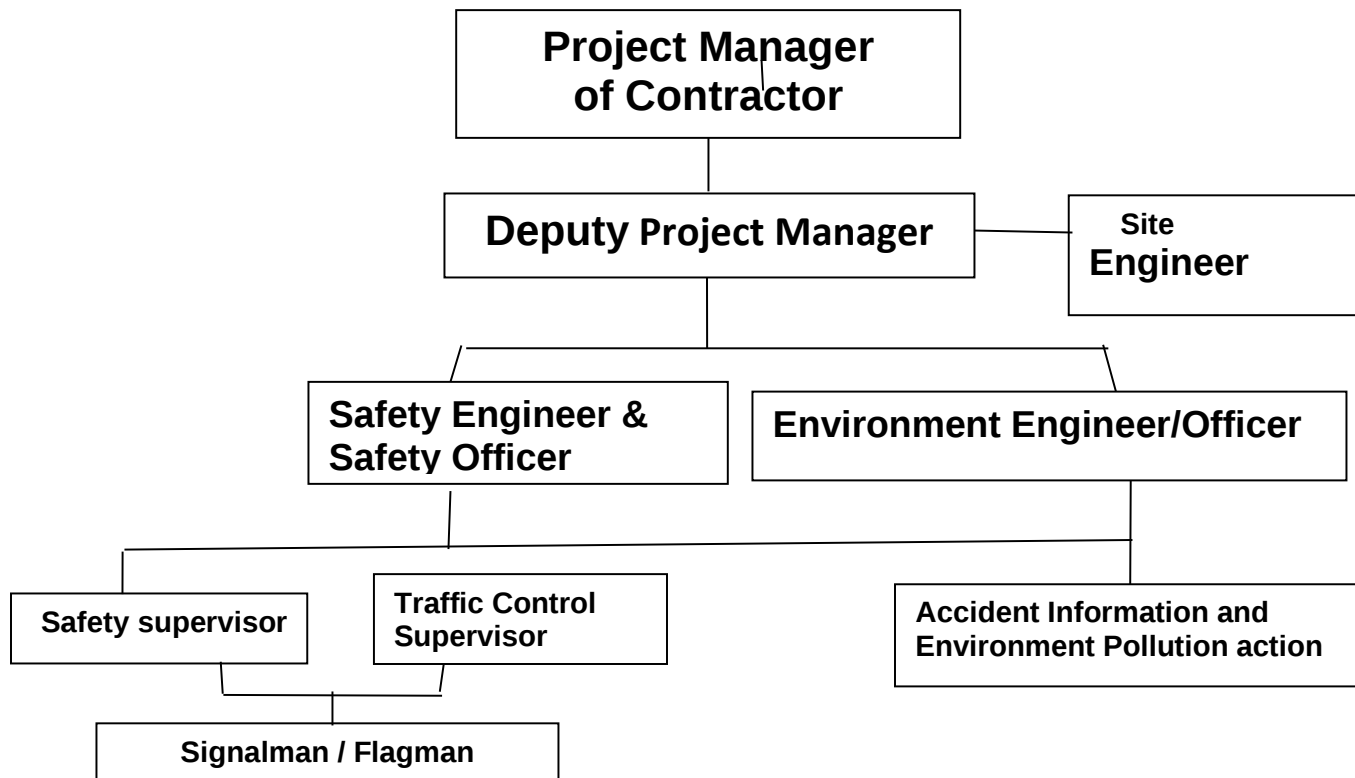
1.1 Introduction

The Management is committed to review all of the subproject's relevant plans. Traffic Management Plan (TMP) part of a comprehensive suite of environmental controls within the Site-Specific Environmental Management Plan (SEMP) for the construction phase of the CTWSSP. The TMP addresses the potential construction traffic effects associated with the construction of the subproject

1.2 Purpose

The purpose of this Traffic Management Plant (TMP) to Perform the requirements and concerns of about the road safety of vehicular traffic, pedestrians and workers in the General and Particular Conditions of each work under the Contract. It shall comply the procedures, requirements and standards necessary for managing the traffic effects during construction works of the subproject so that safe, adequate and convenient facilities for local movements by all transport modes are maintained throughout the construction period". The site-specific traffic management plan is designed to protect the workers and the local community and also the environment of the area. The traffic will move for loading /unloading and hauling in different locations at site using the local and national highway road where the areas are predominantly residential areas. To take due care to the local residents and the Safety Policy is to state clearly the objectives of the subproject in relation to Environment, Health and Safety, Quality and Security and also in compliance to requirements stipulated in the contract documents and legislation and regulations of the Government of the People's Republic of Bangladesh.

1.3 Traffic Control Organization Chart



1.4 Responsibility / Authority

Contractor's Responsibility (as per BRTA Sign Manual)

- Contractor shall be responsible for providing signing in accordance with the BRTA Code of Practice.

The Contractor shall take necessary measures for the safety of traffic, pedestrians and workmen during the road works. The contractor shall provide, erect, operate and maintain signs, markings, lights, barricades and traffic control equipment in accordance with the Bangladesh Road and Transport Authority's Code of Practice for Signing at Roadworks, as modified by the Consultant or the Client's Representative.

The contractor shall maintain an acceptable standard of signing and shall provide adequate signing, if it is detailed in the list of works to be done. This way the contractor will get the paid for each sign supplied and placed correctly.

1.4.1 Project Manager of Contractor

The Project Manager is responsible for the establishment to the Temporary Traffic Management Plan programmed. This programmed shall be according to policies with the recommendations and assistance of the Deputy Project Manager, Site Engineer and the Safety Officer. Accident prevention procedures will be included in all activities by the application of good safety planning. Specifically, the Project Manager shall provide advice to his management staff for administration, implementation and monitoring of the Site Temporary Traffic Management Plan programmed with safety advice from the Safety Manager that include the following:

- Direct the activities of the Safety and traffic control Team as the Project Manager;
- Promote full support of the health Safety & Traffic Planning programmed;
- Delegate responsibilities for the various safety functions and authorities with the traffic control promoted at all of the Project;
- Ensure prompt investigation action on any accident investigations with proper reports completed and follow-up action

1.4.2 Deputy Project Manager

The Deputy Project Manager will be in charge of the activities with Quality Health Safety and Traffic aspects after implementation of the site EHST system in the Project. He will oversee the activities concerning these aspects by reviewing/discussing with the Safety Officer or even together with the Project Manager to ensure compliance with the laws and regulations. The specific health and safety Traffic control plan responsibilities of the Deputy Project Manager:

- Ensure compliance to the Traffic Management safety programmed by all departments in the Project;
- Responsible for all safety activities on the Project and maintain liaison with the Construction Engineer / Safety Officer/Traffic engineer.
- Establish and direct the site health, safety Traffic control plan programmed, and the rehabilitation plan whenever requires;
- Ensure the Safety Team is formed and actively involved in the health safety Traffic and environment matters in the Project;
- Ensure information and follow-up action of HSE & Traffic control team after discussion with Project Manager.

1.4.3 Safety Officer/Traffic Engineer:

Safety Officer will be responsible for the administration of the Health, Safety & Traffic management system, the site security plans and must have a thorough knowledge of the safety. These responsibilities include:

- Overall in-charge of all traffic control operations
- Develop and establish Traffic Control Plans
- Prepares and conducts training for all traffic crew on traffic management plans
- Provision of resources (materials, signage, traffic cones, barricades, lighting, relevant PPE etc.) and maintain inventory
- Maintenance of all traffic control related materials equipment periodically and replenishment of these as needed.
- Regular inspection/audit on implementation of the traffic control plans
- Liaise with Consultant, Authorities and Safety Officer on traffic related matters.
- Monitors road closures to maintain traffic control and ensures compliance with applicable regulations.
- Regular updates and reports to the Contractors' management regarding traffic control plan implementation.
- Identify potential safety/health hazards & risks and significant environmental aspects & impacts and implement the controls.
- Authorized to stop or divert traffic with the consent of consultant and authorities.

1.4.4 Traffic Control Supervisor:

- Be aware of the local regulations and changes on traffic control management based on codes and standards
- Implement all established traffic control plans
- Ensure compliance with regulatory requirements,
- Regulate traffic during peak hours and non-peak hours as per plans, with support from traffic.
- Conduct daily toolbox meeting to brief the crew before starting their work
- Ensure and enforce compliance with PPE requirements for traffic control
- Provide feedback to supervisors on any concerns & suggestions for improvement
- Inform the coordinator upon noticing any abnormal or dangerous signs and symptoms related to traffic management.
- Participate and involve in consultation activities to provide constructive suggestions and implementation measures.
- Implement the control measures effectively for identified hazards related to traffic.
- Directing the movement of traffic through or around the work site location.

1.4.5 Signal Men I Watch men

Trained guider/signal men shall be employed to guide the traffic and the pedestrian. Guiders/Signal men shall have an additional precautionary measure to prevent any accident. There should be at least two Guiders/Signal men in each set having two different coloured flags (green & red) at both ends of diversion road. Signal men I guiders shall work for round the clock in number of sets (as per labour law). Special attention shall be made during nighttime.

Watch men are mandatory to be employed at structure site, bituminous work site, construction equipment movement locations and welding operations areas.

Guider/Signal man shall be trained properly (may be from traffic police) before sent to work. A few examples are given regarding the Traffic Police directing manually the traffic on the road.



a

Traffic Police Directing the Traffic

A traffic control person may also be known as a flag person (flag woman/flag man) or Signaler. The main role is to:

- Stop, slow, and safely direct traffic through work or construction sites.
- Protect workers in the construction zone by regulating traffic flow.
- Give traffic control directions and signals clearly and precisely so that motorists understand their meaning.
- Keep the flow of traffic moving with as few delays as possible.

Only use traffic control persons when other methods of traffic control are not adequate. Always use barriers, barricades, lane control devices, traffic signal lights, sign trucks, and other methods as appropriate instead of, and/or in addition to, traffic control persons to ensure the safety of all workers and protected against any risk to general public traffic using the road.

1.5 Training Plans

The Traffic Control engineer, with support from the Traffic Control supervisor, shall develop a training plan for the workforce associated with traffic management and implement the trainings effectively for all project sites.

The Traffic Control engineer shall provide regular and appropriate training to all personnel in the operation of Traffic Control Plan (including subcontractors and their workforce) as necessary to ensure their competency to do their work and maintain records of all such trainings.

Additional training will be provided when there is a change in the plan or requirements. The Traffic Control engineer, together with the Project Manager and other subproject team members, shall develop and maintain training.

1.6 Meetings and Instructions

The Project Manager/Safety Officer/Traffic Control Supervisor shall organize regular monthly meetings with relevant stakeholders on the status of traffic control implementation measures.

The team will identify shortcomings if any and improvement opportunities and implement the corrective measures in a timely manner. Meetings of Minutes or Reports shall be maintained. Any special instructions arising from these meeting discussions shall be communicated to the relevant traffic control team for implementation at site level.

1.7 Working Hours

Working hours for the project shall be followed as stipulated by the regulation of Bangladesh (8am to 5pm). Nighttime will be from 5pm to 8am.

1.8 Labour Laws

Contractors will follow all relevant labour laws applicable to the contractor's personnel, including laws relating to their employment, health, safety, welfare, immigration and emigration, and will allow them all their legal rights.

1.9 Forced Labour

Contractors will not employ forced labour, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any

kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.

1.10 Child Labour

The Contractor will not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development. Where the relevant labour laws of Bangladesh have provisions for employment of minors the Contractor will follow those laws applicable to the Contractor. Children below the age of 18 years will not be employed in dangerous work.

1.11 Communications and Publicity

Necessary communication modes and channels shall be established for internal and external communications, which include the general public and authorities, relating to traffic control measures and plans.

The following measures shall be implemented for communications

- Internal Communications => Meetings, E-mails, Display Posters and Signage's
- External Communication => Through Media, Publicity materials, Banners and bulletins, Hoardings, Signage's, E-mails

Communication campaigns and programs shall be initiated by the Traffic Coordinator and team. These measures include issuing flyers, handouts, radio & walkie-talkie etc. as deemed necessary prior to commencement of temporary or permanent work.

2.0 TRAFFIC CONTROL DEVICES AND FACILITIES

Materials for traffic control devices shall meet the requirements below:

i. Water Filled Barriers

Water filled barriers are modular water filled plastic container of various sizes and shapes. Hollow polyethylene barriers in trapezoidal shape of about 80cm – 10cm length have been developed for a short-term application where portability is important.

ii. Cones

Cones shall be a minimum of 75 cm in height with a broadened base and shall be capable of withstanding impact without damage to the cones or vehicles. All cones shall be orange/white colored and highly visible both in daylight and darkness. Cones shall be capable of remaining bright and in position during normal traffic flow and wind conditions in the area where they are used. Lamps for cones shall be suitable for purpose.

iii. Warning Lights (flashing or steady)

Warning lights shall be Type A (low intensity flashing), Type B (high intensity flashing), or Type C (steady burn) as deemed appropriate, and as approved by the Consultant.

iv. Stop and Go boards

Where there is a lot of traffic or the work site is very long, traffic will be controlled manually using these Stop and Go boards. If obstruction is less than 30 meters long and is on straight section road you will only need a single board operating at one end or in the middle. Boards will be operated by a competent person.

v. Traffic Flags

The traffic flag is a red square cloth measuring at least 300mm x 300mm. It is fastened to a staff about 600mm. The flag does not contain any message so to give motorist the correct message, the flagger must hold the flag properly and use the correct hand signals.

vi. Wand Flashing Batons

During nighttime work flashing batons are used to supplement the stop and go paddle. The flagger shall hold the flashlight in the left hand, shall hold the paddle or flag in the right hand and shall use the flashlight in the following manner to control approaching road users:

- To inform road users to stop, the flagger shall hold the flashing baton with the left arm extended and pointed down toward the ground and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.
- To inform road users to proceed, the flagger shall point the flashlight at the vehicle's bumper, slowly aim the flashlight toward the open lane, then hold the flashlight in that position. The flagger shall not wave the flashlight.
- To alert or slow traffic, the flagger shall point the flashlight toward oncoming traffic and quickly wave the flashlight in a figure eight motion.
- Extra reserve batteries should be available to continue usage.

vii. Flashing Lights

Flashing lights are often used to supplement a traffic control device. Flashing lights shall be flashing yellow light with a minimum nominal diameter of 200mm with rotating amber lights equipped to be operated over the entire 24hr duration.

Construction Requirements

Traffic control devices and services shall be provided and maintained both inside and outside the project limits as needed to facilitate traffic guidance should this be necessary.

The provision of traffic control devices and services shall comply with the Bangladesh Road Transport Authority (Road Signal Regulations).

Prior to the start of construction operations, the project site team shall erect such signs, barricades, and other traffic control devices as may be required by the plans and directed by the Consultant.

Traffic control devices shall be operated only when they are needed, and only those devices that apply to conditions actually in existence shall be operable.

Temporary fences shall be placed to provide a visual barrier between the work area and adjacent traffic or buildings and at locations directed by the Consultant. All traffic control devices and materials shall be maintained in good condition at all times.

Three types of Signs to be used at Road Works

TYPE	WHAT THIS TYPE DOES	EXAMPLES
Regulatory Sign	These signs regulate drivers / motorists. It must be obeyed; the police enforce these signs	Speed Restriction No Overtaking No Turns Stop Give Way Keep/Move Left/Right
Warning Signs	These signs provide warning to drivers / motorists about possible hazards ahead.	Road Works Ahead Lane Drop Ahead Diversion Ahead
Guide Signs	These signs provide information and guidance to drivers / motorist to reduce their chance of getting lost or taking the wrong path	Delineators Traffic Cones Chevron Alignment Markers

Plant and Equipment

All vehicles used in traffic control operations shall be equipped with the appropriate vehicle mounted warning devices in accordance with BRTA / RHD / Other Approved Traffic Control at Work-Sites Manuals.

During the daytime, plant and equipment working in a position adjacent to traffic should have a projection beyond the normal width of the item.

During poor light conditions or at night, an additional traffic controller with an illuminated red wand shall direct traffic around such plants and equipment.

During nighttime, where traffic is permitted to use the whole or portion of the existing road, all plant items and similar obstructions shall be removed from the normal path of vehicles, to provide a lateral clearance of at least 6m where practicable, with a minimum clearance of 1.2m.

Plant and equipment, within 6m of the normal path of vehicles, shall be lit by not less than two yellow steady lamps suspended vertically from the point of the obstruction nearest to a traffic lane, and one yellow steady lamp at each end of the obstruction on the side furthest away from the traffic lane.

Basic Signs at Road Works and Installation Procedure

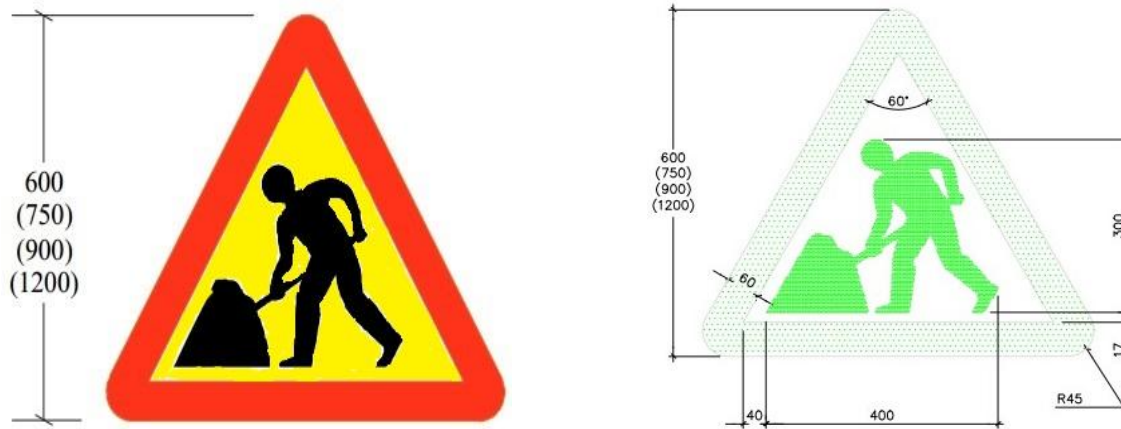
Basic Traffic Signs

The basic traffic signs shall have YELLOW Background, with definition Plate written in both English and Bengali languages

Road Works Ahead (BRTA B38)

Description: Triangular Sign with a symbol of a workman

Application: The sign warns drivers of a temporary obstruction caused by men working in the road ahead. In practice this sign is used for all roadwork's regardless of whether the work is being carried out by manual labor. The sign will normally be positioned on the left-hand side of the road in advance of the hazard. On dual carriageways, a second sign will be placed on the median. The size of the sign and distance from the hazard will be as detailed below. Where there is a series of warning signs, such as at major roadwork's, the sign position may need to be altered in order to keep at least 50 meters between signs. It will always be the first sign that drivers see when approaching roadwork.



Actual Men at Work signage used at worksite

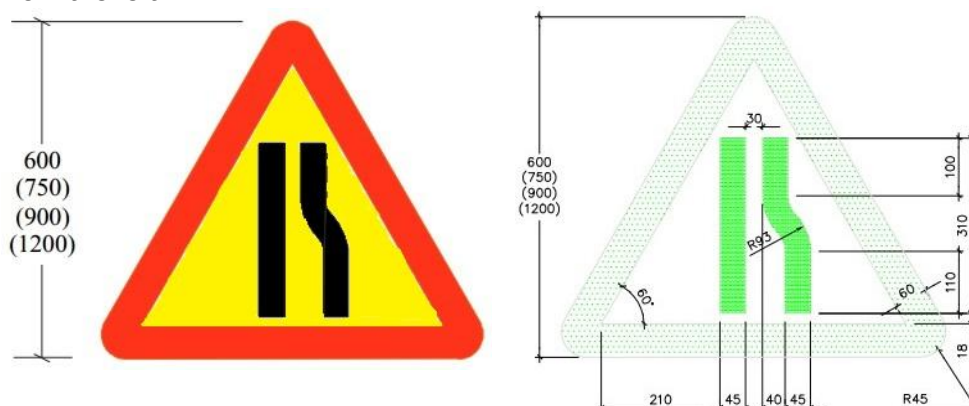


Road Narrow Ahead (BRTA B15)

Description: Triangular Sign with symbol indicating the width of the road ahead narrowing from right or left.

Application: This sign warns that the width of the road ahead will suddenly become narrower from the right (left). The sign is often used at roadworks. The sign should not be used where the reduction in width is gradual. The sign will be positioned on the left hand side of the road in

advance of the hazard. The symbol can be reversed to indicate that the road ahead narrows from the left.

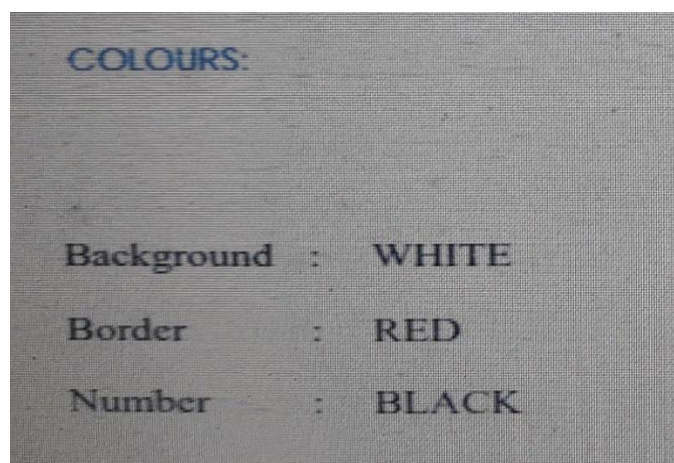
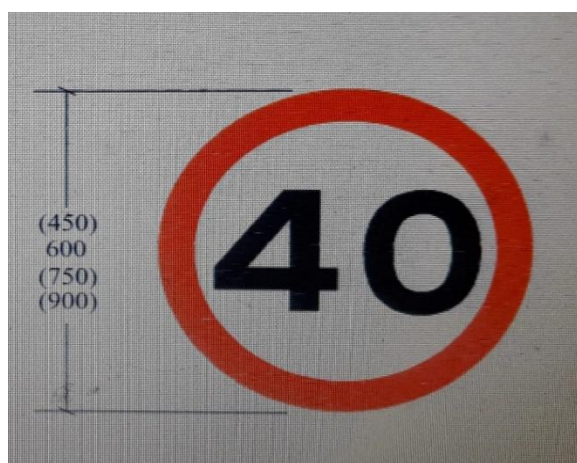


Speed Limit (BRTA A26)

DESCRIPTION: VARIATION: Circular sign with numbers indicating the speed limit.

APPLICATION: The sign shows the maximum permitted speed in kilometer per hour for the section of road ahead. Do not impose a speed limit unless it is essential for road safety. Unrealistically low speed restrictions will be ignored, which will make the signing look silly. Only use limits of 25, 40, 50, and 60 -see Section E2.3. Always ensure that the end of the speed restricted section is marked, either with the A27 sign or with another A26 sign indicating a different speed limit. Where the special speed limit is to apply only to a particular type of vehicle, this should be indicated on a supplementary plate - such as D20 or D21. A supplementary plate explaining in Bangla the meaning of the sign must be added until the new signs have been in use for five years.

LOCATION: The sign should be positioned on both sides of the road, for maximum impact. The sign should be repeated after every major junction and about every 400meter between junctions. The 40 km/h signs are not usually repeated in towns.

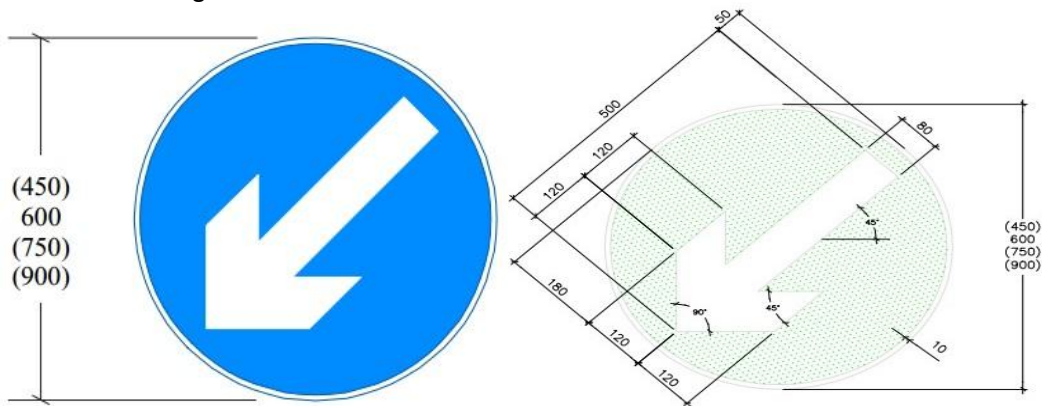


Keep Left / Keep Right (BRTA A33)

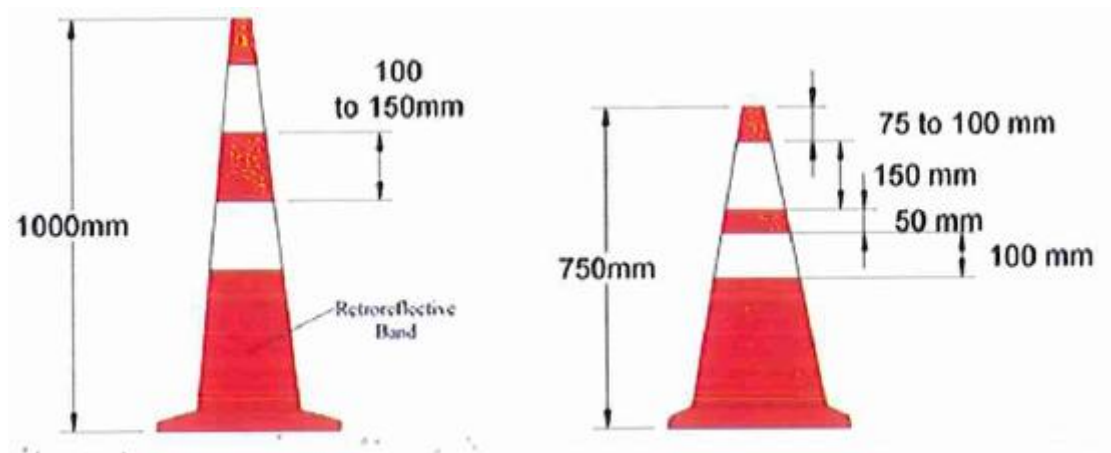
Description: Circular Sign with single arrow to indicate Keep Left or Keep Right where the arrow is pointing.

Application: Vehicular traffic may only proceed by keeping to the side indicated by the arrow. The sign is used to mark obstructions, such as traffic islands, medians on dual carriageways, and work areas at roadworks. The Keep Right sign is only used on temporary roadworks. Vehicular traffic may only proceed by keeping to the side indicated by the arrow. The sign is used to mark obstructions, such as traffic islands, medians on dual carriage ways and work areas on roads. The keep right sign is only used at temporary road works.

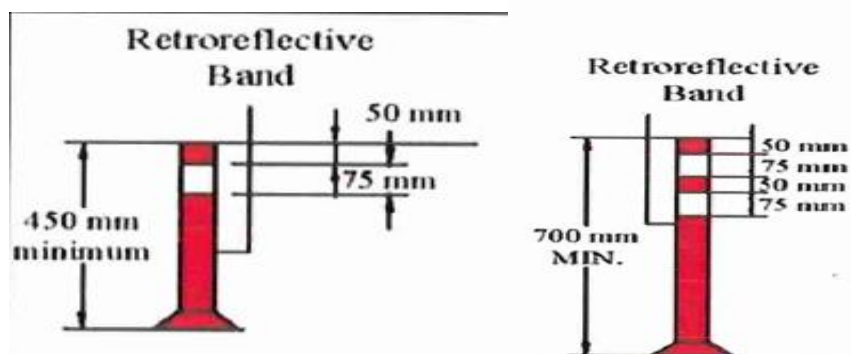
Location: The sign must be placed on or close to the beginning of the obstruction with adequate clearance between the sign and the edge of the carriageway. When used on traffic islands, it may be mounted with the lower edge 1 meter above the carriageway so that it is directly in the beam of vehicle headlight.



Traffic Cones - Place a line of traffic cones to guide pedestrian and vehicle traffic past the works. Leave some working space between the lines and cones and the actual works area. Traffic cones should be red and if used at night, should preferably have white reflective sleeves.



Tubular Markers

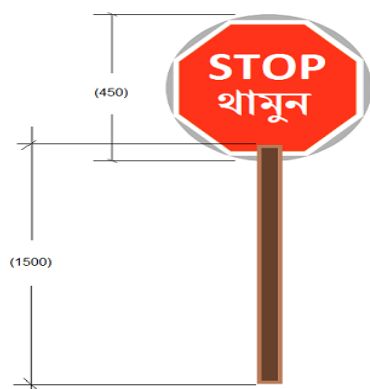


Stop and Go – Where there is a lot of traffic or the work site is very long, traffic will be controlled manually using these Stop and Go boards. If obstruction is less than 30 meters long and is on straight section road you will only need a single board operating at one end or in the middle. Boards will be operated by a competent person.

Portable Stop & Go Boards

COLOURS:

Background : RED
Border : WHITE
Sign plate : GREY



COLOURS:

Background : GREEN
Border : WHITE

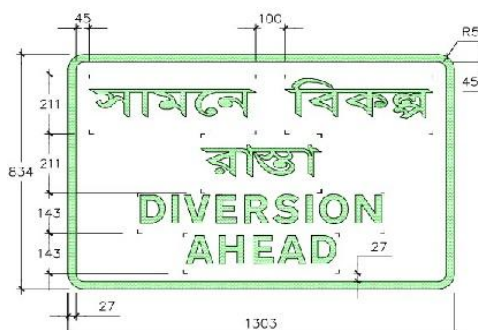
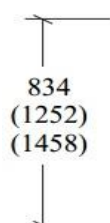


Diversion Ahead (BRTA B51)

Description: Rectangular sign with text stating diversion ahead in both English and Bengali.

Application: This sign warns that due to roadworks or temporary obstruction of carriageway there is a diversion in operation ahead.

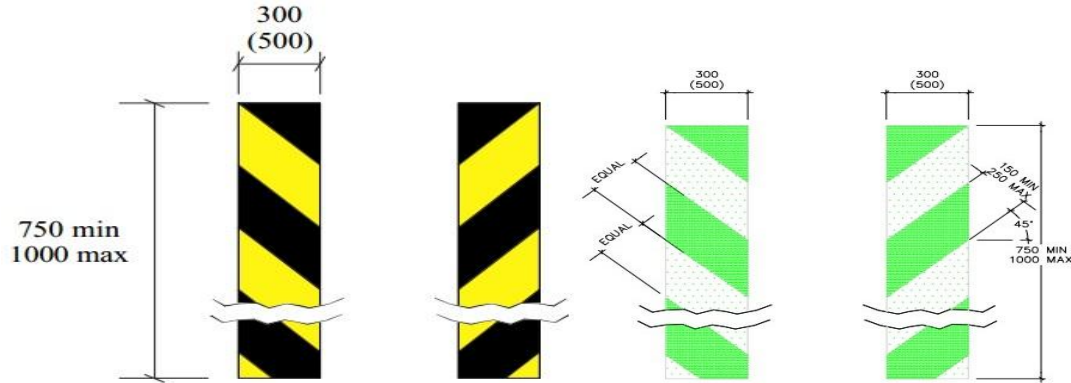
Location: The sign will be positioned on the left-hand side of the road in advance of the hazard.



Dangerous Obstruction – One Way (B49 BRTA)

Description – Rectangular sign with diagonal stripes from top left to bottom right for left side obstruction; from right to bottom left for right side obstruction.

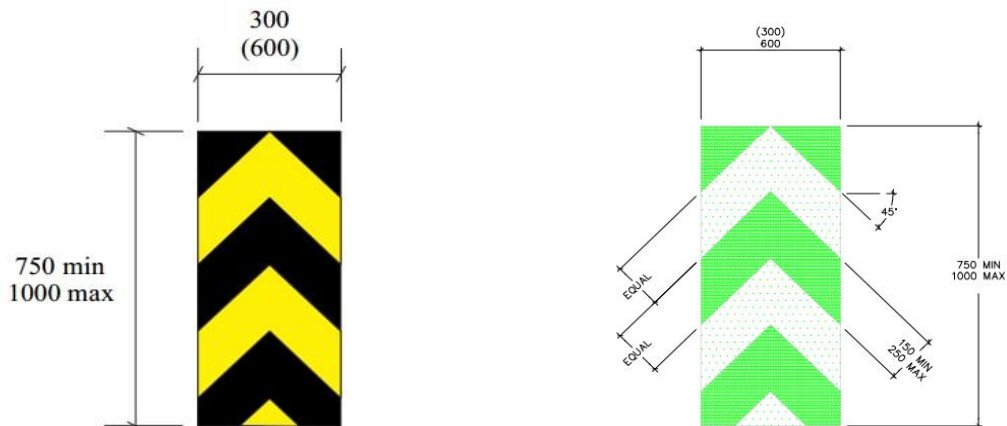
Application – This is used to highlight an obstruction which is close to the edge of the carriage way – such as bridge parapet or bridge pier. The yellow stripes point downwards to the side where the traffic shall pass. The sign plate may be fixed to the end of the obstruction.



Dangerous Obstruction – Two way (B50 BRTA)

Description – Rectangular sign with arrow shades stripes facing upwards.

Application – The sign is used to highlight an obstruction which is close to the edge of the carriageway and where traffic can pass on either side. It can also be used to draw attention to a channelizing island where traffic streams are divided. The sign is sited either on an obstruction or on the nose of the channelizing island where traffic divides.



Other road signs to be used if required follows:

Note: Road signs that have Red, White, Black color shall be Red, YELLOW Background and Black color with definition Plate written in both English and Bengali languages. Yellow replacing White. Other road signs will be the same color.

WARNING SIGN

সতর্কতামূলক সাইনসমূহ

 (CROSS ROAD-MINOR ROAD AHEAD) সামনে আড়াআড়ি ছোট সড়ক আছে	 (CROSS ROAD-MAJOR ROAD AHEAD) সামনে আড়াআড়ি প্রধান সড়ক আছে	 (SIDE ROAD RIGHT) সামনে ডানদিকে পার্শ্ব রাস্তা আছে	 (STAGGERED JUNCTION) সামনে বাম-ডানে একধিক সংযোগ সড়ক আছে
 (T JUNCTION) সামনে টি-জংশন আছে	 (Y JUNCTION) সামনে ওয়াই-জংশন আছে	 (TRAFFIC MERGES FROM LEFT) সামনে বামদিক থেকে গাড়ি এসে মিশতে পারে	 (MERGE WITH TRAFFIC FROM RIGHT) সামনে ডানদিকের গাড়ির সাথে মিশতে হবে
 (ROUND ABOUT) সামনে গোলাচকর	 (SHARP BEND TO THE RIGHT) সামনে ডানদিকে আচমকা মোড় আছে	 (SHARPEN BEND TO RIGHT) সামনে ডানদিকে খাঁড়া বাঁক আছে	 (DOUBLE BEND FIRST LEFT) সামনে দুটি বাঁক আছে, প্রথমটি বামে
 (ROAD NARROWS ON BOTH SIDES) সামনে উভয়পাশ হতে রাস্তা সর হতেছে	 (ROAD NARROWS ON THE RIGHT) সামনে ডানদিক হতে রাস্তা সর হতেছে	 (DUAL CARRIAGEWAY ENDS) দুটি পৃথক সড়ক সামনে মিলিত হয়ে দু-পাশের একটি সড়কে পরিণত হয়েছে	 (TRAFFIC SIGNALS) সামনে ট্রাফিক সিগন্যাল আছে
 (STEEP HILL DOWNWARDS) সামনে ঢালু পাহাড় আছে	 (STEEP HILL UPWARDS) সামনে খাঁড়া পাহাড় আছে	 (HEIGHT LIMIT AHEAD) প্রতিবন্ধকতার কারণে সামনে সীমিত উচ্চতা আছে (এই বোর্ডে ৪.৪ মিটার)	 (TWO WAY TRAFFIC STRAIGHT AHEAD) সামনে উভয়দিকে সোজা সড়ক চলাচল

REGULATORY SIGNS

 (NO ANIMAL-DRAWN VEHICLES) পশুদ্বারিত যান চলাচল নিষেধ	 (NO PEDESTRIANS) পথচারী চলাচল নিষেধ	 (NO RICKSHAWS) রিকশা চলাচল নিষেধ	 (NO CYCLES) সাইকেল চলাচল নিষেধ
 (NO TRACTORS OR FARM VEHICLES) ট্রাক্টর অথবা ধীরগতির মোটরযান চলাচল নিষেধ	 (NO VEHICLES CARRYING EXPLOSIVES) বিস্ফোরকবাহী মোটরযান চলাচল নিষেধ	 (NO VEHICLES OVER LENGTH 100 M) প্ৰদৰ্শিত মাপের বেশি দৈর্ঘ্যের মোটরযান চলাচল/প্রবেশ নিষেধ	 (NO VEHICLES OVER HEIGHT 3000 MM) প্ৰদৰ্শিত মাপের বেশি উচ্চতার মোটরযান চলাচল/প্রবেশ নিষেধ
 (NO VEHICLES OVER WIDTH 2000 MM) প্ৰদৰ্শিত মাপের বেশি প্রস্থের মোটরযান চলাচল/প্রবেশ নিষেধ	 (NO VEHICLES OVER MAXIMUM GROSS WEIGHT 100 T) দর্শিত ওজনের বেশি মোটরযানে মোটরযান চলান নিষেধ (কুল সেট)	 (AXLE WEIGHT LIMIT) দর্শিত ওজনের বেশি এক্সেল ওজনের মোটরযান চলাচল নিষেধ	 (NO PARKING) পার্কিং নিষেধ
 (NO STOPPING) থামানো নিষেধ	 (NO OVERTAKING) ওভারটেকিং নিষেধ	 (NO PARKING WITHOUT STOPPING) না থামে অতিক্রম করা/চলা নিষেধ	 (NO RIGHT TURN) জনদিকে মোড়/টার্ন নেওয়া নিষেধ
 (NO LEFT TURN) বামদিকে মোড়/টার্ন নেওয়া নিষেধ	 (NO U TURN) ইউটার্ন নেওয়া নিষেধ	 (NO USE OF HORN) হর্ন বাজানো নিষেধ	 (SPECIAL SPEED LIMIT) বিশেষ গতিসীমা বা সর্বোচ্চ গতিসীমা
 (NATIONAL SPEED LIMITS APPLY) পূর্বের সর্বোচ্চ গতিসীমার বাধ নিষেধ শেষ এবং জাতীয় গতিসীমা শুরু	 (RESTRICTION ENDS) গতিসীমা ব্যতীত অন্যান্য বাধানিষেধ শেষ	 (TEMPORARY STOP SIGN) সাময়িক থামার চিহ্ন	 (TEMPORARY GO SIGN) সাময়িক চলাচলের চিহ্ন

INFORMATIVE SIGNS

 (TWO-WAY TRAFFIC CROSSES ONE-WAY ROAD) একদুই রাস্তা সামনে (এ-রাস্তার দিকটি হয়ে দে-রাস্তার উল্লম্বিক গতি/সড়কচিহ্নি চলাচল করে)	 (PEDESTRIAN CROSSING) সামনে পথচারী পারাপার	 (PEDESTRIANS IN ROAD AHEAD) হুটপাত না খাওয়া সামনে সড়কে পথচারী চলাচল করে	 (CHILDREN) সামনে স্কুল খাওয়া রাস্তায় শিশু-কিশোর চলাচল করে
 (CATTLE) সামনে গবাদিপশু রাস্তায় চলাচল করতে পারে	 (WILD ANIMALS) সামনে বন্যপ্রাণী রাস্তায় চলাচল করতে পারে	 (RIVER BANK) সামনে নদী/পাড়ার খালের কিনারা আছে	 (UNEVEN ROAD) সামনে অসমতল/ছত্রিপুর সড়ক
 (SLIPPERY ROAD) সামনে শিথিল সড়ক	 (ROAD HUMP) সামনে গতিরোধক	 (LOW FLYING AIRCRAFT) সামনে বিমানবন্দর : নিম্ন উচ্চতায় উড়ন্ত বিমানের উল্লম্ব দৃশ্য হতে পারে	 (FALLING ROCKS) সামনে পাহাড়ের পার্শ্ব হতে রাস্তায় শিলা/ধসেধস পড়তে পারে
 (DANGEROUS DIP) সামনে বিপজ্জনক খাদ/গর্ত আছে	 (NARROW BRIDGE) সামনে সরু/সঙ্কীর্ণ সেতু আছে	 (OTHER DANGER) সামনে বিভিন্ন রকম বিপদাশঙ্কা আছে	 (CHECKPOINT) সামনে চেকপয়েন্ট আছে
 (ROAD WORKS) সামনে সড়ক মেরামতের কাজ চলাছে	 (LOOSE CHIPPINGS) সামনে রাস্তার ওপর ঢিলা/ অচল্য নুড়ি-পাথর আছে	 (CYCLES AND RICKSHAWS) সামনে রাস্তায় সাইকেল/রিকশা চলাচল করে	 (DANGEROUS SHOULDER) সামনে রাস্তার শোভার বিপজ্জনক
 (FERRY) সামনে ফেরিঘাট আছে	 (BLIND PERSONS) সামনে রাস্তায় অন্ধমানুষ চলাচল করতে পারে	 (RAILWAY LEVEL CROSSING WITHOUT GATE OR BARRIER) অরক্ষিত (গেট/পাহারা/বাইন) রেলক্রসিং	 (RAILWAY LEVEL CROSSING WITH GATE OR BARRIER) রক্ষিত (গেট/পাহারা/বাইন) রেলক্রসিং

বিশেষ সতর্কতামূলক সাইনসমূহ

(SHARP CHANGE OF DIRECTION TO THE LEFT) অচমকা বামে মোড়  এই ধরনের সাইন বিপজ্জনক বাঁক, বিশেষ করে যে-সব বাঁক সম্পর্কে পূর্বে হুঁতে ধারণা করা যায় না সে-সব বাঁকে ব্যবহৃত হয়।	(SHARP CHANGE OF DIRECTION TO THE RIGHT) অচমকা বামে মোড়  গাময়িক বিকল্প সড়কের ক্ষেত্রে ব্যবহৃত অচমকা বামে মোড় সাইন।	(T JUNCTION CHEVRON) সামনে টি-জংশন  এই ধরনের সাইন টি-জংশনের প্রবেশ মুখে ছোট রাস্তার বিপরীতে প্রদর্শন করা হয়, যাতে চালক ছোট রাস্তা দিয়ে অসহসর হওয়ার সময় জ্ঞাংখন সনাক্ত করতে পারে এবং প্রয়োজন অনুযায়ী গুরুত্বপূর্ণ বা বা চমকিত হতে পারে।
(TEMPORARY DIVERSION AHEAD) সামনে সাময়িক বিকল্প সড়ক  মেয়ামত বা অন্য কোনো কারণে মূল রাস্তা বন্ধ থাকলে, বিকল্প রাস্তা ব্যবহারের বিষয়ে সতর্ক করতে এই সাইন ব্যবহৃত হয়।	(DIRECTION OF TEMPORARY DIVERSION AHEAD) সামনে সাময়িক বিকল্প সড়কের নকশা  এই সাইনটি বিকল্প রাস্তার নকশা বা বিন্যাস বুঝতে ব্যবহৃত হয়। এই নির্দিষ্ট নকশাটি দেখাচ্ছে যে, দু-পেন বিশিষ্ট একটি বিকল্প রাস্তা, যা বিপরীত দিকে দৌঁতে রাস্তা পড়েছে।	(DIRECTION OF TEMPORARY DIVERSION) সাময়িক বিকল্প সড়কের নির্দেশনা  এই সাইনটি শহরের মধ্য দিয়ে প্রবাহিত বিকল্প রাস্তা চিহ্নিত করতে ব্যবহৃত হয়। এটি বিকল্প রাস্তার শুরুতে এবং বিকল্প রাস্তা বরাবর জ্ঞাংখনে ব্যবহৃত হয়।
(LANE CLOSED TO TRAFFIC AHEAD) সামনে সাময়িকভাবে লেন বন্ধ  সামনে এক বা একাধিক লেন সাময়িকভাবে বন্ধ করতে এই ধরনের সাইন ব্যবহার করা হয়। এই নির্দিষ্ট সাইনে দেখানো হয়েছে যে, তিন লেনবিশিষ্ট রাস্তার চানপাশের লেনটি বন্ধ রয়েছে।	(COUNT-DOWN MARKERS) নিম্নমুখী গণনা সাইন  রেলস্টেশনের দূরত্ব বুঝতে এই সাইন ব্যবহৃত হয়। তিনবারের সাইন দিয়ে মোট দূরত্ব, দু-বারের সাইন দিয়ে দূরত্বের অর্ধেক এবং একবারের সাইনটি দিয়ে এক-তৃতীয়াংশ দূরত্ব বুঝায়।	(LOCATION OF RAILWAY CROSSING) রেলস্টেশনের অবস্থান  এই সাইনটি রেলস্টেশনের অবস্থান বুঝতে রেলিং পয়েন্টের নিকটে প্রদর্শন করা হয়। এদের অধিক রেল-স্ট্রাক থাকলে দেখানো অতিরিক্ত 'অর্ধেক ক্রস' সাইনটি ব্যবহৃত হয়।
(SINGLE SIDED DANGEROUS OBSTRUCTION) একপাশে বিপজ্জনক প্রতিরোধক  সেতু/ব্রিজ, কাগজাট ইত্যাদি বিপজ্জনক প্রতিরোধকের প্রাচীর/পিছারে এই ধরনের সাইন ব্যবহার করে আলোর প্রতিফলনের মাধ্যমে বিপজ্জনক প্রতিরোধক সম্পর্কে চালকের দৃষ্টি আকর্ষণ করা হয়। হৃদয় ভোরাকাটা দাগসমূহ যে-পাশেরদিকে (বরাবর) নিম্নগামী হয়, সে-পাশ দিয়ে যানবাহন অতিক্রম করবে।		(DOUBLE SIDED DANGEROUS OBSTRUCTION) উভয়পাশে বিপজ্জনক প্রতিরোধক  এই ক্ষেত্রে গাড়ি যে-কোনো পাশ দিয়ে যেতে পারে। চ্যালেঞ্জকৃত সড়কদ্বীপ, যেখানে জটিল প্রবাহ বিভক্ত হয় সেখানে চালকের মনোযোগ আকর্ষণ করতে এই ধরনের সাইন ব্যবহৃত হয়।

Clothing and Personal Protective Equipment (PPE)

High-visibility clothing shall be provided for all safety and traffic crew such as Reflective personal vests / clothing for better visibility.

Traffic control Supervisors / Coordinators shall ensure traffic related equipment and protective clothing are available at the site at all times and implement measures for effective enforcement of proper usage and necessary replacement / replenishment of such equipment and clothing. Personal protective equipment shall include as minimum (but not limited to):

- Protective Headgear (hard hat or similar)
- Reflective Jacket
- High Visibility Vest
- Safety Boot with steel toe caps and steel sole plate
- Other items such as Safety Glasses, Gloves and Rubber boot etc.

PLANNING AND IMPLEMENTATION OF TRAFFIC MANAGERMENTS

Delineation of Work Site

Construction site shall be delineated, in absence of boundary walls, by fences. The jobsite should be adequately marked to warn the public of construction activities. Warning signs can be used to restrict public access.

Special attention shall be made for excavation, piling, and pre-stressing. Excavation, piling and pre-stressing sites shall be fenced all around. No trespassing shall be allowed. Sufficient number of notice boards, danger signs, flashing lights etc shall be provided in the area.



Jobsite marked with



Jobsite delineated by



Jobsite cleaning

The work area should be kept clean in order to minimize hazards to workers. During the erection of tall structures, the nylon net shall be put around the structure periphery 3 to 4 meters below the working level. No scaffolding, ladder, working platform, gangway, runway, etc. shall be placed within 3 meters of an un-insulated electric wire.

- All signs and delineator shall be maintained in good clean conditions.
- The worksite shall be clearly delineated with reflective devices including soft plastic bollards, guideposts, hazard markers, and other approved devices. Dangerous items such as concrete blocks, tree branches, and individual concrete barricades shall not be used for delineation or traffic control at the work site.
- Use fluorescent traffic cones at least 750mm high to delineate the traffic path into, through and out of the work site. Always place the cones in smooth lines so they look like the edge of traffic path. Always replace any cones that are knock out of line.
- Use long tapers. Remember that drivers / motorist need longer tapers than you think
- No alternative paths for road users shall be allowed. Any other possible optional route is to be closed off with strong delineation.
- Vertical Clearance
- In general, any temporary work placed over roads or diversions used by public traffic should maintain a vertical clearance of at least 4.5 meters.
- Where required by the Consultant, the respective site team shall erect and maintain suitable approved check gates, fitted with warning signs indicating the vertical clearance.
- All Temporary Road works and associated materials used for temporary purposes shall be constructed, including temporary traffic fences, road works, temporary traffic ramps, Traffic Control for Public Roads etc.
- The respective site project's team shall erect and maintain at prescribed points on the work and at the approaches to the work, traffic aids, markings, signs, lights, flares, barricades, rubber cones with traffic lamps and other facilities as indicated in the Drawings or required by the Consultant for the direction and control of traffic.

Traffic Safety and Control

The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. The barricades erected on either side of the carriageway / portion of the carriageway closed to traffic, shall be of strong

design to resist violation, and painted with alternate black and white stripes. Red lanterns of warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the carriageway) the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or similar devices as per the directions of the Engineer. At night, the passage shall be delineated with lanterns or other suitable light sources.

Safety in Road Construction Zones

The construction zone creates an environment where the road user is faced with a series of unusual hazards in the form of unfamiliar routes, substandard horizontal and vertical alignment, adverse cambers, construction equipment etc. The road user also has to watch for traffic control devices apart from performing normal driving functions of vehicle control and responding to other traffic and hazards. These factors increase the strain on driver performance and lead to accidents. The safety practices in construction zones should, therefore, be orientated towards reducing conditions which lead to such hazards and consequent stress, whereby risk of accidents is increased. The guiding principles for safety in road construction zones are: i) Warn the road user clearly and sufficiently in advance; ii) Provide safe and clearly marked lanes for guiding road users; iii) Provide safe and clearly marked buffer and work zones; iv) Provide adequate measures that control driver behavior through construction zones.

Construction zone

Highest regard is to be given to traffic safety as well as to provide a safe working environment to the workmen. Before starting the construction work, which will influence traffic, the contractor has to get the legal permission of the road traffic authority and local police about the means and extent of securing the construction zone. The traffic management strategies to be used at construction zones should ensure that traffic safety is an integral and high-priority element of the project. This can be ensured by avoiding inconvenience to traffic as far as possible and by guiding the drivers in a clear and positive way. Routine inspections of traffic control elements and traffic operations must be carried out so that care and attention to roadside safety is never slack during the progress of the project.

Traffic Control Means During Non-Working Time

The Safety Officer ensure that during non-working hours and following completion of a particular construction operation, all warning signs, except those necessary for the safety of the public are removed or entirely covered with either metal or plywood sheeting so that the sign panel will not be visible.

Retro-reflective sheeting on signs, barricades, and other devices shall be kept clean. Stretches, rips, and tears in the sheeting shall be promptly corrected by the responsible site personnel as and when necessary. The Traffic Control Coordinator together with the Safety Officer shall ensure Retro-reflective sheeting are maintained to have retro-reflection at all times.

Traffic Control Means During Night Time

In many situations night construction may be preferred as the volume of traffic is generally lower, and conflicts are minimized. Consideration must be given to the effect of night operations

on the surrounding environment as well as the workers. Further, even if the work occurs at night, a lane or lanes may need to remain closed during higher traffic times.

Lighting Devices--Lighting devices should be provided in work zones based on engineering judgement. When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Four types of lighting devices are commonly used in work zones. They are floodlights, flashing warning beacons, warning lights, and flashing batons.

Floodlights--Utility maintenance or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double shift basis requiring night work. When nighttime works is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas. The adequacy of floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically.

Flashing Warning Beacons – Flashing warning beacons are often used to supplement a traffic control device. Flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of ss200mm with the rotating amber lights equipped to be operated over the entire 24hrs duration. The temporary terminus of an expressways is an example of a location where flashing warning beacons alert the drivers to change roadway conditions and the need to reduce speed in transitioning from expressway to another roadway type.

Warning Lights - Type A, Type B, Type C, and Type D 360° warning lights are portable, powered, yellow lens-directed and enclosed lights. When warning lights are used they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not penetrate through the windshield. The maximum spacing for warning lights should be identical to the channelizing device spacing requirements. Flashing lights should not be used as delineation, as a series of flashers fails to identify the desired vehicle path.

- Type A – A low-intensity flashing warning lights are used to warn road users during night time that they are approaching or proceeding in a potentially hazard area. Type A warning light maybe mounted on channelizing device.
- Type B – High intensity flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potential hazard area.
- Type C -- Steady-burn warning lights and Type D 360° steady-burn warning lights may be used during night time to delineate the edge of the traveled way and channelize traffic.

Flashing Baton - During the night time works, or in other conditions of poor visibility, each traffic control person must be provided with and must use in addition to the personal protective equipment, a flashing baton/wand. The traffic controller must have immediate access to spare batteries for the flashing baton/wand.

Maintenance of Diversions and Traffic Control Devices

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversions shall be maintained in a satisfactory condition till such time they are required as directed by the Engineer. The temporary diversion road shall be kept free of dust by frequent applications of water, if necessary

SAFETY INDUCTION AND TRAINING PROGRAM

Contractors will take all reasonable steps including training and drills to ensure the safety of all person on the Site and shall at all times promote the merits of safety awareness.

Awareness program shall be ensured for Contractors staff and workers and new employees regarding safety practices while at work before being allowed to work at project sites. Such items will include “fundamental Safety Rules applicable to each employee”.

No worker shall be allowed to access the Site unless they have undergone an induction course prepared by the Contractor - Participants who successfully complete such a course shall be presented with a laminated card and lanyard, indicating their authority to enter the site, such card being prominently displayed for the period that the holder is on site.

Training is one of the most important ways to ensure that the workers are capable and effective in maintaining a safe and healthy work environment. All workers (including casual, hired and trained workers), supervisors, engineers, sub-contractors, visitor will be inducted in this training.

Training and Record Keeping

Contractor will provide Induction Training for all new employees. Workers shall be trained so that they can apply systems of work and work practices that are safe and without risk to health.

Contractor will make sure that all employees have been adequately trained and instructed to perform their work safely before allowing them to commence construction work.

Contractor will conduct training on monthly/quarterly basis to make aware of any dangers involved with their work and safety precautions that need to be taken to avoid accident or injury.

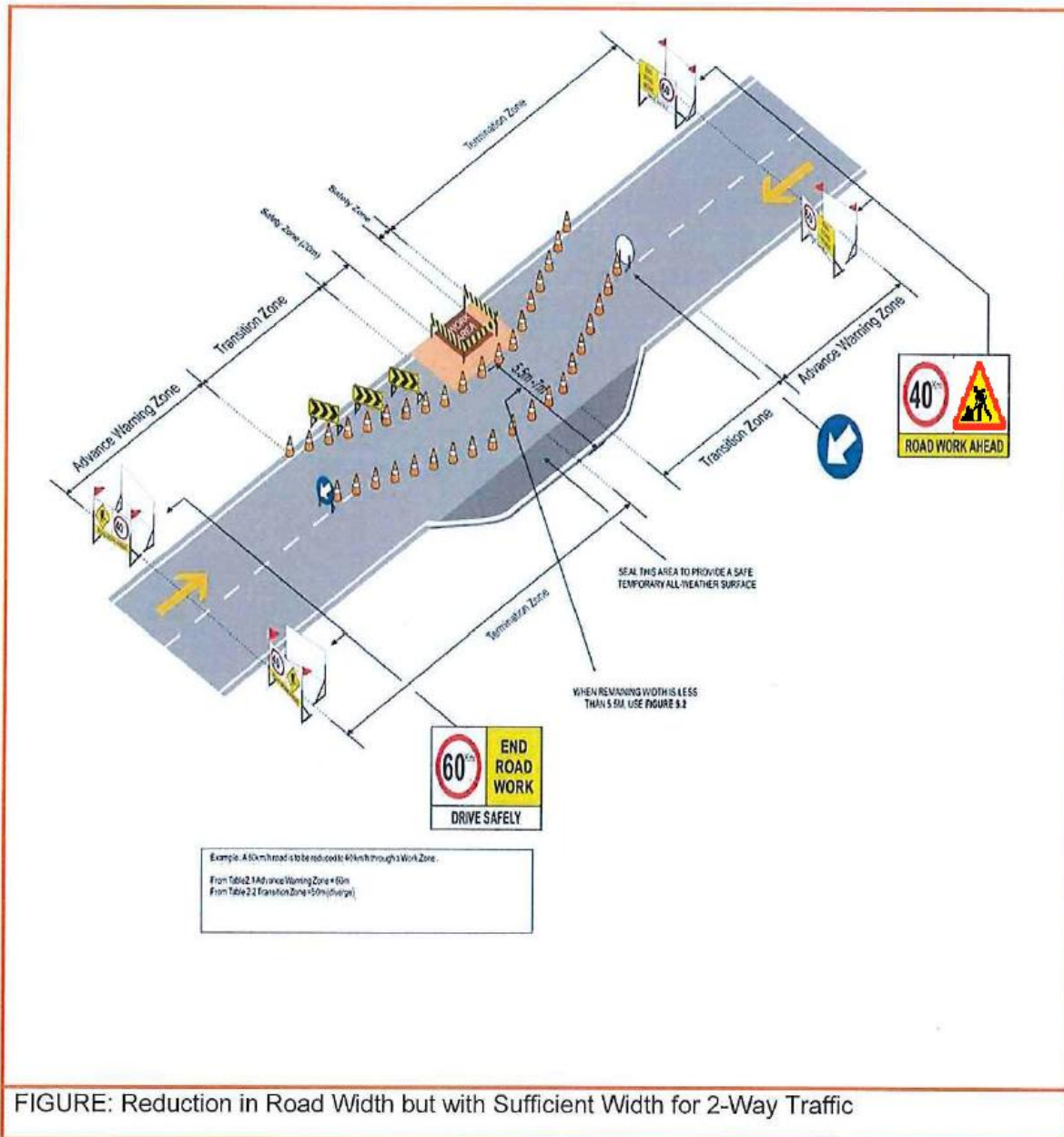
Work Activity and Traffic Induction Training

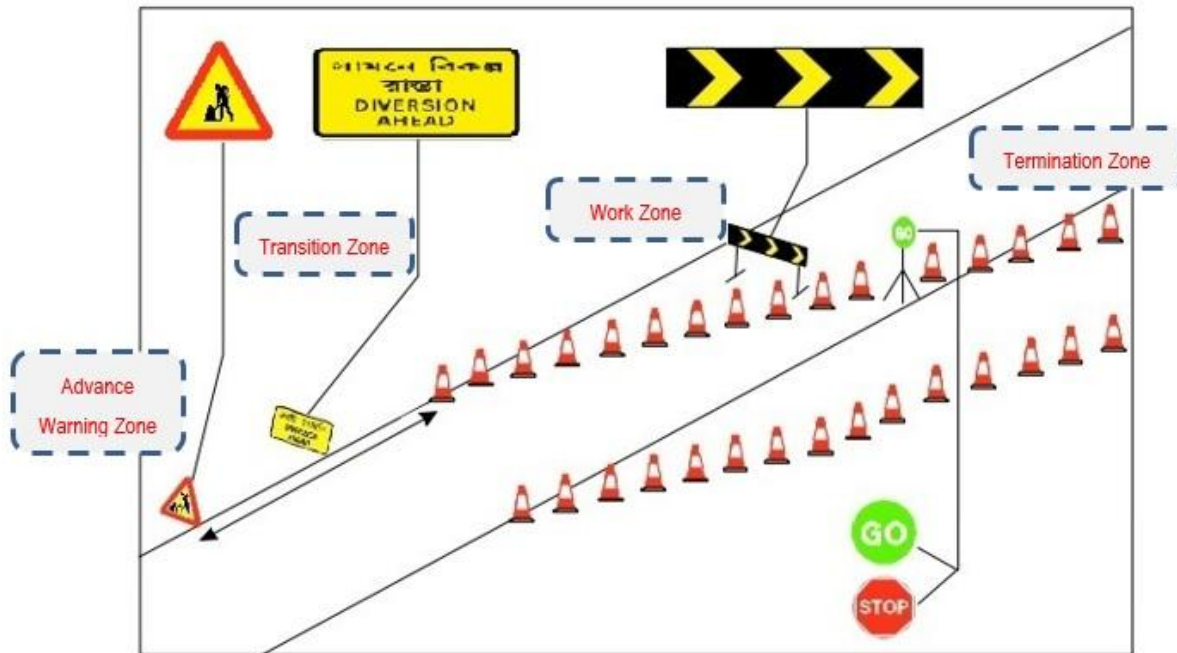
The objective of Work Activity-based health and safety traffic induction in the Road of highway sector is to give workers knowledge of the OHS issues relevant to road construction and maintenance, if this training is Conducted as a training course, where the employer has 10 or more employees it shall be developed by a person who holds a 'Certificate of HIV in Workplace Assessment and Training' and be run by a person who has Statement of Attainment in 'Train Small Groups'.

Emergency Response Training

Regular training in the form of drills and exercises will be conducted by the Emergency teams will be conducted at regular intervals. These drills will be designed to test the knowledge and understanding of the training undertaken and its application to the varying environments within the site.

The drills will cover the training elements j,e, Fire Rescue, Collapse of lifting appliances and transport equipment, Collapse of building, sheds or structure etc. Gas leakage or spillage of dangerous goods or chemicals, criminal or terrorist attack, Landslides getting workers buried floods, Earthquake, storms and other natural calamities, Rescue from Height& Medical Emergency etc. relevant to the extent of their initial training and the risks identified within the location. For each drill a scenario will be developed that clearly identifies the drills objective,





Temporary Traffic Control Zone Components

The Temporary Traffic Control Zone Component is a method of separate breaking zones according to the purpose of each. It follows the path of the road users as they approach, pass through and depart from the work site. The four components that constitute a temporary traffic control zone are describe in the order that drivers encounter them includes the following.

- Advance warning zone is to alert drivers / motorist of road works ahead and to instruct them how to safely proceed. On freeways and expressways, where the driving speed is generally 45mph or more, signs may be placed from 500ft to ½ mile or more before the temporary traffic control zone.
- Transition Zone is used where there is a need to direct traffic into another lane. To guide drivers /motorist into correct alignment in which they should remain in order to pass safely through the work zone.
- Work Zone is the length of the work area. To control drivers /motorist through the area where the work is taking place at a speed and is a lane that is safe for them and which is also safe for the road workers.
- Termination Zone is to inform drivers /motorist that they are now past the work zone, to inform them of a new speed limit that applies on the road ahead, to thank them for driving carefully through the work and remind them to always drive safely.

8.0 CONCLUSION

The contractor will put into practice a list disturbance policy and will implement the specific traffic managements identified in this document. Contractor will ensure that the site rules as set out in this document are complied with by all who work at the subproject. It's important to note that this Plan will be under constant review and will be revised as required to take into account any improvements or modifications which will improve the safety aspects of the route.

Appendix 8: Environmental Audit of Existing Facilities

Draft Environmental Audit of Existing Facility (Ishwardi Cluster Water Supply System)

[This draft environmental audit is based on the feasibility study shared and the sample site visits during the IEE study. ADB technical team to confirm that the findings are valid and used as basis for the final detailed designs.]

I. Purpose and scope of the environmental audit

An environmental audit of the existing water supply systems in the Ishwardi Cluster was undertaken to critically examine the environmental performance, compliance status, operational practices, and risk profile of current facilities prior to the implementation of the proposed cluster surface water supply system. The audit covers groundwater abstraction infrastructure, water treatment and storage facilities, distribution networks, and associated operational practices in Pabna, Ishwardi, Gopalpur and Natore, using feasibility study findings as the primary evidence base. ADB consultants visited and validated status and performance of the water supply infrastructure components through direct witnessing and conducting stakeholder meetings with the people involved with water supply systems across the four cluster towns.

II. Overview of existing water supply arrangements³⁶

The audit confirms that existing water supply systems in all four Paurashavas are fully groundwater-based. Gopalpur Paurashava does not have any infrastructure and people use their own tubewells. There are production tubewells (PTWs) for abstraction of groundwater, which are installed in various areas, which include functional ones in Pabna (20 nos.), and Paurashavas of Ishwardi (10 nos.), and Natore (12 nos.). In addition, six overhead tanks (OHTs) are available but non-functional (3 in Pabna, 3 in Natore Paurashava) in the water supply systems of four cluster towns. Besides there are two iron removal plants in Natore, which are non-functional.

Water quality in the project towns generally fails to meet government standards and overall piped service coverage remains low reaching only 15-20% of the total population across the four cluster towns. Supply is characterized by intermittent service delivery (2–16 hours per day), limited network coverage, aging infrastructure, and poor treatment performance resulting in both environmental and public health concerns. Many PTWs (42 numbers), all IRPs (2 numbers) and OHTs (6 numbers) need rehabilitation and major refurbishment or repair to continue these water supply systems. Public toilets are limited and poorly maintained, while fecal sludge and solid waste services remain underdeveloped. In addition, the urban local bodies of the project towns lack sufficient technical and financial capacity to operate, maintain, and sustainably expand water supply and sanitation systems. Due to shortage of water supply across all the four cluster towns, people beyond coverage of water supply use their private own deep and shallow tube wells.

³⁶ Partly based on Feasibility Study conducted under the Urban Infrastructure Improvement Preparatory Facility Project (UIIPFP)

Environmental performance of groundwater abstraction.

From an environmental sustainability perspective, uncontrolled and cumulative groundwater abstraction represents a key adverse impact of the existing systems. The feasibility study documents the following:

- (i) Declining groundwater reliability and widespread dependence on aquifers that are already under stress.
- (ii) Continued abstraction without effective demand management or recharge assessment poses risks of aquifer depletion.
- (iii) Potential land subsidence.
- (iv) Reduced base flows to connected surface water systems, indicating poor long-term environmental performance.

Groundwater quality constraints and contamination risks.

Feasibility and baseline studies conducted under the CTWSSP show that groundwater quality is a critical environmental and health constraint. Elevated concentrations of iron, manganese, and in some cases arsenic exceeding Bangladesh drinking water standards have been observed in several operational wells. The continued use of contaminated groundwater indicates ineffective environmental risk control, exposing users to chronic health hazards and increasing reliance on household-level treatment or alternative unsafe sources.

Water treatment and source protection practices.

The two iron removal plants (IRPs) are out of operation for about or more than 10 years. Those IRPs use natural process of aeration, flocculation, sedimentation and filtration process to remove Iron and Arsenic from groundwater. This process does not require any extra chemical other than the disinfectants. This process requires regular cleaning of the media filter. After certain interval (3 months) the media needs through cleaning which requires a huge amount of money. Due to this cost the Paurashava is unwilling to operate these units.

Testing of raw groundwater is not practiced in the towns. The quality perceived based on the users feedback, but not on the actual laboratory testing. Sampling and then testing in the laboratory costs money which is a burden to the municipalities.

Distribution network leakage and non-revenue water.

The audit identifies poor physical condition of distribution networks as a significant environmental performance issue. Existing pipelines (largely PVC or small-diameter pipes) are aged, frequently leaking, and poorly maintained. High levels of leakage contribute to non-revenue water, increased abstraction volumes, localized waterlogging, increase risk of contamination, and unnecessary stress on groundwater resources, further undermining environmental efficiency.

Energy efficiency and emissions considerations.

Existing pumping systems typically operate with low hydraulic efficiency and limited energy optimization, including the absence of variable-frequency drives and modern control systems. From an environmental audit perspective, this results in excessive electricity consumption per unit of water supplied, indirectly increasing greenhouse gas emissions associated with power generation, particularly where diesel generators are used during power outages.

Chemical handling and storage risks.

The two IRPs are out of operation more than a decade and hence those sites are locked and no chemical are preserved within those establishments. When these treatment plants are rehabilitated, care should be taken to handle the sludge and disinfectants in a safe manner to avoid potential risks of chemical spills, improper storage, and occupational exposure, as well as inadequate emergency preparedness, indicating partial non-alignment with good practice environmental health and safety standards.

Wastewater and residuals management.

Existing groundwater-based water supply systems generate limited treatment residuals; however, spent backwash water and sludge, where treatment units exist, are discharged without adequate control, sometimes into nearby drains or open land. While volumes are small relative to a centralized surface water plant, the lack of controlled disposal points represents an environmental compliance gap.

Institutional and operational capacity constraints

The environmental audit highlights institutional weaknesses affecting environmental performance. Local government institutions (city corporation and *Paurashava*) face constraints related to inadequate staff, technical staffing, routine monitoring, record-keeping, and preventive maintenance. Environmental monitoring of abstraction rates, analyzing the data from the observation tube wells to know groundwater levels, and water quality are limited, reducing the ability to identify cumulative impacts or implement corrective actions.

III. Summary of Municipality-specific Findings

Pabna Paurashava.

In Pabna, the largest demand center within the cluster with a projected 2045 population of 279,339, the existing municipal piped water system exhibits very low service coverage. This deficit forces the extensive majority of residents to rely on private hand tube wells drawing from unmonitored shallow aquifers. This fragmented, decentralized abstraction pattern creates diffuse environmental impacts, rapidly depletes shallow water tables, and makes systematic water safety surveillance or source protection completely impractical. This heavy groundwater dependency, combined with the lack of institutional monitoring, represents a high-risk environmental and public health performance profile under current municipal arrangements.

Ishwardi Paurashava

Ishwardi shows a relatively distinct water supply profile due to its historical development and strategic infrastructure, including a functioning localized ground water treatment facility. While it has achieved comparatively better municipal coverage than neighboring towns, the existing network is highly vulnerable to seasonal water table drops and severe chemical contamination, particularly from elevated levels of iron, arsenic, and manganese. Operating an aging, groundwater-dependent extraction system, environmental audit findings indicate only moderate performance due to significant distribution line leakages and systemic operational inefficiencies. These limitations underscore the urgent need to transition toward the planned 113 MLD centralized surface water system from the Padma River to allow for sustainable urban expansion.

Natore Paurashava

In Natore, low water supply coverage and complete dependency on vulnerable groundwater sources create severe environmental and operational risks. The town's flat, low-lying terrain is

highly susceptible to structural encroachment along its adjacent water bodies, like the Narad River, which limits natural aquifer recharge and worsens dry-season water scarcity. Furthermore, the absence of proper wellhead protection zones leaves the town's current production wells exposed to surface-level contamination from untreated urban runoff and solid waste accumulation. The baseline audit notes that continued operation of the existing groundwater-dependent systems will inevitably aggravate local environmental stress, accelerate aquifer depletion, and fail to meet acceptable public health and sustainability thresholds.

Gopalpur Paurashava.

Gopalpur presents the most critical utility deficit in the cluster, currently suffering from a complete absence of public piped water infrastructure. The entire population is forced to rely exclusively on private shallow tube wells that extract raw groundwater heavily contaminated with iron, manganese, and hazardous concentrations of arsenic. Audit observations indicate that the total absence of a municipal treatment process, coupled with uncontrolled private drilling, significantly increases public health exposure to waterborne and heavy metal toxicities. This lack of centralized distribution and treatment results in localized environmental degradation and unnecessary deep-aquifer vulnerability, highlighting Gopalpur as the most fragile environment in the cluster prior to the implementation of the proposed surface water transmission grid.

IV. Compliance with National Environmental Requirements

Compliance with scale groundwater abstraction typically falls outside major permitting thresholds in national environmental requirements

From a regulatory standpoint, existing water extraction systems in the Ishwardi cluster operate with minimal formal environmental permitting or monitoring, reflecting legacy conditions rather than current best practice. While the Paurashavas of Pabna, Ishwardi, Gopalpur (Lalpur), and Natore do not impose any requirement for obtaining permission prior to the installation of a private tube well, there is currently a major institutional gap regarding the implementation of a standardized No Objection Certificate (NOC) framework or municipal abstraction fees within these jurisdictions.

Despite the fact that regional groundwater withdrawals for domestic and drinking water supply purposes cause a minimal loss for groundwater depletion as compared to the dominant agricultural sector (roughly 90%) and localized industrial operations, the cumulative environmental impact observed across the cluster raises concerns. The localized dropping of water tables, combined with widespread chemical vulnerabilities, complicates alignment with the intent of the country's Environmental Conservation Act 1995, Water Act 2013, and Environment Conservation Rules 2023, particularly with respect to long-term aquifer protection and other environmental consequences resulting from the over-abstraction of groundwater.

Although historically slow, Bangladesh is in a structural transition to shift from its heavy reliance on groundwater to surface water use through robust treatment to combat severe aquifer depletion, localized arsenic or heavy metal contamination, and river pollution. The proposed regional cluster project has been specifically designed to utilize surface water from the Padma River, drawing a total design volume of 113 MLD via a centralized intake facility near Sara Ghat. This multi-town framework involves large-scale water treatment infrastructure utilizing conventional sedimentation, rapid sand filtration, and chlorination to safely distribute treated

surface water across the Paurashavas of Pabna, Ishwardi, Gopalpur, and Natore, establishing a more sustainable and legally compliant urban water resource framework by the 2045 horizon.

V. Findings and Conclusion

Long-term cumulative environmental risk

Existing groundwater-based systems offer limited resilience to climate variability, particularly prolonged dry periods. Dependence on declining aquifers reduces adaptive capacity, while the absence of integrated water resource planning limits the system's ability to respond to future climatic stressors, including drought and increased urban demand.

The environmental audit concludes that, while individual components of the existing systems generate relatively localized impacts, their cumulative effect across the four municipalities is significant, resulting in unsustainable groundwater use, inefficient energy consumption, and persistent water quality risks. These cumulative impacts are assessed as environmentally unacceptable in the long term.

Audit conclusion and implications for project design

When benchmarked against the proposed regional surface water supply system, the existing water supply arrangements exhibit inferior environmental performance across key indicators, including resource sustainability, water quality assurance, energy efficiency, and institutional environmental control. The audit thus provides a strong environmental justification for system replacement rather than incremental rehabilitation.

In conclusion, the environmental audit of existing water supply systems in the Ishwardi Cluster identifies systemic deficiencies that compromise environmental sustainability, public health protection, and climate resilience. The findings support the strategic shift toward a centralized surface water supply system, which, if properly implemented and managed, offers substantially improved environmental performance, stronger regulatory compliance, and long-term sustainability compared to the legacy groundwater-dependent systems.

However, where specific elements of the existing water supply system are retained for continued use, it is essential that their rehabilitation and upgrading strictly adhere to the mitigation measures outlined in the IEE and EMP of the subproject. This approach will ensure that potential environmental and public health risks are minimized while maintaining compliance with applicable standards and improving overall system performance.

Photos captured during field visit in May 2026



Photo 1: Newly constructed Secondary Transfer Station and the old Water Tank near PTI, Natore.



Photo 2: Old Street hydrant at Natore.



Photo 11: Intake site visit at Ishwardi



Photo 5: Visited IRP site at Natore Paurashava.



Photo 6: IRP and OHT Site visit at Pabna.



Photo 8: Solid waste dump site at Gopalpur Paurashava



Photo 13: Water Reservoir and IRP at Jolkol, Natore



Photo 12: Water Reservoir at Natore

Site Visit Monitoring Sheet

(Note: This sheet should be accomplished based on actual visits undertaken by the Environment Specialist. Once completed, this monitoring sheet will form part of the IEE report as appendix, in addition to the accomplished REA Checklist)

Date of Site Visit: 08 & 19-Apr-2026__
 Site Visit Team Members: Dr. Miah M. Hussainuzzaman
 Mr. Nurul Amin Siddique

Site Visit Findings

Site Visit Checklist Items	Findings	Other Remarks
II. Package Name	Rehabilitation of Production Tubewell, Cluster Town Water Supply and Sanitation Project (CTWSSP)	
III. Location of Network Alignment (GPS Coordinates)	Along the streets of the municipality	
IV. Length, km		
V. Narrowest width of ROW, m	1.5	House connections
VI. Widest width of ROW, m	30	Only in highway
VII. Are there existing side drainages?	Yes	Mostly
VIII. Land Uses	On both sides of the road are mostly residential, commercial and institutional that are within the town/Paurashava center. Other land uses along the alignment are agricultural lands with small pockets of communities.	
IX. No. of Trees to be Cut/Felled, if any	None at this stage. However, there are 189 trees found along the roadside of this alignment.	Distribution network within RoW
X. Topography	Mostly flat.	
XI. Is there a flood or water logging risk?	No. The elevation of the existing road is much higher than the adjacent lands on both sides.	
XII. Is there a landslide risk?	No. The topography is mostly flat.	
XIII. Is there are river crossing? If yes, what is the name, width and chainage location?	Yes, There are several road bridges over Ichamoti river (<50m) and the distribution network shall follow those roads and cross the bridge in several locations.	<i>Note: All these should be shown on photos and the google earth maps in the IEE report.</i>
XIV. Is there any rail crossing? If yes, at what chainage location?	Yes, there are around 4 rail crossings within the city and the pipe network shall follow those roads.	

Site Visit Checklist Items	Findings	Other Remarks
XV. Any Protected Areas (PAs) or environmentally sensitive areas within 1km? If yes, what is/are the name/s?	No.	
XVI. Any Healthcare Facilities? If yes, what is the name of the facility and at what chainage is it located?	Yes. Pabna municipality has a Medical College Hospital, Sadar Hospital, 2 TB Hospital and Clinic, 1 Mental Hospital, one Matrimangal Kendra (mother care center), one Children's Hospital, 21 Private Clinics and a Diabetic Hospital	
XVII. Any schools or educational facilities (e.g. Madrasa)? If yes, what is the name of the facility and at what chainage is it located?	Yes. In the municipal area there are 14 colleges/institutes, 6 madrasa, 20 high schools and 41 primary schools.	
XVIII. Any Physical Cultural Resources (PCR)?	Yes.	
B. Historical Monuments (Nationally or Internationally Declared)		
C. Local Cultural/Historical Monuments	Jor Bangla Mandir, Tarash Rajbari, Sree Sree Thakur Anukul Chandra Shatshang Poromtirtho	
D. Mosques	90	
E. Prayers Areas or Eidgahs	7	
F. Other Religious Temples or Structures	Temple: 32, Church: 1	
G. Graveyard	6 and one crematory	

Photos Taken During Site Visits



Typical Road Setting



Narrowest Road Section



Widest Road Section



Marketplace / Bazar Along Alignment

Name/Location:

[insert photo here]

Marketplace / Bazar Along Alignment

Name/Location:

[insert photo here]

Marketplace / Bazar Along Alignment

Name/Location: