Initial Environmental Examination

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Bangladesh: Chattogram Hill Tracts Inclusive and Resilient Urban Water Supply and Sanitation Project – Lama Sanitation and Solid Waste Management Component

Package Nos: W-18/LPS and W-19/LPS

Prepared by the Department of Public Health and Engineering of the Government of Bangladesh for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 1 April 2022)

Currency Unit	=	Bangladesh Taka (BDT)
BDT1.00	=	$0.0115
$1.00	=	BDT86.42

ABBREVIATIONS

BHDC	-	Bandarban Hill District Council
BWDB	-	Bangladesh Water Development Board
CBO	-	Community Based Organizations
CHT	-	Chittagong Hill Tracts
CHTRC	-	Chittagong Hill Tract Regional Council
CHTIRUWSSP	-	Chattogram Hill Tract Inclusive and Resilient Urban Water Supply and Sanitation Project
DOE	-	Department of Environment
DPHE	-	Department of Public Health Engineering
ECR	-	Environmental Conservation Rules
EA	-	Executing Agency
EIA	-	Environmental Impact Assessment
ECC	-	Environmental Clearance Certificate
FSM	-	Fecal Sludge Management
GoB	-	Government of Bangladesh
GRC	-	Grievance Redressal Committee
GRM	-	Grievance Redress Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IWTP	-	Integrated Waste Treatment Plant
LARB	-	Land Resources Appraisal of Bangladesh
MoEFCC	-	Ministry of Environment, Forests and Climate Change
NGO	-	Non-Government Organizations
NEP	-	National Environment Policy
O&M	-	Operation & Maintenance
OSH	-	Occupational Safety and Health
PIU	-	Project Implementation Unit
PMDS	-	Project Management Design and Supervision
PMU	-	Project Management Unit
REA	-	Rapid Environmental Assessment
SCC	-	Site Clearance Certificate
SDG	-	Sustainable Development Goals
SPS	-	Safeguard Policy Statement
SWM	-	Solid Waste Management
TA	-	Technical Assistance
UIIPF	-	Urban Infrastructure Improvement Preparatory Facility

WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
m	–	meter
mg/l	–	milligram per liter
MLD	–	million liters per day
mm	–	millimeter
km/h	–	kilometer per hour

NOTE

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

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EXECUTIVE SUMMARY

Project Description. Chattogram Hill Tracts Inclusive and Resilient Urban Water Supply and Sanitation Project (CHTIRUWSSP, the project) will support sustainable, inclusive, and resilient drinking water, sanitation, and solid waste management (SWM) services in Bandarban, Lama, and Rangamati pourashavas. It will also support further project preparation and readiness for inclusive and resilient water supply and sanitation investments in eight towns and economic zones in the Cumilla and Ishwardi clusters, Khagrachari pourashava in Chattogram Hill Tracts (CHT), and 22 coastal towns. The project will complement previous interventions in Bandarban and Rangamati pourashavas under the Third Urban Governance and Infrastructure Improvement (Sector) Project. Department of Public Health Engineering (DPHE) will be the executing agency of charge of these components. Respective hill councils of Rangamati and Bandarban implementing agencies for water supply components, while respective Pourashavas are implementing agencies for sanitation and solid waste management components.

CHTIRUWSSP will be aligned with the following impact: access for all to adequate, safe, and affordable basic services including water, sanitation, and waste management ensured.[1] The project will have the following outcome: access to safely managed, sustainable, inclusive, and resilient drinking water supply, sanitation, and SWM services improved in the project area. The Outputs of the project are:

- Output 1: Climate-resilient and inclusive drinking water supply, sanitation, and solid waste management infrastructure developed and/or upgraded.
- Output 2: Capacity, governance, and awareness of institutions and local communities in climate-resilient, sustainable, and inclusive urban services strengthened.
- Output 3: Quality, readiness, and resilience of water supply and sanitation projects in Cumilla and Ishwardi clusters, Khagrachari pourashava, and coastal towns improved.

Lama is one of the three towns benefitted under this Project. Rapid urbanization of the town degrading the urban environment, public health and creating high stress to the already inadequate basic urban service infrastructure. The lack of three basic urban waste management services in Lama degrading the urban environmental and causing serious public health threat. Sanitation component of the CHTIRUWSSP aims to provide sustainable, reliable, and climate-resilient sanitation services in Lama Town. It will enhance the sanitation service delivery in the Lama Town with improvements achieved in Fecal Sludge Management (FSM) and Solid Waste Management (SWM). This is achieved by implementing the complete solutions for both FSM and SWM that includes Collection, Transportation, Segregation and Treatment as per the prevailing standards in Bangladesh. A City-Wide Inclusive Sanitation (CWIS) approach is applied for designing FSM. Also, the 3R strategy of (Reduce, Reuse, and Recycle) forms the basis for designing SWM. Through this sanitation sub-project, high-quality and reliable FSM and SWM services shall be made available for all the Town's population.

[1] This period (2010–2019) saw per capita income rise from $754 to $2,064, life expectancy increased from 67 years to 73 years, adult literacy expanded from 58% to 75%. Government of Bangladesh. 2020. *Eighth Five-Year Plan July 2020 – June 2025: Promoting Prosperity and Fostering Inclusiveness*. Dhaka.

Scope of Subproject. The proposed subproject is an integrated waste management (IWM) scheme that will serve Lama Pourashava in the Bandarban District in Bangladesh. Per preliminary design, the subproject will be implemented to serve the ultimate projected design population of 2045 and with a design capacity of about 20 tons of solid wastes per day. The components of the subproject include (i) primary waste collection and transport; (ii) secondary storage and transport; and (iii) IWTP facility that includes (a) a materials recovery facility (MRF), (b) a composting plant, (c) a fecal sludge treatment plant (FSTP), and (d) a landfill system with landfill cells, leachate collection and treatment system and landfill gas collection and control system; other allied subcomponents needed to run the entire facility such as management building, internal roads, etc. Interventions for FSM will include improving the existing Fecal Collection System and Construction of the FSM Treatment and Disposal Facility; Provision of Vacuum Trucks and Pumps; Undertake improvement in Containment Systems by providing 768 of prefabricated plastic septic tanks and replacing 857 Hanging Toilets; Repair of existing 8 public latrines and installing 11 new public latrines; 2 toilets for small ethnic communities; and Capacity Building of the Pourashava Staff on O&M of the Sanitation system.

Primary Waste Collection and Transport. Based on feasibility study conducted for the subproject, the current and future waste generation in the Pourashava will require additional primary waste collection vehicles and implements to ensure efficient waste collection activities. Per recommendation of the feasibility study, for phase I up to 2025, the capacity of the household waste collection fleet needs to be increased by the procurement of 10 mechanical rickshaw vans and 10 manual rickshaws with bins for the house-to-house collection. These vans will complement the existing equipment currently in use. These primary waste collection vehicles will be deployed to the different areas of the town equitably based on area population density. The mechanical rickshaws will support for collection in the hill areas. Collection will be done daily in the high density and market areas while every two days in low density areas. Household level segregation of wastes (i.e., biodegradable, recyclables, and non-biodegradables/hazardous wastes) will be encouraged and be part of the continuing information campaign at the Pourashava level.

Separately, fecal sludge management will also be introduced with the procurement of 2 vacuum trucks with capacities 1m3 and 2.5m3 for collection of fecal sludge from septic tanks of households and transporting to the fecal sludge treatment plant that is part of the IWTP facility component under the subproject. In addition to this. for containment improvement, use of prefabricated plastic septic tanks (768) will be promoted.

Secondary Storage and Transport. Based on feasibility study, secondary storage and transport will adopt a movable temporary storage system with the use of demountable containers and demountable container carrier trucks. It is envisaged that the scheme will make use of the demountable containers as an alternative to the traditional secondary transfer stations being employed in other IWM schemes elsewhere particularly in bigger urban towns or cities. The idea of using demountable containers is to (i) have a movable collection storage that can be strategically located around the Pourashava area, and (ii) eliminate the need for loading and unloading of wastes. Therefore, adopting demountable containers avoids the occurrence of littering and waste mismanagement normally experienced in traditional secondary transfer station operations.

Per recommendation of the feasibility study, the secondary storage will need to be increased with the addition of 120 communal bins/containers (660L), 2 containers (5000L) and 13,200 green and yellow color households' bins (50L). The containers will be distributed at strategic locations in the Pourashava equitably based on area activities (e.g., markets where high volume of wastes is generated) and population density (e.g., cluster residential communities). Positioning these

containers will consider the incidence of flooding, and the exact locations will ensure that these are elevated above the known flood levels at the areas. Each location will have containers to cater to the segregated wastes desired (biodegradable, non-biodegradable, hazardous). To cater to these containers, the secondary transport fleet will need three (3) dump truck of 3-ton capacity along with 2 compactors truck with lifting mechanism (5 ton) to be used to transport to the landfill facility.

IWTP (IWTP) Facility. The total area of the for the facility is about 20250 sqm. or 5 acres, which will be fully utilized by various subcomponents, such as the MRF, Composting Plant, FSTP, landfill cells, leachate collection and treatment plant, landfill gas collection and control system, and other allied subcomponents/infrastructures.

Materials Recovery Facility. The MRF is an integral part of the IWTP facility component of the subproject. Recognizing that household segregation of wastes may not be perfect or satisfactory, further sorting of wastes will still be done at the MRF. The facility along with composting plant will occupy a total area of 5770 sqm. to provide a wider area for proper segregation and storage of recyclable wastes and will also be provided with a shredder and baling machine. Dedicated storage area for household hazardous wastes will be provided. Accordingly, these types of wastes will be transported to authorized treaters. Other specific operational details of the MRF will be finalized during the detailed design stage, with due consideration of related recommendations in this IEE report.

Composting Plant. The composting plant is an integral part of the IWTP facility component of the subproject. Based on feasibility study, compost plant of biodegradable wastes has been proposed at the initial stage. Operationally, the plant will be maintained by a third party to be engaged by the Pourashava. So, the compost plant will divert significant portion of the incoming waste that is otherwise sent for landfilling. The facility can utilize significant portion of organic waste in a cost-effective way. This compost plant is designed for organic wastes (fresh organic waste coming mainly from kitchens, restaurants, vegetable wholesale markets, parks, and lawns), and its operation envisages three major activities, namely: collection of segregated waste from the source, processing of waste using aerobic compost technology, and marketing of compost produced. The final technology to be adopted, specific processes involved, and other operational details of the composting plant will be further elaborated during the detailed design stage, with due consideration of related recommendations in this IEE report.

Fecal Sludge Treatment Plant. The FSTP is an integral part of the IWTP facility component of the subproject. Operationally, the FSTP will be maintained by a third party to be engaged by the Pourashava.. Fecal sludge will be collected directly from households using two (2) vacuum trucks. Collection of fecal sludge will be on needs or on call basis and/or on scheduled basis. No desludging will be allowed beyond 5 m^3/day per day to avoid overloading the FSTP. The sludge collection at the household level will involve mechanical desludging of septic tanks only, and no manual desludging will be allowed as well. For compacted layers of sludge, long spades or jet water hoses will be used. The vacuum trucks will have long hose pipe to enable them to reach the pits or septic tanks located in inaccessible areas. The FSTP is designed to employ the conventional biological treatment process. The solids will be dried and brought to the composting plant, while the supernatant liquid will be treated to compliance level prior to discharge. The specific processes involved and other operational details of the FSTP will be further elaborated during the detailed design stage, with due consideration of related recommendations in this IEE report.

Landfill Facility (Landfill Cells, Leachate Collection and Treatment Plant, and Landfill Gas Collection and Control System). The landfill facility is an integral part of the IWTP facility component of the subproject. Per preliminary design, the landfill site is planned to contain initially 6 inert waste cells. The size of waste cell ranges between 0.41-0.43acres. along with a leachate collection and treatment plant (LCTP). While most of the organic waste will be handled by composting, a landfill gas collection and control system will also be included as part of the design. The technical details of the landfill component and its allied subcomponents will be finalized during the detailed design stage, with due consideration of related recommendations in this IEE report.

Categorization. The proposed subproject is classified as Environmental Category "B" per the ADB SPS as no significant impacts are envisioned and accordingly this Initial Environmental Examination (IEE) has been prepared. This IEE is assessing the environmental impacts and providing mitigation and monitoring measures to ensure that there are no significant impacts because of the proposed subproject implementation.

Description of the Environment. Lama town is subdivision headquarter town in Bandarban district, is one of the hill districts in Chattogram Hill Tracts which is predominantly covered with hilly forest areas (61% of geographic area). Subproject components are in Lama pourashava and its immediate surroundings. These were converted into urban use or agricultural use since many years. Pourashava surrounding areas comprises developed areas with residential and commercial areas, and also has considerable undeveloped and agricultural lands, mainly comprises of hills and valleys. Hills have notable vegetation and tree cover, which is again mostly with trees of commercial value or with horticultural crops. Proposed IWTP site of 5 acre area for fecal sludge treatment and solid waste management facility is located in the north of the town, about 5 km from the town center. Site is surrounded by agricultural fields, and there are no houses or habitation within 200 m of site. Site is about 500 m from the main road connecting Lama. Matamuhuri River flows at the edge of the Town. There are no endangered fish or river species in the subproject area of influence. There are no forests and protected areas in the vicinity of the project sites. Preliminary screening via Integrated Biodiversity Assessment Tool (IBAT) indicated presence of various protected species in the wider area of Bandarban district and Chattogram hill tracts. Movement of these species is mainly limited to forests and protece4d areas, although there is a chance of animals venturing out. Further biodiversity screening and precautionary measures suggested in the EMP.

Proposed Integrated Waste Management Facility Site. As per preliminary design and waste management estimates, a suitable site of 5-acre area is required to establish integrated waste treatment including FSM, Composting and Landfilling and associated facilities. The region has hilly terrain which makes identifying and selecting a suitable site for the IWTP including landfill facility a challenge. During preliminary investigation and due diligence, a total of 5 potential sites were reviewed for their suitability keeping in view different criteria such as (i) distance from nearest residential area; (ii) distance from nearest water body; (iii) total area required by the IWTP and associated facilities for the design year; (iv) minimum distance from any protected area or designated wildlife sanctuary; etc. Finally, a privately owned 5-acre site located in an isolated area surrounded by agricultural fields and a natural buffer in the form of a small hills on three sides of the proposed facility. There is no habitation near the proposed site. The area falls within an agricultural zone, and presently the site has commercial tree plantations which will be required to be cleared during the construction. The site is privately owned and Pourashava is in the process of acquiring the site. There are no permanent houses or structures in the neighborhood, only temporary sheds for agricultural laborers to stay during the day for managing the fields. Based on preliminary investigations and site visits done by the technical and project team and consultants, it was noted that there is a nearby drain / channel along the periphery of the site that

connects with the Matamuhuri river after meandering through more than 2 km away from the site. It was found that the drain/channel connecting the river is full of ditches, lowlands, borrow pits, etc.

This small hill drain originating in the hill above the proposed site, flows in flows towards southwest and joins River Matamuhuri after traversing for about 2 km from the proposed site. As per local investigation, this flows only during rains, carries runoff from the hill, and as it originates on the same hill, the catchment area is limited, and its discharge is not considerable, this however needs to be further studied during the detailed design. Local consultations further indicate that, this drain was originally very narrow, however, as its course is mostly dry, local farmers use it as approach to access their agricultural fields, and therefore the drain course appears wide (about 4-6 m wide) and well defined. River Matamuhuri, into which it discharges, is a perennial river and is water source for Lama town. This is a large river, carries considerable flows, especially during rainy season. The location of new water intake on Matamuhuri, proposed as part of water supply subproject in Lama, is located just downstream of meeting point of this drain with Matamuhuri river. This intake point is identified after detailed investigations, and therefore is not feasible to shift this intake point upstream. Given the constraints in identifying ideal lands in Lama for waste management site, this site is selected, and proposed to develop with various safeguards to avoid pollution of Matamuhuri river. Wastewater/ leachate from landfill will be treated prior to discharge, and following additional measures are included in the preliminary designs:

(i) Further investigations on the drain should be carried out during the detailed design, and Location Clearance Certificate from the DOE shall be secured prior to bidding. This is important, as per Landfill criteria, no water body, river or lake should be within 200 m of landfill site.
(ii) Facility design will ensure proper surface drainage system within internal and peripheral drains to facilitate runoff. Design will ensure separation of runoff from contaminated areas and clean areas.
(iii) Protection of drain from leaching of leachate via ground/soil
(iv) Diversion of contaminated runoff to treatment plant.
(v) Peripheral drains will be provided to avoid entry of runoff from uphill and surrounding areas into facility and will ensure safe passage of upstream runoff into the drain.
(vi) Treated leachate will be recirculated and not discharged into drain
(vii) Wastewater from FSTP will be utilized within the site for plantation or facility operation, and there be no discharge into drains.
(viii) However, during the rains, the leachate generation may be considerable, and, also, treated wastewater from FSTM may not be utilized within the site. Therefore, it may be necessary to discharge treated water into drain, which will further discharge into Matamuhuri river. Given intake on the downstream side, following two alternatives are suggested to include in the design. These alternatives will be examined during the detailed design, and appropriate alternative will be implemented. This will avoid risk of polluting the water source.

a. Interception of the drain close to river Matamuhuri and divert the same to downstream of intake (~ 500 m or as appropriate during finalized during the detailed design), by constructing an open concrete channel along the bank of the river or through a pipe buried along the river, duly considering river high flood level, taking measures to avoid erosion of riverbed at discharge point
b. Laying of an outfall pipe from the IWT facility to nearest drain or river Matamuhuri to directly discharge runoff and treated wastewater into river downstream of intake

(~ 500 m or as appropriate during finalized during the detailed design). This may be laid within the access road right of way.

Assessment of Potential Environmental Impacts and Mitigation Measures. Positive environmental impacts of the subproject have been identified and noted in this IEE study. Improvement of the solid waste management in the *Pourashava* is expected to result to the following environmental benefits: (i) cleaner and visually pleasant land and water environments; (ii) cleaner ambient air quality; and (iii) odor free surroundings. Socio-economic benefits include (i) employment opportunities during construction and operation phases of the subproject; (ii) livelihood opportunities because of the 3R initiatives; and (iii) better health condition of the people in the medium to long term as a result of cleaner environment.

Potential adverse environmental impacts were also assessed based on secondary data, stakeholder consultations, and field visits at the subproject sites. Impacts were assessed based on the location and subproject activities during the pre-construction, construction, and operation phases. Based on their nature and magnitude, impacts during operation phase of the IWTP facility component are the most important impacts to assess under the subproject. Accordingly, these impacts are best avoided or mitigated through (i) proper siting of the facility; and (ii) designing each subcomponent based on properly guided solid waste management planning, solid waste characterization and quantification, and use of best available but practical technologies and practices. Measures for climate change risks such as increased precipitation and flooding in the subproject area are incorporated upfront into the preliminary design of the facility and will be confirmed during the detailed design phase.

Similarly, the construction phase of the subproject will also involve impacts that need to be assessed. Given a properly designed facility, all subsequent construction activities will only involve straightforward works, and are unlikely to cause significant adverse impact. Usual construction-related impacts such as noise, dust generation, silt generation, soil contamination from chemicals spills and leaks, construction waste generation, and occupational and community health and safety risks including the spread of COVID-19, among others, will be localized, temporary and avoidable with the implementation of mitigation measures in the EMP. There are no areas of archeological or heritage importance in the vicinity of the proposed FSM and landfill site. within 2 km away from this area.

Environmental Management Plan. An environmental management plan (EMP) has been developed and included as part of this IEE, which outlines the following: (i) mitigation measures for environmental impacts during implementation; and (ii) an environmental monitoring program, and the responsible entities for implementing, monitoring, and reporting. In accordance with this EMP, the Contractor will be required to prepare a site-specific environmental management plan (SEMP). Contractor will submit its SEMP for approval to the project implementation unit PIU.

The EMP and SEMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. Copies of the EMP and SEMP shall be kept on-site during the construction phase. The Contractor will be responsible for the organization, direction, and execution of environmental management related activities during construction of the proposed subproject. The Contractor will

also undertake all activities in accordance with the relevant environmental requirements, including consent documentation and other regulatory and/or statutory and contractual requirements.

Implementation Arrangement. Department of Public Health and Engineering (DPHE) is the Executing Agency (EA) of this project. DPHE as the executing agency shall be responsible for compliance with ADB Safeguard Policy Statement (SPS) 2009. DPHE would be responsible for overall implementation of the project and would contact various agencies, support their functioning and coordinate with concerned Project Implementation Units (PIUs) under overall guidance of the Local Government Division (LGD). A project management unit (PMU) will be established along with project implementation units (PIUs) at the field level to implement the project. PMU will be staffed with two safeguard officers: (i) Environment Safeguard Officer (ESO) and (ii) Social Safeguard and Gender Officer (SSGO) who will be responsible for compliance with the environmental, social and gender safeguards and community related issues in program implementation respectively.

Project management, construction, supervision, and design review consultants (PMCSDRC) shall be appointed and the Environmental Safeguard Specialist of the PMCSDRC will have primary responsibility of preparing the safeguard documents and supervising the EMP implementation, while the Safeguards Officers at PMU will review, approve, and oversee the compliance. At each PIU, a Safeguard/Environment Officer of Assistant Engineer rank, AE (SEO), will be responsible for safeguard implementation. AE(SEO) will oversee the safeguards implementation at PIU level and will be responsible for reporting to Environment Safeguard Officer at PMU. Contractor will appoint an Environment, Health and Safety (EHS) supervisor to implement EMP. The PMU will also have the responsibility for obtaining environmental clearance of the subproject from the Department of Environment.

During the operation phase of the subproject, it is proposed that the waste collection, storage and transport components will be operated by third parties to be engaged by the *Pourashava*. The IWTP facility will be awarded to a third-party contractor after completion of detailed design under a civil works contract modality. Specific details of this proposed engagement will be finalized during the detailed design phase.

The contractor will be required to (i) obtain all other statutory clearances prior to commencement of civil works; (ii) establish an operational system for managing environmental impacts; (iii) prepare a SEMP based on the EMP of this IEE, and submit to PIU or PMU for approval; (iv) carry out all of the monitoring and mitigation measures set forth in the approved SEMP; and (v) implement any corrective or preventative actions set out in safeguards monitoring reports that the PMU will prepare from time to time to monitor implementation of this IEE, EMP, and SEMP. The Contractor shall allocate a budget for compliance with these EMP measures, requirements, and actions.

Grievance Redress Mechanism. The subproject will adopt the common grievance redress mechanism (GRM) of the overall CHTIRUWSSP, which will be set up to register grievances of the people regarding technical, social, and environmental aspects. The process will be designed to be transparent, gender responsive, culturally appropriate, and commensurate to the risks and adverse impacts of the subproject, as well as readily accessible to all segments of the affected people. Affected people are to be informed about the mechanism through media and public outlets. This participatory process shall ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Procedurally, every grievance or complaint will be resolved at the first tier or Pourashava level. Any unresolved grievances at the first level will be automatically elevated to second tier. Then any unresolved

grievances at the second level will be automatically elevated to the third-tier or PMU level for final resolution.

The GRM, notwithstanding, an aggrieved person or complainant shall have access to the country's legal system at any stage. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

Information Disclosure and Consultation. The subproject has undertaken meaningful consultations[2] during the project preparatory stage. During the feasibility phase, focus group discussion (FGD) and public consultations were conducted with the representatives, officials and community people for site selection and construction of the subproject components at the proposed location. Their views were incorporated into the IEE and in the planning and development of the subproject.

The IEE and/or the executive summary translated in the local language (Bangla) understandable to affected people and other stakeholders will be made available in an accessible place (e.g. community bulletin boards, offices of PMU, PIU, Pourashava, and Contractor, including any satellite office of Contractor at the subproject site) and will be disclosed to a wider audience via the ADB and project websites. Disclosure will be made locally at least two weeks prior to scheduled consultation/s to provide stakeholders time to read and consult with expert/s if needed. The consultation process will be continued and expanded during project implementation, including design period, to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.[3]

Monitoring and Reporting. The PMU, PIU and PMCSDRC will be responsible for monitoring and reporting. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. PIU with the assistance of PMCSDRC, will monitor the compliance of contractor, prepare a quarterly environmental monitoring report (QEMR) and submit to PMU. The PMU will oversee the implementation and compliance and will submit semi-annual environmental monitoring reports (SEMR) to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted at PMU websites.

Conclusion and Recommendations. The subproject will result in environmental benefits because of improved FSM and solid waste management for Lama Pourashava. While the nature and magnitude of potential environmental impacts inherent to operation of IWTP facilities are obvious, these impacts are avoided, mitigated, or reduced with the selection of site- and site-specific design measures to suit the site conditions. The proposed site for IWTP facility is in the process of procurement by Lama Pourashava. The proposed facility will therefore improve the existing situation and will have various measures to prevent surface and groundwater pollution,

[2] Per ADB SPS, 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.

[3] 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."

and nuisance to scattered houses etc., and the institution of best available practical technologies and engineering designs ensuring all emissions and effluents from the facility operations comply with national and international standards. Design measures such as the following are included in the EMP, which will be considered in detailed design.

Overall facility

- Designs should be based on detailed site-specific surveys investigations
- Further investigations on the drain should be done during the detailed design, and Location Clearance Certificate from the DOE shall be secured prior to bidding. This is important, as per Landfill criteria, no water body, river or lake should be within 200 m of landfill site.
- Facility design will ensure proper surface drainage system within internal and peripheral drains to facilitate runoff. Design will ensure separation of runoff from contaminated areas and clean areas.
- Protection of drain from leaching of leachate via ground/soil
- Diversion of contaminated runoff to treatment plant.
- Peripheral drains will be provided to avoid entry of runoff from uphill and surrounding areas into facility and will ensure safe passage of upstream runoff into the drain.
- Treated leachate will be recirculated and not discharged into drain
- Wastewater from FSTP will be utilized within the site for plantation or facility operation, and there be no discharge into drains.
- Following two alternatives are suggested to include in the design. These alternatives will be examined during the detailed design, and appropriate alternative will be implemented. This will avoid risk of polluting the water source.

    a. Intercept the drain close to river Matamuhuri and divert the same to downstream of intake (~ 500 m or as appropriate during finalized during the detailed design), by constructing an open concrete channel along the bank of the river, or through a pipe buried along the river, duly considering river high flood level, taking measures to avoid erosion of riverbed at discharge point
    b. Laying of an outfall pipe from the IWT facility to nearest drain or river Matamuhuri to directly discharge runoff and treated wastewater into river downstream of intake (~ 500 m or as appropriate during finalized during the detailed design). This may be laid within the access road right of way.
- Provide proper fencing / walls around the facility, with green buffer zone all around •

Compost plant

- Ensure compost plant design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.
- Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;
- Use acoustic screens around fixed/mobile composting plant and equipment;
- The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate;
- If windrows system is selected, design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration;

- If windrows system is selected, use windrow turning equipment that is specially designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles;
- Store leachate in a lined earthen basin or in aboveground storage tanks;
- Provide a fire alarm system, including temperature sensors in the waste being treated; and
- Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.

Fecal sludge treatment plant

- Ensure fecal sludge treatment plant design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on and EHS Guidelines on Water and Sanitation and Waste Management Facilities.
- Design septage collection system with appropriate collection vehicles and equipment to service all households; no manual handling of septage, and no intermediate transfer of septage to other vehicles
- Design the septage treatment facility to meet the effluent discharge standards.

Landfill

- Ensure landfill design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.
- Install catch fences and netting to trap windblown litter;
- Provide perimeter planting, landscaping, or fences to reduce wind. Indigenous/native species will be preferred in planting;
- Construct temporary banks and bunds immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest downwind crest, and/or fully enclose of the tipping area within a mobile litter net system;
- Use of low-permeability[4] landfill liners to prevent migration of leachate as well as landfill gas;
- Ensure water table depth requirement of at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development;
- Inclusion of a leachate collection and treatment system
- Installation of groundwater monitoring wells
- Inclusion of landfill gas collection system, use of landfill gas as fuel if practical, or treat before discharge

This IEE which is based on feasibility / preliminary design will be updated by PMU during the detailed design, and submitted to ADB for review, clearance and disclosure. Accordingly, PMU will ensure that updated IEE will reflect:

- Confirmation of full compliance of the proposed landfill site with the siting requirements of Bangladesh Solid Waste Management Rules, 2021
- Site specific surveys and baseline information on – soil and geotechnical, groundwater, surface water, and air

[4] Liner systems for MSW landfills can consist of a combination of geological barrier with an overlying bottom liner and leachate drainage layer. Permeability and thickness requirements may range from a hydraulic conductivity of 1 x 10^{-7} centimeters/second for a 0.6-meter layer of compacted soil overlaid by a 30-mil flexible membrane liner (60-mil if made from high density polyethylene [HDPE]).

- Site development plan, which shall include site layout, final site preparation/construction methodology, number of cells, phasing, bunding, cover materials, landscaping, etc.;
- Final engineering calculations on which the site development plan is based;
- Technical description of other allied subcomponents/infrastructures to be built, such as access road, office building, accommodation facilities, weighbridge, wheel cleaner, perimeter fence, etc.;
- Groundwater and surface water management, which shall include groundwater control measures, surface water collection system, and groundwater and surface water monitoring points;
- Lining systems, that shall describe the kind of liners to be installed in consideration of the type of wastes to be landfilled (hazardous, non-hazardous);
- Leachate collection and treatment system as recommended in this IEE, that shall include leachate volume quantification, composition/content analysis, leachate collection and removal system, storage, treatment process, and recirculation (if required as part of design);
- Landfill gas collection and management as recommended in this IEE, that shall include gas quantification, landfill gas control, collection, venting or flaring, and other safety measures related to landfill gas management;
- Capping design and construction; and
- Complete final design description of the other allied subcomponents such as the materials recovery facility, composting plant, and fecal sludge treatment plant; with consideration of the design-related recommendations enumerated above.

This IEE has been prepared in accordance with ADB SPS requirements for projects classified as Category B for the environment. On the premise of the preliminary design and information, this IEE study has been concluded and no further special study or detailed environmental assessment needs to be undertaken to comply with ADB SPS. However, per Environmental Conservation Rules of Bangladesh (ECR, 1997), the project is categorized as “Red” category. Subsequent to LCC, preparation of a full-scale environmental impact assessment (EIA) based on DOE approved terms of reference is mandatory. No bids will be invited for the project until LCC is issued by the DOE. Approval of the EIA and issuance of the Environmental Clearance Certificate (ECC) must be obtained from the DOE prior to award of contract. The following are recommendations applicable to the subproject to ensure no significant impacts:

- Conduct detailed site investigations and prepare detailed designs duly integrating the design measures suggested in the EMP
- Obtain location clearance certificate prior to issuance of bids
- Obtain environmental clearance certificate prior to issuance of bids or award of contract; integrate any conditions, recommendations and/standards specified in ECC into subproject design, construction and operation
- The updated/final IEE report will incorporate results of detailed engineering design and of any additional baseline studies on biodiversity as required and will be submitted to ADB for approval and disclosure at ADB website.
- Engage biodiversity expert during detailed design to conduct confirmatory field survey, and updated IEE and EMP
- Implement measures recommended by biodiversity study
- Updated IEE shall be approved by ADB prior to bidding, and approved IEE shall form part of bidding and contract documents
- Update and implement the recommendations from the biodiversity expert report.

- Conduct safeguards induction to the contractor upon award of contract.
- PIU and PMCSDRC to strictly supervise EMP implementation.
- Ensure contractor appoints qualified environment, health and safety (EHS) officers prior to start of works.
- Implement appropriate community and occupational health and safety measures during construction phase; ensure that excavated trenches are properly protected to avoid any damage / disruption to adjacent structures or buildings
- Documentation and reporting on a regular basis as indicated in the IEE.
- Continuous consultations with stakeholders.
- Timely disclosure of information and establishment of GRM.
- Involvement of contractors, including subcontractors, in first level GRM.

I. INTRODUCTION

A. Project Background

1. Proposed ADB funded Chattogram Hill Tracts Inclusive and Resilient Urban Water Supply and Sanitation Project (CHTIRUWSSP, the project), will support sustainable, inclusive, and resilient drinking water, sanitation, and solid waste management (SWM) services in Bandarban, Lama, and Rangamati pourashavas. It will also support further project preparation and readiness for inclusive and resilient water supply and sanitation investments in eight towns and economic zones in the Cumilla and Ishwardi clusters, Khagrachari pourashava in Chattogram Hill Tracts (CHT), and 22 coastal towns. The project will complement previous interventions in Bandarban and Rangamati pourashavas under the Third Urban Governance and Infrastructure Improvement (Sector) Project. Department of Public Health Engineering (DPHE) will be the executing agency of charge of these components. Respective hill councils of Rangamati and Bandarban implementing agencies for water supply components, while respective Pourashavas are implementing agencies for sanitation and solid waste management components.

2. The CHT region in southeast Bangladesh comprises a mostly hilly area of about 10% of the country's territory (13,294 square kilometers) across three districts (Bandarban, Khagrachari, and Rangamati). The region is one of the country's most disadvantaged and least developed areas. Around 50% of CHT population belongs to 11 different small ethnic communities (SEC). People living in project towns are 54,000 in Bandarban, 27,100 in Lama (Bandarban district), and 107,500 in Rangamati and suffer from inferior urban services compared to the country's average (footnote 9). Less than a third of their population has access to piped water supply, which is intermittent and unsafe. Other households rely on a shared tube well as a source, often located at remote points or on untreated surface water. Groundwater resources in project towns are at risk of contamination and/or depletion, especially in Lama, where groundwater table decreases at a rate of 0.74 meter per year. Sanitation and SWM services are also insufficient because of poor containment, collection, and treatment infrastructure. Almost 100% of fecal waste or wastewater and 90% of solid waste end up in the environment with no treatment or stagnate in proximity to urban dwellings creating unsanitary conditions. Unmanaged waste often clogs drainage systems increasing the impact of urban floods, especially in dense and vulnerable settlements. As a result, people in the three *pourashavas* sacrifice productive time by collecting water and/or coping with waterborne or vector-borne diseases. This reduces economic opportunities and aggravates poverty, which in project towns is higher than the national urban poverty rate.

3. CHTIRUWSSP will be aligned with the following impact: access for all to adequate, safe, and affordable basic services including water, sanitation, and waste management ensured. The project will have the following outcome: access to safely managed, sustainable, inclusive, and resilient drinking water supply, sanitation, and SWM services improved in the project area. The Outputs of the project are:

(i) **Output 1:** Climate-resilient and inclusive drinking water supply, sanitation, and solid waste management infrastructure developed and/or upgraded. The project will develop full surface-based drinking water supply systems with household connections to provide inclusive, resilient, and safely managed continuous (24/7) drinking water supply services in Bandarban, Lama, and Rangamati pourashavas. These will include (i) new or rehabilitated water treatment plants, (ii) drinking water distribution networks with metered households' connections (including 90% of vulnerable households), and (iii) smart water management and district metered

area approaches to improve capacity for sustainable water management and climate-resilience. The project will also establish end-to-end systems adopting a city-wide inclusive sanitation framework and simple digital applications to provide safely managed sanitation and SWM services in Bandarban and Lama pourashavas. These will include (i) improved toilets containment for vulnerable households and public toilets; (ii) equipment for safe fecal sludge emptying and solid waste collection and transportation such as trucks with integrated geographic information system and bins with radio-frequency identification tags; and (iii) integrated facilities for fecal sludge and organic waste treatment, recycling, and resource recovery (e.g., composting), which will also include a sanitary landfill for safe disposal of non-marketable treated fecal sludge and waste.

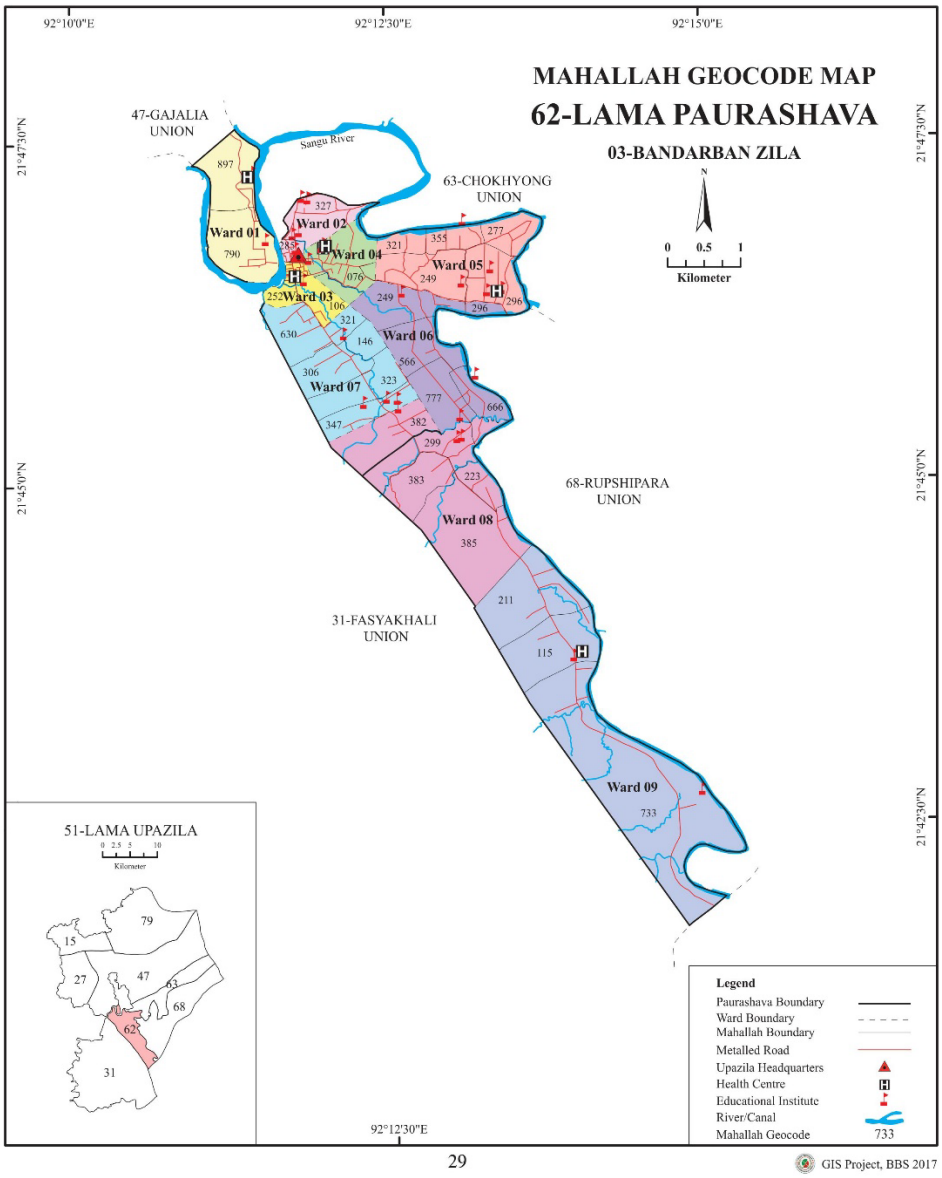
(ii) **Output 2:** Capacity, governance, and awareness of institutions and local communities in climate-resilient, sustainable, and inclusive urban services strengthened. To improve sustainability and quality of urban service delivery, the project will strengthen capacity of staff (at least 90% women staff) from DPHE, pourashavas, and HDC, in climate-resilient, inclusive, and sustainable water supply, sanitation, and SWM service delivery. It will develop GESI-responsive O&M service sustainability plans, with clear responsibilities, financing mechanisms and revenue improvement for O&M. Pourashavas and HDC will also develop water and sanitation safety plans supported by the project. Digital applications for georeferenced customers' records and revenue collection, nonrevenue water control, SWM collection (e.g., geographic information system and radio-frequency identification, and assets and complaints management will strengthen the service provision capacity of local institutions. The project will conduct community awareness and behavior change campaigns (at least 60% women and girls, and vulnerable people) on water, sanitation, and hygiene (including menstrual hygiene for girls), climate-resilience, and sustainable SWM (including reduce, reuse, recycle) to maximize the health and economic impact of the infrastructure investments. This output will also support an institutional reform agenda to improve governance, sustainability, and service quality and citizens' inclusion in urban service provision. A performance-based grant scheme will further incentivize pourashavas to improve FSM and SWM services quality and sustainability.

(iii) **Output 3:** Quality, readiness, and resilience of water supply and sanitation projects in Cumilla and Ishwardi clusters, Khagrachari pourashava, and coastal towns improved. The project will support high quality design preparation and readiness for inclusive and resilient water supply and sanitation investments in the Cumilla and Ishwardi clusters towns (8) and economic zones, Khagrachari pourashava in CHT, and 22 coastal towns, which face similar challenges related to urban service provision. This will include preparation of disaster-, climate-resilient and GESI responsive feasibility studies, detailed designs, and bidding documents. The project will propose optimal institutional arrangements for sustainable O&M in cluster-based water supply, which is an innovative approach for Bangladesh.

4. **Scope of the subproject.** Lama is one of the three towns benefitted under this Project. Administratively it is Bandarban District in the Chattogram Hill Tracts (Figure 1). Geographically, town is located at 21°46'28.9" N latitude and 92°11' 48.7" E longitude. It is developed mostly on the left bank of Matamuhuri River, which flows through Pourashava. Project will enhance the sanitation service delivery in the Bandarban Town with improvements achieved in Fecal Sludge Management (FSM) and Solid Waste Management (SWM). This is achieved by implementing the complete solutions for both FSM and SWM that includes Collection, Transportation, Segregation and Treatment as per the prevailing standards in Bangladesh. A City-Wide Inclusive

Sanitation (CWIS) approach is applied for designing FSM. Also, the 3R strategy of (Reduce, Reuse and Recycle) forms the basis for designing SWM. Through this sanitation sub-project, high-quality and reliable FSM and SWM services shall be made available for all the Town's population.

Figure 1: Project Location Lama Town in Bangladesh



B. Purpose of the Initial Environment Examination

5. The objective of the IEE is to provide guidance to DPHE, its consultants and contractors on how to design and construct the subproject in an environmentally responsible manner, ensuring that all negative effects are prevented or mitigated, and positive impacts are enhanced.

6. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguards Policy Statement (2009). Accordingly, this initial environmental examination (IEE) has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts because of the subprojects. The potential environmental impacts of the subprojects have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for water supply system (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS requirements for environment Category B projects.

7. This IEE will be updated and finalized during detailed design, and submitted to ADB for review, clearance and disclosure. The updated IEE will be included in the bids and contract documents, and therefore contractually applicable to the contractor.

8. The implementation of the subprojects will be governed by Government of Bangladesh applicable environmental acts, rules, regulations, and standards. Accordingly, DPHE/Lama *Pourashava* will obtain ECC from DOE and will ensure timely compliance with rules and regulations.

C. Extent of the IEE

9. This IEE is prepared for Lama integrated waste management project under CHTIRUWSSP. The project includes civil works, project implementation and management, and non-physical investments and is proposed for implementation under the "Civil Works" bidding/contract modality, where the construction will be carried out by the selected bidder based on the detailed designs prepared prior to bidding. However, at present detailed designs are not yet completed, thus, this IEE is based on the feasibility report. This IEE is based on field reconnaissance surveys and secondary sources of information, and limited field monitoring (environmental) surveys were conducted to establish baseline air, noise, water and soil quality in the subproject area. Detailed field investigation will be conducted during the design phase. The environmental monitoring program developed as part of the environmental management plan (EMP) will also require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation is an integral part of the IEE.

D. Report Structure

10. The IEE has been structured as per ADB's SPS 2009, and Government of Bangladesh Environmental Regulations. This report contains the following sections:

(i) Introduction.

(ii) Legal and Institutional Framework.
(iii) Description of the Project.
(iv) Description of the Environment.
(v) Anticipated Environmental Impacts and Mitigation measures.
(vi) Environmental Management Plan
(vii) Environmental Monitoring Plan.
(viii) Public Consultations and Information Disclosure.
(ix) Grievance Redressal Mechanism, and
(x) Conclusion and Recommendation.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

11. Alongside the ADB Safeguard Policy Statement (SPS, 2009), each component of the project must comply with the relevant legal and policy framework of Government of Bangladesh, such as the Environment Conservation Act 1995 (ECA, 1995) with amendments in 2000, 2002 and 2010, and the Environment Conservation Rules 1997 (ECR, 1997), which are the primary environmental law and rules of the country.

A. ADB Safeguards Policy Statement, 2009

12. 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, APIIC 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.[5]

13. **Screening and Categorization.** Subprojects are to be screened for their expected environmental impacts and are assigned one of the four categories given below. Categorization is to be based on the most environmental sensitive component.

(i) **Category A**: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
(ii) **Category B**: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible and, in most cases, mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
(iii) **Category C**: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
(iv) **Category FI**: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary.

14. **Environmental Assessment.** Environmental assessment shall include description of environmental and social baseline to provide an understanding of current conditions forming the benchmark against which subproject 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 structure and composition of the typical IEE report is provided in Annex to

[5] ADB. 2009. *Safeguard Policy Statement*. Manila.

Appendix 1 of ADB SPS. The IEEs of subprojects prepared during the ADB loan processing stage may be used as model documents for subprojects.

15. **Environmental Planning and Management.** The PMU and PIUs 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 subproject'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.

16. **Public Disclosure.** Per requirements of ADB's SPS 2009 and Access to Information Policy 2018, DPHE, through PMU, shall submit the following reports to ADB for disclosure on ADB website so affected people, other stakeholders, and the public can provide meaningful inputs into the subproject design and implementation:[6]. ADB will disclose upon receipt of acceptable reports and endorsement from the PMU.

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

17. **Consultation and Participation.** PMU and PIUs shall carry out meaningful consultation[7] 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.

18. **Grievance Redress Mechanism.** DPHE, through PMU, shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the subproject's environmental performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

19. **Monitoring and Reporting.** PMU shall monitor, measure and document the progress of implementation of the EMP. If necessary, PMU will identify the necessary corrective actions, and reflect them in a corrective action plan. PMU 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. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

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[6] 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."

[7] 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;1 (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.

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

21. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, PMU 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.

22. **Occupational Health and Safety**. PMU[8] shall ensure that workers[9] are provided with a safe and healthy working environment, considering risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (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) enforcing appropriate protocols necessary to prevent the spread of communicable diseases, including emerging infectious diseases such as the 2019 Coronavirus Disease (COVID-19); (vi) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

23. PMU 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.

24. **Community Health and Safety**. PMU to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts. The borrower shall ensure to apply preventive and protective measures for both occupational and community health and safety consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. PMU shall also adhere to necessary protocols in response to emerging infectious diseases such as the coronavirus disease (COVID-19) consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

25. **Physical Cultural Resources**. PMU is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral

[8] In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents

[9] Including non-employee workers engaged by the borrower/client through contractors or other intermediaries to work

part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

26. **Pollution Prevention and Control Technologies**. During the design, construction, and operation of the project, PMU, shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.[10] These standards contain performance levels and measures that are normally acceptable and applicable to the project infrastructures. When the government's 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 circumstances, PMU, will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

27. **Bidding and Contract Documents**. This IEE report, which contains the EMP, after updating with detailed designs, submitted to ADB and approved and disclosed, shall be included in bidding and contract documents and verified by PMU. The PMU shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all other conditions required by ADB, and (ii) to submit to PMU, for review and approval, a site specific environmental management plan (SEMP), 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 as per EMP; and (iv) budget for SEMP implementation, among others as may be required. No works can commence prior to approval of SEMP. A copy of the EMP and/or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP and/or SEMP constitutes a failure in compliance and shall require corrective actions.

28. **Conditions for Award of Contract and Commencement of Work**. PMU shall not award any works contract under the subproject until (i) relevant provisions from the EMP are incorporated into the works contract; (ii) IEE report is updated to reflect any changes in subproject's design after bidding and PMU has obtained ADB's clearance of such updated IEE report and disclosed; and (iii) other necessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMU shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the works contract; and (ii) this IEE report is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance for such updated IEE.

B. Government of Bangladesh Environmental Policy & Regulations

29. The implementation of the sub-projects under the CHTIRUWSSP will be governed by environmental acts, rules, regulations, and standards set by the GoB and the Local Authorities. These regulations impose requirements on activities to minimize or mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure sub-projects are consistent with the relevant legal framework. Compliance is required in all

[10] World Bank Group. 2007. Environmental, Health, and Safety General Guidelines. Washington, D.C.; https://www.ifc.org-ehs-guidelines

stages of the subprojects' implementation, including design, construction, and operation and maintenance.

30. This section provides an understanding of the relevant policies on environmental protection and management in order to ensure that the project is carried out in a manner consistent with the stated policies. It is based on the recent EIA Guidelines for Industries issued by the Government of Bangladesh[11]. In this regard, it should be noted that certain policies and legislations are of direct relevance to environmental pollution control, while many other policies and legislations related to resource protection and conservation, and these relate to forest, fisheries, land, mineral resources, community and occupational safety & health and others.

C. National Environment Policy

31. The National Environment Policy of 1992 and the associated legislation on environmental protection and conservation represent the most important document that relate to environmental protection and management in Bangladesh.

32. The NEP defines the overall environmental framework and assigns responsibility of regulatory development, administration and enforcement. This responsibility is given to the Department of Environment (DOE) which is under the Ministry of Environment, Forest and Climate Change (MOEFCC). The National Environmental Council with the head of the Government as Chairperson, provides the overall policy direction.

33. A revised National Environment Policy was adopted in 2018 to bring in a more rigorous and pragmatic way of protecting and conserving environment and ecosystem as well as to mainstream climate change aspect into environment and development.

34. The NEP provides sector-wise policy coverage for various sectors along with their plan of implementation, identification of respective implementing agencies, legal and institutional framework and directives on compliances. The requirement of EIA for projects is also described in NEP.

35. A number of other National Plans, Policies and Guidelines that confirm, complement and support the NEP have been enacted. These include the following:

(i) National Bio-Safety Strategy & Action Plan, 1995;
(ii) National Biodiversity Strategy & Action Plan of Bangladesh, 2016-2021;
(iii) A Roadmap for Clean Fuels and Vehicles in Bangladesh, 2011;
(iv) National Action Programme on Desertification, Land Degradation and Drought (2016-2024);
(v) Ecological Critical Area Management Rules, 2016;
(vi) Medical Waste (Management and Processing) Rules, 2008;
(vii) Hazardous Waste and Ship Breaking Waste Management Rules, 2011;
(viii) Bangladesh Biosafety Rules, 2012;
(ix) Bangladesh Biological Diversity Act, 2017;
(x) National Water Reservoir Conservation Act, 2000;
(xi) National Forestry Policy, 2016;
(xii) National Conservation Strategy 1998 and Draft Update, 2013;

[11] EIA Guidelines for Industries, Department of Environment, Ministry of Environment, Forest and Climate Change, Government of the People's Republic of Bangladesh, Feb. 2021

(xiii) National 3R (Reduce, Reuse & Recycle) Strategy, 2010;
(xiv) Bangladesh Climate Change Strategy & Acton Plan (BCCSAP), 2009;
(xv) Bangladesh Delta Plan 2100;
(xvi) National Disaster Management Plan 2010;
(xvii) Nationally Determined Contributions (NDCs);
(xviii) Five-Year Plan;
(xix) Sustainable Development Goals (SDGs);
(xx) National Adaptation Program of Action (NAPA) 2005 and Update 2009;
(xxi) Other Sector Policies like Industry, Agriculture, Energy, Water, Health etc.;
(xxii) National Bio-safety Framework and Guidelines;
(xxiii) Guidelines for Environmental Management, Waste Treatment and Workers' Occupational Health and Safety for Ship Breaking Yard in Bangladesh;
(xxiv) Establishing National Land use and Land Degradation Profile 2018 (proposed).

36. **Environmental Conservation Act (ECA), 1995**. 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, 1997 have been framed. 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.

37. **Environmental Conservation Rules (ECR), 1997**. The Rules outline the processes and requirements of environmental clearances for specific type of projects indicated therein and stipulates that "no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an ECC from the Director General" of the DOE. Schedule 1 of the Rules classifies industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) orange-A, (iii) orange–B, and (iv) red. The rules specify the procedures for issuing ECC for the various categories of projects. Table 1. summarizes the requirements for environmental clearance application for each category.

Table 1: Summary Environmental Clearance Application Requirements Per Category[a]

Category	Requirements
Green	(i) Completed Application for Environmental Clearance Certificate (ECC); (ii) Payment of the appropriate fee based on Schedule 3 of Environmental Conservation Rules (ECR), 1997; (iii) General information about the project; (iv) Exact description of the raw materials to be used and the product to be manufactured (where relevant); and (v) No objection certificate from the local authority.
Orange-A	(i) Completed Application for ECC; (ii) Payment of the appropriate fee based on Schedule 3 of ECR, 1997; (iii) General information about the project; (iv) Exact description of the raw materials to be used and the product to be manufactured (where relevant); (v) No objection certificate from the local authority; (vi) Prior issued location clearance certificate (LCC) from Department of Environment (DOE); (vii) Process flow diagram;

Category	Requirements
	(viii) Layout plan (showing location of effluent treatment plant (ETP); (ix) Effluent discharge arrangement; and (x) Outlines of the plan for relocation and rehabilitation (if applicable).
Orange-B	(i) Completed Application for ECC; (ii) Payment of the appropriate fee based on Schedule 3 of ECR, 1997; (iii) Report on the feasibility of the project (if still being proposed); (iv) Report on the initial environmental examination (IEE) of the project, including process flow diagram, layout plan (showing ETP), design of ETP of the project (if still being proposed); (v) Report on the environmental management plan (EMP); (vi) No objection certificate from the local authority; (vii) Prior issued LCC from DOE; (viii) Emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; (ix) Outline of the relocation and rehabilitation plan (where applicable); and (x) Other necessary information as may be required.
Red	(i) Completed Application for ECC; (ii) Payment of the appropriate fee based on Schedule 3 of ECR, 1997; (iii) Report on the feasibility of the project (if still being proposed); (iv) Report on the IEE of the project and the terms of reference (TOR) for environmental impact assessment of the project; or environmental impact assessment (EIA) report on the basis of the TOR previously approved by DOE, including process flow diagram, layout plan (showing ETP), design of ETP of the project (if still being proposed); (v) Report on the EMP; (vi) No objection certificate from the local authority; (vii) Prior issued LCC from DOE; (viii) Emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; (ix) Outline of the relocation and rehabilitation plan (where applicable); and (x) Other necessary information as may be required.

[a] A Guide to Environmental Clearance Procedure, DOE, Bangladesh Ministry of Environment and Forests, August 2010.

38. Schedule 1 of ECR, 1997 provides the classification for industrial projects and types of development that are common in Bangladesh. Table 2 indicates the subproject's category and its likely classifications based on this schedule.

Table 2: Government of Bangladesh Classification of the Subproject

No.	Subproject	Component	Equivalent in Schedule I of Environmental Conservation Rules	Department of Environment Classification
1.	Solid Waste Management for Bandarban Pourashava	FSM & SWMi Facility	Landfilling by industrial, household and commercial wastes	Red

39. Based on the ECR 1997, the subproject is required to obtain an ECC.

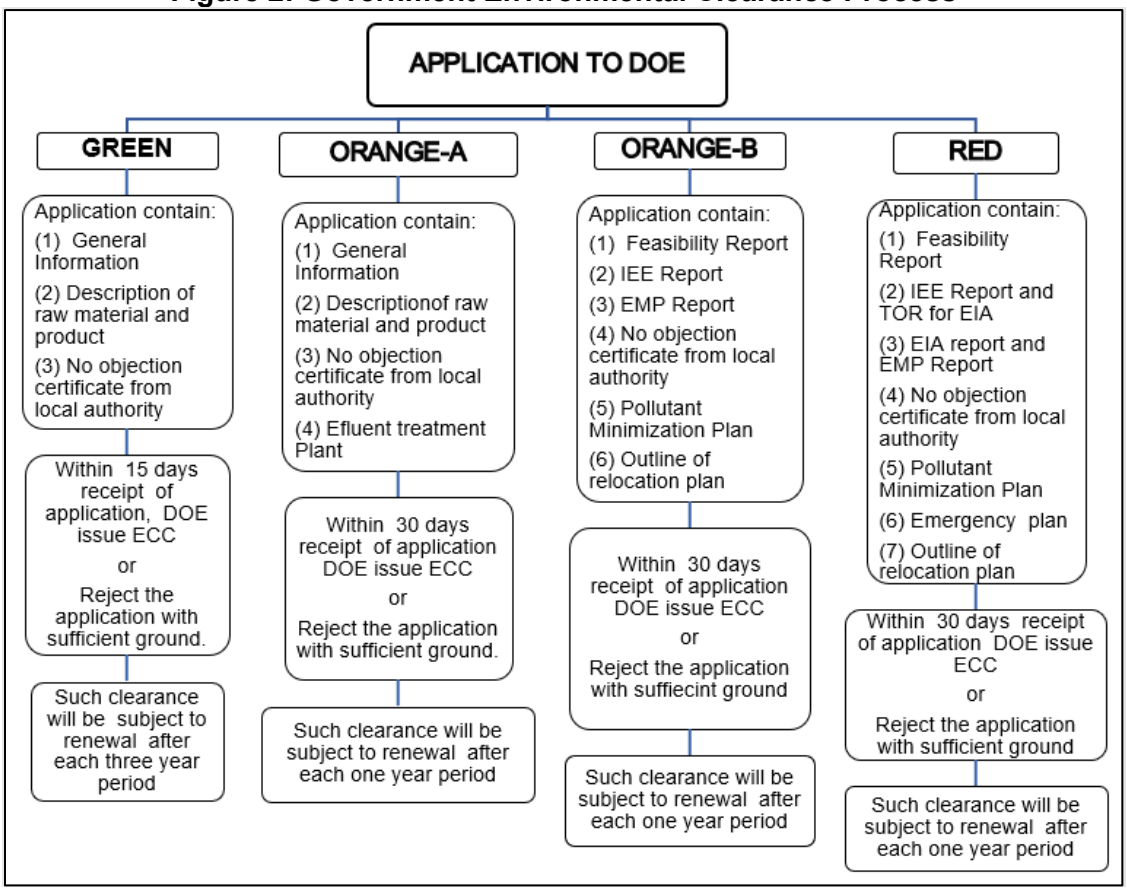
40. **Application for Environmental Clearance**. The application and requirement for issuance of ECC are described in the ECR, 1997 and summarized in Table 2. This involves the

completion and submission of an application using a form available from the DOE website,[12] which is revised from time to time. The accomplished application form is submitted to DOE together with requirements as enumerated in Table 2. The proponent is also required to pay equivalent application fee prescribed in Schedule 13 of ECR, 1997.

41. The ECC is issued within 30 days from receipt of the application by DOE. Such ECC is required to be renewed every year from the date of its effectivity. For the project, PMU is responsible for application for ECC. Each subproject will obtain its corresponding ECC depending on the requirements per ECR 1997, and approval should be obtained before contract award.

42. Figure 2 shows the summary of review process and timelines set under ECR, 1997, leading to the issuance of environmental clearance certificate (ECC) by DOE. For the subproject, site of the IWTP facility is not in compliance with the recently notified Solid Waste Management Rules 2021 from the DOE, which provides the site selection guidelines for landfill projects. Thus, a location clearance certificate (LCC) is critical to the issuance of an ECC. Bandarban municipality has already submitted application to DOE for issuing LCC which is prerequisite. The application in process and LCC is likely to be issued in the month of April 2022. Bandarban municipality's discussion indicate that, in principle, DOE has no issue with the site since it has already been acquired by the Government for landfilling of the waste following all the Government of Bangladesh procedures. Application of LCC for the subproject has been submitted.

Figure 2: Government Environmental Clearance Process



DOE = Department of Environment, ECC = environmental clearance certificate, EIA = environmental

[12] Government of Bangladesh. Department of Environment.

impact assessment, EMP = environmental management plan, IEE = initial environmental examination, TOR = terms of reference.

43. **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 promotion of sustainable waste management practices, etc.

44. Major component of the subproject is the construction and establishment of a IWTP facility for Bandarban Pourashava. The site of the facility is required to comply with the Rules, with requirements summarized in Table 3 below.

Table 3: Siting Requirements for Landfills

Subject	Requirements
1. Landfill site selection	A. Landfill project permission will not be provided in environmentally critical areas (ECA), reserved areas, sanctuaries, declared environmentally sensitive areas, and flood plains.
	B. The site shall be large enough to last for 20-25 years and shall be developed as small “landfill cells” in a phased manner with the provision to use and close the facility as required.
	C. A ‘no development’ buffer zone shall be maintained around the solid waste processing and disposal facility (for facilities exceeding 5 tons per day of installed capacity). This will be maintained within the total area of the solid waste processing and disposal facility. The buffer zone shall be prescribed on a case-to-case basis by the local body in consultation with the Department of Environment (DOE).
2. Site selection parameters	A. Landfill site shall be located at least 200 meters away from rivers, waterbodies, or ponds.
	B. Landfill site shall be located at least 250 meters away from residential development project sites.
	C. Landfill site shall be located at least 500 meters away from national highways, housing areas, public parks, and water-supplying wells.
	D. Landfill site shall be located at least 3 kilometers away from airports or airbases.

45. **Other relevant government laws and regulations.** The implementation of subprojects proposed under the project will be governed by government environmental acts, rules, policies, and regulations. Table 4 summarizes the applicable national and local laws, regulations, and standards for environmental assessment and management, including applicable international environmental agreements.

Table 4: Relevant Government Laws and Regulations

Laws, Regulations, and Standards	Details	Relevance to the Project
National Environmental Policy, 2018	The central theme of the policy is to ensure protection and improvement in environment. The policy gives a thrust to sustainable development and long-term use of natural resources. The National Environment Policy contains policy	Subproject will have site-specific impacts and will require implementation of mitigation measures to ensure protection and improvement of the environment.

Laws, Regulations, and Standards	Details	Relevance to the Project
	statements and strategic options with regard to 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.	
Environment Court Act, 2000 and subsequent amendments in 2003	Establishment of Environment Court for trial of an offence or for compensation under environmental law, such as environment pollution.	Option to affected persons for grievances related to environmental safeguards.
National Safe Drinking Water Supply and Sanitation Policy of 1998	Ensures access to safe water and sanitation services at an affordable cost	Pourashavas and water sanitation authorities will take actions to prevent wastage of water. They will take necessary steps to increase public awareness to prevent misuse of water Pourashavas shall be responsible for solid waste collection, disposal and their management
National Water Act 2013 Water Rule 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 contamination.	The subproject is required to implement measures (e.g., impermeable liners for landfill cells, leachate treatment) to ensure that water source pollution is avoided.
Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural waterbodies such as lakes, ponds, beels, khals, 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 measures (e.g., impermeable liners for landfill cells, leachate treatment) to ensure that water bodies around the subproject site for the IWTP facility are not impacted.
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	Siting of subproject components need to comply with land use and zoning regulations

Laws, Regulations, and Standards	Details	Relevance to the Project
	establishments, rail and highway and for tea and rubber gardens.	
Bangladesh Labor Law, 2006	It is a comprehensive law covering labor issues such as: conditions of service and employment, youth employment, benefits including maternal benefits, compensation for injuries, trade unions and industrial relations, disputes, participation of workers in company's profits, regulation of safety of dock workers, penalty procedures, administration and inspection. This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable environment for working. It also includes rules on registration of laborer, misconduct rules, income and benefits, health and fire safety, factory plan	Compliance with the provisions on employment standards, occupational health and safety, welfare and social protection, labor relations and social dialogue, and enforcement. Prohibition of employment of children and adolescents.
Bangladesh Labor Rules, 2015	Includes rules on registration of laborers, misconduct rules, income and benefits, health and fire safety, factory plan	Contractor to implement occupational health and safety measures Contractor will be liable for compensation for work-related injuries
The Pourashava Act 2009 / Ordinance issued for the amendment of local government (municipality) ordinance, 2009 and 2010; The Pourashava Ordinance, 1977; Municipal Administration Ordinance, 1960	Provides guidance for subproject integrated community and workers health and hygiene at the construction and operation and maintenance stages of the project	Coordinate with pourashava committees on disaster management measures, water and sanitation and waste management
Bangladesh Climate Change Strategy and Action Plan of 2009	Enhances the capacity of government ministries, civil society and private sector to meet the challenges of climate change	Integrate adaptation measures for buildings in consideration of extreme climatic events
The Chittagong Hill Tracts Forest Transit Rules 1973	Under this rule, the Department of Forests through the relevant Divisional Forest Officer shall be authorized to approve the removal of timber or other forest produce from other Government	Under this Rule, once the land acquisition is complete, the DPHE shall seek an approval for removal of timber from the land acquired. The application to the Divisional Forests Officer shall be routed through the

Laws, Regulations, and Standards	Details	Relevance to the Project
	land or private land which are not reserved or protected forests.	District Commissioner as required under the Rule.
Building Construction (Amendment) Act and Building Construction Rules, Bangladesh National Building Code	Regulates technical details of building construction and to maintain standards of building construction	Follow specifications to ensure structural integrity of buildings
Standing Order on Disaster, 1999 (Updated 2010)	Enhances capacity at all tiers of government administrative and social structures for coping with and recovering from disasters	Geographical information system (GIS) technology will be applied at the planning stage to select location of landfill site considering habitation, communication facilities, distance from the nearest cyclone center, etc. Advice from the concerned District Committee should be obtained prior to final decision
National Disaster Management Act of 2012	Establishes a framework for managing disasters in a comprehensive way.	Setting-up emergency response procedures
Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas an emergency has arisen, it is necessary to make special provision for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective community and workers in particular during the construction related work.	Relevant especially during the construction phase
The Employees State Insurance Act, 1948	It must be noted that health, injury and sickness benefit should be paid to people, particularly respective workers at workplace under the Act.	Relevant to the welfare of workers under the project.

EMP = environmental management plan, LGI = local government institutions.

D. International Environmental Agreements

46. Table 5 below lists the relevant international environmental agreements that the government is party to, and their relevance to the subproject.

Table 5: International Environmental Agreements Relevant to the Subproject

International Environmental Agreement	Signed/Year Ratified	Details	Relevance
United Nations Framework Convention on Climate Change (UNFCCC)	22 Oct 2001 13 Nov 2003 (amended)	Parties to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.	The subproject is subject to the impact of climate change. Engineering designs of the subproject consider climate change impacts, such as flooding and temperature rise. A climate change assessment is a part of the project processing, which covers the subproject and all other subprojects under the Project
Paris Convention on Protection of the World Cultural and Natural Heritage, 1972	1983	Parties to ensure the protection and conservation of the cultural and natural heritage situated on territory of, and primarily belonging to, the State	The subproject location is not near any Heritage Site. The related works with the subproject may impact undiscovered cultural and natural heritage relics during construction phase. The environmental management plans (EMPs) of subprojects ensure measures for chance finds.

47. **Gaps in the ADB SPS 2009 requirements and government laws and regulation on environmental assessment.** There are no major gaps between the ADB SPS 2009 requirements and the GoB's requirements on environmental assessment. Screening, categorization, environmental assessment and environmental management plan preparation, implementation and compliance monitoring are required. However, analysis of alternatives and public consultation and disclosure are not mandatory under the GoB's ECR (1997).

48. **Applicable Environmental Standards.** The ECR, 1997 also provides the environmental standards applicable to the project. Schedule 2 of the ECR presents the national standards for ambient air quality and Schedule 4 of the ECR presents the national standards for ambient noise. Following requirements of ADB SPS, the subproject shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in EHS Guidelines. When the government regulations differ from these levels and measures, the subproject shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, DPHE through PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

49. The tables below show the comparison of the national standards and internationally recognized standards, including the applicable standards to be followed under the project per ADB SPS requirements.

Table 6: Applicable Ambient Air Quality Standards for Bangladesh Projects

Parameter	Bangladesh Ambient Air Quality Standard (µg/m^3)[a]	WHO Air Quality Guidelines (µg/m^3)	
		Global Update[b] 2005	Second Edition[c] 2000
TSP	200 (8-h)	-	-
PM_{10}	50 (1-year) 150 (24-h)	50 (24-h) 500 (10-min)	-
$PM_{2.5}$	15 (1-year) 65 (24-h)	10 (1-year) 25 (24-h)	-
SO_2	80 (1-year) 365 (24-h)	20 (24-h) 500 (10-min)	-
NO_2	100 (1-year)	40 (1-year) 200 (1-h)	-
CO	10,000 (8-h) 40,000 (1-h)	-	10,000 (8-h) 100,000 (15-min)
Lead	0.5 (1-year)		
Ozone (O_3)	235 (1-h) 157 (8-h)	100 (8-h)	

ADB = Asian Development Bank, CO = carbon oxide, h = hour, µg/m^3 = microgram per cubic meter, min = minute, NO_2 = nitrogen dioxide, $PM_{2.5}$ = particulate matter 2.5, PM_{10} = particulate matter 10, SO_2 = sulfur dioxide, TSP = total suspended particle, WHO = World Health Organization.

[a] Based on SRO 220-Law 2005 (Amendment of Schedule 2 of ECR, 1997). Air Quality Management Project of Bangladesh http://www.doe-bd.org/aqmp/standard.html

[b] IFC World Bank Group. 2007. *Environmental, Health and Safety General Guidelines*. Washington, D.C.

[c] WHO Regional Office for Europe. 2000. *Air Quality Guidelines for Europe, Second Edition*. Copenhagen.

Table 7: Ambient Noise Quality Standards

Receptor/ Source	National Noise Standard Guidelines, 1997[a] (dB)		WHO Guidelines Value For Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)	
	Day	Night	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	50	40	55	45
Silent Zone	45	35	55	45

[a] Schedule 4 of ECR, 1997.

[b] WHO. 1999. Guidelines for Community Noise**;** World Bank Group. 2007. Environmental, Health and Safety General

Table 8: Applicable Standards for Sound Originating from Motor Vehicles or Mechanized Vessels (Schedule 5 of ECR, 1997)

Category of Vehicles	Unit	Standards	Remarks
*Motor Vehicles (all types)	dBa	85	As measured at a distance of 7.5 meters from exhaust pipe.
		100	As measured at a distance of 0.5 meter from exhaust pipe.
Mechanized Vessels	dBa	85	As measured at a distance of 7.5 meters from the vessel which is not in motion, not loaded and is at two thirds of its maximum rotating speed.
		100	As measured at a distance of 0.5 meter from the vessel which is in the same condition as above.

* At the time of taking measurement, the motor vehicle shall not be in motion and its engine conditions shall be as follows:-

(a) Diesel engine – maximum rotating speed.

(b) Gasoline engine –at two thirds of its maximum rotating speed and without any load.

(c) Motorcycle – If maximum rotating speed is above 5000 rpm; two-thirds of the speed, and if maximum rotating speed is less than 5000 rpm, three-fourth of the speed.

Table 9: Applicable Effluent Discharge Standards
(Schedule 10 Standards for Waste from Industrial Units or Projects Waste [See Rule 13])

Sl. No.	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated Land
1	Ammoniacal nitrogen (as elementary N)	mg/L	50	75	75
2	Ammonia (as free ammonia)	mg/L	5	5	15
3	Arsenic (as As)	mg/L	0.2	0.05	0.2
4	BOD_5 at 20°C	mg/L	50	250	100
5	Boron	mg/L	2	2	2
6	Cadmium (as Cd)	mg/L	0.5	0.05	0.05

Sl. No.	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated Land
7	Chloride	mg/L	600	600	600
8	Chromium (as total Cr)	mg/L	0.5	1.0	1.0
9	COD	mg/L	200	400	400
10	Chromium (as hexavalent Cr)	mg/L	0.1	1.0	1.0
11	Copper (as Cu)	mg/L	0.5	3.0	3.0
12	Dissolved oxygen (DO)	mg/L	4.5-8	4.5-8	4.5-8
13	Electro-conductivity (EC)	micromho/cm	1200	1200	1200
14	Total dissolved solids	mg/L	2100	2100	2100
15	Flouride (as F)	mg/L	2	15	10
16	Sulfide (as S)	mg/L	1	2	2
17	Iron (as Fe)	mg/L	2	2	2
18	Total kjeldahl nitrogen (as N)	mg/L	100	100	100
19	Lead (as Pb)	mg/L	0.1	1	0.1
20	Manganese (as Mn)	mg/L	5	5	5
21	Mercury (as Hg)	mg/L	0.01	0.01	0.01
22	Nickel (as Ni)	mg/L	1.0	2.0	1.0
23	Nitrate (as elementary N)	mg/L	10.0	Not yet set	10
24	Oil and grease	mg/L	10	20	10
25	Phenolic compounds (as C_6H_5OH)	mg/L	1.0	5	1.0
26	Dissolved phosphorus (as P)	mg/L	8	8	15
27	Radioactive substance	(to be specified by Bangladesh Atomic Energy Commission)			
28	pH	----	6-9	6-9	6-9
29	Selenium (as Se)	mg/L	0.05	0.05	0.05
30	Zinc (as Zn)	mg/L	5	10	10
31	Temperature	°C (summer) °C (winter)	40 45	40 45	40 45
32	Suspended solids (SS)	mg/L	150	500	200
33	Cyanide (as Cn)	mg/L	0.1	2.0	0.2

Notes:

These standards shall be applicable to all industries or projects other than those specified under the heading "Standards for sector wise industrial effluent or emission."

Compliance with these standards shall be ensured from the moment an industrial unit starts trial production, and in other cases, from the moment a project starts operation.

These standards shall be inviolable even in case of any sample collected instantly at any point of time. These standards may be enforced in a more stringent manner if considered necessary in view of the environmental conditions of a particular situation.

Inland Surface Water means drains/ponds/tanks/water bodies/ ditches, canals, rivers, springs and estuaries.

Public sewerage system means treatment facilities of the first and second stage and also the combined and complete treatment facilities.

Irrigable land means such land area which is sufficiently irrigated by waste water taking into consideration the quantity and quality of such water for cultivation of selected crops on that land.

Inland Surface Water Standards shall apply to any discharge to a public sewerage system or to land if the discharge does not meet the requirements of the definitions in notes 5 and 6 above.

Table 10: Applicable Drinking Water Quality Standards for Bangladesh Projects

National Standards for Drinking Water (Schedule 3, Rule 12B of ECR 1997)			WHO Guidelines for Drinking Water Quality 4th Edition incorporating the first addendum, 2017
Parameter	**Unit**	**Standards**	
Aluminum	mg/l	0.2	None established
Ammonia (NH_3)	mg/l	0.5	None established
Arsenic	mg/l	0.05	0.01
Barium	mg/l	0.01	1.3
Benzene	mg/l	0.01	0.01[b]
BOD5 20°C	mg/l	0.2	-
Boron	mg/	1.0	2.4
Cadmium	mg/l	0.005	0.003
Calcium	mg/l	75	-
Chloride	mg/l	150 – 600[a]	None established
Carbon tetrachloride	mg/l	0.01	0.004
1,1-Dichloroethylene	mg/l	0.001	-
1,2-Dichloroethylene	mg/l	0.03	0.05 (1,2-Dichloroethene)
Tetrachloroethylene	mg/l	0.03	0.04 (tetrachloroethene)
Trichloroethylene	mg/l	0.09	0.02 (trichloroethene)
Pentachlorophenol	mg/l	0.03	0.009
2,4,6 -Trichlorophenol	mg/l	0.03	0.2 (2,4,6 trichlorophenol)
Chlorine (residual)	mg/l	0.2	0.2[c]
Chloroform	mg/l	0.09	0.3
Chromium (hexavalent)	mg/l	0.05	0.05
Chromium	mg/l	0.05	0.05
COD	mg/l	4	-
Coliform (fecal)	n/100 ml	0	Must not be detectable in any 100 ml sample
Coliform (total)	n/100 ml	0	Must not be detectable in any 100 ml sample
Color	Hazen unit	15	None
Copper	mg/l	1	2
Cyanide	Mg/l	0.1	None
Detergents	mg/l	0.2	-
DO	mg/l	6	-
Fluoride	mg/l	1	1.5
Hardness (as $CaCO_3$)	mg/l	200 – 500	-
Iron	mg/l	0.3 – 1.0	-
Kjeldahl nitrogen (total)	mg/l	1	-
Lead	mg/l	0.05	0.01
Magnesium	mg/l	30 – 35	-
Manganese	mg/l	0.1	-
Mercury	mg/l	0.001	0.006
Nickel	mg/l	0.1	0.07
Nitrate	mg/l	10	50
Nitrite	mg/l	<1	3
Odor	mg/l	Odorless	-
Oil and grease	mg/l	0.01	-

National Standards for Drinking Water (Schedule 3, Rule 12B of ECR 1997)			WHO Guidelines for Drinking Water Quality 4th Edition incorporating the first addendum, 2017
pH	--	6.5 – 8.5	-
Phenolic compounds	mg/l	0.002	-
Phosphate	mg/l	6	-
Phosphorus	mg/l	0	-
Potassium	mg/l	12	-
Radioactive materials (gross alpha activity)	Bq/l	0.01	-
Radioactive materials (gross beta activity)	Bq/l	0.1	-
Selenium	mg/l	0.01	0.04
Silver	mg/l	0.02	-
Sodium	mg/l	200	
Suspended particulate matters	mg/l	10	-
Sulfide	mg/l	0	-
Sulfate	mg/l	400	-
Total dissolved solids	mg/l	1,000	-
Temperature	°C	20-30	-
Tin	mg/l	2	-
Turbidity	NTU	10[d]	-
Zinc	mg/l	5	-

[a] In coastal area 1000. Reference: Bangladesh Gazette, Addendum, August 28,1997 Source: Department of Environment (DOE).

[b] For substances that are considered carcinogenic, the guidance value is the concentration in drinking water associated with an upper-bound excess lifetime cancer risk of 10^{-5} (one additional case of cancer per 100,000 of the population ingesting drinking water containing the substance as the guidance value for 70 years). Concentrations associated with upper-bound estimated excess lifetime cancer risks of 10^{-4} and 10^{-6} can be calculated by multiplying and dividing, respectively, the guideline value by 10 (WHO, 2017).

[C] For effective disinfection, there should be residual concentration of free chlorine of $\geq$ 0.5 mg/l after at least 30min contact time at pH < 8.0. A chlorine residual should be maintained throughout the distribution system. At the point of delivery, the minimum residual concentration of free chlorine should be 0.2 mg/l.

[d] The FS advises producing treated water that conforms to WHO guidelines and Bangladesh drinking water quality ECR 1997. One of the two most important parameters reduced by the WTP is turbidity (the other is microbiological matter, by providing a multi-stage barrier). In Section 10.3, the FS quotes WHO and Bangladesh standards of 10 and 5 NTU respectively. We recommend that the turbidity in the treated water leaving the WTP should never exceed 1.0 NTU and that the operational guideline should be set at 0.5 NTU, to be achieved 95% of the time. The design of the process units and their controls should accommodate these recommendations. Operational procedures must be devised to achieve these recommendations. Computerized monitoring equipment must be provided and staff trained in its use to display real-time trends and record events. Laboratory staff must monitor, record, and report treated water quality parameters to review past trends and predict operational changes, if required.

[e] If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

III. DESCRIPTION OF THE SUBPROJECT

A. Existing Solid Waste Management System in Lama

50. The solid waste generated by households in Lama is not managed properly. There is no established source segregation practice at household level and no formal separate collection system. Recycling is limited to informal recycling activities and disposal is the main management practice. The Solid Waste Management (SWM) in the Lama Town can be characterized as inadequate and unscientific.

51. It is estimated that the Town generates about 9MT/day of waste. The municipality has arranged for door-to-door collection of a very small portion of the total generated waste. The rest of the waste are collected by the Municipality from the waste bins and those that are dumped on roadsides, drains and valleys within the municipality. The collected waste is dumped into vacant lands within the municipality boundary. The dumping site is located adjacent to residences and a school, as well. The leachate from these dumping areas flow either to the groundwater or into the streams below, thereby causing contamination. Also, the wastes are burned regularly resulting in release of toxic contaminants into the air. The inadequate door-to-door collection can be attributed to lack of appropriate number of vehicles that can reach the congested areas of the town. To overcome this, the Municipality has installed a number of collection bins at key public gathering areas in the town. However, at a majority of these collection points, the waste is dumped indiscriminately around the bins thereby attracting fleas and rodents. The uncollected wastes make their way into the nearby valleys and streams that ultimately discharges into the Matamahuri River.

52. This unscientific management of solid waste in the town right from manual handling of the wastes to lack of segregation and recovery and absence of engineered landfill results in contamination of soil, surface and groundwater. Additionally, due the burning of the wastes, it results in release of toxic contaminants into the air. Also, there is a potential risk of mixing of household hazardous and biomedical wastes into the municipal waste stream. All the above have serious consequences on public health. Hence, there is an urgent need to provide adequate and scientific FSM and SWM services in the Town including those wards which are socio-economically poor.

B. Existing Sanitation and Fecal Sludge Management System in Lama

53. **Pit Latrine, Septic Tank and Public Toilets.** Around 11% households use septic tank; over half 57% households use single pit and only 6% use double pit latrines. On the other hand, it is also noted that 26% don't have any containment. In addition to the above situation, there are eight public toilets among them only 2 are operational, followed by 5 not operational and 1 abandoned in the town. Maximum of public toilets need proper operation & maintenance and construction of new soak pit. Although, some emptying is performed in some public toilets, but the sludge is dumped into nearby water bodies, drains or open places.

Figure 3: Photographs showing existing sanitation system

Pit Latrine in Lama Municipality

Outlet of septic tank connected to nearby open drain in Lama

Figure: Hanging Latrine connected to nearby open drain in Lama

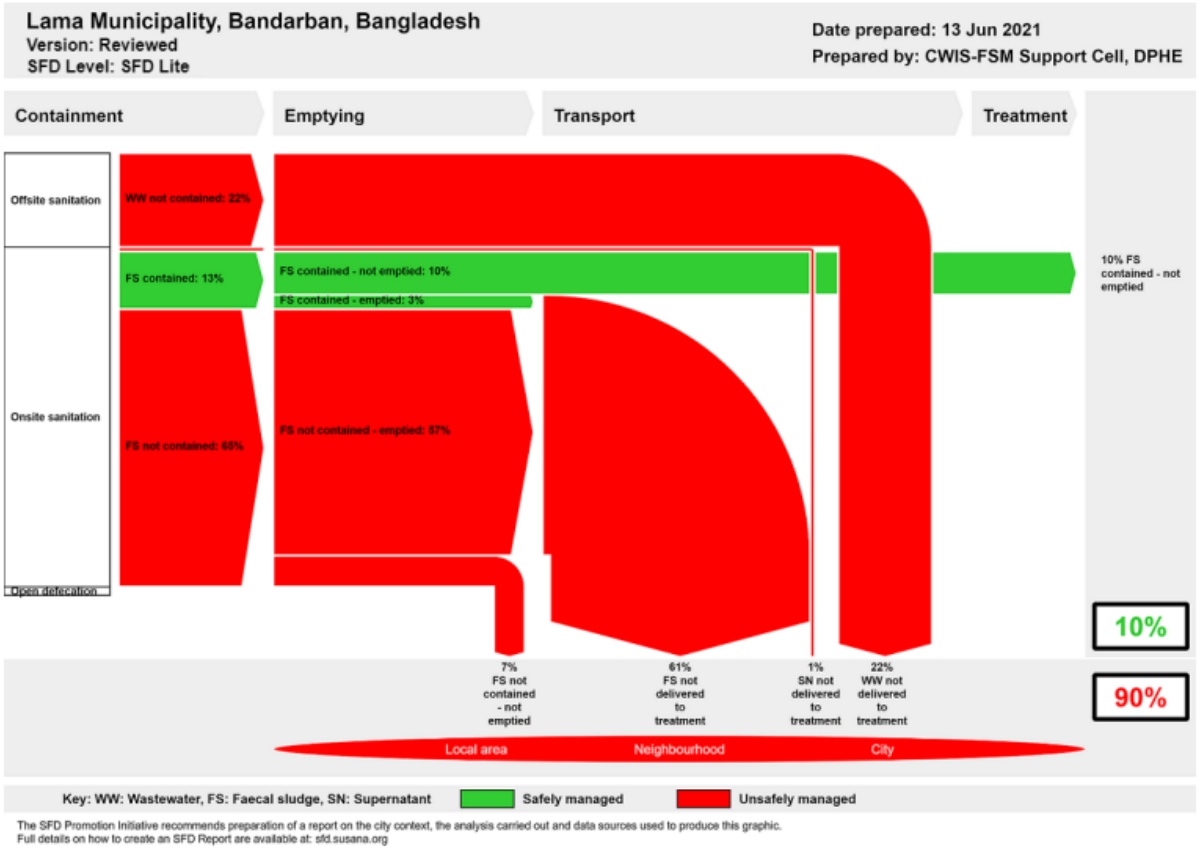
outfall of drain connected to the Matamuhuri River

54. **Faecal Sludge Management.** The improvements in urban public health were not up to the desired expectations as only part of the sanitation service chain is addressed. The other part, which is absent, is the safe disposal of the fecal sludge contained in the pits and septic tanks or in other words, the lack of proper FSM. Facilities for the safe withdrawal, transport, treatment, and reuse/disposal are largely absent, pits and septic tanks are illegally connected to the surface drains and the fecal sludge is emptied manually and disposed-off to nearby water bodies or open spaces. These causes serious health and environmental threat to the urban local communities and defeats the benefits of the strong progress made in increasing the latrine coverage.

55. The promotion of household sanitation in Lama over the last decade ensured total coverage of pit latrines amongst its population. However, the absence of the entire process of Fecal Sludge Management (FSM) viz., from collection to treatment and safe disposal resulted in unscientific management of fecal sludge. Under the circumstances, it is normal to come across supernatant from the septic tanks discharged into stormwater drains and the sludge periodically emptied from the septic tanks discharged into valleys and surface water sources. Additionally, the public toilets, which are essential for a town that has a high tourist footfall, are inadequate and those that are constructed are not properly maintained and hardly useful. Additionally, majority

of the septic tanks lack containment structures and release wastewaters straight into the valleys and stormwater drains that directly discharge into the Matamahuri River. To compound the problem, the Matamahuri River is the source of drinking water to the Lama population, as well. All the above, have serious consequences on public health and negates the efforts done by the Government to improve sanitation coverage.

Figure 4: SFD Graphic of Lama Municipality



source: www.sfd.susana.org

C. Proposed Solid Waste Management System

56. **Waste generation.** According to Enayetullah et al (2005), Das et al (2015), JICA (2005) and Waste Concern (2014), the per capita waste generation rate in urban areas in Bangladesh varies from 0.34 to 0.56 kg/cap/day. To estimate the waste generation in Lama, an assumption has been made that the waste generation rate is 0.34 Kg/day/person. Table 11 shows the estimated waste generation in tons per day (TPD) in 2020. Estimated waste generation from 2030 to 2045 based on the projected population growth is shown in Table 12.

Table 11: Estimated waste generation in Lama (2020)

Waste generators	Population	Total waste (TPD)
Residential	25,445	8
Institutional, commercial, and floating population (10% of the residential)		1

Total waste generated		9

Table 12: Projected waste generation (2030 to 2045)

Year	Estimated population	Projected waste generation (TPD)
2030	35,018	11
2040	47,751	15
2045	63,910	20

57. **Waste composition**. There are no formal waste composition data for Lama.

58. A field survey was carried out by Waste Concern in 2021 to study waste composition in Rangamati based on samples collected from households, markets and trucks arriving at dumping sites.

59. The average physical composition of solid waste for high, middle, low-income areas of Lama municipality is assumed to be similar to Rangamati that is presented in Table below.

60. **Waste composition.** No waste composition data available for Lama, where there was no survey yet conducted. A field survey was carried out by Waste Concern in 2021 to study waste composition in Rangamati based on samples collected from households, markets and trucks arriving at dumping sites is adopted here as indicative. The study indicates that organic waste accounts for about than 85%. The large content of degradable organic materials requires provision of more frequent and regular waste collection services. This also limits the available waste treatment options to composting and/or anaerobic digestion technologies. Given the waste characteristics (high organic content), conventional incineration may not be a viable treatment option for Lama.

Table 13: Indicative waste composition in Rangamati (adopted for Lama)

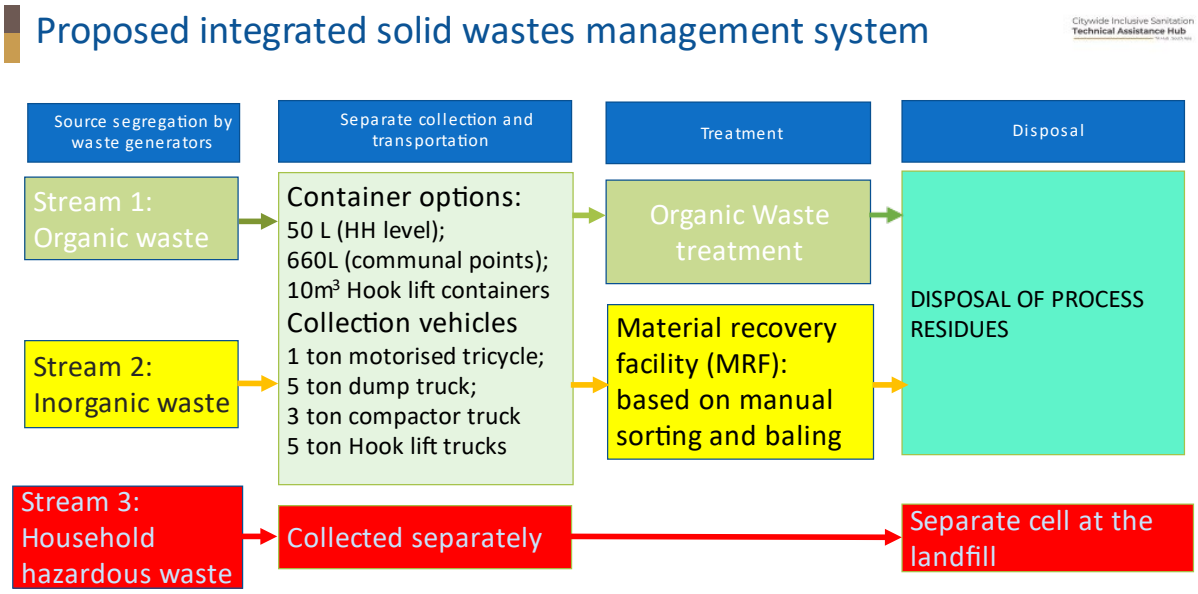
Component	High	Middle	Low	Dumping site
Paper	4.7	3.2	1.9	1.8
Organic Waste	77.8	84.2	92.3	83.9
Plastics	10.8	7	4.8	6.8
Glass	1.6	1.3	0.6	0.3
Metals	0	0	0	0.1
Textiles	2.4	2.4	0.1	6.1
Other Materials	2.6	1.9	0.1	1

61. **Proposed interventions.** Integrated solid waste management refers to the strategic approach for sustainable solid waste management covering all types of waste generators and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in a sustainable manner with an emphasis on maximizing resource use and efficiency. The proposed system is based on the national 3R policy and complies with the MSW Management Rules (2021). Figure below illustrates the proposed integrated MSW management systems that includes:

(i) separate collection of three streams of waste (organic/ wet, inorganic/ dry and domestic hazardous waste) using colored containers,

(ii) transportation of the separately collected waste using special waste vehicles and motorized tricycles.
(iii) treatment of organic waste and recyclable materials at appropriate facilities to extract value (e.g., compost and good quality materials for re-processing); and
(iv) disposal of process residues at a sanitary landfill.

Figure 5: Proposed integrated MSW management system



62. **Source segregation and containment,** The Pourashava should develop the necessary by-laws for the segregation of wastes at sources (households, commercial places, institutions, hotels and restaurants, markets and others) by using three color coded bins. The most important step of an efficient and effective waste management is source segregation. The national legislation requires segregation/separation of wastes in 3 streams (organic, inorganic and domestic hazardous) at the point of generation (household/institution/marketplace and others).

63. This is proposed to be achieved by providing 3 color coded bins, implementation of public awareness raising initiatives, community participation and enforcement of the legislation. As per the MSW management rules (2021), green bin will be provided for organic waste, yellow bin for inorganic and recyclable waste and red bin for domestic hazardous waste:

64. In case of households, 10L-50L capacity bins (with lids) can be used. In case of marketplace, commercial buildings and institutions, 03 colored larger storage bins of 660L shall be provided. They will be placed at communal waste collection points. Larger skips will be used for ad-hoc collection of bulky waste and waste generated at special events.

65. The communal bins must have removable lids and have wheels for easy moving. Multi-storied residences, commercial complexes, in addition to storage facilities in individual residences/shops, could also keep 03 color containers within their premises for communal storage facilities. Hotels, offices, shops and restaurants need to keep adequate number of 03 color coded bins to facilitate easy handling and transfer of waste to municipal collection system. In case of

slum areas, the 3-color coded communal storage facilities for organic, inorganic and hazardous wastes can be provided in the convenient locations.

Figure 6: Example bins and containers (for illustration only)

Typical HH organic waste bin (50L)

Typical communal organic waste bin (660 L)

Typical communal inorganic recyclable waste bin (660 L)

Example communal domestic hazardous waste bin (660 L) with locking provision

Example hook lift skip for bulk waste collection

66. **Waste collection.** It is proposed to implement following two waste collection methods. The LGIs can engage private operators or CBOs for door-to-door or communal waste collection.

(i) Door to door collection for households; and
(ii) Communal collection in slum areas, multi-storied residential complexes, market and commercial places.

67. Non-motorized tricycles are normally used for door-to-door waste collection and motorized single compartment auto tripper can be used for communal waste collection. The collected waste is then transported directly to processing, treatment and disposal. The major operational cost in most collection and transport systems is worker's wages. It is therefore important to establish clear benchmarks for number of households per worker per day. This is influenced by the speed of the vehicle, the volume it can carry, the weight it can pull, and whether it is powered or manually driven. For example, a rickshaw van can serve much fewer households than a battery vehicle. Therefore, the cost of operating a battery cart is lower per household. On the other hand, an auto-tipper can serve as many households as a battery vehicle but employs 2 workers (one driver, one worker) whereas a battery cart only required one worker who also drives the cart. While the actual number of workers may vary in each context the principle for choice of vehicle is to optimize per household per month cost.

68. This criterion is of course subject to constraints such as narrow streets, permission to emissions e.g., battery vehicles are unregistered and cannot operate on highways), ergonomics of reaching up and dumping waste into the vehicle's trolley etc. Some of these constraints can be addressed during the design of the vehicle. Others can be addressed through user behavior change. For example, an auto tipper can be run more cost-effectively if users deposit waste into the trolley themselves, thus avoiding the worker.

Figure 7: Door-to-door collection vehicles

Typical manually operated tricycle van

Three wheeler mecanical van

Small pickup for waste collection

Auto-tripper for waste collection

69. **Waste transportation.** The selection of the appropriate types of vehicles depends on wastes characteristics and density of the urban area, waste handling practices, loading and unloading conditions and initial capital cost. The route of transportation will need to be considered carefully to minimize the transportation costs. The waste must be covered properly during transport to avoid odor and spillage of waste on the streets during transport. Larger transport vehicles of three different types are proposed to be used to transport waste for treatment and disposal: skip truck (dumper placer), refuse collection truck and hook loader/ hook lifter.

Figure 8: Proposed waste transportation vehicles (for illustration only)

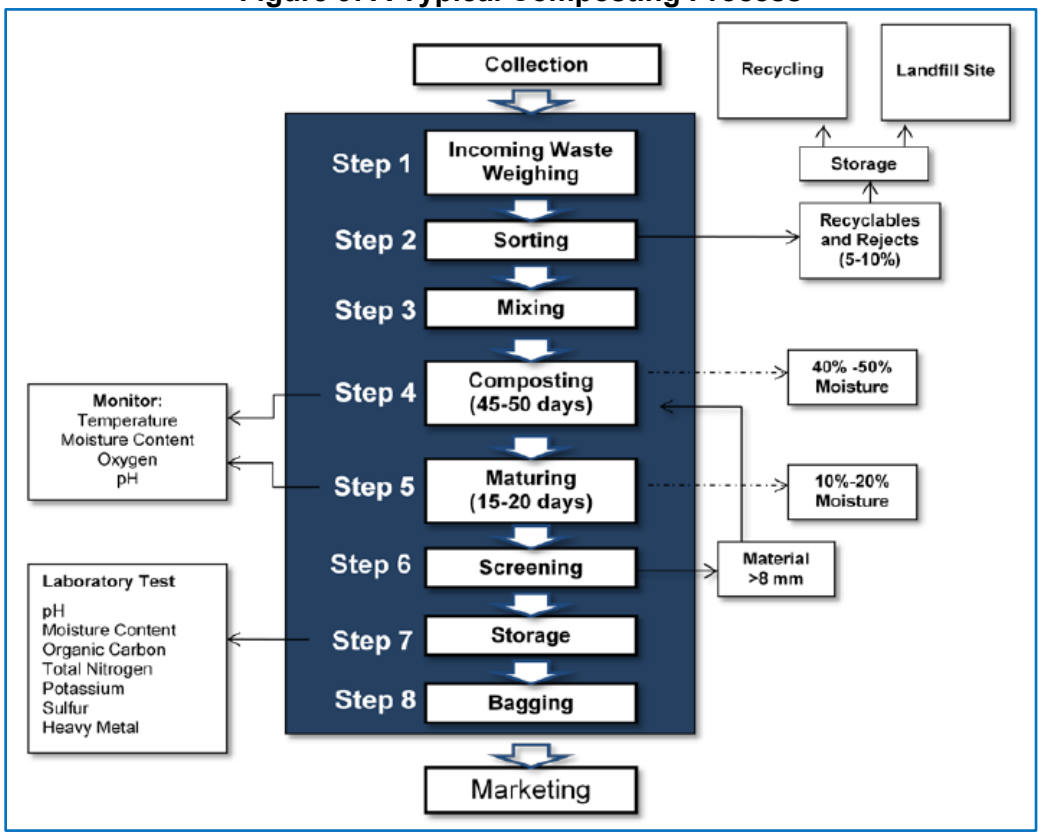
70. **Innovations during waste collection and transport.** It is proposed to implement a RFID (radiofrequency identification) based technology on a pilot scale in two areas in Bandarban. This will improve the service efficiency and quality by optimizing waste collection operations and facilitate data collection, management and reporting. If proven successful, this system can be adopted for other areas. The containers located in the selected pilot areas will be fitted with RFID tags that will be used in combination with handheld readers and/ or vehicle mounted devices. The system will allow:

(i) To track service delivery date and time.
(ii) To monitor location of the container; when it was picked up and dropped off, where and by which truck/ driver.
(iii) To rapidly respond to equipment malfunctions and other critical conditions.

71. **Composting Plant**. The composting plant is an integral part of the FSM and SWM facility of the subproject. The facility can utilize significant portion of organic waste in a cost-effective way. This compost plant is designed for organic wastes (waste coming mainly from kitchens, restaurants, vegetable wholesale markets, parks and lawns), and its operation envisages three major activities, namely: collection of segregated waste from the source, processing of waste using aerobic compost technology, and marketing of compost produced. Similarly, the composing plant will be operated by a third party to be engaged by Pourashava.

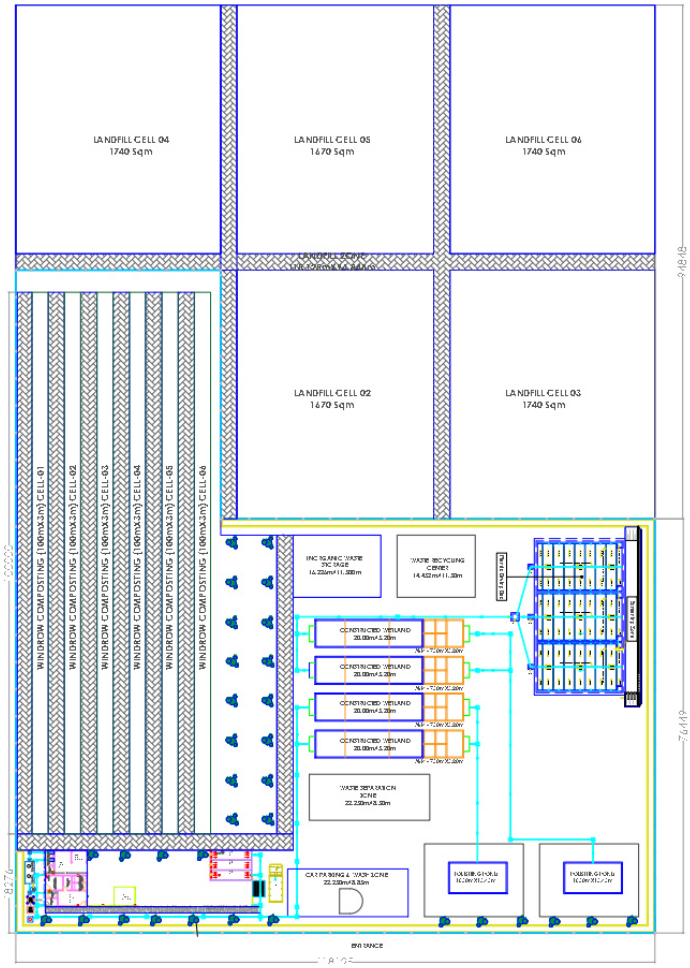
72. Figure below illustrates the process that will be adopted by the compost plant. Preliminary design recommends the use of box system with forced aeration method of composting. The final technology to be adopted, specific processes involved, and other operational details of the composting plant will be further elaborated during the detailed design stage, with due consideration of related recommendations in this IEE report.

Figure 9: A Typical Composting Process



73. **Landfill Facility (Landfill Cells, Leachate Collection and Treatment System, and Landfill Gas Collection and Control System).** The landfill facility is an integral part of the FSM and SWM facility component of the subproject. Per preliminary design, it will have six landfill cells and a leachate collection and treatment system (LCTS). The technical details of the landfill component and its allied subcomponents will be finalized during the detailed design stage, with due consideration of related recommendations in this IEE report, particularly those design parameters related to ensuring protection of the groundwater, surface water, and the environment as a whole, including minimization of release of greenhouse gas with high global warming potential.

Figure 10: Indicative layout for proposed infrastructure (for illustration only)



D. Fecal Sludge Management System

74. Proposed sanitation and septage management service supply chain is presented in the following Figure 11. The fecal sludge treatment plant (FSTP) is an integral part of the FSM and SWM facility of the subproject. The proposed treatment process and layout is presented in Figure 2 and 3. Operationally, the FSTP will be maintained by a third party to be engaged by the Pourashava. Fecal sludge will be collected directly from households using vacuum trucks. Collection of fecal sludge will be on needs or on call basis and/or on scheduled basis. No desludging will be allowed beyond 5 m3/day to avoid overloading the FSTP.

75. The sludge collection at the household level will involve mechanical desludging of septic tanks only, and no manual desludging will be allowed. For compacted layers of sludge, long spades or jet water hoses will be used. The vacuum trucks will have long hose pipe to enable them to reach the pits or septic tanks located in inaccessible areas. Operational personnel of vacuum trucks for collection and transport of septage will be provided with all necessary implements, and personnel protected equipment, and provided with proper training to conduct the operational fully mechanically and safely.

76. The FSTP is designed to employ the conventional biological treatment process. The solids will be dried and brought to the composting plant, while the supernatant liquid will be treated at

the FSTP plant. The treated supernatant liquid will be treated to meet the discharge standards and will be then used for internal applications such as washing and green belt maintenance around the IWTP plant. Any remaining liquid will be let out in the drain located at 300m from IWTP site. This drain ultimately joins the river at the downstream end away from the IWTP site. The specific processes involved and other operational details of the FSTP will be further elaborated during the detailed design stage to ensure that the treated effluent meets the discharge standards. Sludge from FSTP will be composted along with the biodegradable waste in the compost plant.

77. The contract for the establishment of the entire FSM and SWM facility will also be awarded after completion of detailed design under a civil works contract arrangement. Specific operational details as to the linkages among the different subcomponents of the whole facility (i.e., MRF, Composting Plant, FSTP, and Landfill) will be finalized during the detailed design. FSTP will be designed to meet applicable treated wastewater discharge standards.

Figure 11: Schematic Diagram shows the Sanitation Service Chain

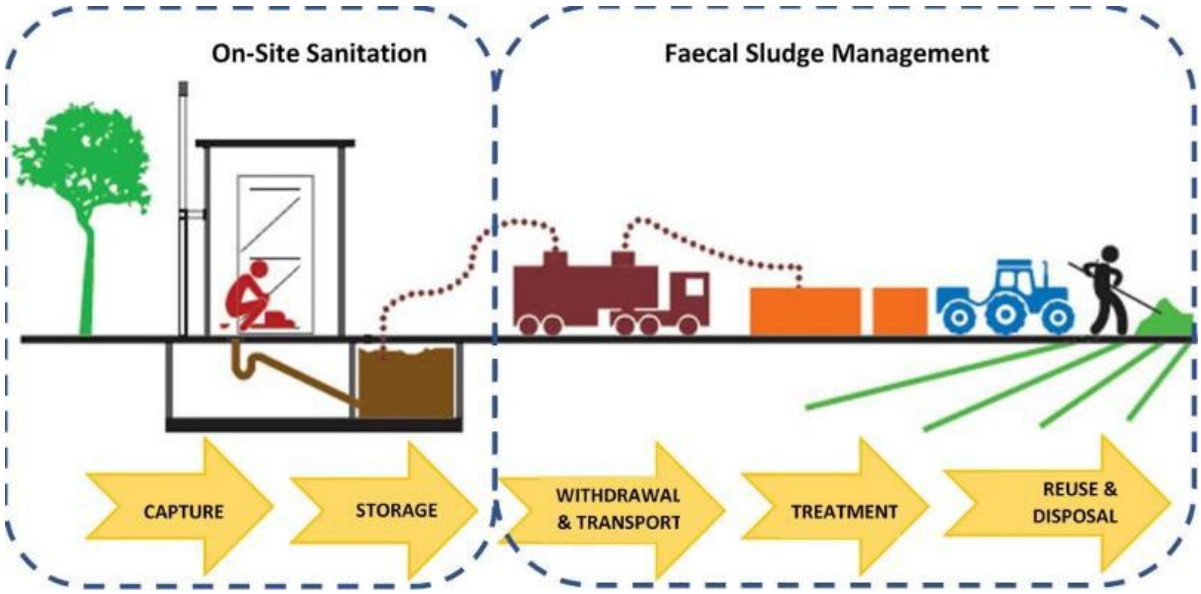


Figure 12: Proposed Process Flow

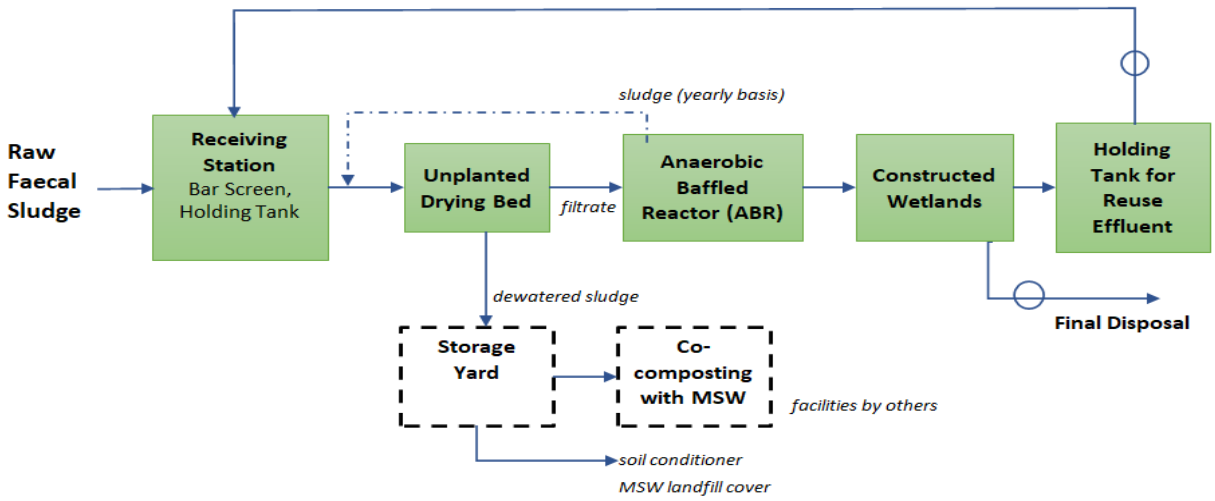
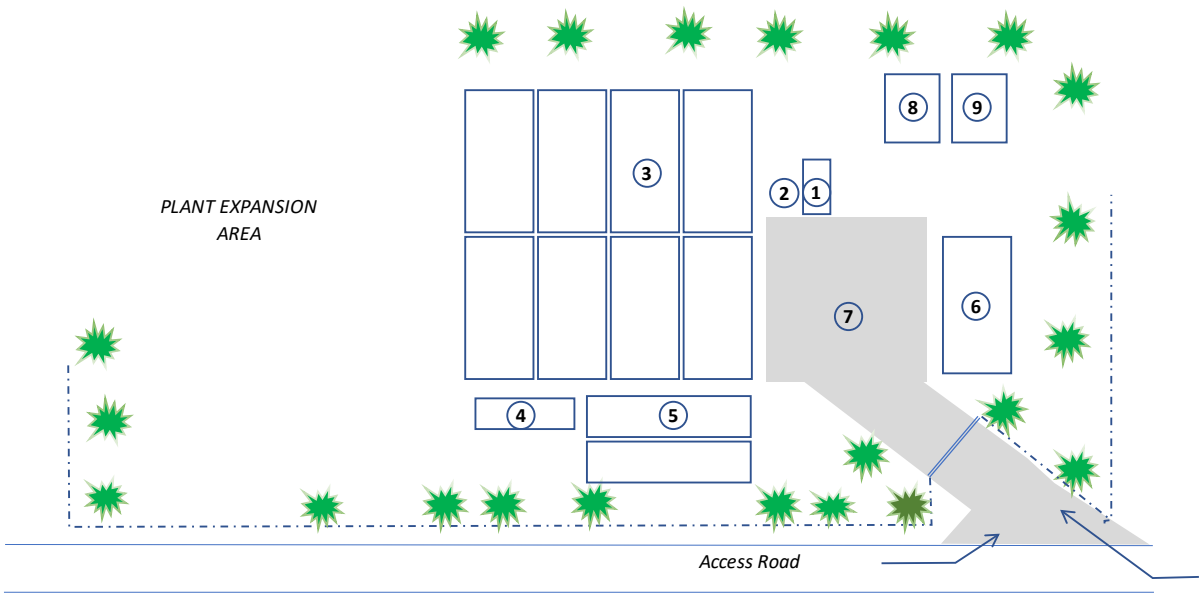


Figure 13: Preliminary Design Layout for Lama FS Treatment Plant



Solid Waste Facilites across FS Treatment Plant

1	Acceptance Unit/Screens	6	Office
2	Holding Tank	7	Truck Unloading/Parking Area
3	Unplanted Drying Beds (8 units x 5m x 10.4m)	8	Storage
4	Anaerobic Baffled Reactor (1 unit x 1.8m x 7.2m)	9	Operator's Quarters
5	Constructed Wetlands (2 units x 3m x 12m)		

E. Proposed Subproject Scope and Components

78. The proposed subproject is an FSM and SWM scheme that will serve Lama Pourashava in the Bandarban district of Bangladesh. Per preliminary design, the subproject will be developed in two phases Phase I (2025) with ultimate Phase II design capacity of 20 tons of solid wastes per day based up to 2045 generation scenario for Lama Pourashava. The components of the subproject include (i) improving the existing fecal collection system and construction of the FSM treatment and disposal facility; (ii) provision of vacuum trucks and pumps; (iii) undertake improvement in containment systems by providing prefabricated plastic septic tanks; (iv) replacement of hanging toilets (857); repair of existing 8 public latrines; installing 11 new public latrines and 2 new public latrines for small ethnic community; (v) SWM including improving the existing collection, transportation and treatment of solid waste and providing with composting, recovery and landfilling facility. The subproject will also include capacity building of the Pourashava Staff on operations & maintenance of these sanitation and integrated waste management systems.

79. Based on preliminary designs, the subproject components and subcomponents are tabulated as follows:

Table 14: Proposed Subproject Components - Fecal Sludge Management

No.	Particulars	Details
I.Fecal Sludge Management (Capacity & Coverage)		
1	Phase 1 (2030)	5m^3/day
2	Phase 2 (2045) – End of Project Period	10m^3/day
3	Coverage	100%
II. FSM Investments (Phase 1)		
1	Fecal Sludge Treatment Plant	*Screen:* 1 Unit (2x3m); Hydraulic Design Load - 5m^3 tanker load discharging in 10-15minutes. *Holding Tank:* 1 Unit (2.1m diameter); Hydraulic Design Load – 5m^3 tanker load; *Unplanted Sludge Drying Bed:* 8 Units of 5m x 10.4m each; Cycle Time = 18 days; Design Daily FS Load = 5m^3/day; *Anaerobic Baffled Reactor:* 1 Unit of 1.8 x 7.2m each; Retention Time = >1.5 days; Organic Loading Rate = 6 kgCOD/m^3/day, Hydraulic Loading Rate = 5.45m^3/day; *Constructed Wetlands (Submerged Horizontal Flow)*: 2 trains of 3mx12m each; Organic Loading Rate = 22.90 gBOD/m^2/day, Hydraulic Loading Rate = 5.45m^3/day; *Reuse Water Holding Tank*: 2 tanks of 200 litres each to meet 2 days reuse water requirements, Hydraulic Loading Rate = 200 liters / day;
2	Vacuum Truck Transport & Pumps	2 Nos. with 1 no. of 1m^3 capacity and 1 No. of 2.5m^3 capacity.
3	Containment Improvements	Promote use of prefabricated plastic septic tanks – 768 Nos., Replacement of Hanging Toilets – 857 Nos.
5	Public Toilets	Repair 8 Nos. existing public toilets; Install 11 Nos. new public toilets

Table 15: Proposed Subproject Components - Solid Waste Management

SL. No	Description of item	Unit	Proposed for 2025
1	**Procurement of equipment**		
	Buckets (50L)	Nos.	13200
	Communal bins (660L)	Nos.	120
	Container (10000L)	Nos.	2
	Hazardous waste container	Nos.	2
	RF ID tag	Nos.	50
	RFID tag readers	Nos.	2
2	**Procurement of Vehicles**		
	Dump Truck (3T)	Nos.	3
	Compactor truck with lifting mechanism (5 ton)	Nos.	2
	Hook lift trucks	Nos.	1
	Water Voucher	Nos.	1
	Excavator	Nos.	1
	Bull dozer	Nos.	1
	Mechanical Roller	Nos.	1
	Rickshaw Van(Manual)	Nos.	10
	Rickshaw Van(Mech)	Nos.	10
3	**Procurement of City maintenance and monitoring equipment**		
	Hand Trolley	Nos.	15
	Miscellaneous and Sweeping tools	Nos.	LS
	Motor cycle	Nos.	1
	Pick-up	Nos.	1
4	**Integrated Solid waste treatment facilities**		
	Development of land for **Integrated** waste treatment plant and disposal.	Acres	5
	Treatment plant Site office cons. Including approach road	LS	1 unit
	Construction of windrow Compost Plant,, Material Recovery Center	LS	1 unit
	Construction of Landfill cells	LS	1 unit
5	**Awareness Building & IEC Campaign**	L.S	L.S
	Total		

F. Project Implementation Schedule

80. The feasibility study for the subproject has been conducted based on the concepts envisaged for an integrated waste management scheme appropriate for Lama Pourashava. The detailed design phase may take about 12 months. After approval detailed designs, bids are likely to be invited in 2023. The subproject will be implemented through a single civil work contract and

the implementation period is expected to be 24 months followed by an O&M period of 5 years. The executing agency, the DPHE, will establish a Project Management Unit (PMU) to monitor the progress of the project followed by establishing a Project Implementation Unit (PIU) to supervise the project implementation at the town-level. The PMU and PIU shall be supported by Project Management Construction Supervision and Design Review Consultants who shall be hired specifically for the project.

ANALYSIS OF ALTERNATIVES

'No Project' SCENARIO

The 'No Project Scenario' is analyzed with respect to the development of the region as a requirement of reliable quality sanitation infrastructure for improved health of the community and creation of the right environment to attain sustained growth of economy and consequent continued well-being of its citizens.

All the households have access to some form of toilets which includes water-sealed flush/pour flush toilet and unimproved pit latrines, with the latter holding a major share of household sanitation infrastructure. However, a system to ensure safe disposal of the fecal sludge contained in the pits and septic tanks is lacking. The pits and septic tanks are illegally connected to the surface drains, and the fecal sludge is emptied manually and disposed-off to nearby water bodies or open spaces. These cause serious health and environmental threat to the urban local communities. Also, there is no established system for septage cleaning and its disposal. Septage disposal is done in an unorganized manner in land available nearby, pits, ditches, roadside, water body, etc. thus impeding the environmental quality of the surrounding media.

With respect to solid waste, majority of the houses dump their waste indiscriminately in the streets and drains, causing clogging of drains, localized flooding, breeding of insect and rodent vectors, and spreading of diseases. These spread foul smells, blocks parts of the roads causing traffic congestion and are unsightly. The 9MT / day solid waste generated in the Lama Town is collected by the Municipality from households, waste bins and from locations along roadsides, drains and valleys within the municipality. The collected waste is dumped into vacant land that located adjacent to residences and a school, as well. The leachate from these dumping areas flow either to the groundwater or into the streams below, thereby causing contamination. Also, the wastes are burned regularly resulting in release of toxic contaminants into the air.

The "No Project Scenario" shall be an impediment to the development of Lama town hindering further social and economic development of the town and, indirectly, the Government of Bangladesh's commitment to achieve Millennium Sustainable Development Goals (SDG 6) that requires providing the population with access to sustainable, safe drinking water and basic sanitation.

Overall, the proposed project and its components, as the 'with project alternative' will be the best solution to overcome the threat to the health, hygiene and access to a good environment for the local community. The project will bring about improved public health and a living environment that will contribute to improved quality of life in Lama Town and create an enabling environment for local economic development and improved social services that communities within the project area can benefit from.

'With Project' SCENARIO

The "with project scenario" alternative consists of providing FSM and SWM infrastructure to cover the entire population of Lama Town. Different possible alternatives, in particular for locating an Integrated Waste Treatment Plant (IWTP) to house both the FSM and SWM infrastructure were assessed. These "alternative" options considered are described in the subsequent paragraphs for selecting the location of the IWTP site.

Alternatives for IWTP Site

The selection of an appropriate site that meets the tough guidelines for solid waste management units is an important step that has been taken right at the start of the project activities. Alternative sites were evaluated to ensure that the selected site meets the criteria as per SWM Rules 2021. The evaluation as per requirements of the SWM Rules 2021 of the two sites viz., the Old IWTP Site (Site 1) and the New IWTP sites (Site 2) is presented in Table below:

Table: Compliance to Site Selection Indicators for the Lama IWTP Sites

Indicators for Evaluation of IWTP Site as per SWM Rules 2021	Old IWTP Site (Site 1)	New IWTP Site (Site 2)
Selection of Landfill Site The SWM Rules recommend that the selection of landfill site should meet the following indicators: A. Landfill projects will not be permitted in Environmentally Critical Areas (ECAs), protected areas, sanctuaries, declared environmentally sensitive areas and floodplains. B. A place should be selected that can be used for at least 20-25 years and can be used and closed by creating small phase-based "landfill cells". C. Buffer zones with a capacity of more than 5 tons should be placed around the solid waste processing and waste areas where no development activities can be undertaken and local government authorities, in consultation with the DoE, should issue separate buffer zone guidelines for each landfill.	The evaluation under the Location Criteria shows the following: A. The site is NOT located in the ECA, protection areas, flood plains or in any declared ESAs. B. The 20-25 years design horizon shall be met during the design; C. Presently, no buffer zone exists. However, since the total area available is 5-acres, a portion of the land can be demarcated as a Buffer Zone to meet the requirements.	The evaluation under the Location Criteria shows the following: A. The site is NOT located in the ECA, protection areas, flood plains or in any declared ESAs. B. The 20-25 years design horizon shall be met during the design; C. Presently, no buffer zone exists. However, since the total area available is 5-acres, a portion of the land can be demarcated as a Buffer Zone to meet the requirements.

Distance Indicator Instructions Distance Indicator specifications for landfill are as follows: A. Construction should be done at a minimum distance of 200 meters from rivers, wetlands, ponds. B. It should be constructed at 250 meters from the residential development project. C. National highways, residential areas, public parks and water supply wells should be constructed at 500 meters. D. The airport should be constructed at 3 km from the airbase.	The evaluation of the Lama IWTP site for the distance indicators is as follows: A. The IWTP site is within the 200m distance from the Matamuhuri River which is the source of drinking water for Lama Town; B. The IWTP site is not within the 250m distance from residences in the locality; C. No National Highway, residential areas, public parks or water supply wells are planned within 500m; D. No airport is being planned within a 3kms distance from the site.	The evaluation of the Lama IWTP site for the distance indicators is as follows: A. The IWTP site is not within the 200m distance from any major water body. However, the small natural stream at the edge of the site shall be diverted to avoid leachate contamination; B. The IWTP site is not within the 250m distance from any residential development project; C. No National Highway, residential areas, public parks or water supply wells are planned within 500m; D. No airport is being planned within a 3kms distance from the site.
Environmental Pollution Prevention Management in Landfills **A.** Storm water drainage drains should be maintained in such a way as to create less leachate and prevent surface water contamination. **B.** Storm water drains should be constructed in such a way that surface water flow due to rainfall cannot enter the landfill site and solid waste sludge is not mixed with the water flow in any way. **C.** Non-permeable lining system should be provided in diameter and wall in abandoned areas. **D.** Landfill 1.5 mm thick HDPE (geo-membrane or geo-synthetic liner) or equivalent liner and 90 cm thick soil (mud or modified soil) overlying coating less composite liner than $1x10^{-7}$ cm/sec. **E.** Groundwater level should be at least 2 meters below maximum level of mud or modified soil barrier level. **F.** Landfill should have sewage management with waste collection and treatment system. Under no	Detailed designs shall accommodate the requirements to prevent environmental pollutions from landfills.	Detailed designs shall accommodate the requirements to prevent environmental pollutions from landfills.

circumstances should the cesspool be discharged in the open. **G.** Arrangements should be made in the landfill area so that if the sewage flows, it cannot enter the lake or pond. If for any reason the effluent is mixed with the flowing water, the local government authorities or other authorities will have to make arrangements to purify the water.		
Closed Landfill Exterior Instructions **A.** The cover will have a 60 cm thick barrier made of mud or clay with a permeability less than $1x10^{-7}$ cm/sec of co-efficient. **B.** Drainage level should be 15 cm above the barrier. **C.** Above the drainage layer is a natural vegetation support and a soil-proof 45 cm plant-friendly layer. **D.** Solid waste processing with a capacity of more than 5 tons and a buffer zone should be set up around the waste area where any development activities can be undertaken.	Operation of landfill, including maintaining the cover and drainage levels shall be ensured. The buffer zone requirements can be investigated during the subsequent project preparatory activities.	Operation of landfill, including maintaining the cover and drainage levels shall be ensured. The buffer zone requirements can be looked into during the subsequent project preparatory activities.
Considerable Facilities in Sanitary Landfill **A.** Walls and appropriate gates should be constructed at the landfill site. **B.** Landfill connections and internal roads shall be paved or concrete. **C.** Sheds should be kept for keeping offices, machineries and equipment for keeping waste records. **D.** Adequate arrangements should be made for weigh bridges and fire prevention for waste measurement. **E.** Arrangements should be made for provision of drinking water, sanitary facilities, adequate lighting for the workers working in the landfill and monitoring of the health condition of the workers. **F.** Adequate provision of vehicle parking in landfill, cleaning and	Detailed Project Report shall ensure appropriate layout and designed for the sanitary landfill, if the site is selected.	Detailed Project Report shall ensure appropriate layout and designed for the sanitary landfill, if the site is selected.

washing of garbage vehicles should be provided. **G.** If it is not possible to process the waste due to natural calamity or other reasons, arrangements have to be made to conserve the waste.		
Landfill Closure Instructions **A.** Landfill solid waste should be compacted into thin layers using heavy compactors to ensure longevity of the landfill use; **B.** At the end of daily waste filing, the landfill cell should be covered with at least 10 cm of soil, inert material or construction material. **C.** Before the onset of monsoon, a hard soil cover of 40-65 cm thickness should be made in the landfill.	A Landfill Closure Development Plan shall be developed at the start of the landfill operations that shall be reviewed and approved by the Department of Environment. The same shall be implemented, as required.	A Landfill Closure Development Plan shall be developed at the start of the landfill operations that shall be reviewed and approved by the Department of Environment. The same shall be implemented, as required.
Landfill Site Planting Guidelines **A.** Many perennial endemic plants of tolerant and high temperature tolerance should be selected which are unsuitable for cattle feed and can thrive in infertile soils. **B.** Plants of this species should be selected so that the root does not penetrate to a maximum depth of 30 cm until the landfill is stable. **C.** Planting should be done in such a way that the landfill area does not collapse. **D.** Trees should be planted around the landfill boundary.	Boundary afforestation with appropriate local climate-resilient tree species shall be planted and maintained during the landfill operation period.	Boundary afforestation with appropriate local climate-resilient tree species shall be planted and maintained during the landfill operation period.

Accordingly, a 5-acre site (New IWTP Site) on the Al-Khadim Road was selected for constructing the Integrated Waste Treatment Plant (IWTP) Facility, after reviewing the various alternative sites available for the Municipality. The site is located just outside the municipal boundary at about 3 kms from the center of the Town and 11km from the farthest corner of the town periphery. One of the main reasons for rejecting the Old IWTP site from further consideration was its proximity to the Matamuhuri River and to certain residences in the area. And, locating an IWTP at the site would have had a deleterious impact on the health and safety of the community.

Fecal Sludge (FS) Treatment Process Alternatives and Recommendations

Alternatives were evaluated for the preliminary facilities and the main treatment process.

For the preliminary facilities (receiving station) where trash and other large inorganic matter are removed, the use of mechanical equipment was ruled out due to the low fecal sludge loads. Manually screened bar screens which are simple to operate were proposed. For the main treatment of fecal sludge, there are two main treatment processes/objectives: dewatering and filtrate treatment.

For dewatering, three alternatives were evaluated as shown below in Table 2:

Table: Alternatives for Sludge Dewatering for Lama Town

Criteria	Alternatives		
	1	2	3
	Planted Drying Bed (PDB)	**Unplanted Drying Bed (UDB)**	**Mechanical Dewatering Equipment (Screw Press/Belt Press)**
Area Requirement (unit footprint only)	80 m2	288 m2	around 100 m2 (building footprint)
Quality of Dewatered Sludge	30% DS	20% DS	20% DS
Complexity/Risks of Operation	Need technical supervision to ensure plant survival	Fairly simple operation	Need for trained operators. Need equipment supplier service support
O and M	Harvesting of Plants after a few months. Removal of sludge only required after several months	Daily removal of dewatered sludge at full capacity	Require power and polymer.
Other	Sludge is removed after a long period and co-composting will not be possible	Dewatered sludge can be produced daily and can be used for co-composting	Dewatered sludge can be produced daily and can be used for co-composting

Unplanted drying bed (UDB) was considered as the best dewatering option as it is simple to operate and maintain over the other 2 alternatives. Also, dewatered sludge can be produced regularly for co-composting with solid waste, and the compost product is one benefit. The UDB process has been proven suitable and effective in numerous FS treatment plants.

For filtrate treatment, four alternatives were evaluated as shown below in Table 3:

Table: Alternatives for Filtrate Treatment for Lama Town

Criteria	Alternatives			
	1	2	3	4
	Anaerobic Baffled Reactor (ABR) + Horizontal Flow Constructed Wetlands (HFCW)	**Stabilization Ponds (SP)**	**Settling Tank + CW + Polishing Pond**	**Activated Sludge**
Area Requirement (unit footprint only, based on 1000 mg/l BOD inflow)	80 m2	around 600 m2 (Excluding maturation pond)	130 m2	30 m2
Quality of Effluent	Can fairly meet ECR 1997 standards ECR 1997 standards	TSS standard may be difficult to attain due to algae production	Can fairly meet ECR 1997 standards Polishing pond may produce effluent with lower coliform content	Can consistently meet ECR 1997 standards
Complexity/Risks of Operation	Fairly simple operation	Fairly simple operation	Fairly simple operation	Need for trained operators. Need equipment service support
O and M	Desludging of ABR and CW plant harvesting after several months	Will require sludge removal from ponds after several months	CW plant harvesting after several months	Power Intensive. Regular wasting of sludge required
Others				Extremely difficult to operate because of intermittent loadings

ABR+CW (Alternative 1) was proposed for filtrate treatment. This system is quite common in Bangladesh. Multiple treatment mechanisms are in effect and the system is therefore quite robust. The ABR system is easy to maintain and will only require desludging after several months. It is not necessary to stop inflows to the ABR when desludging, so no bypass tank is necessary. If the peak loads are kept within the design values, the ABR is robust against variations in flow and

quality. CW is relatively easy to maintain and removal of solids in a bed will be done only after several years. Plants may die from high solids and organic loading, bed blocking by accumulated solids resulting to poor hydraulic flow, or lack of flow due to low FS sludge collection. However, provision of the ABR will prevent high solids and organic loading to the CW. Also, with multiple CW beds, inflows can be conveyed to only a few beds, and hydraulic underloading can be prevented. The system requires the least area among the natural system alternatives.

IV. DESCRIPTION OF BASELINE ENVIRONMENT

A. Baseline Information

81. The primary objective in this chapter is to provide an environmental baseline in the subproject area or location. Baseline data includes an inventory of physical, ecological, and socio-economic parameters. Baseline environmental data presented in this chapter are based on available primary and secondary information. Air, Noise and Water quality test results conducted during the feasibility report preparation are used. Baseline environmental monitoring for such will also be conducted before the start of construction. The Integrated Biodiversity Assessment Tool (IBAT) was used to screen the potential risks on the protected areas or critical habitat that may exist around the project sites and a preliminary Critical Habitat Assessment study is being conducted by a biodiversity expert.

82. **Primary data gathering**. Visits were undertaken to the subproject sites toward assessing the existing environment (physical, biological, and socioeconomic) and gathering information in respect of the proposed sites and scale of the proposed subproject. A separate socio-economic study was conducted to determine the demographic information, archaeological and religious places, densely populated pockets, and settlements. The methods used for primary data collection were transect walk, field GPS measurement, photographic records, need basis environmental survey, observations.

83. **Secondary data gathering**. Secondary data for this study have been collected through the following:

(i) subproject details, reports, maps, and other documents available with the ADB project documents and Technical Consultant, DPHE and interactions with pourashava.
(ii) relevant acts and extraordinary gazettes, and guidelines issued by Government of Bangladesh agencies and CHT council.
(iii) literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and environmental planning documents collected from Government of Bangladesh agencies and websites; and
(iv) web search for literature.

B. Project Influence Area

84. Impacts and risks were analyzed in the context of the project's area of influence, which encompasses the area where the water supply activities will be conducted. These include water source, intake areas, water transmission and distribution pipeline alignments, pump houses and

GLSR's, access road, and the location of construction phase facilities such as the worker's camp, storage, and disposal areas.

C. Physical resources

85. **Location.** Lama is located in Bandarban district in Chattogram division. It is the headquarter of Lama subdivision (Upazilla), which has an area 671.84 sq km, located in between 21°36' and 21°59' north latitudes and in between 92°04' and 92°23' east longitudes. It is bounded by Bandarban Sadar and lohagara (chittagong) Upazilla on the north, Naikhongchhari and Alikadam Upazilla on the south, Ruma, Thanchi and Alikadam Upazilla on the east, Chavarria upazila on the west. Lampang Dang and Muranga Tang Hills of the Upazilla are notable. Lama town is located in on the western border of the district. Geographically, it is located at 21°46'28.9" N latitude and 92°11' 48.7" E longitude. It is developed mostly on the left bank of Matamuhuri River.

86. **Topography, soil and Geology:** Lama pourashava is a part of Bandarban district and generally has similar topography and environmental features. Lama topography is naturally hilly area located along the lower portion of a 580 km long highly irregular deltaic coastline, rising into low hills generally no more than 200 m high, but achieving altitudes from 600 to 900 MASL further inland in Bandarban District. At 1,280 MASL, the highest elevation in Bangladesh is Tahjindong in the Mowdok range, on the border with Myanmar, also in Bandarban District. Topography most comprises of hills with vegetation. Geologically, Pourashava is composed of Surma group (Miocene).

87. **Soil nutrient quality.** Lama area falls mainly under Agro Ecological Zones (AEZ) 29, Northern and Eastern Hills. Brown hill soils are the predominant general soil type of the area. Organic matter content and general fertility levels are low. Secondary data obtained from the LRAB and BWDB on the soil nutrient quality in the area are provided in Table 16 below. From the available data, it is revealed that the soil of the project area is slightly acidic, low with respect to EC, nitrogen, low to normal with respect to phosphorus and zinc content very low to low with respect to organic matter content with relatively very low value of boron, calcium and potassium.

Table 16: Soil Nutrient Data from LRAB and BWDB

Major land type	Soil pH	Soil OM	Nutrient status								
			N	P	K	S	Ca	Mg	Zn	B	Mo
Highland (92 %)	4.1-7.1	L-M	VL-L	L	L-M	L-M	L-M	L-M	L-M	L-M	L-M

Source: *Land Resources Appraisal of Bangladesh (LRAB): Agricultural Development, Technical Report No.2.UNDP/FAO*

Note: *L-M: Low to Medium; VL-L: Very low to low; OM: Organic matter; N: Nitrogen; P: Phosphorus; K: Potassium; S: Sulphur; Ca: Calcium; Mg: Magnesium; Zn: Zink; B: Boron, Mo: Molybdenum, VL=Very low; L=Low*

88. **Seismicity.** 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

89. **Climatic conditions:** According to the Bangladesh Meteorological Department, the city area and surrounding area experience a tropical monsoon climate. It is characterized by warm, humid summers and cool-dry winters. The maximum mean temperature observed is 26.3°C -

32.3°C between April-August, with the minimum mean temperatures of between 11.8-13.3°C in January. About 84% of the total annual average rainfall of 2,250 mm occurs in the period from May through October and the driest months of the year are November to March. According to the flood zoning map of Bangladesh (BMD, 2012), the city is in a flood-free zone. However, the drainage network of the city is not adequate. Every year, many city areas face water logging during the monsoon.

90. **Air Quality.** As there are no notable industries in Lama. The main sources of air pollution are vehicles and non-point sources such as open burning. There are currently no air quality monitoring stations are in operation within the Pourashava limit. Ambient air quality measurement at key locations of the subproject area has been completed and the results are shown in Table 4.2. Air quality depends on substances, which are present in atmosphere in such concentrations that they produce undesirable effects on human beings, animal as well as plant life. These components include gases (SOx, NOx, CO, O_3, etc.), Suspended Particulate Matter ($PM_{2.5}$ and PM_{10}), etc. The air quality parameters were analyzed from samples collected over four (24) hour period at each sampling sites. As shown in Table 17, the minimum, average and maximum concentration of all the parameters are below the standard value at all locations. Detail information of air quality measurement is appended in **Annex 3** of this Report.

Table 17: Ambient Air Quality Parameters in the Subproject Influence Area

Parameter	Unit	Location									Standard (DOE)
		AAQ7 (Linejhiri Proposed WTP Site)			AAQ8 (Lama Bazar)			AAQ9 (Linejhiri Dumping Site)			
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	
CO	µg/m3	0.03	2.8	0.37	0.02	1.9	0.21	0.13	1	0.29	10 (8 hour)
NO	µg/m3	23	82	24.19	0	68	20.64	37	72	36.03	100 (annual)
NO2	µg/m3	31	56	45.91	4	67	34.48	41	79.3	63.86	
CO2	µg/m3	87	169	143.1	67	164	142.4	97	168	122.7	365 (24 hour)
O3	µg/m3	11.61	36.58	17.01	3.03	110.1	51.62	6.78	68.23	20.74	157 (8 hour)
Pb	µg/m3	0.25	0.95	0.34	0.08	0.83	0.17	0.31	0.89	0.47	1 (24 hour)
PM10	µg/m3	41.4	122	87.95	43.4	131	96.42	72.7	141	121.28	150 (24 hour)
PM2.5	µg/m3	23	52	44.7	12.6	58	45.27	36.3	54.2	43.17	65 (24 hour)
Temp	0C	23	28.2	24.17	27	33.9	32.82	28	33.7	32.2	-
RH	%	34	68.1	53.82	44	64.4	56.21	44	82.9	75.72	-
Wind speed	km/hr	0.3	2	0.41	2.3	4	3.2	2.7	8	6.53	-
Wind direction	degree	77	151.3	110.2	41	89	81.16	57.1	121	106.63	

** The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rule, 1997*

Source: UIIPF survey, 2021

91. **Noise Levels**. Subproject components are in the urban areas of Lama Pourashava with residential, commercial, and institutional establishments. The volume of traffic that passes through these sections is not significant and traffic jams are not frequent. However vehicular movement can be considered as major cause of noise pollution. Noise level data were measured at the locations where air quality was measured and the test results are given in the Table 18. The measured minimum and Leq noise values are within the prevailing standards set by DoE (Table 19) for mixed residential area with the exception of maximum value. Detail information on noise level measurement is appended in **Annex 4** of this Report.

Table 18: Ambient Noise Level Measurement Result in Project Influence Area

Sample ID	Time of measurement	Sample count	Unit	Minimum	Maximum	Leq
NM 07	Day	12 hour	dBA	34.6	61.4	46.8
	Night	12 hour	dBA	36.9	69.1	52.4
NM 08	Day	12 hour	dBA	36.2	60.7	49.8
	Night	12 hour	dBA	35.9	65.8	57.3
NM 09	Day	12 hour	dBA	37.3	70.7	48.3
	Night	12 hour	dBA	35.7	67.5	49.7

Source: *UIIPF survey, 2021*

Table 19: Noise Quality Standards of Bangladesh

Sl. No.	Area Category	Noise Quality Standard in dBA
A	Silent Zone	50
B	Residential Area	55
C	Mixed Area (basically residential and together used for commercial and industrial purposes)	60
D	Commercial Area	70
E	Industrial Area	75

Source: The amended schedule-4, 2006, of (Noise Measurement Standard), ECR 1997

92. **Surface water:** Matamuhuri River passes through the Pourashava. Matamuhuri River flows Northwest in the Hill Tracts and enters Cox's Bazar district from the east. Bhuban, Boka Bil, Tipam Sandstone and Dupi Tila formations constitute the bedrock of Lama town. The Matamuhuri river is navigable throughout the year by small engine boat. Surface water quality data obtained through sampling and analysis of sample collected at River Matamahuri is provided in Table 20 below. Except for turbidity, all other parameters tested were within the standards. The high-turbidity values may be due to the fact that the sample was taken soon after the rainy season.

Table 20: Surface Water Quality of River Matamahuri

Parameter	Unit	SW Sample (04.11.2020)	Bangladesh Standards
pH		6.6	6.5 – 9.0
Turbidity	NTU	237	10
TDS	mg/l	93	1000

Total Hardness	mg/l	195	200-500
Chloride	mg/l	14	150-600
Ammonia – Nitrogen	mg/l	0.22	0.5
Nitrate – Nitrogen	mg/l	0.10	10

Source: *UIIPF Survey, 2020*

93. **Groundwater.** In Bandarban District, data from two wells, one at Bandarban Upazilla and another at Lama Upazilla, were collected as part of the Groundwater Study from 2008-2018[13]. In both the wells, the groundwater water table was above surface till monsoon of 2015 and acted as an artesian well. Then water level was continuously decreasing at an alarming rate around 0.74m per year and going ahead. During the site visit it was observed that the location of the proposed IWTP site is uphill and the expected groundwater levels at the site will be well below the required norms. The hydrogeological studies shall be conducted during the detailed design stage and the IEE shall be updated accordingly.

94.

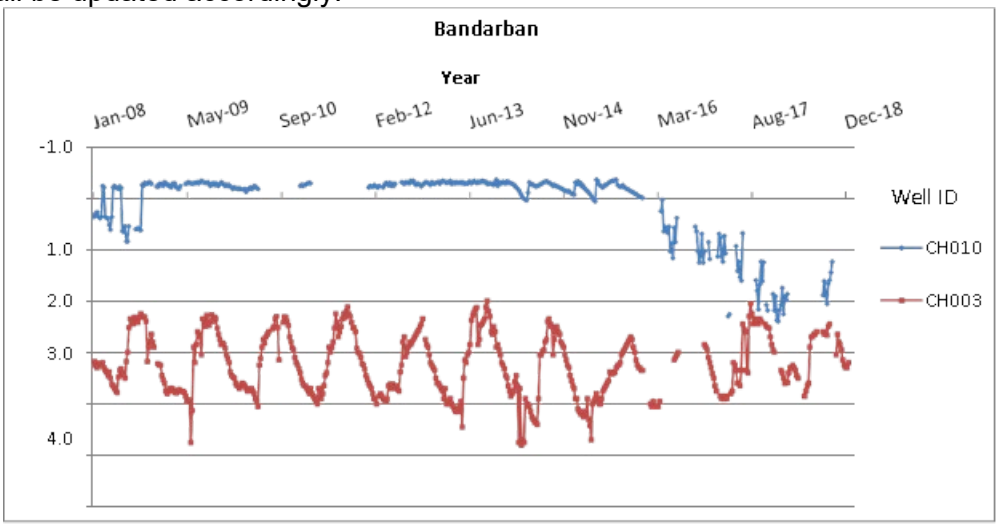
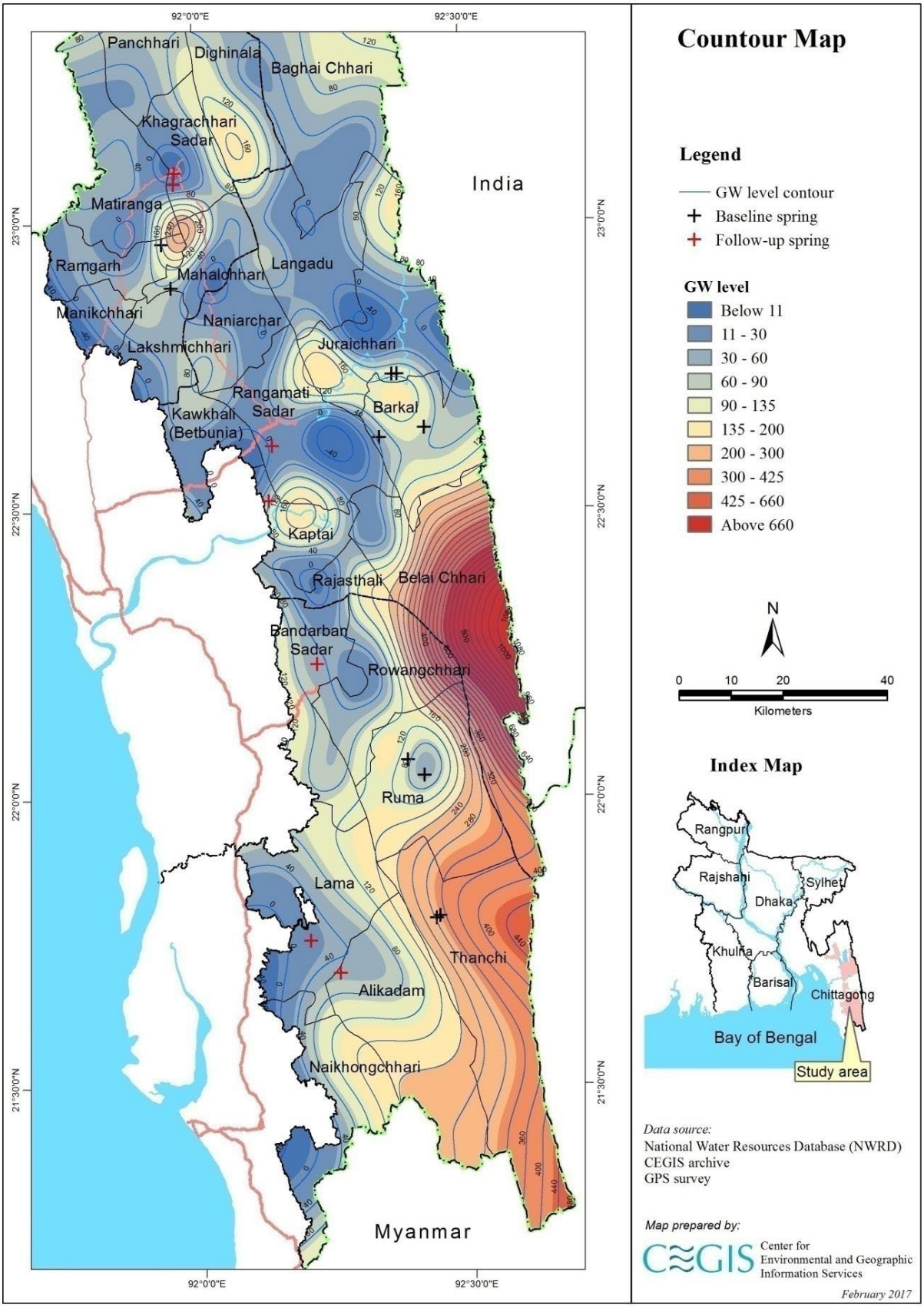


Figure: Hydrographs of GWT of Bandarban District

[13] Bangladesh Water Development Board (BWDB) study conducted on Groundwater Table Hydrographs for 38 Districts in Bangladesh for the Year 2008-2018.

Figure: Groundwater Level Contour Map for CHT


Countour Map
Legend
GW level contour
Baseline spring
Follow-up spring
GW level
Below 11
11 - 30
30 - 60
60 - 90
90 - 135
135 - 200
200 - 300
300 - 425
425 - 660
Above 660
N
0 10 20 40
Kilometers
Index Map
Rangpur
Rajshahi
Sylhet
Dhaka
Khulna
Barisal
Chittagong
Bay of Bengal
Study area
Data source:
National Water Resources Database (NWRD)
CEGIS archive
GPS survey
Map prepared by:
CEGIS Center for Environmental and Geographic Information Services
February 2017
India
Myanmar
Panchhari
Dighinala
Baghai Chhari
Khagrachhari Sadar
Matiranga
Ramgarh
Mahalchhari
Langadu
Manikchhari
Naniarchar
Lakshmichhari
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Kawkhali (Betbunia)
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Rajasthali
Belai Chhari
Bandarban Sadar
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Naikhongchhari
92°0'0"E
92°30'0"E
23°0'0"N
22°30'0"N
22°0'0"N
21°30'0"N

D. Biological Environment

95. Bandarban district is one of the hilly districts of Bangladesh. Hill forests located in hills and hilly areas is one of the main forest types of Bangladesh and comprises of tropical evergreen and semi-evergreen vegetations. These forests are found in Rangamati, Bandarban and Khagrachari Hill Tracts, Chittagong, Cox's Bazar, Sylhet, Maulvi Bazar and Habiganj districts. In Bandarban district, of the total geographical area of 4479.03 sq. km, about 61% of the area is under forest, this included both forest under the control of forest department and unclassed state forest under the control of the Hill District Council. There are no forests within or close to Lama town. There are two reserve forests in the south of the town, nearest is Matamuhuri reserve forest, about 15 km from the boundary of Lama town.

96. **Flora and Fauna in Lama sub-division of Bandarban district.** There is no Lama pourasha specific information available on flora and fauna, secondary information is obtained for Lama subdivision spread over 671.8 sq. km, which is include Lama pourashava. The flora and fauna in Lama Upazila (Lama subdivision in Bandarban district) tree species like gamar, arjun, acasia, kathal, mahogoni, segun, arjun, mango, bamboo, bel, lichu, guava, etc. are common tree species in the area. Various exotic plants like teak (Tectona grandis), babla (Acacia nilotica), pine (Pinus longifolia) and mahagoni (Swietenia macrophylla) etc. have also been introduced in this upazila.

97. The most important commercial timber species of the Lama Upozela is Jarul. Jarul trees (Lagerstroemia speciosa), Gamar, Garjan, Chapalish, Toon, Koroi, Civit, Champa, Simul, Chandul, etc. that used to grow to gigantic proportions. Most of the trees are of the evergreen type, whereas most of the tallest trees are deciduous and semi- deciduous types. Some of the trees shed their leaves during the cold season and some in the summer, so the area always looks green. Mulibansh (Melocanna baccifera), Jali Bet (Calamus guruba), Kanak (Schima wallichii), Achargula (Grewia microcos), Ulotkombal (Achryranthes aspera), Etchri (Anogeissus acuminata) and Chapalish (Artocarpus chaplasha) are the major species growing naturally in the hilly part of Lama.

98. Bamboos are found in abundance either throughout the area as pure patches or as undergrowth and the commonest bamboo is Muli (Melocanna bambusoides). There has extensive plantation area particularly of teak (Tectona grandis) which is implemented by Bangladesh forest department in vacant area, besides the natural forests. Mulibansh and Jali bet is the important non-timber forest product in Lama. In the farmlands, varieties of crops namely rice, wheat, vegetables, spices, pulses, oilseeds and maize etc are produced. The village homesteads are usually covered by dense and lush green foliage of a wide variety of trees, like betel nut (Areca catechu), coconut (Cocos nucifera), palm (Borassus flabellifer), jack fruit (Artocarpus heterophyllus) , guava (Psidium guajava), jam (Syzygium cumaini), mango (Mangifera indica) etc and shrubs and thickets like banana and bamboo. Wayside trees are banyan (Ficus benghalensis), sissu (Dalbergia sissoo), devdaru (Polyalathia longifolia), bel (Aegle marmelos) and Indian plums, etc.

99. Large number of fauna species found in the region but most of these are present in forests and protected areas, such as wildlife sanctuaries: 55 species of mammals including the capped leaf monkey and binturong, 286 species of birds like the hill myna, house swift and the greater painted-snipe; 56 species of reptiles and 13 species of amphibians. Common animals including reptiles and mammals are rhesus macaque , barking deer, Asian black bear, monitor lizard, Bengal monitor, etc. Golden jackals, fishing cats and dholes are common predators of the forest. There are few elusive clouded leopards too roaming inside the remoteness. Indian leopard is very rare. The Asian elephant herds used to roam in and around the sanctuary. However, due to settlements, the vegetation of these areas diminished and became uninhabitable for elephants, which now can be seen in Sangu forests only. Asian black bear is the most common bear species in the area but still low numbered. Second bear species of the area is Sun bear. Other large mammal sambar deer are also reported here but in lower numbers. Endangered species great hornbill are still seen flying in the sanctuary. There are some spotted owlets as well.

100. Among the reptiles reticulated python, rat snakes are found. The poisonous common species includes Bengal cobra, spectacled cobra, king cobra, common krait and branded krait and different species of vipers etc. Lizard, geckos skunks and monitor lizards are represented by more-than a dozen species. There are amphibians like toad, frogs and tree frogs.

101. Some of the fish and amphibians found in the Matamuhuri river are sawfish, butter fish, electric ray, common carp, silver carp, barb, river eels, starfish, king crab, fiddler crab, hermit crab, prawn, etc. Most of the freshwater fish found in other parts of Bangladesh, like ruhi (labeo rohita), catla (Catla catla), mrigel (Cirrhinus mrigala), koi (Anabus testudineus), shing (Heteropneustes fossilis), magur (Clarias batachus), etc. are also found in Lama subdivision.

102. **Protected Areas**. Protected areas (PAs) are “especially dedicated to the protection and maintenance of biological diversity and associated cultural resources, which are managed through legal or other effective means" (IUCN, 1994). They are "designated or regulated and managed to achieve specific conservation objectives" (Mulongoy & Chape, 2004). Three types of protected areas were defined under the Bangladesh Wildlife Preservation Act, 1973; i.e., National Park, Wildlife Sanctuary and Game Reserve. Forests and protected areas in Bangladesh area given in Figure 14. The Integrated Biodiversity Assessment Tool (IBAT) was used to screen the presence of protected areas or critical habitats around the subproject site (default area of analysis of 50 km radius). The IBAT was run at 5,10 and 20 kilometers proximity and screened for terrestrial and freshwater species. As shown in Figure 15 and 16, In Lama, there are no protected areas nor key biodiversity areas (KBAs) within 10 kilometers of the project area. Nearest protected area is Fasiakhali wildlife sanctuary, the boundary of which is about 10 km west of the town. Sangu-Matamahuri wildlife sanctuary is at about 15 km south, and Chunati wildlife sanctuary is about 20 km northwest.

Figure 14: Forest and Protected Areas in Bangladesh

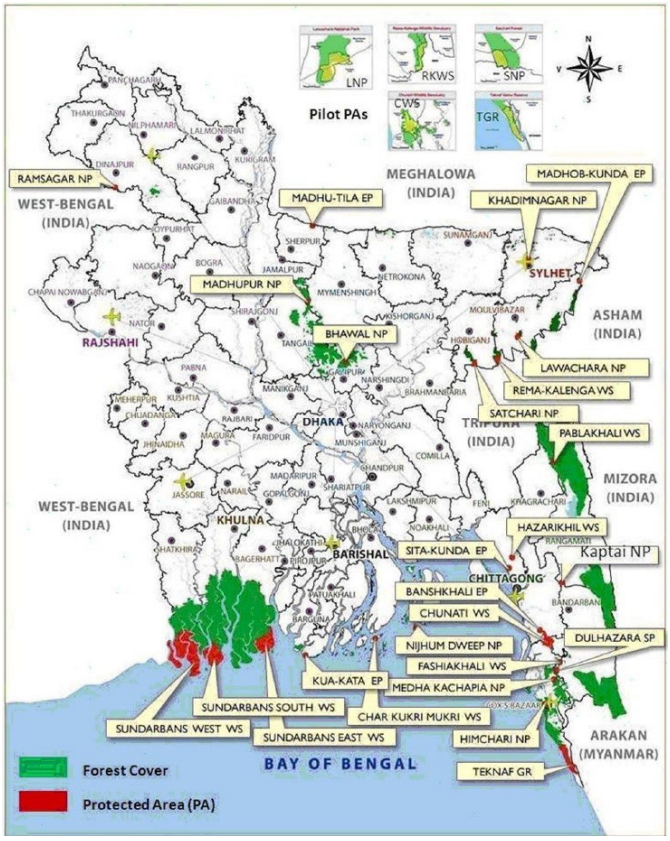


Figure 15: Protected areas in 5, 10 and 20 km radius of proposed IWTP site in Lama

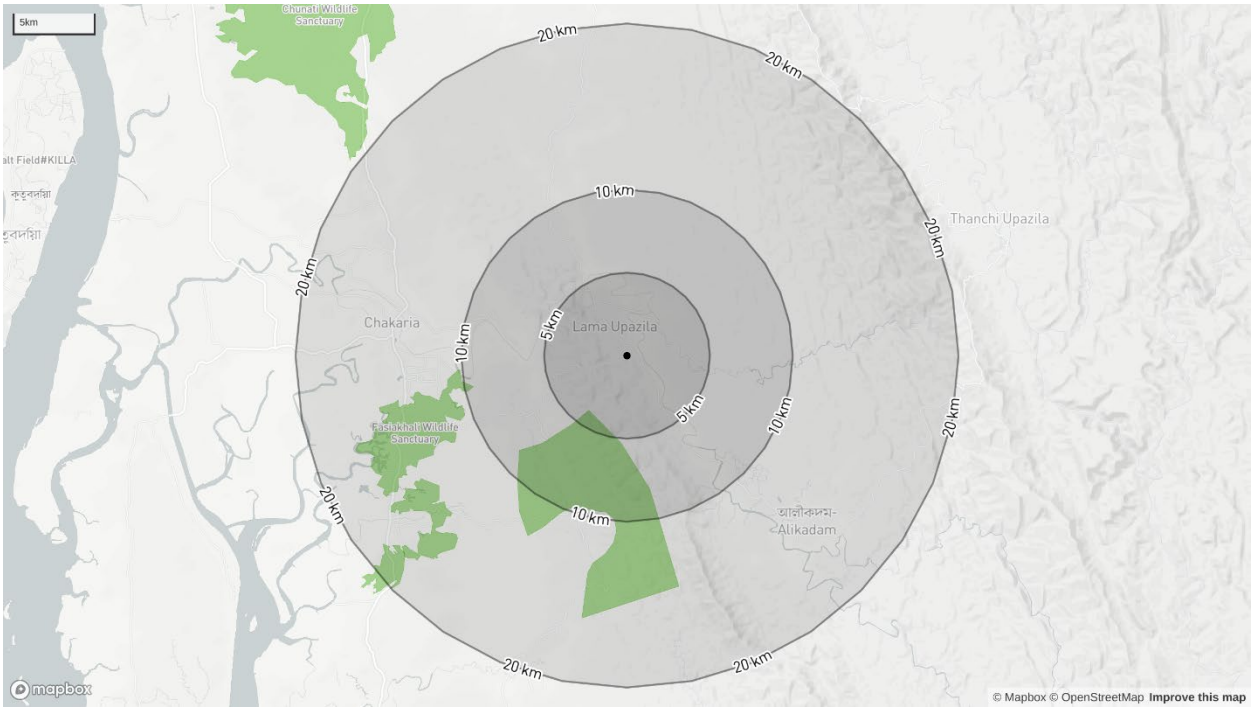
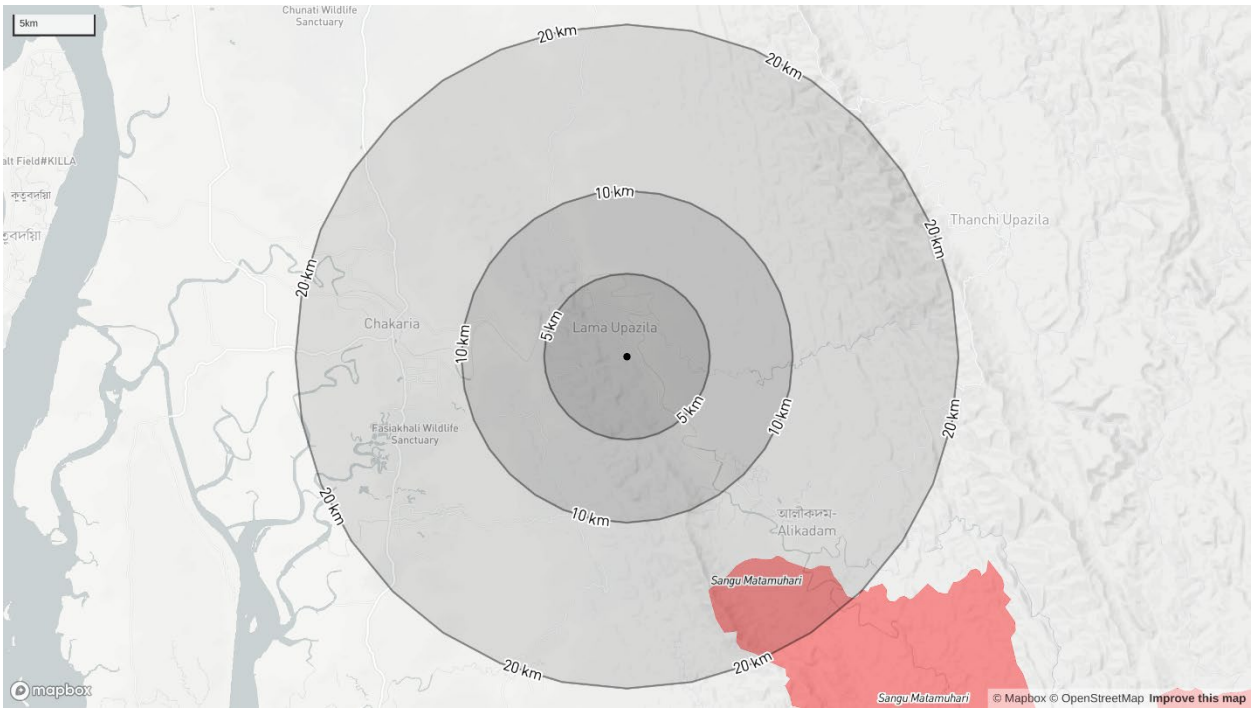


Figure 16: Key biodiversity areas in 5, 10 and 20 km radius of proposed IWTP site in Lama



103. **Protected species and Critical habitat.** While the IBAT identifies the protected areas and key biodiversity areas within a 50km of the area of interest, it should be noted that the Lama Water Supply Subproject is implemented in urbanized areas and none of the protected areas and key biodiversity areas shall be impacted from the project activities. Justification to support this hypothesis is that the project implementation area is already physically altered and disturbed by human presence/activities and other infrastructures. However, the location for the IWTP site for Lama is chosen in accordance with the SWM rules 2020 and based on preliminary studies on tourist spots, aquatic and terrestrial ecosystem, etc. none of these are impacted due to the location of the IWTP.

104. As per the IBAT Report (provided in Annex 6), there are 156 species belonging to the CR (27Nos.) (Critically Endangered), EN (53 Nos.) (Endangered) and VU (76 Nos) (Vulnerable) categories across various taxonomic groups have the potential to occur in the Lama region. Species were further screened by excluding the species which were not relevant to the Biodiversity Area of Analysis (BAA) and its vicinity. The list of species was further updated with

the data from IUCN Red List of Bangladesh (IUCN Bangladesh 2015). While determining the conservation status, priority was given to the national Red List ratings over and global IUCN Red List status. Following table shows the list of species that are relevant t Lama area. The likeliness of the presence of other CR species (Chinese Pangolin) is rare. Recent records show that this species is to be found once in 2-3 years. Some incidents of human-elephant interaction have been reported from Lama Upazilla but those areas do not fall within or close to the IWTP site.

Table 21: Screening for Species of Relevance to wider Lama Area

Scientific Name **English Names**	**Threatened Status**		**Habitat Requirements**	**Presence in Lama area**
	National	**Global**		
Mammals				
Manis pentadactyla Chinese Pangolin	CR	CR	Inhabits subtropical, mixed evergreen and deciduous forests, where there are termite mounds. A burrowing species,	Unlikely Widely distributed in northwest, north, northeast, and southeast Bangladesh,
Coun alpinus Dhole/Wild Dog	EN	EN	Mixed evergreen mid-hill forests of northeastern Bangladesh	Unlikely Found in Satchari National Park, Teknaf Wildlife Sanctuary, Sangu-Matamuhuri Reserve
Hoolock hoolock Hoolock Gibbon	CR	EN	Evergreen, Mixed-evergreen Forest, monogamous, living in groups of 2–5, each group maintaining its territory, in a home range of 30–35 ha; completely arboreal and are mainly frugivorous	Unlikely Northeast and southeast Bangladesh; Maulavibazaar, Cox's Bazaar
Trachypithecus phayrei Spectacled Leaf Monkey	CR	EN	Evergreen, mixed evergreen forests	Likely. Restricted to the northeast (Satchari, Sagarnal, Lathitila, Rema-Kalenga, Lawachara) and southeast Bangladesh

Scientific Name English Names	Threatened Status		Habitat Requirements	Presence in Lama area
	National	Global		
Trachypithecus pileatus Capped/Blonde-bellied Langur	EN	EN	Found in the tropical, wet, evergreen rain forests to moist, deciduous forests,	Likely Widely distributed in the north, northeast, and southeast of Bangladesh
Elephas maximus Asian Elephant	CR	EN	Hilly forest. The biggest threat to the Asian elephant is the loss of habitat and fragmentation as economic growth has led to encroachment into places where they live.	Southeast hilly region Elephants occur in the CHT but are seldom recorded Lama area
Nycticebus bengalensis Bengal Slow Loris	EN	EN	Nocturnal in habit; Mixed evergreen forests, often found close to human settlements	Rare, with few records of its presence within the project AOI. Habitat destruction and capturing alive for the pet trade are the major reasons for its decline.
Prionailurus viverrinus Fishing Cat	EN	VU	Strongly associated with wetlands. It lives typically near water and where thick cover is available. It can be found in habitats such as swamps and marshy areas, mangroves, oxbow lakes, reed beds, tidal creeks, and along watercourses	Rare but present. Widely distributed in Bangladesh covering almost every habitat type where there is a source of water.
Reptiles				
Pangshura sylhetensis Sylhet Roofed Turtle	CR	CR	Hilly Stream and low-lying wetlands, tropical hilly forest, fast-flowing stream	Unlikely; this species has been recorded from further upstream with deep pools and pristine habitat of the Sangu River

Scientific Name English Names	Threatened Status		Habitat Requirements	Presence in Lama area
	National	Global		
Indotestudo elongata Elongated Tortoise	CR	CR	Evergreen, mixed evergreen, deciduous forests, scrubby vegetations	Previously widely distributed in the north-eastern, central deciduous, and South-Eastern forests. At present fragmented populations in the northeast and southeast
Manouria emys Asian Giant Tortoise	CR	CR	Evergreen, mixed evergreen, deciduous forests	Southeast (CHT), Sangu-Matamuhuri Forest Reserve
Cuora mouhotii Keeled Box Turtle	CR	EN	Hilly forest, wetland	Unlikely, mostly in the pristine forests.
Cuora amboinensis Southeast Asian Box Turtle	VU	EN	Evergreen, mixed evergreen forests	Southeastern Bangladesh (CHT)
Birds				
Haliaeetus leucoryphus Pallas's Fish-eagle	EN	EN	Wetlands, Estuarine area, Coastal Wetlands	Likely North East and South West and Central Region
Gyps bengalensis White-rumped Vulture	CR	CR	Open woodlands, forests with large trees	Likely White-rumped Vulture was once a common and widely distributed bird in Bangladesh.

105. **Recommendation of biodiversity screening.** Based on the proposed subproject design and implementation activities, there risk of impacts on protected species will relate to the construction phase, if they are encountered during the process although likelihood is rare given that works are confined mostly to urban area and surroundings. No adverse impacts on qualifying species is likely to occur provided suitable design mitigation and that the construction and operational phases are effectively managed. Therefore, in continuation of the screening exercise conducted above, PMU will engage a biodiversity expert, and following tasks to be conducted during detailed design and prior to start of construction:

(i) Engage Biodiversity expert to conduct further on-site verifications during the detailed design for the short-listed species or any other likely protected species; expert shall interact and consult with relevant stakeholders and community in and around the sites, and confirm the likelihood of occurrence of these species in or close to subproject sites, and provide information on likely reasons for visit (food, water, shelter etc.,), and seasons, and timings (day/night), and other favorable site conditions

(ii) Prepare standard operating procedures (SOPs) for construction to avoid any impacts, risk or damage to flora and fauna in general, and species of interest in particular
(iii) Conduct site visits and verify presence of any protected flora species; if found on site, ensure that those trees are undistributed and considered in the layout design; in unavoidable cases, trees may be safely transplanted under expert supervision within the same area; PIU shall coordinate with the Forest Department for the translocation
(iv) Conduct site verifications again prior to start of construction; if species of interest are found on-site, ensure that the findings are recorded and reported to the PMU. No disturbances or works on the site should start/continue until PMU issues clearance to proceed. Measures to restrict poaching or hunting shall be put in place.
(v) Conduct training and awareness to workers and staff
(vi) For contractors working in areas where species of interest are present, the toolbox talk should include reminders and actions required related to biodiversity conservation as specified in SOP and the environmental management plan (EMP).

E. Socio-Economic Environment

106. The following sections provide brief description of Bandarban District (Zila) and Lama Municipality (Pourashava) based on secondary sources.

1. Bandarban Zila

107. Bandarban District is located in the south-eastern part of Bangladesh under Chittagong Division. It is one of the three hill districts of Bangladesh and a part of the Chittagong Hill Tracts. The district is bounded on the north by Rangamati district, on the east by Rangamati district and Myanmar, on the south of Myanmar and on the west of Chittagong and Cox's Bazar districts. It lies between 21º 11" and 22º 22" north latitudes and between 92º 04" and 92º 41" east longitudes. The total area of the district is 4,479.03 sq. km (1729.36 sq miles) of which 2653.54 sq. km is under forest. Bandarban district consists of 7 upazilas, 31 unions, 96 mauzas, 1554 villages, 2 pourashavas, 18 wards and 103 mahallas. The upazilas are Bandarban Sadar, Rowangchhari, Ruma, Thanchi, Lama, Alikadam and Naikhongchhari. Bandarban city is the headquarters of the Bandarban district.

108. The total number of household of Bandarban zila, as enumerated and Housing Census 2011, is 80,102 of which 20,750 (25.90%) are in urban area and 59,352 (74.10%) in rural area. The household size for the Zila, urban and rural area is 4.75, 4.63 and 4.80 persons respectively, as per Census 2011. The total population of the Bandarban district is 388,335 of which 74.14% constitute rural population and the remaining 25.86% is urban population. The distribution of population by sex indicates 52.36% males and 47.64% females of the total population. The annual and intercensal growth of population of Bandarban Zila are 2.64% and 30.26% respectively. The density of population for the Zila, urban and rural areas is 87, 469 and 68 respectively. The high density in urban area could be due to the migration of a considerable number of people from rural areas to urban areas with a view to seeking job, education and better opportunities of life. The percentage changes of population density during inter-censual periods reflects a sharp decreasing trend in the Zila and fluctuating trend in rural and urban area since 1974.

109. The literacy rates (population 7 years and above) for both sex, male and female in the Zila, urban and rural areas have been increasing since 1991. During the decade 2001-2011, the literacy rates for the Zila, urban and rural areas is 35.86%, 54.13%, and 29.18% respectively. The literacy rate for both sex, male and female has been increasing since 1991 but at a slow the rate. The literacy rates both sex, male and female during the decade 2001-11 increased by 4.19, 2.05 and 7.26 percentage points respectively in the Zila.

110. Sources of drinking water has been classified in three categories namely tap, tube-well and others in Census 2011. Others is the major source of drinking water in the Zila as well as in rural area but tube well is the major source in urban area. Tube-well as a source of drinking water of the general household has increased from 38.70% to 41.36%, 40.24% to 47.30% and from 31.97% to 39.33% in the Zila, urban and rural areas, respectively during the decade 2001-2011. The facilities of tap water are confined to urban area and has increased to 28.43% in 2011 from 20.12% in 2001. As a consequence, the use of others source in urban area possibly has gone down to 24.27% in 2011 from 39.64% in 2001.

111. The sanitary (includes water sealed and non-water sealed) facilities have increased significantly for the Zila, urban and rural areas from 10.44% to 26.64%, 24.48% to 50.62%, and 4.38% to 18.42% respectively during the decade 2001-2011.

2. Ethnic Communities

112. The majority population of the Zila is Muslim. Among population of different religious faith, the Muslim contributes 50.75% followed by the Buddhist 31.69%, the Christian 10.13%, the Hindu 3.38% and others 4.05% in 2011 to the total population of Bandarban Zila. The ethnic communities of the Zila include Marma, Murong, Tripura, Bawm, Tanchanga Chakma, Chak, Khyang, Khumi, Lushei and the Pankho. As per Census 2011, the total ethnic household of the Zila is 36,676 which is 45.79% of the total households of Bandarban District with an average size of household 4.7 persons. The total ethnic population of the Zila is 172,401 persons of which 87,670 (50.85%) are males and 84731 (49.15%) are females. Among the total population of the Zila, 44.39% constitute the ethnic population with a sex ratio of 103. The literacy rate (7 years and above) of the ethnic population for both sex, male and female are 27.44%, 32.83% and 21.89% respectively. As per Census 2011, 10.51% and 21.75% of the ethnic households avail the opportunity of tap and tube-well water for drinking respectively whereas 16.24% have access to sanitary latrine.

3. Economy

113. The economy of Bandarban is predominantly agricultural. Out of total 63,744 holdings of the district, 71.26% holdings are agriculture farm holding that produce varieties of crops, namely, local and HYV rice, wheat, vegetables, spices, cash crop (cotton, tobacco), pulses, oil-seeds, maize and others. Various fruits like banana, pineapple, jackfruit, orange, papaya, mango, lichi, coconut, guava, etc. are grown in the district. Fish of different varieties abound in this district and as in other parts of the country. Varieties of fish are caught from rivers, tributary channels and creeks and from paddy fields during the season. Besides crops livestock, forestry and fishery are the main source of household income. Population in the age group of 10 years and above by field of main activity constitutes 71.9% (279,172) of the total population of the district. This group includes: do not work, looking for work, household work, and employed. The employed population comprises 48.59% of the total population in the age group of 10 years and above. The field of employment includes agriculture, industry, and service. People employed in agriculture, industry

and service accounts for 69.85%, 6.47% and 23.68% respectively. Non-agricultural activities are still sparse. Notable cottage industries of the Zila are tribal textile. Clothes are mostly made of cotton, wool imported from Myanmar and silk cotton which is a rarity in most of Bangladesh. All cotton is spun and woven by hand. Bangladesh Small and Cottage Industry Corporation centre has been established to promote local textiles in Bandarban

4. Lama Pourashava

114. Lama town covers Lama pourashava which was established in 2001. It is located in a hilly area of Bangladesh, surrounded by Hills and River Matamuhuri. The geographical coordinates of Lama are 21° 47' 30" North, 92° 12' 30" East. In the context of Bangladesh, the municipality area is relatively highland. Total length or roads in the town is 63.2 km. Lama is a fast-growing town, and is located 366 km away from the Dhaka city. The municipality covers an area of 14.50 square kilometers. At present, the Lama municipality has 56.00 km of road out of which 24.00 km is the kutcha road, 32.00 km is the pucca road. The city has about 18.00 km of drain which includes 3.00 km of pucca drain and 1,500 km of the earthen kutcha drain.

115. The total population of the Pourashava as enumerated in 2011 census is 19,010 and with the current growth rate is assumed to have reached in 2021 approximately 28,903. The density is high in the north and west, ranging from 2,620 to 8,571 per sq km. The population density in the south and east is lower, ranging from 1,034 to 1,140 per sq km. The Table 22 below provides ward wise data of Lama Pourashava. Population projection is very important to estimate the demand for FSM and SWM infrastructure that would be required over the design period i.e., 2045. In view of this, ward wise population projection has been attempted. A growth rate of 3.29 per year has been considered for population projection. At this growth rate, it may be observed that by 2045, the population of Lama Pourashava will be 57,143.

Table 22: Ward Wise Population & Literacy Data of Lama Pourashava

Lama Town / Pourashava	Area (Sq. km)	Household #s	Population			Sex Ratio	Literacy (%) 7+ years
			Total	Male	Female		
Town	13.87	3996	19,014	9,850	9,164	107	50.3
Ward No. 1	1.3	279	1,318	678	640	106	59.4
Ward No. 2	1.41	400	1,804	955	849	112	51.5
Ward No. 3	1.25	460	1,915	1128	787	143	60.4
Ward No. 4	1.50	536	2,608	1292	1316	98	53.3
Ward No. 5	1.57	486	2,367	1147	1220	94	44.8
Ward No. 6	1.75	452	2,180	1071	1109	97	43.0
Ward No. 7	2.23	561	2,773	1466	1307	112	58.7
Ward No. 8	1.45	412	2,129	1131	998	113	50.6
Ward No. 9	1.41	410	1,920	982	938	105	29.5

F. Proposed Sites for Septage and Solid Waste Management Facility

116. **Location of waste collection and temporary storage**. It is envisaged that the waste collection will cover the entire Lama Pourashava. Waste collection will involve the use of rickshaw vans and bins that will be procured and funded under the subproject, while the temporary storage

will utilize community containers which will likewise be procured and funded under the subproject. These containers will be placed at strategic locations around the Pourashava.

117. **Location of sanitation FSM and landfill facility**. The IWTP facility will house the (i) materials recovery facility (MRF), (ii) composting plant, (iii) fecal sludge treatment plant (FSTP), (iv) landfill cells, (v) leachate collection and treatment plant (LCTP), and (vi) landfill gas collection and control system.

118. **Site Selection.** Lama pourashava covers a small area in the Bandarban district in Chattogram division. It is bounded by Bandarban sadar and lohagara (chittagong) upazilas on the north, Naikhongchhari and Alikadam upazilas on the south, Ruma, Thanchi and Alikadam upazilas on the east, Chakaria upazila on the west. Most of the topography of the region has hilly terrain which makes identifying and selecting a suitable site for the IWTP including landfill facility a challenge. During preliminary investigation and due diligence, a total of 5 potential sites were reviewed for their suitability keeping in view different criteria such as (i) distance from nearest residential area; (ii) distance from nearest water body; (iii) total area required by the IWTP and associated facilities for the design year; (iv) minimum distance from any protected area or designated wildlife sanctuary; etc. Out of the five sites, one of the sites having around 5.3 acres of flat land and which came close to meeting the criteria was located between ward 8 and ward 9 along the roadside of the Matamuhuri river. The location of the site was suitable except for its distance from the river. During the site visits by the consultant and project team it was concluded that the proposed site will not meet the DOE criteria as it was just around 100 meters from the river. Another identified site was close to an elementary school and one site had access road passing through the community making it again not a feasible option. Out of the many options reviewed, the one proposed and selected is detailed below.

The final selected site is located at about 5 kms away from the core residential and commercial area in the Lama pourashava. Proposed site is in an isolated area surrounded by agricultural fields and a natural buffer in the form of small hills on three sides of the proposed IWTP area. There is no habitation near the proposed site. There are no permanent houses or structures in the neighborhood, only some temporary sheds for agricultural laborers to stay during the day for managing the fields. The area falls within an agricultural zone, and presently the site has commercial trees and plantations which will be required to be cleared during the construction. The site is privately owned and Pourashava is in the process of acquiring the site. While this site prima facie meets the required criteria, there are a couple of areas where further investigations and due diligence will be required during the detailed design phase.

- Based on preliminary investigations and site visits done by the technical and project team and consultants, it was noted that there is a nearby drain / channel along the periphery of the site that connects with the Matamahuri river after meandering through more than 1 km away from the site (Refer Appendix 12). It was found that the channel connecting the river was dead and present situation is that the complete channel is full of ditches, lowlands, borrow pits, etc. It was also seen during the site visit that this drain is used as a temporary road for access by the people during the dry season. The Location Clearance process from the DOE will require to confirm that this is not a natural water body and only an outlet for water drainage created during the rainy season for the storm water. Also, a proper drainage system will be required around the site for managing runoff from the nearby hills in the event of heavy rains. This drain may also be used for discharging the water after treatment at the FSM facility.

- The outlet of the drain into the Matamahuri river is at the upstream end of water intake of the water supply scheme. There will be a need to ensure that the storm water discharge coming along the IWTP site and the leachate after treatment is discharged at the downstream end of the river. The detailed design for the IWTP facility including the landfill must ensure that adequate engineering solutions are provided to prevent any potential pollution into the Matamahuri river from this site. A couple of options that may be further investigated and studied during the detailed design stage from the techno-economic considerations will be (A) Intercepting and collecting storm water and treated leachate from the drain close to the river and diverting it downstream around 500 meters through an open channel along the river; (B) The treated water and run-off is collected at the IWTP site and directed downstream of the river for discharge through a pipeline arrangement using pumping as may be required based on the topography of the area.

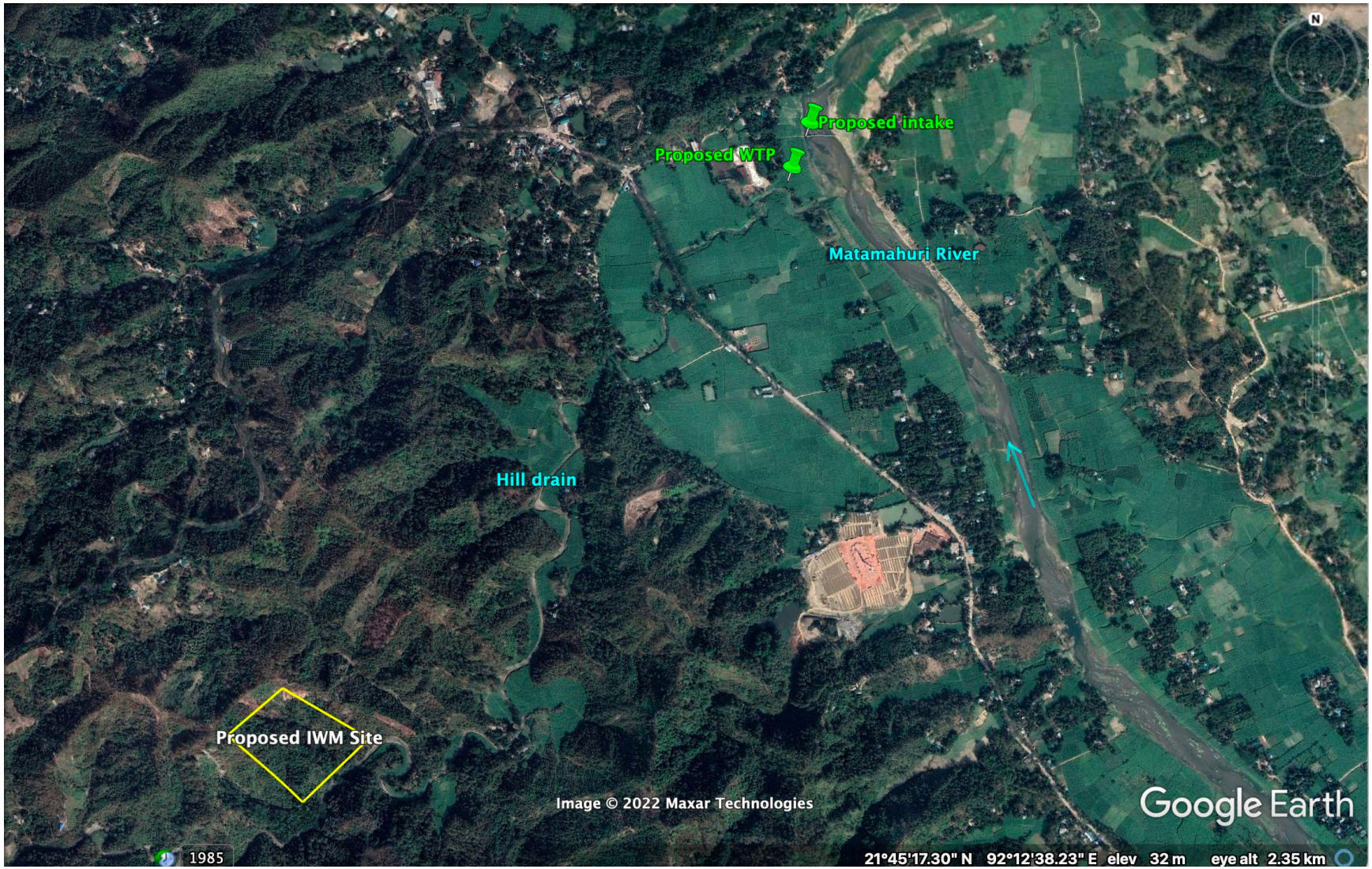
119. **Site Access:** The proposed site is accessible from main road leading to Pourashava. The distance of the site from the main road is around 500 mts which will need to be improved to provide adequate access for FSM / SWM trucks to operate. A small culvert may also be needed for providing clear access over the existing drain. All access road construction will be done and managed by the Pourashava. The area near the access road is proposed to be used for the FSM treatment plant, while the solid waste facilities will be situated on the backside of the site. Co-composting of fecal sludge with biodegradable solid waste will be undertaken. Other facilities in the site will include material recovery facilities, waste processing for non-biodegradable waste, and a landfill for residual waste.

Figure 17: Proposed IWTP Site and Access Road

	
Existing Access Road towards the site	**Flat Area**

Figure 18: Google Map of proposed IWTP site

Figure 19: Google Map of proposed IWTP site, Drain and Matamahuri River



V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

120. Environmental impact assessment is the systematic identification and evaluation of the potential impacts (effects) of proposed projects, plans, programs, or legislative actions relative to the physical, chemical, biological, cultural, and socioeconomic components of the total environment. ADB SPS (2009) requires the assessment of environmental impacts during the different stages of the project, including project design/pre-construction, construction, and operation phases, and the formulation of corresponding mitigation measures to avoid, minimize or offset environmental impacts.

A. Positive Environmental Impacts of the Subproject

121. **Environmental Benefits**. The operation of the IWTP facility including the improvement of solid waste collection and transport scheme will increase solid waste collection coverage. The engineered landfill will provide final disposal for residual wastes which may end up in the streets and waterways of Lama Pourashava. Door to door collection of household wastes will be progressively extended reducing the incidents of open burning of solid wastes including plastic wastes.

122. **Socio-economic Benefits**. The operation of the IWTP facility will increase or create the opportunity for jobs and income to be generated from the sale of reusables and recyclables. The existing recycling activities in the Pourashava will be improved thereby increasing revenues for these activities.

B. Design Phase Impacts and Mitigation Measures

1. Compliance with statutory requirements, guidelines, and standards, and obtaining necessary clearances and permits

123. **Impact.** As presented in Section II, this solid waste subproject needs to comply with various set rules / standards / guidelines of government of Bangladesh. Timely compliance with regulations is must. Any delay in obtaining clearance will impact the project implementation, and any non-compliance may derail the project. At present, Lama municipality disposes the collected solid waste at low lying open spaces in the outskirts of the Municipality areas. The municipality has now proposed to develop a new site into a proper waste processing cum landfill facility. The proposed site is meeting the site selection criteria and has no houses within 200 m or a nearby water body up to 250m from the boundary. The small drain on the periphery of the site needs to be considered and discussed with DOE, and site suitability shall be ascertained as per government regulations. Project requires Location Clearance Certificate (LCC) for the proposed integrated waste management and landfill site, and Environmental clearance certificate (ECC) from Department of Environment (DOE). DOE, for issuing LCC, will review the site and its suitability per the prevailing guidelines/standards including its use as a landfill facility. Therefore, obtaining LCC timely for the proposed site, followed by conduct of EIA study with the TOR approved by DOE, and obtaining ECC prior to start of construction is must to comply with the regulatory framework.

124. **Mitigation**. Prior to any finalization of detailed design, ensure that the following measures are undertaken:

125. Obtain from the Department of Environment a Location Clearance Certificate for the selected site prior to invitation of bids;

126. The subproject is considered as a Red Category undertaking based on ECR 1997. As such, undertake an environmental impact assessment (EIA) and obtain from Department of Environment an environmental clearance certificate (ECC) for the subproject.

1. Biodiversity impacts

127. **Impacts to protected areas and protected species.** Subproject area is located within an area with human and development activities that is too far from ecologically sensitive areas. No impact is predicted. However, there some protected species that may be present in the wider area, and to avoid any chance meetings of negative impacts, following measures are suggested for detailed design phase;

- Engage Biodiversity expert to conduct further on-site verifications during the detailed design for the short-listed species or any other likely protected species; expert shall interact and consult with relevant stakeholders and community in and around the sites, and confirm the likelihood of occurrence of these species in or close to subproject sites, and provide information on likely reasons for visit (food, water, shelter etc.,), and seasons, and timings (day/night), and other favorable site conditions
- Prepare standard operating procedures (SOPs) for construction to avoid any impacts, risk or damage to flora and fauna in general, and species of interest in particular
- Conduct site visits and verify presence of any protected flora species; if found on site, ensure that those trees are undistributed and considered in the layout design; in unavoidable cases, trees may be safely transplanted under expert supervision within the same area; PIU shall coordinate with the Forest Department for the translocation

2. Physical Cultural Resources

128. **Impact.** The subproject area is not in archeologically sensitive area, and there are no notable archeological places or protected monuments or areas in and around Bandarban. Therefore, no impacts envisaged but risk of uncovering archeological remains, given the long history of town, during the excavations cannot be ruled out completely. Construction contractors therefore should follow the below measures in conducting any excavation work:

- Create awareness among the workers, supervisors and engineers about the chance finds during excavation work.
- Stop work immediately to allow further investigation if any finds are suspected.
- Inform Bangladesh Department of Archaeology if a find is suspected and take any action, they require to ensure its removal or protection in situ

3. Site Specific Design Considerations

129. **Impact.** As per preliminary design and waste management estimates, a suitable site of 5 acre area is required to establish integrated waste treatment including FSM, Composting and Landfilling and associated facilities. The region has hilly terrain which makes identifying and selecting a suitable site for the IWTP including landfill facility a challenge. During preliminary investigation and due diligence, a total of 5 potential sites were reviewed for their suitability keeping in view different criteria such as (i) distance from nearest residential area; (ii) distance

from nearest water body; (iii) total area required by the IWTP and associated facilities for the design year; (iv) minimum distance from any protected area or designated wildlife sanctuary; etc. Finally, a privately owned 5-acre site located in an isolated area surrounded by agricultural fields and a natural buffer in the form of a small hills on three sides of the proposed facility. There is no habitation near the proposed site. Site is located 5 km away from the core area. it is at about 500m from the main road leading to pourashava and about 5 km for the Lama Town Centre. Site is a flat land surrounded by natural hill buffer at the periphery of its boundary and away from settlements. The access to site from the main road also has to be properly laid out to ensure regular and efficient movement of FSM / SWM trucks. The area falls within an agricultural zone, and presently the site has commercial tree plantations which will be required to be cleared during the construction. The site is privately owned and Pourashava is in the process of acquiring the site. There are no permanent houses or structures in the neighborhood, only temporary sheds for agricultural laborers to stay during the day for managing the fields. Based on preliminary investigations and site visits done by the technical and project team and consultants, it was noted that there is a nearby drain / channel along the periphery of the site that connects with the Matamuhuri river after meandering through more than 2 km away from the site. It was found that the drain/channel connecting the river is full of ditches, lowlands, borrow pits, etc.

This small hill drain originating in the hill above the proposed site, flows in flows towards southwest and joins River Matamuhuri after traversing for about 2 km from the proposed site. As per local investigation, this flows only during rains, carries runoff from the hill, and as it originates on the same hill, the catchment area is limited, and its discharge is not considerable, this however needs to be further studied during the detailed design. Local consultations further indicate that, this drain was originally very narrow, however, as its course is mostly dry, local farmers use it as approach to access their agricultural fields, and therefore the drain course appears wide (about 4-6 m wide) and well defined. River Matamuhuri, into which it discharges, is a perennial river and is water source for Lama town. This is a large river, carries considerable flows, especially during rainy season. The location of new water intake on Matamuhuri, proposed as part of water supply subproject in Lama, is located just downstream of meeting point of this drain with Matamuhuri river. This intake point is identified after detailed investigations, and therefore is not feasible to shift this intake point upstream. Given the constraints in identifying ideal lands in Lama for waste management site, this site is selected, and proposed to develop with various safeguards to avoid pollution of Matamuhuri river. Wastewater/ leachate from landfill will be treated prior to discharge, and following additional measures are included in the preliminary designs:

(ix) Further investigations on the drain should be carried out during the detailed design, and Location Clearance Certificate from the DOE shall be secured prior to bidding. This is important, as per Landfill criteria, no water body, river or lake should be within 200 m of landfill site.
(x) Facility design will ensure proper surface drainage system within internal and peripheral drains to facilitate runoff. Design will ensure separation of runoff from contaminated areas and clean areas.
(xi) Protection of drain from leaching of leachate via ground/soil
(xii) Diversion of contaminated runoff to treatment plant.
(xiii) Peripheral drains will be provided to avoid entry of runoff from uphill and surrounding areas into facility and will ensure safe passage of upstream runoff into the drain.
(xiv) Treated leachate will be recirculated and not discharged into drain
(xv) Wastewater from FSTP will be utilized within the site for plantation or facility operation, and there be no discharge into drains.

(xvi) However, during the rains, the leachate generation may be considerable, and, also, treated wastewater from FSTM may not be utilized within the site. Therefore, it may be necessary to discharge treated water into drain, which will further discharge into Matamuhuri river. Given intake on the downstream side, following two alternatives are suggested to include in the design. These alternatives will be examined during the detailed design, and appropriate alternative will be implemented. This will avoid risk of polluting the water source.

a. Interception of the drain close to river Matamuhuri and divert the same to downstream of intake (~ 500 m or as appropriate during finalized during the detailed design), by constructing an open concrete channel along the bank of the river or through a pipe buried along the river,, duly considering river high flood level, taking measures to avoid erosion of riverbed at discharge point
b. Laying of an outfall pipe from the IWT facility to nearest drain or river Matamuhuri to directly discharge runoff and treated wastewater into river downstream of intake (~ 500 m or as appropriate during finalized during the detailed design). This may be laid within the access road right of way.

Figure 20: Google Map of proposed IWTP site, drain, intake point

130. **Mitigation**. Following measures needs to be included in the proposed integrated waste management facility:

- Conduct site specific surveys investigations during the detailed design to develop the site baseline profile – topography, geo technical studies, groundwater studies including hydrogeology of the site. depth of groundwater and quality, air quality, surface water quality etc.,
- Facility design to comply with recommendations, if any, of the climate risk and vulnerability assessment or climate change assessment for the subproject
- Ensure that minimum 2 m distance between shallow groundwater level and bottom clay liner in the landfill
- Provide an adequate drainage management system; construct peripheral drains and bunds to ensure that runoff from upper areas do not enter the facility (entire facility area including landfill, compost plant and septage plant) , and safety diverted into natural drainage without any hindrance
- Provide proper fencing / walls around the facility at least 10-20 m wide green buffer zone with tree plantations all around
- Concrete roads to be provided to avoid wastewater penetration in the ground and to avoid attracting rodents and other pests to the facility
- Leachate collection and treatment ponds will be designed to take additional wastewater in case of extreme events. 50% additional volume has been considered so that there is no risk of overflowing of leachate
- The landfill site shall have a HDPE lining and clay layer to avoid percolation of leachate into the groundwater
- To minimize the amount of waste entering the landfill area, 40% of the organic waste shall be recycled using the aerobic composting method. This will help to reduce methane emissions and odors. The composting process will take place under a covered roof; and
- Landfill operations will have daily covering to avoid the attraction of birds as well as to reduce the generation of leachate.

4. Composting Plant Design Considerations

131. **Impact.** Design of the composting plant need to follow national and international best practices and standards to ensure no adverse impacts occur to the environment. Inappropriate or insufficient design could lead to not only environmental catastrophe (e.g., surface water pollution, groundwater contamination, etc.) but to community and occupational health and safety as well (e.g., explosions due to accumulated confined biogas, proliferation of disease vectors in nearby communities, etc.).

132. **Mitigation**. The design of the composting plant need to comply with requirements or recommendations of national standards, if any, and other internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.[14] This set of guidelines provides all the necessary recommendations in designing a municipal solid waste

[14]https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES&CVID=nPtgwEW

processing facility to ensure potential environmental impacts are avoided or mitigated. Among these important recommendations that need to be included in the design of the subproject are as follows:

(i) Ensure compost plant design compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.15
(ii) Adopt a site-specific design, consider the proximity of waste handling and storage areas to water supply wells, irrigation canals, and surface water bodies, and ensure design in a such a way that it prevents contaminated leachate and drainage from entering surface and ground water;
(iii) Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;
(iv) Use acoustic screens around fixed/mobile composting plant and equipment;
(v) Select composting equipment that has low noise emission levels;
(vi) Fit silencing equipment to plant, e.g., baffles/mufflers;
(vii) Install a drainage layer underneath the processing area to provide adequate leachate drainage from composting organics. This may consist of a bed of coarse material such as wood chips, or alternatively the processing platform may permanently incorporate a drainage layer designed to withstand the loading, working and removal of material. For small-scale compost facilities or in dry areas, an adsorbent material can be incorporated in the compost and at the base of the pile;
(viii) The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate;
(ix) If windrows system is selected, design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration;
(x) If windrows system is selected, use windrow turning equipment that is specially designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles;
(xi) Store leachate in a lined earthen basin or in aboveground storage tanks;
(xii) Provide a fire alarm system, including temperature sensors in the waste being treated; and
(xiii) Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.

5. Fecal Sludge Treatment Plant Design Considerations

133. **Impact.** Design of the fecal sludge treatment plant (FSTP) needs to follow national and international best practices and standards to ensure no adverse impacts occur to the environment. Inappropriate or insufficient design could lead to not only environmental catastrophe (e.g., surface water pollution, groundwater contamination, etc.) but to community and occupational health and safety as well (e.g., odor nuisance, proliferation of disease vectors in nearby communities, etc.).

[15] https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES&CVID=nPtgwEW

134. **Mitigation**. The design of the FSTP needs to comply with requirements or recommendations of national standards, if any, and other internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities[16] and EHS Guidelines on Water and Sanitation.[17] This set of guidelines provides all the necessary recommendations in designing a fecal sludge and wastewater treatment facility to ensure potential environmental impacts are avoided or mitigated. Among these important recommendations that need to be included in the design of the subproject are as follows:

1. Design septage collection system with appropriate collection vehicles and equipment to service all households; no manual handling of septage, and there shall be no transfer of septage from one collection vehicle to other; collected septage shall be transported directly to septage plant for disposal
2. If sludge treatment will use an anaerobic digester with biogas recovery, operate under thermophilic digestion conditions, in order to increase the pathogen destruction, biogas production rate (hence higher energy recovery) and the retention time;
3. Design the septage treatment facility to meet the effluent discharge standards
4. If material balance shows significant amount of supernatant liquid, ensure to design a treatment facility that will treat the liquid waste to compliance level prior to discharge. This liquid waste may also be co-treated in the leachate treatment plant of the landfill facility, provided that the design of the same could allow such kind and volume of waste; and
5. For the dried fecal sludge, option of co-composting of dewatered fecal sludge and solid waste is proposed to be one of the FSM sludge disposal options for Lama. Verification of suitability of the selected composting process, quality of the compost product, costs, marketability and pricing for the compost product, etc. will be undertaken during the detailed design stage. Any option for land application, if considered, should be based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements.

6. Landfill Design Considerations

135. **Impact.** Design of the landfill facility need to follow national and international best practices and standards to ensure no adverse impacts occur to the environment. Inappropriate or insufficient design could lead to not only environmental catastrophe (e.g., surface water pollution, groundwater contamination, etc.) but to community and occupational health and safety as well (e.g., explosions due to accumulated landfill gas, proliferation of disease vectors in nearby communities, etc.).

136. **Mitigation**. The design of the landfill needs to comply with requirements or recommendations of national standards, if any, and other internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.[18] This set of

[16]https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES&CVID=nPtgwEW

[17]https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines/watersanitation_firstconsultation

[18]https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES&CVID=nPtgwEW

guidelines provides all the necessary recommendations in designing a landfill facility to ensure potential environmental impacts are avoided or mitigated. Among these important recommendations that need to be included in the design of the subproject are as follows:

(i) Ensure that the recommended methods to control and monitor noise and vibration per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following:
  (a) Construct a buffer zone between the facility and the external environment or locate facilities away from sensitive receptors;
  (b) Include noise and vibration considerations during design, including use of models to predict noise levels at specified noise-sensitive locations, using standardized sound power levels for construction plant;
  (c) Use acoustic screens around fixed/mobile plant and equipment;
  (d) Select equipment that has low noise emission levels; and
  (e) Fit silencing equipment to plant, e.g., baffles/mufflers;

(ii) Ensure that the recommended methods to control and monitor litters and air emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following:
  (a) Consider use of enclosed/covered areas for waste tipping, shredding, compacting, etc.;
  (b) Install catch fences and netting to trap windblown litter;
  (c) Select vehicles and containers that minimize air emissions during waste loading and unloading;
  (d) Design drop-off points to minimize queuing of vehicles;
  (e) Use enclosed waste handling and storage areas for malodorous wastes or wastes that generate hazardous dust (e.g., asbestos). Enclosed waste storage and handling areas are preferred for all wastes;
  (f) Provide perimeter planting, landscaping, or fences to reduce wind. Indigenous/native species will be preferred in planting;
  (g) Construct temporary banks and bunds immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest downwind crest, and/or fully enclose of the tipping area within a mobile litter net system; and
  (h) Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility.

(iii) Ensure that the recommended methods to control and monitor effects of landfill leachate per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following:
  (a) Use of low-permeability[19] landfill liners to prevent migration of leachate as well as landfill gas;
  (b) Ensure water table depth requirement of at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development;
  (c) Inclusion of a leachate collection and treatment system based on prior measurement and recording of the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to

[19] Liner systems for MSW landfills can consist of a combination of geological barrier with an overlying bottom liner and leachate drainage layer. Permeability and thickness requirements may range from a hydraulic conductivity of 1 x 10^{-7} centimeters/second for a 0.6-meter layer of compacted soil overlaid by a 30-mil flexible membrane liner (60-mil if made from high density polyethylene [HDPE]).

weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems;

(d) Installation of groundwater monitoring wells outside the landfill perimeter at locations and depths sufficient to evaluate whether leachate is migrating from the landfill into the uppermost groundwater unit. This groundwater monitoring network should usually include, at a minimum, one monitoring well located in the upgradient groundwater flow direction from the landfill and two monitoring wells located in the down gradient direction. The groundwater monitoring system should be consistent with applicable national regulations and internationally recognized standards; and

(e) Regular sampling from the monitoring wells and analyze for constituents, selected based on:

- The types, quantities, and concentrations of constituents in wastes managed in the landfill;
- The mobility, stability, and persistence of waste constituents their reaction products in the unsaturated zone beneath the waste management area;
- The detectability of indicator parameters, waste constituents, and reaction products in ground water;
- The constituent concentrations in the groundwater background;
- Use impermeable materials for roads, waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas.

(iv) Ensure that the recommended methods to control and monitor landfill gas emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following:

(a) Inclusion of landfill gas collection system designed and operated in accordance with applicable national requirements and recognized international standards including recovery and pre-use processing or thermal destruction through an efficient flaring facility. Prevention of condensation from accumulating in extraction systems by arranging the pipe work to fall to a removal point such as a knock out-pot.

(b) Use of landfill gas as fuel if practical, or treat before discharge (e.g., by using enclosed flare or thermal oxidation if methane content is less than about 3 percent by volume).

(c) Use of gas blowers (boosters) of sufficient capacity for the predicted gas yield and constructed of materials appropriate for landfill gas duty; blowers should be protected by flame arrestors at both gas inlet and outlet.

(d) Installation and regular sampling from boreholes surrounding the landfill to monitor for migration of landfill gas.

(v) Ensure that the recommended methods to control dust and odor emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following:

(a) Compaction and covering of waste promptly after discharge from the vehicle delivering the waste;

(b) Minimization of open tipping face area. Consider inclusion of perimeter and other litter fencing designs to ensure reduction of wind velocity crossing the site, particularly at the proposed tipping area;

(c) Disposal of odorous sludge in covered trenches;

(d) Restriction on the acceptance of loads known to be particularly odorous;

(e) Restriction on tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors);
(f) Sealing of sump covers; and
(g) Aeration of leachate storage areas.

(vi) Installation of bund walls around the facility site; and
(vii) Estimation of the total volume of the solid wastes currently dumped at the site, and inclusion of this estimate into the capacity design calculations of the landfill facility. Expectedly, these dumped wastes should be managed and accommodated upfront once the landfill cells are built.

7. Natural hazards such as floods, landslides, and other climate change-related events

137. **Impact.** While the subproject area is not prone to earthquakes in recent years, there is still a likelihood that the IWTP facility site will be impacted by a minor earthquake and damage the facility components during the operation phase. The risk of landslides is also high in the area[20]. Although site is not prone for flooding and any flood events due to heavy rainfall and runoff coming from upper areas can potentially inundate the site and cause damage to all structures that will be built over it, in particular the landfill cells. This event will potentially wash away all wastes out of the facility and pollute the immediate surroundings including the river nearby..

138. **Mitigation.** Mitigation measures to ensure the stability of the land even during minor earthquakes or flooding events need to be included as part of the facility design, such as, but not limited to, the following:

(i) Structural designs of the facility components shall comply with the Bangladesh Building Code or the recommendations of related climate change risk vulnerability and adaptation assessment, whichever is stricter, to ensure the structures can withstand earthquakes and climate-induced events in the future.
(ii) Land development and site preparation are based on the recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject.
(iii) Installation of sufficient number of canals and appropriate drainage system within the facility area, ensuring that volume of rainwater is handled even when the highest predicted precipitation occurs; and
(iv) Construct peripheral drains and bunds to ensure that runoff from upper areas do not enter the facility (entire facility area including landfill, compost plant and septage plant) , and safety diverted into natural drainage without any hindrance
(v) Provide proper fencing / walls around the facility at least 10-20 m wide green buffer zone with tree plantations all around
(vi) Stabilize slopes and unstable land masses within the facility

8. Issuance of Consents, Permits and Clearances

139. **Impact**. The subproject is required to comply with relevant environmental laws. Any delay in the preparation of environmental impact assessment (EIA), approval of the EIA and issuance of environmental clearance certificate (ECC) will potentially delay the execution of the subproject

[20] Based on Bangladesh Climate and Disaster Risk Atlas that was prepared by ADB in December 2021.

140. **Mitigation**. To avoid any delays, DPHE through the PMU to coordinate with the Department of Environment to start the EIA process, which would include the application for a location clearance certificate (LCC) for the proposed site. Considering the timeline for EIA process and the timetable on the approval of LCC and ECC, PMU to initiate this measure alongside the finalization of the detailed design.

9. Compliance with ADB Loan Agreement and Safeguard Policy Statement

141. **Impact.** There is a general lack of awareness by most contractors on ADB SPS and EMP requirements, and this is the reason why mitigation measures are not normally budgeted in the contract cost.

142. **Mitigation**. PMU will implement the following measures:

(i) Update this IEE in case of change in design based on the final detailed design and submit the same for review and clearance of ADB;
(ii) Incorporate into the bidding and contract documents the cost of implementing OHS and the EMP as well as specific provisions requiring the Contractor to comply with all other conditions required by ADB; and
(iii) Once the Contractor is selected, arrange the conduct of awareness training for contractors on their responsibilities in EMP and OHS implementation, in compliance with ADB and government requirements, self-monitoring and reporting procedures.

C. Pre-Construction Phase Impacts and Mitigation Measures

1. Contractor Mobilization

143. **Impact**. Once contract is awarded, the Contractor may mobilize without fulfilling all pre-construction requirements pertaining to the implementation of the requirements of this IEE and the environmental management plan (EMP).

144. **Mitigation**. Prior to allowing Contractor to mobilize at the site, ensure to require Contractor to comply with all the pre-construction requirements stipulated in this IEE. No mobilization and construction works shall be undertaken unless the following have been complied with by the Contractor:

(i) Designate a full-time Environmental Health and Safety Officer (EHSO);
(ii) Develop a Solid Waste Management Plan to manage the dumped solid wastes at the site. This plan should be consistent with the design phase measures recommended in this IEE study;
(iii) Develop a site-specific EMP (SEMP) that will be approved by PMU/PIU based on the EMP of this IEE report. The SEMP should include all subplans as may be required such as traffic management plan, spoils management plan, dust management plan, construction and domestic waste management plan, water quality management plan, and emergency preparedness and response plan, among others; and
(iv) Develop a specific Health and Safety Plan, that will include a Health and Safety COVID-19 Plan in accordance with relevant government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, to international good practice guidelines such as World Health Organization. 2020.

2. Workers / Labor Camp

145. **Impact**. Unplanned construction of workers or labor camp without basic amenities could result in stress of workers and degradation of the local environment. It is important that these camps be provided with sanitary amenities at designated areas.

146. **Mitigation**. Contractor shall establish construction camp following local standards or regulations, if any. Separately, contractor may follow the guidance note developed by the International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) entitled *"Workers' accommodation: processes and standards (A guidance note by IFC and the EBRD), 2009".*

3. Issuance of Local Permits and Clearances

147. **Impact**. In some cases, local permits, clearances and NOCs are not issued immediately and may take time during the design and pre-construction phases. Without obtaining these local statutory requirements alongside the national statutory requirements such as ECC, the implementation of the subproject may be delayed.

148. **Mitigation**. PMU to ensure that no construction activities shall be undertaken until all local (including national level) statutory requirements are complied with.

4. Disruption of Existing Utilities

149. **Impact.** Construction activities may disrupt existing utilities installed underground, leading to undue disturbance to users of these utilities in the area.

150. **Mitigation**. To avoid/minimize or manage the disruption of existing utilities, the following measures will be implemented:

(i) Conduct investigation at site to determine all the existing utilities that will likely be disturbed during construction phase; and
(ii) Coordinate with agencies responsible for the maintenance of the utilities and formulate a plan to minimize disruption of services during construction phase. The plan must be formulated in coordination with DPHE and stakeholders at the site. Where required, the responsible agency shall be requested by PIU to carry out the necessary works at the time required and at the cost of the subproject.

5. Material sourcing

151. **Impact.** A significant amount of gravel, sand and aggregates will be required for the civil construction works of the subproject. Sourcing these construction materials from unscrupulous sources could negatively impact the environment wherever these are illegally sourced.

152. **Mitigation.** PMU to ensure that Contractor contracts will include the following conditions:

a. Bid documents should include a clause on material sourcing that will require the Contractor to source construction materials from legal or government-approved sources only;
b. No new quarry sites shall be used for the subproject;

c. Verify suitability of all material sources and obtain approval of PMU/ or PIU; and
d. Document all sources of materials and include in the monthly reporting to the PIU.

6. Community awareness

153. **Impact.** Even as the local stakeholders may have been consulted or informed of the subproject in the past, the lack of community awareness on subproject activities, particularly prior to the construction phase, may result in potential community safety concerns and complaints.

154. **Mitigation**. During the pre-construction phase and prior to Contractor mobilization, PMU and Contractor should undertake a meaningful consultation with the affected communities will be conducted. This meaningful consultation will aim to engage community stakeholders, listen to their views, and try to come to a common understanding about the need for an improved drainage system and the sacrifices that need to be made to achieve it. To aid in the consultation process, it is important that the community should be made aware of the details of project activities. Important information to be disseminated to the people are, among others, the following:

a. Overview and updates on the proposed subproject;
b. Final detailed design of proposed subproject components;
c. Potential environmental and social impacts (positive and negative) of the subproject, and the proposed mitigation measures for the perceived negative impacts; and
d. Grievance redress mechanism and contact details of the subproject.

D. Construction Phase Impacts and Mitigation Measures

1. Soil Erosion and Sedimentation

155. **Impact.** Excavation activities at the site will generate loose soil which can be carried through surface run-off during a rainfall.

156. **Mitigation**. During construction phase, the Contractor shall implement the measures at all times to control soil erosion that shall include, but not be limited to the following:

a. The Contractor shall minimize surface excavation works during the rainy season where practicable.
b. The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered;
c. Any borrow pits established by Contractor near the site should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to prevent the development of erosion problems;
d. Channels, earth bunds, netting, tarpaulin and/or sandbag barriers shall be used on site to manage surface water runoff and minimize erosion;
e. The overall slope of the works areas and construction yards shall be kept to a minimum to reduce the erosive potential of surface water flows; and
f. Monitor groundwater quality that could exist close to the working areas to ensure compliance.

2. Surface water Quality

157. **Impact**. Silt-laden run-off from stockpiled materials, solid wastes and domestic wastewater from the construction camp, and leaks from chemical storage areas and machineries may contaminate or pollute the nearby river. Oil leakage from the operation of machineries and heavy equipment may also cause pollution to these surface water bodies.

158. **Mitigation**. The Contractor will be required to:

(i) Provide temporary sedimentation canal and/or silt traps on the perimeter of the construction area.
(ii) All temporary discharge points shall be located, designed and constructed in a manner that will minimize erosion in the receiving channels;
(iii) 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;
(iv) Use surplus soil for beneficial purposes such as in any other construction activities, or to raise the level of low lying areas at the site;
(v) Avoid scheduling of excavation work during the monsoon season. Earthworks should be scheduled during dry season;
(vi) Confine construction area including the material storage (sand and aggregate) so that runoff will not enter the site;
(vii) Ensure that drains are not blocked with excavated soil;
(viii) Stockyards at least 50 meters (m) away from watercourses;
(ix) Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume;
(x) Daily control of machinery and vehicles for leakages;
(xi) No obstruction in flowing water;
(xii) For effluents from workplace, camps, and 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 the PMCSDRC; and
(xiii) Monitor water quality according to the environmental monitoring plan.

159. For management and final disposal of solid wastes following mitigation, Contractor will be required to apply the follow-up measures such as:

(i) Collection of recyclable solid wastes and supply to scrap vendors;
(ii) Ensure all the camp wastes and construction wastes are placed in the designated waste collection pits away from receiving water;
(iii) Establishment of separate storage area protected with impermeable lining bunded 110% by volume for the all the toxic material wastes, including batteries, oil filters, burnt oils, etc. at the construction site; and
(iv) Consultation with PIU on the proper disposal of all residual wastes. However, these wastes can be properly stored at the site and will be included in the residual wastes that will be landfilled in the future during the operation phase of the subproject.

3. Groundwater Quality

160. **Impact.** Increased demand for groundwater is anticipated during the construction phase for construction activities and personal consumption by workers. Uncontrolled extraction of water may affect availability of water to locals. In addition, construction waste, if left unattended, will

result in percolation of leachate through the soil strata reaching the groundwater table and contaminating it.

161. **Mitigation**. It is necessary that arrangement for safe drinking water is made prior to start of work. Water will be supplied for consumption only after adequate analysis and requisite treatment. The workers may also be trained on the need for judicious use of freshwater resources. The Contractor will use water in consideration to its value as a resource. Mitigation measures will include:

(i) Prevent pollutants from contaminating the soil and the groundwater;
(ii) All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned;
(iii) The Contractor will undertake groundwater quality sampling and analysis to ensure that water from tube wells is in good quality meeting the drinking water quality standards. If the groundwater quality does not comply with the standards, the contractor will source potable water from an alternative source or provide a potable onsite treatment facility with own costs and approval from PIU/PMU..
(iv) Storage of lubricants and fuel at least 50 m from water bodies;
(v) Storage of fuel and lubricants in double hulled tanks. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110%;
(vi) Daily control of machinery and vehicles for leakages;
(vii) Collection of waste during construction activities;
(viii) Provide uncontaminated water for dust suppression; and
(ix) Enclose the construction area to prevent unauthorized access.

4. Drainage Congestion

162. **Impact**. Construction material getting into surface run off or uncontrolled disposal may cause drainage congestion. The impact of these on hydrology is expected to be more pronounced during post monsoon period with rapid movement of rainwater through existing drainage structures, which if blocked by construction waste and debris may cause flooding or waterlogging at the site and in neighboring areas.

163. **Mitigation**. The Contractor shall adopt a site clearance procedure that separates topsoil and stores it under appropriate conditions for reuse as instructed by the Engineer in charge at the site. Wastes and construction debris will not be disposed in a manner that these would end up in drainage canals. The on-site storage of excessive quantities of unwanted spoil and aggregate materials should be avoided. Where storage is necessary, the Contractor shall ensure heaps and stockpiles are located at sites that they do not permit direct runoff into watercourses and are on land sloping at less than 1.5%. All heaps shall be of a size and stability that will ensure the risk of mass movement during period of heavy rainfall is minimized.

5. Ambient Air Quality

164. **Impact.** There will be two main sources of air emissions, i.e., mobile sources and fixed sources during construction phase. Mobile sources are mostly associated with vehicles involved in construction and transport or hauling activities. On the other hand, air pollution from fixed sources is mainly from generator sets, stationary construction equipment (e.g. compressors) and excavation/ grading activities.

165. Dust and gaseous emissions will be generated by the construction machinery. Pollutants of primary concern include particulate matter (PM10). However, suspended dust particles are coarse and settle within a short distance of the construction area. Therefore, the impact will be direct but temporary, and will be restricted to areas in close vicinity of the construction activities only.

166. Construction work also involves breaking up, digging, transporting, and dumping large quantities of dry material. The particulate matter from these can cause health impacts, i.e. respiratory problems, irritation in eyes and reduction in visibility.

167. **Mitigation**. In the conduct of construction and transport or hauling activities, and in the operation of equipment, Contractor shall utilize all practical methods to control, prevent and otherwise minimize atmospheric emissions, specifically:

a. Take every precaution to reduce the levels of dust at construction site, and not exceeding the pre-project ambient air quality standards;
b. Fit all heavy equipment and machinery with air pollution control devices that are operating correctly;
c. Vehicles travelling to and from the construction site must adhere to speed limits to avoid producing excessive dust;
d. Reduce dust by spraying stockpiled soil, excavated materials, and spoils;
e. Cover with tarpaulin vehicles transporting soil and sand;
f. Cover stockpiled construction materials with tarpaulin or plastic sheets;
g. Heavy equipment and transport vehicles shall move only in designated areas and roads;
h. Water spraying to access roads, camp sites and work sites to reduce dust emissions;
i. Machines and vehicles must be regularly examined and maintained to comply with requirements of technical specifications;
j. All vehicles, equipment, and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of DOE. Copies of conformance will be submitted regularly to the PMCSDRC;
k. Repair and maintain access roads, as necessary;
l. Monitor air quality according to the environmental monitoring plan;
m. Clean wheels and undercarriage of vehicles prior to leaving construction site;
n. Prohibit burning firewood in work and labor camps (promote liquified petroleum gas for cooking purposes and electric heater for heating purposes);
o. Use vehicles that have government-issued permits and registrations; and
p. Prohibit open burning of solid waste.

6. Ambient Noise Level

168. **Impact.** Noise-emitting construction activities include earthworks, concrete mixing, concrete formation works, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates, among others. The vulnerable groups who are susceptible to construction noise include (i) onsite workers who are the most exposed to the highest noise levels generated from different construction activities due to their proximity to the noise sources; and (ii) neighboring communities and other sensitive receptors (such as worshipers at churches or mosques, students at schools and other educational institutes, patients at hospitals, etc.).

169. The significance of noise impact will be higher at the immediate vicinity of the subproject site where noise-sensitive receptors are situated. Noise levels should not exceed the national standards for noise or WHO noise level guidelines, whichever is more stringent, or result in increase in background noise level of 3 decibels at the nearest receptor location off-site.[21]

170. **Mitigation**. Mitigation measures to reduce the noise impacts off-site at the nearest sensitive receptors include the following:

(i) Provide prior information to the local public, including households, near the site, if any, that may be affected, about the work schedule;
(ii) Use equipment that emits the least noise, well-maintained and with efficient mufflers. Install silencers if necessary and practical;
(iii) Restrict noisy activities to day time when background noise is relatively higher;
(iv) Avoid use of noisy equipment or doing noisy works at night time, especially near residential houses if any;
(v) Limit engine idling to a maximum of one minute;
(vi) Spread out the schedule of material, spoil and waste transport;
(vii) Minimize drop heights when loading and unloading coarse aggregates;
(viii) Avoid use of horns unless it is necessary to warn other road users or animals of a vehicle's approach; and
(ix) Implement a complaints handling system of the grievance redress mechanism.

7. Construction Waste Generation

171. **Impact.** The construction work is likely to generate considerable quantities of waste soil and other solid wastes. Indiscriminate disposal of the soil and waste, excess construction material, concrete, packing materials, containers, lubricants and oils may affect the soil, landscape and aesthetics of local environment and the worker's and community's health and safety. The quantum of hazardous waste during construction is expected to be minimal. The waste will mainly include used oil, paints, empty containers, plastics etc. These will be collected and disposed by Pourashava to the recycling and scrap collection facilities in Chittagong.

172. **Mitigation**. To mitigate the impacts, the Contractor will implement the following to manage wastes:

(i) Use excess spoils to elevate low lying portions of the site;
(ii) Avoid stockpiling of excavated soils near the Matamuhuri river;
(iii) Avoid disposal of any debris and waste soils in or near the river.
(iv) The Contractor should take every opportunity to reduce the amounts of waste generated and collect recyclable material for processing by local operators;
(v) Contractor shall implement waste segregation on site;
(vi) Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of properly;
(vii) Construction waste should also be disposed of properly. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future;

[21] IFC World Bank Group. 2007. *Environmental, Health and Safety (EHS) Guidelines – General EHS Guidelines: Environmental – Noise Management*.

(viii) Clean construction waste such as excess soil or rubble should be used in landscaping or elevating low lying areas on site as part of the land development and site preparation;
(ix) Maintain waste auditing by recording the quantity in tons and types of waste and materials leaving site during the construction phase. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future;
(x) Waste fuels/oils may be generated from equipment used on-site during construction and may be classified as hazardous waste. Such wastes will be stored in an are that is protected with lining, secure, and bunded 110% by volume on-site prior to collection by authorized transporters; and
(xi) Remove all wreckage, rubbish, or temporary structures which are no longer required.

Construction of Drainage / Open Channel for Water Discharge

173. **Impact.** Excavation activities, construction activities at the site will generate loose soil / construction materials which can be carried to the river through surface run-off during a rainfall.

174. **Mitigation**. During construction phase, the Contractor shall implement the measures at all times to control soil erosion / discharge of construction materials that shall include, but not be limited to the following:

g. The Contractor shall minimize surface excavation works during the rainy season where practicable.
h. The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered;
i. Any borrow pits established by Contractor near the site should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to prevent the development of erosion problems;
j. Channels, earth bunds, netting, tarpaulin and/or sandbag barriers shall be used on site to manage surface water runoff and minimize erosion;
k. The overall slope of the works areas and construction yards shall be kept to a minimum to reduce the erosive potential of surface water flows; and
l. Monitor groundwater quality that could exist close to the working areas to ensure compliance.

8. Aquatic Resources

175. **Impact.** The water body close to the site may flow into the Matamuhuri river. Any discharge from the site will impact the quality of the river and thereby the aquatic species in it.

176. **Mitigation**. The Contractor will implement the following measures:

(i) Use excess spoils in low lying areas at the site;
(ii) Avoid stockpiling of excavated soils near the river.

(iii) Avoid disposal of any debris and waste in the nearby drain;
(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.
(vi) No equipment or machinery shall be operated outside the work areas;
(vii) Avoid spillage of fuels, chemicals and lubricants. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume;
(viii) Ensure that drains are not blocked with excavated soil;
(ix) For effluents from construction camps and offices, provide treatment arrangements such as retention ponds and septic tanks which should be incorporated in the facility designs;
(x) Monitor water quality according to the environmental monitoring plan;
(xi) Clean up of the area after the completion and prior to the onset of monsoon season; and
(xii) Avoid or stop site clearance and grading works during heavy rains. Avoid scheduling of excavation work during the monsoon season. Earthworks should be undertaken during dry season.

1. Biodiversity impacts

177. **Impacts on protected areas and protected species.** Subproject area is located within an area with human and development activities that is too far from ecologically sensitive areas. No impact is predicted. However, there some protected species that may be present in the wider area, and to avoid any chance meetings of negative impacts, following measures are suggested;

Pre-construction phase

- Conduct site verifications again prior to start of construction; if species of interest are found on-site, ensure that the findings are recorded and reported to the PMU.
- No disturbances or works on the site should start/continue until PMU issues clearance to proceed. Measures to restrict poaching or hunting shall be put in place.
- Conduct training and awareness to workers and staff
- For contractors working in areas where species of interest are present, the toolbox talk should include reminders and actions required related to biodiversity conservation as specified in SOP and the environmental management plan (EMP)

Construction phase

- Follow the standard operation procedures for construction developed by Biodiversity expert
- Avoid working at night to reduce disturbances for nocturnal animals
- Avoid unnecessary removal of trees and vegetation
- Monitor the area for these creatures to ensure they are well away from the site – safely scare them away if they are too close to the site.
- Areas reserved for future development at the site shall be made up of green by growing grasses and shrubs and herbs
- Use only existing licensed quarries for sourcing aggregates.

- Avoid introduction of new invasive species to, and spread of existing invasive species within
- Barricade the construction site with controlled entry and exit, ensure that no wild animals enter the sites to avoid any accidents
- Maintain natural courses of rivers and streams without any obstruction
- Restore temporary diversions to their natural courses as soon as possible, if put any.
- Store chemicals and oils in secure, impermeable containers.
- Equip construction camps with sanitary latrines that do not pollute surface waters.
- Install low noise pump set and proper maintenance to avoid excessive noise generation.
- Prohibit hunting by staff and contractor, with heavy penalties applied.
- Train staff and contractor in good environmental practice and prohibited activities.
- Ensure contractors supply all necessary food, cooking fuel and appropriate housing

178. **Impact to Traffic.** The site for the IWTP facility is 500 m inside from the main road of the Pourashava, Besides, traffic movement is also very light in the area.

179. In terms of delivery of construction materials at the site, it is expected that these materials will not be delivered all at once at the site, but on scheduled delivery basis. Further, the scale of the subproject will not require tremendous number of deliveries, and therefore unlike to impact the traffic in the area. But as a precautionary approach, deliveries will be scheduled during the non-busy hours of the day.

180. **Impacts on physical cultural resources (PCR) and chance finds.** The site for the IWTP facility is in an agricultural area that is bounded by hills on 3 sides with no structures. Therefore, the subproject does not expect to encroach into or run over any physical cultural resources (PCRs). The Contractor will be required to implement the following measures in the event of a chance finds during excavation activities:

- Strictly follow the protocol by coordinating immediately with PIU and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works;
- Stop work 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.

2. Occupational Health and Safety

181. **Impact.** Safety risks and health issues arise from storage, handling and transport of hazardous construction material. Construction workers are also at risk of accidents due to moving vehicles, and other construction related activities. Workers are also exposed to high level of pollution from dust, exhaust of vehicles and machinery and noise, exposed to pathogens, hazardous material contained in solid waste, septage etc.,. Hazardous working conditions in some places of the facility due to lack of oxygen and flammable nature of methane emissions will be detrimental to the health and safety of workers. Further, if workers do not keep to regulated working hours, the risk of accident events will be higher due to fatigue. Insufficient supply and

improper use of personal protective equipment (PPE) and lack of safety procedures may cause injuries or fatal accidents. Spread of COVID-19 is also a risk to manage among workers.

182. **Mitigation**. The Contractor will be required to implement the following measures:

(i) All relevant provisions of the Bangladesh Labor Act, 2006 and relevant WHO guidelines will be adhered to, concerning the provision of adequate measures to avoid contracting and/or spreading diseases during construction phase;
(ii) 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;[22] and EHS Guidelines on Waste Management Facilities.[23] These practices include recommended measures to prevent, minimize and control health and safety issues including pathogens from inflicting workers through training and use of appropriate PPEs, clothing and equipment when working in waste management facilities.
(iii) Hazardous working conditions in some places of the facility due to lack of oxygen and flammable nature of methane emissions will be detrimental to the health and safety of workers and facility. Put in place standard operating procedures with appropriate equipment, and workers are provided with necessary training and personnel protection equipment to safeguard health and safety
(iv) Follow established occupational health and safety protocol on emerging infectious diseases such as the corona virus disease (COVID-19). See Appendix 3 for a sample guidance note in responding to COVID-19;
(v) A readily available first aid unit, including an adequate supply of sterilized dressing material and appliances, will be provided as per the factory rules. Suitable transport will be provided to facilitate the transfer of injured or ill persons to the nearest hospital;
(vi) Other first aid medical equipment and nursing staff will be made available or arranged on-call;
(vii) The Contractor will, at his own expense, conform to all disease prevention instructions as may be given by PMU/PMU and/or PIU;
(viii) Provide regular health check-ups, sanitation and hygiene, health care, and control of epidemic diseases to the workforce;
(ix) The Contractor shall provide at cost all labor and materials and construct/install and maintain site safety, hard barricading, flexible green net, signboards, temporary day/light traffic diversions throughout the construction activities according to the specifications and provide free of charge personal protective equipment (PPE) to all the laborers working at the construction site;
(x) Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards;
(xi) Make available first aid kits, ambulance facilities, and fire extinguishers in camp sites, if any;
(xii) 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

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

(xiii) Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.

3. Community Health and Safety

183. **Impact.** While the site is far from residential areas and busy areas of the Pourashava, some community people may still chance to roam near or within the site. Thus, there is also a serious threat to these pedestrians, other community people, and including animals, due to moving heavy equipment or electrocution at the site. There may also be risk of accidental fall of these community people or animals in excavated areas.

184. **Mitigation**. To mitigate these impacts, the Contractor will be required to implement the following measures:

(i) Code of conduct for workers includes restricting workers in designated areas, no open defecation, no littering, no firewood collection, no fire except designated places, no trespassing, no residence at construction sites, and no obligation to potentially dangerous work;
(ii) 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;[24]
(iii) Follow established community health and safety protocol on emerging infectious diseases such as COVID19. See Appendix 3 for a sample guidance note in responding to COVID19;
(iv) Implement measure to prevent proliferation of vectors of diseases at work site;
(v) Maintain a complaint logbook in worker's camp and take action promptly of complaints. Follow the established GRM of the overall project
(vi) Schedule transportation activities by avoiding peak traffic periods;
(vii) Clean wheels and undercarriage of haul trucks prior to leaving construction site;
(viii) Educate drivers: limit speed not more than 30 km/h in settlements and avoid use of horn;
(ix) Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement;
(x) Provide adequate space and lighting, temporary fences, reflectorized barriers and signages at the work site; and
(xi) Ensure Contractor has staff trained on emergency response.

185. **Post-construction clean-up and reinstatement.** Construction debris, spoils, and excess construction materials may pose hazards to properties, community and environment if left unattended after construction.

186. The Contractor will reinstate all working areas and access routes as work proceeds during construction. All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity and the surface of the ground restored as near as practicable to its original condition. The following generic measures should be taken:

- Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required;

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

- All damaged roads leading to the site shall be reinstated to original condition;
- All disrupted utilities restored;
- All affected structures rehabilitated/compensated;
- The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up;
- All hardened surfaces within the construction camp area shall be ripped;
- All imported materials removed, and the area shall be top-soiled and revegetated;
- The Contractor must arrange the cancellation of all temporary services;
- Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.

E. Operation Phase Impacts and Mitigation Measures

187. Operation phase of typical IWTP facilities that include among others composting plant, fecal sludge treatment plant, leachate collection and treatment system, and landfill cells has inherent environmental impacts. Mitigation of these impacts are normally included in the operation and maintenance (O&M) manual being developed for this kind of facility. Some of the common impacts and recommended mitigation measures are discussed below.

1. Littering and Clandestine Dumping

188. **Impacts.** Waste collection, storage, and transport of solid wastes could lead to littering and indiscriminate dumping in the streets of Lama Pourashava and along the path of solid waste transports leading to the IWTP facility.

189. **Mitigation.** The operator of waste collection and transport services shall ensure to implement all measures included in the O&M manual, which may include the following:[25]

(i) Encourage use of containers or bags for waste at the point of collection for each household and establishment;
(ii) Implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage;
(iii) Use vehicles appropriate for the geographic conditions and waste types to maximize reliability of collection (e.g., compactor trucks may be appropriate for neighborhoods with wide streets and low-density trash, while smaller vehicles may be appropriate for neighborhoods with narrow streets and higher-density garbage);
(iv) Encourage separation of recyclable materials at the point of generation, so that the collection points do not become sorting points for informal sector waste pickers;
(v) Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter;
(vi) Clean vehicles used for waste hauling before transportation of any goods, including compost;
(vii) Encourage residents to put waste out at designated times and locations; and
(viii) Where possible, block off access to dumping sites and penalize illegal dumpers.

[25] Recognizing the difficulty of changing people's bad habits on solid waste handling and disposal, the information and behavior change campaign strategy to be developed by the experienced organization is expected to help achieve these measures successfully. The strategy will also be able to assess the pre- and post-campaign behaviors of the different stakeholders.

2. Air Emission from Storage and Transport of Solid Wastes

190. **Impacts.** Waste collection, storage, and transport of solid wastes could lead to air emission causing nuisance and respiratory health risks to workers and residents of Lama Pourashava.

191. **Mitigation.** The operator waste collection and transport services shall ensure to implement all measures included in the O&M manual, which may include the following:

(i) Establish frequent waste collection schedules;
(ii) Select vehicles and containers that minimize air emissions during waste loading and unloading;
(iii) Institute a washing program for waste collection vehicles and for company-owned waste collection and transfer containers;
(iv) Promote the use of bags to reduce the odors from soiling of waste collection and transport equipment;
(v) Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions;
(vi) Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure;
(vii) Drivers should also be instructed on the benefits of driving practices which reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits;
(viii) Sweep waste management areas and roads frequently and use water spray for dust control where needed;
(ix) Pre-treat wastes as needed (e.g., solidification, encapsulation, or wetting sufficient to reduce dust but without forming leachate);
(x) Use enclosed waste handling and storage areas for malodorous wastes. Enclosed waste storage and handling areas are preferred for all wastes;
(xi) Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions (e.g., bag filter);
(xii) Remove, treat, or dispose of all biological/malodorous wastes in an expeditious manner; and
(xiii) Use odor-neutralizing sprays where necessary.

3. Noise and Vibration from Facility Operations (MRF, Composting Plant, FSTP, Landfilling)

192. **Impacts.** Operation of the various subcomponents of the IWTP facility will potentially produce noise and vibration that could harm the welfare of the workers and communities surrounding the facility.

193. **Mitigation.** The operator/s of the different subcomponents of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following:

(i) Construct a buffer zone between the facility and the external environment;

(ii) Maintain site roads in good condition to reduce noise and vibration from vehicle movements;
(iii) Use acoustic screens around fixed/mobile plant and equipment;
(iv) Select equipment that has low noise emission levels;
(v) Fit silencing equipment to plant, e.g. baffles/mufflers; and
(vi) Use buildings to contain inherently noisy fixed plant equipment (e.g., locate waste shredder in the tipping hall, and enclose tipping hall on all sides) and consider use of sound-insulating materials in construction.

4. Nuisance to workers and nearby communities due to the IWTP facility

194. **Impacts.** Landfill operation could lead to many forms of nuisance to communities around the landfill area and along access road due to strong winds, erosion at waste containment area, ground vibration and generation of hazardous wastes (used oil, etc.) from the operation and maintenance of heavy equipment and vehicles; and generation of domestic solid waste by personnel.

195. **Mitigation**. The operator or management of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following:

(i) Apply of soil cover as soon as possible during the landfill operation;
(ii) Maintain all litter fences to ensure their efficient functioning per design;
(iii) Maintain tree plantation at the perimeter of the site. Trees can serve as wind breaker;
(iv) Protect slope of waste containment from sliding or erosion;
(v) Use appropriately sized heavy equipment for particular activities at site; and
(vi) Use dedicated containers for collection of ordinary wastes and hazardous wastes.

5. Fire and Explosions at the IWTP Facility

196. **Impacts.** Accumulation of various forms of gases in the different sub-facilities (MRF, Composting Plant, FSTP) and landfill gas from the landfill cells could potentially lead to fire and explosion affecting the lives of workers in the facility and any passersby in the surrounding areas.

197. **Mitigation**. The operator or management of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following:

(i) For the composting plant, avoid conditions that can lead to spontaneous combustion (e.g., moisture between 25 – 45 percent and temperatures above about 93ºC. This can be achieved for example by keeping windrows (if windrows is adopted) less than about 3m high and turning them when the temperature exceeds 60ºC); and
(ii) For the landfill, ensure landfill gas collection and control system is working efficiently. Collect biogas for use or treatment (e.g., energy recovery or flaring).

6. Surface Water and Groundwater Quality

198. **Impact**. Operations of the MRF, Composting Plant, FSTP and Landfill could pollute nearby water bodies or groundwater due to discharge or percolation of generated leachate from these

sub-facilities, including wastewater from routine cleaning and maintenance of heavy equipment and vehicles, and wastewater as a result of domestic use at the facility.

199. **Mitigation**. The operator or management of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following:

(i) Regularly check and ensure the leachate collection and treatment system is efficiently functioning per design;
(ii) During dry season, recirculate collected leachate back into the landfill mass, with any excess treated to compliance level prior to discharge;
(iii) Maintain site drainage system and; ensure no section is blocked or damaged;
(iv) Ensure all dedicated sanitation facilities at site such as septic tanks are maintained;
(v) For the composting plant, maintain ideal composting conditions such as:
    (a) Carbon: nitrogen (C:N) ratio between 25:1 and 35:1;
    (b) Moisture content of 50 to 60 percent of total weight during treatment (and less than 50 percent for marketing following screening);
    (c) Balance between particle size and void space to promote rapid decomposition. Void space should be sufficient to achieve a 10 to 15 percent oxygen level within the pile in aerobic systems;
    (d) Optimum temperature levels which can range between 32 and 60 degrees Celsius. Pathogen destruction can be achieved by attaining and maintaining a temperature of 55 degrees Celsius for three days in a vessel composting system or 15 days in a windrow system; and
    (e) pH of between 6 and 8.
(vi) For the FSTP (if using anaerobic digestion process), maximize recycling of wastewater to the reactor;
(vii) For the FSTP (if using anaerobic digestion process), measure total organic carbon (TOC), chemical oxygen demand (COD), nitrogen (N), phosphorus (P) and chlorine (Cl) levels in the inlet and outlet flows from an anaerobic digester. When a better control of the process is required, or a better quality of the waste output, monitoring of additional parameters may be necessary;
(viii) For the FSTP (if using anaerobic digestion process), operate the anaerobic digester under thermophilic digestion conditions, in order to increase the pathogen destruction, biogas production rate (hence higher energy recovery) and the retention time;
(ix) Minimize the daily exposed working face and use perimeter drains and landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste;
(x) Prevent run-on of precipitation into the active area of the landfill (e.g., by use of berms or other diversions); systems should be designed to handle the peak discharge from a 25-year storm; and
(xi) Collect and control run-off from the active area of the landfill; the system should be designed to handle the discharge from a 24-hour, 25-year storm. Runoff is typically treated together with leachate from the site.

7. Ambient Air Quality

200. **Impact**. Landfill operation could affect the air quality in the are due to generation of gaseous pollutants from the landfill, and generation of gaseous pollutants and noise from the use of heavy equipment and vehicles at the site.

201. **Mitigation**. The operator or management of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following

(i) Periodically monitor the generated landfill gases, including their concentrations, and ensure landfill gas collection/trap system is efficiently functioning. Landfill gasses include harmful substances, such as hydrogen sulfide, methane gas. Monitoring of landfill gasses is essentially required to protect the health and safety of operation staff and the nearby communities;
(ii) Ensure proper operation of the treatment facilities and inspection of conditions of lift stations;
(iii) Regular inspect and maintain backup power supplies and the associated automatic transfer switch of the backup power at the lift stations to ensure uninterrupted operation during power failure; and
(iv) Proper and regular maintenance of generator sets.

8. Community and Occupational Health and Safety

202. **Impact**. Landfill operation could affect the health and safety of workers and community people in the area due to the following:

- Nuisance odors and disease vector infestation from the landfill operations;
- Increased traffic volume along the access roads to the project site, threat to road/public safety, and community and occupational safety and health risks from the use of heavy equipment and vehicles; and
- Possible increase in crime incidence with the influx of workers.
- Lack of oxygen and risks related to flammable methane emission

203. **Mitigation**. The operator or management of the IWTP facility shall ensure to implement all measures included in the O&M manual, which may include the following

(i) The landfill activities should be carried out properly and effectively to reduce the emission of unpleasant odor. It is possible for odor levels to increase on a sunny day following a downpour. At this instance, immediately undertake soil cover to minimize odor problem. Spraying deodorants or other appropriate measures shall be taken if the odor level is high in the peripheral area;
(ii) Apply insecticide or chemicals as necessary to control proliferation of disease vectors;

(iii) Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “B” (in consultation with appropriate physicians);
(iv) Use vacuum trucks for removal of fecal sludge instead of manual methods;
(v) Maintain work areas to minimize slipping and tripping;
(vi) Standard operation procedures with appropriate equipment are ensured, and workers are provided with necessary training and personnel protection equipment to safeguard health and safety.
(vii) Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate PPE;
(viii) Provide all the personal protective equipment like gum boots, nose mask, gloves etc. for the protection of workers;
(ix) The workplace will be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment will be periodically inspected and maintained in good working condition;
(x) Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work;
(xi) Medical check-up will be conducted on regular basis and the health conditions will be monitored;
(xii) First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility;
(xiii) Maintain good housekeeping in waste processing and storage areas;
(xiv) Conduct detailed identification and marking of all electrical connections prior to any maintenance work;
(xv) Use specially trained personnel to demount electrical parts;
(xvi) Provide safe means of access and egress from confined places, such as stairs and ladders, and safety ropes;
(xvii) Avoid operating combustion equipment for prolonged periods unless the area is actively ventilated; and
(xviii) Avoid exposure to excessive noise levels beyond permissible limits set out by local and international regulations.

F. Decommissioning / Abandonment Phase

204. **Abandonment Plan**. In the interim, all closure and rehabilitation works shall be in accordance with an approved closure plan by the government through the DOE. Any equivalent plan applicable for the facility as may be required or promulgated by new laws or regulations in the future will be followed. In the event that no specific plan is required during the abandonment phase, the project will ensure that the planning for closure of the facility includes the elements per EHS Guidelines on Waste Management Facilities, as follows:

(i) Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future land use (as defined in consultation with local communities and government agencies), closure schedule, financial resources, and monitoring arrangements;
(ii) Evaluation, selection, and application of closure methods consistent with post-closure use and which should include the placement of a final cover to prevent further impacts to human health and the environment;

(iii) Application of final cover components that are consistentwith post closure use and local climatic conditions. The final cover should provide long term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs; and
(iv) Financial instruments in place to cover the costs of closure and post-closure care and monitoring.

G. Unanticipated Impacts during Construction and Operation

205. In the event of unanticipated environment) impacts not considered as significant during implementation and not considered in the IEE and EMP, the PMU shall prepare a corresponding time-bound and budgeted corrective action plan acceptable to ADB, and ensure that these are implemented by the contractor/s and reported accordingly in environmental monitoring reports to ADB. If unanticipated environmental impacts deemed as significant become apparent during project implementation, the PMU will: (i) inform and seek ADB's advice; (ii) assess the significance of such unanticipated impacts; (iii) evaluate the options available to address them; and (iv) update the IEE including EMP. ADB will help the borrower mobilize the resources required to mitigate any adverse unanticipated impacts or damage.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation

206. Meaningful consultation is an essential part of the environmental assessment process which enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, and the sharing of development benefits and opportunities, and implementation issues. The process also helps avoid potential conflicts with stakeholders for smooth project implementation. The findings from the public consultations are documented and considered in the development of the EMP, especially in identifying the significant impacts of the proposed Project and developing the corresponding mitigation measures.

207. Consultations may be conducted through focus group discussions, interviews, and town meetings. During these activities, implementation of COVID-19 health and safety measures as per local and national guidelines must be observed.

208. The key stakeholders to be consulted include:

(i) Project beneficiaries;
(ii) Elected representatives, community leaders and representatives of community-based organizations;
(iii) Local non-government organizations (NGOs);
(iv) Local government and relevant government agency representatives, including local authorities responsible for land acquisition, protection and conservation of forests and environment, archaeological sites, religious sites, and other relevant government departments;

(v) Residents, shopkeepers, businesspeople, and farmers who live and work near the subproject;

B. Public Consultations Conducted

209. Consultations were conducted with key stakeholders and community members in line with ADB's requirements pertaining to environmental and social considerations. These consultations helped in identifying the felt needs, concerns and apprehensions of the communities related to the project and their priorities.

Table 23: Details of Consultations

No.	Meeting Date	Meeting with	Issues Discussed
1	08 Feb. 2022	Prominent residents and representatives of Lama Town	Discussions covered issues confronting the population, water supply and sanitation issues in particular. The residents wanted project (both water supply and sanitation) to be implemented immediately and indicated their willingness to cooperate in all respects for achieving successful implementation.
			
2	20 Nov. 2021	Discussion with Mayor, Lama Pourashava and other officials of the Lama Pourashava	Discussions covered the finalization of locations of the various sub-project components and role that the Pourashava can play in project execution. The suggestions have been incorporated in the Project Preparatory documents.

<table>
<tr><th>No.</th><th>Meeting Date</th><th>Meeting with</th><th>Issues Discussed</th></tr>
<tr><td></td><td></td><td colspan="2">  </td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">08 Nov. 2021</td><td>All Key Stakeholders – details to be obtained.
Chittagong Hill Tracts Regional Council – Chairperson
District Commissioners – Rangamati and Bandarban;
Mayor – Rangamati;
Mayor – Bandarban;
Mayor – Lama
Officials of DPHE from the Hill Division and Dhaka Division.</td><td>A day-long stakeholder workshop was held at Cox Bazaar in which all the participants were invited exclusively for the purpose. A presentation was made on the project to cover all technical and safeguards issues. A presentation on Environmental Safeguards was delivered and the importance of complying with ADB SPS 2009 and the GOB requirements were explained.

Suggestions from the participants were made to include training and capacity building activities in the project. The suggestions have been incorporated in the IEE.</td></tr>
<tr><td colspan="2"> 

Photograph taken at the Stakeholder Consultation Workshop</td></tr>
</table>

No.	Meeting Date	Meeting with	Issues Discussed
5	April 2021	Focus Group Discussions (6 Nos.) with Women Groups, Women-Men Combined Groups, Diverse Groups including indigenous women and men.	Major suggestions provided by the households for the water and sanitation services are: • Adequate supply of safe water • Improvement of water quality and quantity • Installation of a meter or pre-paid system so that people can pay as per usage. • Better sanitation facilities including fecal sludge management and solid waste management. The following suggestions were made to for better project implementation: • Ensure people's participation in the monitoring / maintenance committee; • Increase women's participation in decision making on water and sanitation services; • Improving the effectiveness of the Water-Sanitation Committees in the Municipality; • Improve participation of NGOs and other voluntary organizations.

C. Future Consultations during Detailed Design Stage

210. Stakeholder consultations, including town-level consultations, will continue during the detailed design stage and throughout the project implementation. PMU and PMCSDRC will ensure that consultations will be conducted as meaningful per definition of ADB SPS 2009 and the final site selected for IWTP facility and other project details after detailed design are shared with the concerned stakeholders. The summary of IEE will be locally disclosed in an accessible place and in a form and language(s) understandable to affected people and other stakeholders at least two weeks before consultations to give stakeholders a chance to read it and consult experts.

D. Information Disclosure

211. Information shall be disclosed through public consultation and making available relevant documents in public locations. The following documents will be submitted by the PMU to ADB for review and disclosure on its website. ADB will disclose upon receipt of acceptable reports and endorsement from the PMU: [26]

212. The EA/IA will send a written endorsement to ADB for disclosing these documents on the ADB website. The PIUs will provide relevant safeguard information in a timely manner, in an accessible place and in a form and language understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used. For the benefit of the community, the summary of the IEE will be translated in Bangla and made available at: (i) office of PMU; and (ii) offices of the contractors. Hard copies of the IEE report will also be

[26] 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." Upon its receipt of acceptable safeguard documents and endorsement by PMU, ADB discloses the same on ADB website.

available at the PMU and accessible to citizens as a means of disclosing the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Project Director, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of DPHE after approval of the documents by Government and clearance from ADB. Disclosure will follow ADB's Access to Information Policy, 2018.

VII. GRIEVANCE REDRESS MECHANISM

A. Common Grievance Redress Mechanism

213. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated and shared with affected persons and other stakeholders. The campaign will ensure that the poor, vulnerable and others are made aware of the need for and process in availing the GRM.

214. **Common GRM**. A common GRM will be in place for social, environmental, or any other grievances related to the project; the Resettlement and Indigenous Peoples Plan (RIPP) and IEEs will follow the GRM described below, which is developed in consultation with key stakeholders. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons‟ grievances related to the project. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons‟ advice at each stage, as required.

215. Across *Pourashava* public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the campaign. The project implementation unit (PIU) under the guidance of Executive Engineer DPHE will conduct *pourashava*-wide awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements and will work with the PIU safeguards assistant to help Affected persons (Aps) will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes that are installed by project *pourashavas* or through telephone hotlines at accessible locations or by any other medium. The pourashava office maintains complaints register where such grievances may be registered. **Appendix 5** has the sample grievance registration form. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. The Project Director / Deputy Project Director from project management unit (PMU), PMU and Project Implementation Unit (PIU) will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, and communication with the aggrieved party. Ensure that their grievances are addressed.

216. **Grievance redress process**. In case of grievances that are immediate and urgent in the perception of the complainant, the DPHE EHS supervisor, Contractor and Social Safeguard and Environment Safeguard Officers from the project management construction, supervision, and design review consultants (PMCSDRC) team on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact phone numbers and names of the concerned PIU EHS supervisor, contractors, PMU Executive officer, PMCSDRC environmental and social safeguards officer will be posted at all construction sites at visible locations.

217. **Who can file a complaint:** A complaint may be registered by stakeholders who may be, directly or indirectly affected by the Project. A representative can register a complaint on behalf of the affected person or group, provided that the representative is identified by the affected person or group and submits evidence of the authority to act on their behalf.

218. **What type of grievance/complaint.** Any comments, complaints, queries, and suggestions pertaining to safeguard compliance – environment, involuntary resettlement, and indigenous people, design related issues, compensation, service delivery or any other issues or concerns related to the project can be registered. The complaint must indicate the name, date, address/contact details of the complainant, location of the problem area, along with the problem.

219. **Where and how to file a complaint:** The contractor's site office will be the primary point for receiving and lodging any complaint. Apart from that, grievances/suggestions/queries from affected persons can be dropped into suggestion boxes or conveyed through phone or e-mails. Affected persons or any complainant will also be able to register grievances on social, environmental or other related issues, personally to the Complaint Cell at PIU level.

220. **Process and Timeframe:** The grievance redress process and timeframe involved in the GRM[27] is described below:

(i) **1st Level grievance redress (Field/site Level).** In case of grievances that are immediate and urgent in the perception of the complainant, 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 Hill District Council (HDC), as nominated, will make efforts to resolve the complaint at the site level. Efforts will be made to resolve all grievances within three (3) days from the date of receipt of a complaint / grievance. If the grievance is not under the contractor's scope, then it will be escalated to second level. The first level grievance redress team will comprise of the following members:

(a) Chief Executive Officer or in his absence *Pourashava* Secretary
(b) Executive Engineer, *Pourashava* (Safeguard and Gender Focal person)
(c) Administrative Officer, *Pourashava*
(d) Representative of HDC
(e) Assistant Engineer, DPHE
(f) Municipal Ward Councilor (designated) / Small ethnic community representative

[27]The existing grievance redress mechanism at the level will be integrated to the project GRM. Any project-related complaints received through the government's help lines will be routed through the project GRM.

(g) EHS Supervisor, Contractor

(ii) **2nd Level grievance (PIU Level).** Grievances that cannot be redressed at first level within three 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 fifteen (15) days of receiving the complaint from the first level with the support of Social and Environment Safeguard Officers, PIU, Municipal ward members 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. The composition of 2nd level grievance redress team will be as follows:

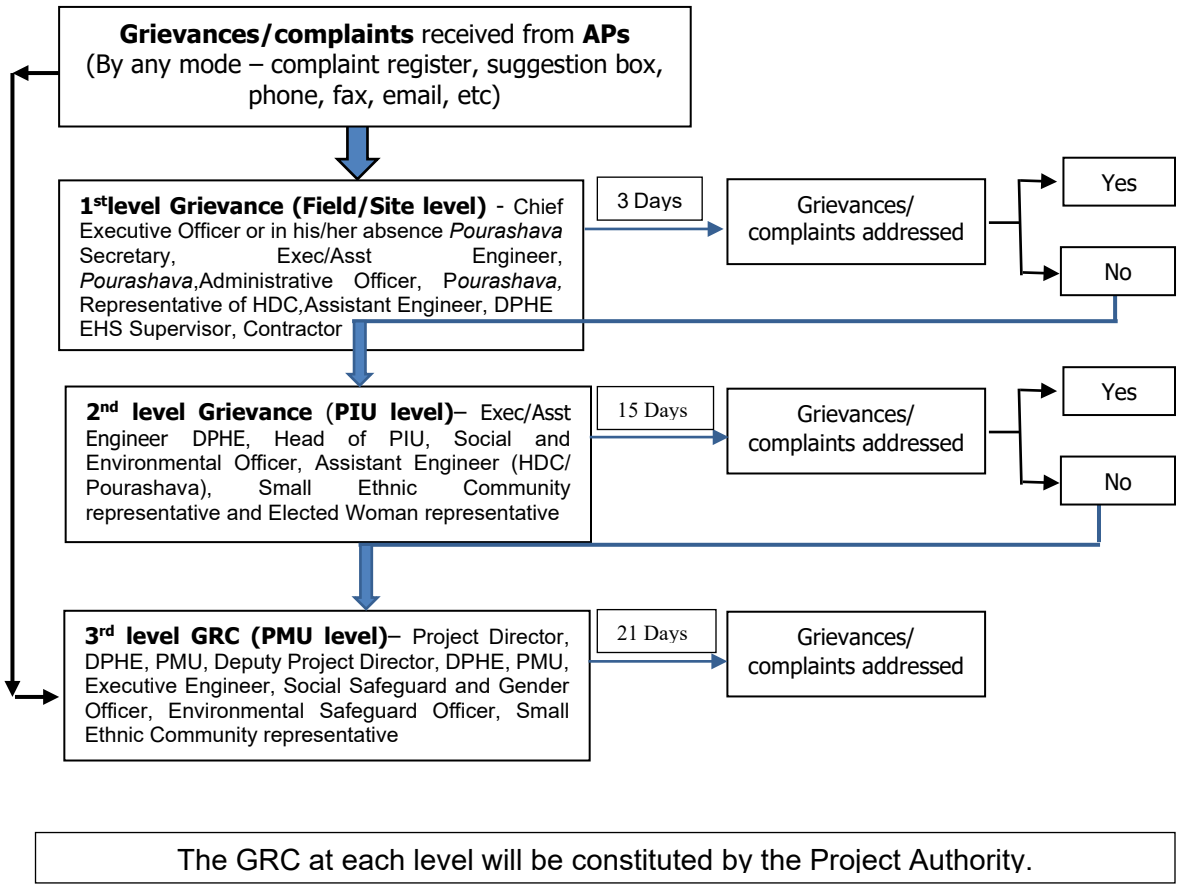
(a) Deputy Project Director
(b) Head of PIU
(c) Social and Environmental Officer
(d) Assistant Engineer (HDC/ Pourashava)
(e) Small Ethnic Community representative

(iii) **3rd Level** Grievance**, PMU Level**. All grievances that cannot be redressed within 15 days at PIU level will be brought up to the PMU level. The PMU safeguards team will refer any unresolved or major issues to the PMU level grievance redress team, that will be headed by the Project Director and will have Deputy Project Director, PMU Executive engineer, social and environmental safeguards and gender officers PMCSDRC, and small ethnic community representative will resolve the complaints/grievances within 21 days. The PMU level grievance team will comprise of:

(a) Project Director, DPHE, PMU
(b) Deputy Project Director, DPHE, PMU
(c) Executive Engineer
(d) Social Safeguard and Gender Officer
(e) Environmental Safeguard Officer
(f) Small Ethnic Community representative

221. The process of the project GRM is given in Figure 19.

Figure 21: Grievance Redressal Mechanism – (DPHE)



222. The timeframes within which to resolve the issues may be adjusted (to a maximum of 7 additional days at each level) accordingly during extraordinary circumstances, such as lockdowns or travel restrictions imposed by local or national governments due to the ongoing COVID-19 pandemic. The adjustment will depend on the period of interruption during these events and will be decided upon by the PMU.

223. **Information Dissemination Methods about GRM**. Periodic community meetings will be held by PIUs, and Project consultants with affected communities to understand their concerns and help them through the process of grievance redress (including translation from local dialect/language, recording, and registering grievances of non-literate affected persons and explaining the process of grievance redress) if required. The above Grievance Redress Process will be discussed with the different stakeholders during stakeholder consultation meetings. These meetings will be held with affected persons and community members (beneficiaries) and the concerned local government representatives where civil works are proposed. The process and timelines for grievance redress and contact details of the persons responsible for grievance redress will be shared in the stakeholder meetings. Action taken in respect of all complaints will be communicated to the complainant by letter, over phone or e-mail or text messaging.

224. **Consultation Arrangements for GRM.** This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Social Specialist of PMU/PIU for one-on-one consultations. Non-literate affected persons/vulnerable affected persons will be assisted to understand the grievance redress process, at the site office of the contractor and at PIU level, the official appointed to receive grievances will assist the non-literate affected persons to register complaints and follow-up with actions at different stages in the process.

225. **Record Keeping.** Records of all grievances received, including contact details of complainant, date of receiving complaint/grievance, nature of grievance, agreed actions and measures, the date these were affected, and outcome will be kept by PIU. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PIU office, and on the website of PMU, as well as reported in the semiannual social and environmental monitoring reports to be submitted to ADB. The Environmental Officer and the Social Safeguard Officer will be responsible for maintaining the grievance record.

226. **Periodic Review and Documentation of Lessons Learned.** The PMU, and PIUs, supported by the Project consultant's specialist will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

227. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

228. **ADB Accountability Mechanism.** If the established GRM is not able to resolve the issue, the affected person can use the ADB Accountability Mechanism[28] through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make effort in good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the Bangladesh Resident Mission (BRM)). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. 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.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

229. This environmental management plan (EMP) has been prepared in accordance with the ADB's Safeguard Policy Statement 2009. 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, to avoid, minimize or offset the potential environmental impacts identified in the chapter on Anticipated

[28] Accountability Mechanism. http://www.adb.org/Accountability-Mechanism/default.asp.

Environmental Impacts and Mitigation Measures of this IEE. This chapter also discusses the institutional arrangement, roles, and responsibilities for the effective implementation of the EMP.

A. Institutional Arrangement

1. Safeguards Compliance Responsibilities

230. Department of Public Health and Engineering (DPHE) is the Executing Agency (EA) of this project. DPHE as the executing agency shall be responsible for compliance with ADB Safeguard Policy Statement (SPS) 2009. DPHE would be responsible for overall implementation of the project and would contact various agencies, support their functioning and coordinate with concerned Project Implementation Units (PIUs) under overall guidance of the Local Government Division (LGD). A project management unit (PMU) will be established along with project implementation units (PIUs) at the field level to implement the project. Based on the project components to be implemented, four (4) PIUs are proposed under different HDCs and Pourashavas as explained in Table 24 below for smooth implementation of the project.

Table 24: Project Implementation Units in Rangamati, Bandarban & Lama

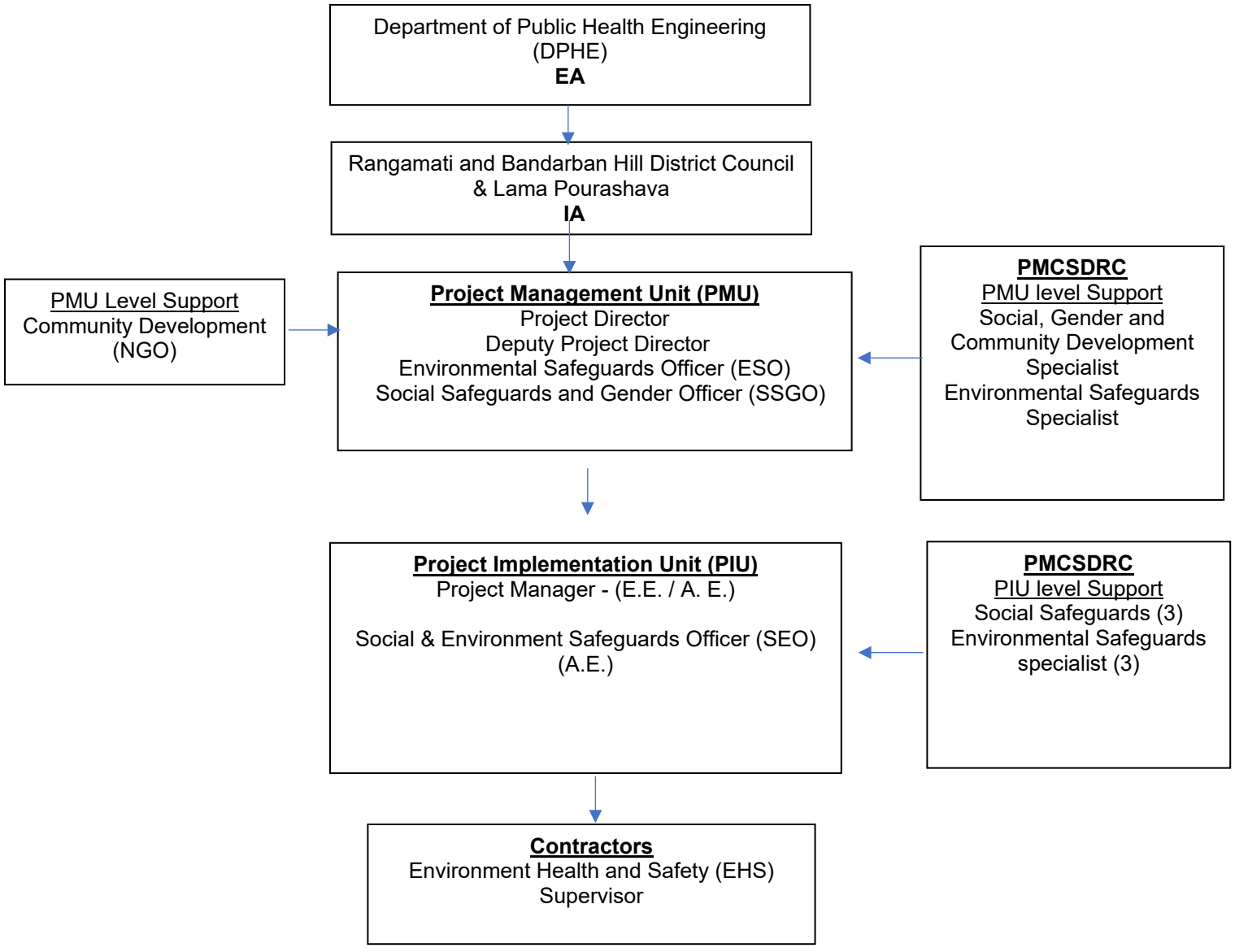
Project Component	Project Implementation Unit (PIU)
Water Supply	Rangamati Hill District Council (HDC)
Water Supply	Bandarban Hill District Council (HDC)
Sanitation services management	Bandarban Pourashava
Water Supply & Sanitation services management	Lama Pourashava

231. **Project Management Unit (PMU).** A project management unit (PMU) will be established to implement the project. PMU will be staffed with two safeguard officers: (i) Environment Safeguard Officer (ESO) and (ii) Social Safeguard and Gender Officer (SSGO) who will be responsible for compliance with the environmental, social and gender safeguards and community related issues in program implementation respectively. Environment Safeguard Officer and Social Safeguard and Gender Officer will have overall responsibility of safeguard implementation in compliance with ADB SPS 2009. PMU SSGO will also be supported by a NGO for community development and outreach related activities. At individual subproject level, Environment Safeguard Officer and Social Safeguard and Gender Officer will ensure that environmental assessment and social impact assessment is conducted, and IEE reports and corresponding Environmental Management Plan EMPs and Social Management Plan (SMP) and Resettlement and Indigenous Peoples Plan (RIPP)s, due diligence reports (DDRs) are prepared and implemented, and the compliance, and corrective actions, are undertaken.

232. Environmental Safeguard Specialist and Social Safeguards and Gender Specialist of the Project management, construction, supervision, and design review consultants (PMCSDRC) will have primary responsibility of preparing the safeguard documents and supervising the EMP and Resettlement and Indigenous Peoples Plan (RIPP) implementation, while the Safeguards Officers at PMU will review, approve and oversee the compliance. At each PIU, a Safeguard/Environment Officer of Assistant Engineer rank, AE (SEO), will be responsible for safeguard implementation. AE(SEO) will oversee the safeguards implementation at PIU level and will be responsible for reporting to Environment Safeguard Officer and Social Safeguard and Gender Officer at PMU. The AE(SEO) will coordinate public consultation, information disclosure, regulatory clearances

and approvals, EMP and Resettlement and Indigenous Peoples Plan (RIPP) implementation and grievance redress. In all the three towns of Rangamati, Bandarban and Lama, one Environmental Safeguard officer and Social Safeguards and Gender Officer of the Project management, construction, supervision, and design review consultants (PMCSDRC) team will be placed to support the PIUs. Contractor will appoint an Environment, Health and Safety (EHS) supervisor to implement EMP; EHS supervisor of Civil works / DBO Contractor will have responsibilities related to environmental and social safeguards compliance and grievance redress and management at field level.

Figure 22: Safeguards and Gender Implementation Arrangements



EA = Executive Agency, IA = Implementation Agency, PMU = Project Management Unit, PIU = Project Implementation Unit, C.E. = Chief Engineer, DPHE = Department of Public Health and Engineering, LGD = Local Government Department, S.E. =

Superintending Engineer, E.E. = Executive Engineer, A.E.E.= Assistant Executive Engineer, PMCSDRC = Project Management Construction Supervision and Design Review Consultant

2. Environmental Safeguards Roles and Responsibilities:

233. **Project Management Unit.** PMU will be staffed with an Environment Safeguard Officer (ESO) who will be responsible for compliance with the environmental safeguards related issues in project implementation. ESO will have overall responsibility of safeguard implementation in compliance with ADB SPS 2009.Key responsibilities of the ESO are as follows:

(i) Submit IEE to ADB for approval and disclosure in ADB website.
(ii) Ensure approved IEEs are disclosed in PMU websites and summary posted in public areas accessible and understandable by local people.
(iii) Ensure EMPs are included in the bid documents and contracts.
(iv) Organize an orientation workshop for PMU, PIU, Pourashavas all staff involved in the project implementation on (a) ADB SPS, 2009; (b) Government of Bangladesh National environmental laws, CHT applicable environmental regulations, core labor standards, OHS and community health and safety, EMP implementation especially spoil management, working in congested areas, traffic management during construction, COVID19 guidelines, ongoing consultations, grievance redress, etc;
(v) Assist in addressing any grievances brought about through the GRM;
(vi) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
(vii) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements.
(viii) Assist PMU, PIUs, and project consultants to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE and EMP.
(ix) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE.
(x) Review monthly monitoring reports submitted by PIUs and prepare and submit to ADB semi-annual monitoring reports.
(xi) If necessary, prepare corrective action plan and ensure implementation of corrective actions to ensure no environmental impacts.
(xii) Review and submit corrective action plans to ADB.
(xiii) Coordinate with National and CHT and Pourashava level government agencies; and
(xiv) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented.

234. The PMU will be supported by 4 PIUs under the supervision and control of PD, PMU. The project management construction supervision and design review consultants (PMCSDRC) will support the PMU and PIUs.

235. **Project Implementation Units.** There will be 4 PIUs at Rangamati, Bandarban and Lama. Each PIU will have a designated environmental safeguards officer / nodal person for ease of day-to-day monitoring and management at local level. The PIU environmental safeguards officer will assist PMU ESO in implementation of the environmental safeguards in PIUs under its jurisdiction.

The PIUs will undertake internal monitoring and supervision and record observations throughout the project period to ensure that the safeguards and mitigation measures are provided as intended. The PIU environmental safeguards officer with support from PMCSDRC environment consultant will oversee safeguards implementation in the towns, coordinate public consultations, information disclosure, regulatory clearances and approvals, implementation of EMP and grievance redressal. Key safeguard tasks and responsibilities of the officer are as follows:

(i) Coordinate updating/revision of IEEs updated based on detailed design and technical studies (traffic management, and/or biodiversity assessment);
(ii) Review and submit approved updated/revised IEE to PMU.
(iii) Ensure relevant information in the IEE is disclosed to stakeholders.
(iv) Obtain all necessary clearances, permits, consents, no objection certificates (NOCs), etc. Ensure compliance to the provisions and conditions.
(v) Ensure EMP requirements for pre-construction regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc., are compiled and communicated by town-level PIUs to contractors in a timely manner.
(vi) Support Pourashavas and town-level PIUs in supervising contractor EMP implementation. If necessary, organize an induction course upon mobilization of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during implementation.
(vii) Coordinate actions required for obtaining ROW in timely manner.
(viii) Take corrective actions when necessary to ensure no environmental impacts.
(ix) Consolidate monthly environmental monitoring reports by town-level PIUs and submit to PMU.
(x) Formulate time bound corrective actions for non-compliances.
(xi) Conduct continuous public consultation and awareness.
(xii) Address any grievances in a timely manner as per the GRM; and
(xiii) Issue clearance for contractor's post-construction activities as specified in the EMP.

236. **Contractors.** The contractor shall appoint an environment, health and safety (EHS) supervisor who will be responsible on a day-to-day basis for (i) ensuring implementation of EMP, (ii) coordinating with the town-level PIUs and environment specialists of project consultant teams; (iii) community liaison, consultations with interested/affected people, (iv) field-level grievance redress; and (iv) reporting.

237. The Contractor will be required to submit to PIU, for review and approval, a SEMP including (i) proposed sites or 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 SEMP; (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP.

238. 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 constitutes a failure in compliance and will require corrective actions. The IEEs specify responsibilities in EMP implementation during design, construction and O&M phases.

239. PMU will ensure that bidding and contract documents include specific provision 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 (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS, to employees and local communities surrounding the project sites.

Table 25: Institutional Roles and Responsibilities for Environmental Safeguards Implementation

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
PMU (Environment Safeguards Officer)	(h) Review and approve EIA/IEE (ii) Submit EIA/IEE to ADB for approval and disclosure in ADB website (i) Ensure approved IEEs are disclosed in PMU websites and summary posted in public areas accessible and understandable by local people. (iv) Ensure environmental management plans (EMPs) are included in the bid documents and contracts (j) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH&S, I EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (k) (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEi) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (l) (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirement) Assist PMU, PIUs, and project NGOs to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE.		
	(m) (xi) Assist in the review of the contractors' implementation plans to ensure compliance with the IEEi) Over-all environmental safeguards compliance of the project (n) (iii) Monitor and ensure compliance of EMPs as well as any other environmental provisions and condition) Review monthly monitoring report (o) (ii) Prepare and submit to ADB semi-annual monitoring report) If necessary, prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impact) Review and submit Corrective Action Plans to Av) Organize capacity	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP	

building programs on environmental safeguard) Coordinate with national and state level government agencies) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEx) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented	

(p) PIU, Environment Safeguard Officer) Ensure IEE is included in bid documents and contract agreements. Ensure cost of EMP implementation is provided.

(q) (iv) Disclose of approved EIAs/IEEv) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions.

(vi) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc.

(r) (vii) Organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation) oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations.

(s) (ii) take necessary action for obtaining rights of way) oversee implementation of EMPs, including environmental monitoring by contractors;

(t) (iv) take corrective actions when necessary to ensure no environmental impacts) submit monthly environmental monitoring reports to PMU,

(vi) conduct continuous public consultation and awareness;

(u) (vii) address any grievances brought about through the grievance redress mechanism in a timely manner as per the IEEs; ai) Conducting environmental monitoring, as specified in the EMP.

(ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.

B. Capacity Building and Development

240. Executing and implementing agencies need to have a sustained capacity to manage and monitor environmental safeguards. Although specialist consultants support will be available to PMU and PIUs, it is necessary to mainstream safeguards in day-to-day working. Therefore, PMU and PIUs require capacity building measures for (i) a better understanding of the project-related environmental issues; and (ii) to strengthen their role in preparation of IEE, implementation of mitigation measures, and subsequent monitoring. Trainings and awareness workshops are included in the project with the primary focus of enabling the PMU and PIU staff to understand impact assessments and carry out environmental monitoring and implement EMPs. After participating in such activities, the participants will be able to review environmental assessments, conduct monitoring of EMPs, understand government and ADB requirements for environmental assessment, management, and monitoring (short- and long-term), and incorporate environmental features into future project designs, specifications, and tender documents and carry out necessary checks and balances during project implementation.

PMCSDRC's ESO shall assess the capabilities of the target participants, customize the training modules accordingly and provide the detailed cos

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Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply, sanitation and SWM projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites

242. .

Table 26: Capacity Building Program on EMP Implementation

Sl. No.	Description	Target Participants and Venue	Cost and Source of Funds
1	Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement -Government applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH&S, etc. -Incorporation of EMP into the project design and contracts -Monitoring, reporting and corrective action planning	All staff, PMU, PIUs and consultants involved in the project At PMU, Dhaka	PMU cost
4	EMP implementation (2 days) -Roles and responsibilities -OH&S planning and implementation -Wastes management (water, hazardous, solid, excess construction materials, spoils, etc.) -Working in congested areas, - Public relations - Consultations - Grievance redress -Monitoring and corrective action planning -Reporting and disclosure -Post-construction planning	All staff and consultants involved in the subproject All contractors before start of construction works At PIUs	PMU cost
5	Plans and Protocols (1 day) -Construction site standard operating procedures (SOP) -Biodiversity and Critical Habitat Assessment - Site-specific EMP -Traffic management plan -Spoils management plan -Waste management plan - Chance find protocol - O&M plans - Post-construction plan	All staff and consultants involved in the project All contractors before start of construction works or during mobilization stage. At PIUs	PMU cost Contractors cost as compliance to contract provisions on EMP implementation
6	Experiences and best practices sharing - Experiences on EMP implementation - Issues and challenges - Best practices followed	All staff and consultants involved in the project All contractors All NGOs At PMU Dhaka	PMU Cost
7	Contractors Orientation to Workers on EMP implementation (OH&S, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the	Contractors cost as compliance to

		contractor prior to dispatch to worksite	contract provisions on EMP implementation

Table 27: Environmental Management Plan Matrix

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
Design Phase				
Compliance with Site Selection Criteria for IWTP Facility	Any non-compliance with this set of site selection requirements per IWM Rules 2021 will render the proposed site as inappropriate and could derail the implementation of the subproject.	• Further investigations on the hill drain in the periphery of the site should be carried out during the detailed design, and Location Clearance Certificate from the DOE shall be secured prior to bidding. This is important, as per Landfill criteria, no water body, river or lake should be within 200 m of landfill site. • Obtain from the Department of Environment a Location Clearance Certificate for the selected site; • The subproject is considered as a Red Category undertaking based on ECR 1997. As such, undertake an environmental impact assessment (EIA) and obtain from Department of Environment an environmental clearance certificate (ECC) for the subproject.	PMU	DPHE
Confirmatory surveys to ensure no protected species of flora and fauna in project sites	Damage / disruption of protected species – although there are no such species within or close to project sites, given that wider district area has protected species, precautionary approach is necessary to avoid any impacts	• Engage Biodiversity expert to conduct further on-site verifications during the detailed design for the short-listed species or any other likely protected species; expert shall interact and consult with relevant stakeholders and community in and around the sites, and confirm the likelihood of occurrence of these species in or close to subproject sites, and provide information on likely reasons for visit (food, water, shelter etc.,), and seasons, and timings (day/night), and other favorable site conditions • Prepare standard operating procedures (SOPs) for construction to avoid any impacts, risk or damage to flora and fauna in general, and species of interest in particular • Conduct site visits and verify presence of any protected flora species; if found on site, ensure that those trees are undistributed and considered in the layout design; in unavoidable cases, trees may be safely transplanted under expert supervision within the same area; PIU shall coordinate with the Forest Department for the translocation	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Confirm that proposed intake location is not in or close to sensitive sites, where there is likely presence of protected species or spawning or breeding ground of aquatic species in the river • Assist in designing intake pipes with screens to avoid entry of aquatic species into the intake • Conduct site verifications again prior to start of construction; if species of interest are found on-site, ensure that the findings are recorded and reported to the PMU. No disturbances or works on the site should start/continue until PMU issues clearance to proceed. Measures to restrict poaching or hunting shall be put in place. • Conduct training and awareness to workers and staff • For contractors working in areas where species of interest are present, the toolbox talk should include reminders and actions required related to biodiversity conservation as specified in SOP and the environmental management plan (EMP)		
Physical Cultural Resources	The subproject sites are not located close to any archeological sites that could be impacted.	• Create awareness among the workers, supervisors and engineers about the chance finds during excavation work. • Stop work immediately to allow further investigation if any finds are suspected. • Inform Bangladesh Department of Archaeology if a find is suspected and take any action, they require to ensure its removal or protection in situ	PIU/PMCSDRC	PMU
Integrated waste management facility (resource recovery, compost plants, FSTP and landfill)– overall site planning and design	Potential impacts on groundwater, surface water and nuisance to surrounding scattered houses	• Conduct site specific surveys investigations during the detailed design to develop the site baseline profile – topography, geo technical studies, groundwater studies including hydrogeology of the site. depth of groundwater and quality, air quality, surface water quality etc., • Facility design to comply with recommendations, if any, of the climate risk and vulnerability assessment or climate change assessment for the subproject	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Ensure that minimum 2 m distance between shallow groundwater level and bottom clay liner in the landfill • Provide adequate drainage management system; construct peripheral drains and bunds to ensure that runoff from upper areas do not enter the facility (entire facility area including landfill, compost plant and septage plant) , and safety diverted into natural drainage without any hindrance • Provide proper fencing / walls around the facility at least 10-20 m wide green buffer zone with tree plantations all around • Concrete roads to be provided to avoid wastewater penetration in the ground and to avoid attracting rodents and other pests to the facility • Leachate collection and treatment ponds will be designed to take additional wastewater in case of extreme events. 50% additional volume has been considered so that there is no risk of overflowing of leachate • The landfill site shall have a HDPE lining and clay layer to avoid percolation of leachate into the groundwater • To minimize the amount of waste entering the landfill area, 40% of the organic waste shall be recycled using the aerobic composting method. This will help to reduce methane emissions and odors. The composting process will take place under a covered roof; and • Landfill operations will have daily covering to avoid the attraction of birds as well as to reduce the generation of leachate.		
	Hill drain along the periphery of the site, and risk of water source contamination on the downstream	• Facility design will ensure proper surface drainage system within internal and peripheral drains to facilitate runoff. Design will ensure separation of runoff from contaminated areas and clean areas. • Protection of drain from leaching of leachate via ground/soil		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Diversion of contaminated runoff to treatment plant. • Peripheral drains will be provided to avoid entry of runoff from uphill and surrounding areas into facility and will ensure safe passage of upstream runoff into the drain. • Treated leachate will be recirculated and not discharged into drain • Wastewater from FSTP will be utilized within the site for plantation or facility operation, and there be no discharge into drains. • However, during the rains, the leachate generation may be considerable, and, also, treated wastewater from FSTM may not be utilized within the site. Therefore, it may be necessary to discharge treated water into drain, which will further discharge into Matamuhuri river. Given intake on the downstream side, following two alternatives are suggested to include in the design. These alternatives will be examined during the detailed design, and appropriate alternative will be implemented. This will avoid risk of polluting the water source. **.1.1** Interception of the drain close to river Matamuhuri and divert the same to downstream of intake (~ 500 m or as appropriate during finalized during the detailed design), by constructing an open concrete channel along the bank of the river or through a pipe buried along the river,, duly considering river high flood level, taking measures to avoid erosion of riverbed at discharge point **.1.2** Laying of an outfall pipe from the IWT facility to nearest drain or river Matamuhuri to directly discharge runoff and treated wastewater into river downstream of intake (~ 500 m or as appropriate		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		during finalized during the detailed design). This may be laid within the access road right of way. •		
Composting Plant Design	Inappropriate or insufficient design could lead to not only environmental catastrophe (e.g., surface water pollution, groundwater contamination, etc.) but to community and occupational health and safety as well (e.g., explosions due to accumulated confined biogas, proliferation of disease vectors in nearby communities, etc.).	• Ensure compost plant design compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.29 • Adopt a site-specific design, consider the proximity of waste handling and storage areas to water supply wells, irrigation canals, and surface water bodies, and ensure design in a such a way that it prevents contaminated leachate and drainage from entering surface and ground water; • Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas; • Use acoustic screens around fixed/mobile composting plant and equipment; • Select composting equipment that has low noise emission levels; • Fit silencing equipment to plant, e.g. baffles/mufflers; • Install a drainage layer underneath the processing area to provide adequate leachate drainage from composting organics. This may consist of a bed of coarse material such as wood chips, or alternatively the processing platform may permanently incorporate a drainage layer designed to withstand the loading, working and removal of material. For small-scale compost facilities or in dry areas, an adsorbent material can be incorporated in the compost and at the base of the pile; • The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate;	PIU	PMU

[29]https://www.ifc.org/wps/wcm/connect/456bbb17-b961-45b3-b0a7-c1bd1c7163e0/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES&CVID=nPtgwEW

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• If windrows system is selected, design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration; • If windrows system is selected, use windrow turning equipment that is specially designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles; • Store leachate in a lined earthen basin or in aboveground storage tanks; • Provide a fire alarm system, including temperature sensors in the waste being treated; and • Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.		
Fecal Sludge Treatment Plant Design	Inappropriate or insufficient design could lead to not only environmental catastrophe (e.g., surface water pollution, groundwater contamination, etc.) but to community and occupational health and safety as well (e.g. odor nuisance, proliferation of disease vectors in nearby communities, etc.).	• Design septage collection system with appropriate collection vehicles and equipment to service all households; no manual handling of septage, and there shall be no transfer of septage from one collection vehicle to other; collected septage shall be transported directly to septage plant for disposal • If sludge treatment will use an anaerobic digester with biogas recovery, operate under thermophilic digestion conditions, in order to increase the pathogen destruction, biogas production rate (hence higher energy recovery) and the retention time; • Design the septage treatment facility to meet the effluent discharge standards • If material balance shows significant amount of supernatant liquid, ensure to design a treatment facility that will treat the liquid waste to compliance level prior to discharge. This liquid waste may also be co-treated in the leachate treatment plant of the landfill facility, provided that the	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		design of the same could allow such kind and volume of waste; and • For the dried fecal sludge, opt to dispose in the landfill facility. An option for land application should be based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements.		
Landfill Design	Inappropriate or insufficient design not following national and international best practices and standards could lead to not only environmental catastrophe but to community and occupational health and safety as well	• Ensure that the recommended methods to control and monitor noise and vibration per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following: a. Construct a buffer zone between the facility and the external environment or locate facilities away from sensitive receptors; b. Include noise and vibration considerations during design, including use of models to predict noise levels at specified noise-sensitive locations, using standardized sound power levels for construction plant; c. Use acoustic screens around fixed/mobile plant and equipment; d. Select equipment that has low noise emission levels; and e. Fit silencing equipment to plant, e.g., baffles/mufflers; • Ensure that the recommended methods to control and monitor litters and air emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following: • Consider use of enclosed/covered areas for waste tipping, shredding, compacting, etc.; • Install catch fences and netting to trap windblown litter; • Select vehicles and containers that minimize air emissions during waste loading and unloading; • Design drop-off points to minimize queuing of vehicles; • Use enclosed waste handling and storage areas for	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		malodorous wastes or wastes that generate hazardous dust (e.g., asbestos). Enclosed waste storage and handling areas are preferred for all wastes; • Provide perimeter planting, landscaping, or fences to reduce wind. Indigenous/native species will be preferred in planting; • Construct temporary banks and bunds immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest downwind crest, and/or fully enclose of the tipping area within a mobile litter net system; and • Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility. • Ensure that the recommended methods to control and monitor effects of landfill leachate per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following: • Use of low-permeability landfill liners to prevent migration of leachate as well as landfill gas; • Ensure water table depth requirement of at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development; • Inclusion of a leachate collection and treatment system based on prior measurement and recording of the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems; • Installation of groundwater monitoring wells outside the landfill perimeter at locations and depths sufficient to evaluate whether leachate is migrating from the landfill into the uppermost groundwater unit. This groundwater monitoring network should usually include, at a minimum, one monitoring well located in the upgradient groundwater flow direction from the landfill and two monitoring wells located in the down gradient direction.		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		The groundwater monitoring system should be consistent with applicable national regulations and internationally recognized standards; and • Regular sampling from the monitoring wells and analyze for constituents, selected based on: • The types, quantities, and concentrations of constituents in wastes managed in the landfill; • The mobility, stability, and persistence of waste constituents their reaction products in the unsaturated zone beneath the waste management area; • The detectability of indicator parameters, waste constituents, and reaction products in ground water; • The constituent concentrations in the groundwater background; • Use impermeable materials for roads, waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas. • Ensure that the recommended methods to control and monitor landfill gas emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following: · Inclusion of landfill gas collection system designed and operated in accordance with applicable national requirements and recognized international standards including recovery and pre-use processing or thermal destruction through an efficient flaring facility. Prevention of condensation from accumulating in extraction systems by arranging the pipe work to fall to a removal point such as a knock out-pot. · Use of landfill gas as fuel if practical, or treat before discharge (e.g., by using enclosed flare or thermal oxidation if methane content is less than about 3 percent by volume). · Use of gas blowers (boosters) of sufficient capacity for the predicted gas yield and constructed of materials		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		appropriate for landfill gas duty; blowers should be protected by flame arrestors at both gas inlet and outlet. · Installation and regular sampling from boreholes surrounding the landfill to monitor for migration of landfill gas. • Ensure that the recommended methods to control dust and odor emissions per World Bank's EHS Guidelines on Waste Management Facilities are integrated in the design, such as the following: 1. Compaction and covering of waste promptly after discharge from the vehicle delivering the waste; 2. Minimization of open tipping face area. Consider inclusion of perimeter and other litter fencing designs to ensure reduction of wind velocity crossing the site, particularly at the proposed tipping area; 3. Disposal of odorous sludge in covered trenches; 4. Restriction on the acceptance of loads known to be particularly odorous; 5. Restriction on tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors); 6. Sealing of sump covers; and 7. Aeration of leachate storage areas. • Installation of bund walls around the facility site; Estimation of the total volume of the solid wastes currently dumped at the site, and inclusion of this estimate into the capacity design calculations of the landfill facility. Expectedly, these dumped wastes should be managed and accommodated upfront once the landfill cells are built		
Natural Hazards and Climate Change	The risk of flooding is high in the area and any flood events could potentially inundate the site and damage all structures that will be built over it.	• Structural designs of the facility components shall comply with the Bangladesh Building Code or the recommendations of related climate change risk vulnerability and adaptation assessment, whichever is more stringent, to ensure the structures can withstand earthquakes and climate-induced events in the future; • Land development and site preparation by raising to a level higher than the surrounding area and based on the	DDC	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject; • Installation of sufficient number of canals and appropriate drainage system within the facility area, ensuring that volume of rainwater is handled even when the highest predicted precipitation occurs • Construct peripheral drains and bunds to ensure that runoff from upper areas do not enter the facility (entire facility area including landfill, compost plant and septage plant) , and safety diverted into natural drainage without any hindrance • Provide proper fencing / walls around the facility at least 10-20 m wide green buffer zone with tree plantations all around Stabilize slopes and unstable land masses within the facility		
Landslide Prevention	The land use changes may result in landslides during extreme weather events. However, Bandarban Town is not known to be traditionally associated with occurrence of landslides.	1 Incorporate landslide proof designs at locations where land use changes are being proposed. This includes the IWTP site where a hill is located at the northern periphery of the site. .	PMU	DPHE
Issuance of Consents, Permits and Clearances	Any delay in the preparation of environmental impact assessment (EIA), approval of the EIA and issuance of environmental clearance certificate (ECC) will potentially delay the execution of the subproject	2 PMU to coordinate with the Department of Environment to start the EIA process, which would include the application for a location clearance certificate (LCC) for the proposed site. 3 Considering the timeline for EIA process and the timetable on the approval of LCC and ECC, PMU to initiate this measure alongside the finalization of the detailed design.	PMU	DPHE
Compliance with ADB Loan Agreement and SPS	Mitigation measures are not normally budgeted in the contract cost due to general lack of awareness by most contractors on	4 Update this IEE in case of change in design based on the final detailed design and submit the same for review and clearance of ADB; 5 Incorporate into the bidding and contract documents the cost of implementing OHS and the EMP as well as specific	PMCSDRC, PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	ADB SPS and EMP requirements	provisions requiring the Contractor to comply with all other conditions required by ADB; and 6 Once the Contractor is selected, arrange the conduct of awareness training for contractors on their responsibilities in EMP and OHS implementation, in compliance with ADB and government requirements, self-monitoring and reporting procedures.		
Pre-Construction Phase				
Contractor Mobilization	Contractor may mobilize without fulfilling all pre-construction requirements pertaining to the implementation of the requirements of this IEE and environmental management plan (EMP)	7 Designate a full-time Environmental Health and Safety Officer (EHSO); 8 Develop a Solid Waste Management Plan to manage the dumped solid wastes at the site. This plan should be consistent with the design phase measures recommended in this IEE study; 9 Develop a site-specific EMP (SEMP) that will be approved by PMU/PIU based on the EMP of this IEE report. The SEMP should include all subplans as may be required such as traffic management plan, spoils management plan, dust management plan, construction and domestic waste management plan, water quality management plan, and emergency preparedness and response plan, among others; 10 Develop a specific Health and Safety Plan, that will include a Health and Safety COVID-19 Plan in accordance with relevant government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, to international good practice guidelines such as World Health Organization. 2020;	Contractor	PMU, PMU, PIU, PMCSDRC
Workers / Labor Camps	Unplanned construction of workers or labor camp without basic amenities could result in stress of workers and degradation of the local environment. It is important that these camps be provided with sanitary amenities at designated areas.	11 Establish construction camps following local standards or regulations, if any. Separately, contractor may follow the guidance note developed by the International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) entitled “Workers’ accommodation: processes and standards (A guidance note by IFC and the EBRD), 2009”.	Contractor	PMU, PMU, PIU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
Biodiversity – protected species	Damage / disruption of protected species – although there are no such species within or close to project sites, given that wider district area has protected species, precautionary approach is necessary to avoid any impacts	**Pre construction phase** • Conduct site verifications again prior to start of construction; if species of interest are found on-site, ensure that the findings are recorded and reported to the PMU. • No disturbances or works on the site should start/continue until PMU issues clearance to proceed. Measures to restrict poaching or hunting shall be put in place. • Conduct training and awareness to workers and staff • For contractors working in areas where species of interest are present, the toolbox talk should include reminders and actions required related to biodiversity conservation as specified in SOP and the environmental management plan (EMP) **Construction phase** • Follow the standard operation procedures for construction developed by Biodiversity expert • Avoid working at night to reduce disturbances for nocturnal animals • Avoid unnecessary removal of trees and vegetation • Monitor the area for these creatures to ensure they are well away from the site – safely scare them away if they are too close to the site. • Areas reserved for future development at the site shall be made up of green by growing grasses and shrubs and herbs • Use only existing licensed quarries for sourcing aggregates. • Avoid introduction of new invasive species to, and spread of existing invasive species within • Barricade the construction site with controlled entry and exit, ensure that no wild animals enter the sites to avoid any accidents • Maintain natural courses of rivers and streams without any obstruction • Restore temporary diversions to their natural courses as soon as possible, if put any.	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Store chemicals and oils in secure, impermeable containers. • Equip construction camps with sanitary latrines that do not pollute surface waters. • Install low noise pump set and proper maintenance to avoid excessive noise generation. • Prohibit hunting by staff and contractor, with heavy penalties applied. • Train staff and contractor in good environmental practice and prohibited activities. 12 Ensure contractors supply all necessary food, cooking fuel and appropriate housing		
Issuance of Other Local Permits and Clearances	Other local permits, clearances and no-objection certificates are not issued immediately and may take time. Without obtaining these local statutory requirements alongside the national statutory requirements such as ECC, the implementation of the subproject may be delayed.	13 PMU to ensure that no construction activities shall be undertaken until all local (including national level) statutory requirements are complied with.	Contractor, PIU	PMU, PMU, PMCSDRC
Disruption of Existing Utilities	Construction activities may disrupt existing utilities installed underground, leading to undue disturbance to users of these utilities in the area.	14 Conduct investigation at site to determine all the existing utilities that will likely be disturbed during construction phase; and 15 Coordinate with agencies responsible for the maintenance of the utilities and formulate a plan to minimize disruption of services during construction phase. The plan must be formulated in coordination with DPHE and stakeholders at the site. Where required, the responsible agency shall be requested by PIU to carry out the necessary works at the time required and at the cost of the subproject.	Contractor, PIU	PMU, PMU, PMCSDRC
Physical Cultural Resources	The subproject sites are not located close to any archeological sites that could be impacted.	• Create awareness among the workers, supervisors and engineers about the chance finds during excavation work.	PIU	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Stop work immediately to allow further investigation if any finds are suspected. 16 Inform Bangladesh Department of Archaeology if a find is suspected and take any action, they require to ensure its removal or protection in situ		
Material Sourcing	A significant amount of gravel, sand and aggregates will be required for the civil construction works of the subproject. Sourcing these construction materials from unscrupulous sources could negatively impact the environment wherever these are illegally sourced.	17 Bid documents should include a clause on material sourcing that will require the Contractor to source construction materials from legal or government-approved sources only; 18 No new quarry sites shall be used for the subproject; 19 Verify suitability of all material sources and obtain approval of PMU/PMU or PIU; and 20 Document all sources of materials and include in the monthly reporting to the PIU.	Contractor, PIU	PMU, PMU, PMCSDRC
Community Awareness	Lack of community awareness on subproject activities, particularly prior to the construction phase, may result in potential community safety concerns and complaints.	21 Undertake a meaningful consultation with the affected communities. This meaningful consultation will aim to engage community stakeholders, listen to their views, and try to come to a common understanding about the need for an improved drainage system and the sacrifices that need to be made to achieve it. To aid in the consultation process, it is important that the community should be made aware of the details of project activities. Important information to be disseminated to the people are, among others, the following:: **21.1** Overview and updates on the proposed subproject; **21.2** Final detailed design of proposed subproject components; **21.3** Potential environmental and social impacts (positive and negative) of the subproject, and the proposed mitigation measures for the perceived negative impacts; and **21.4** Grievance redress mechanism and contact details of the subproject.	Contractor, PIU	PMU, PMU, PMCSDRC
Construction Phase				

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
Soil Erosion and Sedimentation	Excavation activities at the site will generate loose soil which can be carried through surface run-off during a rainfall.	22 The Contractor shall minimize surface excavation works during the rainy season where practicable; 23 The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered; 24 Any borrow pits established by Contractor near the site should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to prevent the development of erosion problems; 25 Channels, earth bunds, netting, tarpaulin and/or sandbag barriers shall be used on site to manage surface water runoff and minimize erosion; 26 The overall slope of the works areas and construction yards shall be kept to a minimum to reduce the erosive potential of surface water flows; and 27 Monitor groundwater quality that could exist close to the working areas to ensure compliance.	Contractor	PIU, PMU, PMU, PMCSDRC
Surface Water Quality	Silt-laden run-off from stockpiled materials, solid wastes and domestic wastewater from the construction camp, and leaks from chemical storage areas and machineries may nearby stream or pollute ultimately Sangu river. Oil leakage from the operation of machineries and heavy equipment may also cause pollution to these surface water bodies.	28 All temporary discharge points shall be located, designed and constructed in a manner that will minimize erosion in the receiving channels; 29 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; 30 Use surplus soil for beneficial purposes such as in any other construction activities, or to raise the level of low lying areas at the site; 31 Avoid scheduling of excavation work during the monsoon season. Earthworks should be scheduled during dry season; 32 Confine construction area including the material storage (sand and aggregate) so that runoff will not enter the site; 33 Ensure that drains are not blocked with excavated soil; 34 Stockyards at least 50 meters (m) away from watercourses; 35 Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume; 36 Daily control of machinery and vehicles for leakages; 37 No obstruction in flowing water; 38 For effluents from workplace, camps, and offices, provide treatment arrangements such as retention ponds and septic tanks which should be incorporated in the facility designs. A	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		sewage management plan has to be prepared by the Contractor and agreed with the PMCSDRC; and 39 Monitor water quality according to the environmental monitoring plan. For management and final disposal of solid wastes following mitigation, Contractor will be required to apply the follow-up measures such as: 40 Collection of recyclable solid wastes and supply to scrap vendors; 41 Ensure all the camp wastes and construction wastes are placed in the designated waste collection pits away from receiving water; 42 Establishment of separate storage area protected with impermeable lining bunded 110% by volume for the all the toxic material wastes, including batteries, oil filters, burnt oils, etc. at the construction site; and 43 Consultation with PIU on the proper disposal of all residual wastes. However, these wastes can be properly stored at the site and will be included in the residual wastes that will be landfilled in the future during the operation phase of the subproject.		
Groundwater Quality	Increased demand for groundwater is anticipated during the construction phase for construction activities and personal consumption by workers. Uncontrolled extraction of water may affect availability of water to locals. In addition, construction waste, if left unattended, will result in percolation of leachate through the soil strata reaching the groundwater table and contaminating it.	44 The Contractor will undertake groundwater quality sampling and analysis to ensure that water from tube wells is in compliance with the drinking water quality standards. If the groundwater quality does not comply with the standards, the contractor will source quality drinking water supply for its workers from other sources (e.g. bottled water from commercial sources or bulk drinking water from drinking water treatment and refilling stations) at its own cost. 45 Prevent pollutants from contaminating the soil and the groundwater. 46 All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned; 47 Storage of lubricants and fuel at least 50 m from water bodies; 48 Storage of fuel and lubricants in double hulled tanks. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110%;	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		49 Daily control of machinery and vehicles for leakages; 50 Collection of waste during construction activities; 51 Provide uncontaminated water for dust suppression; and 52 Enclose the construction area to prevent unauthorized access.		
Drainage Congestion	Construction material getting into surface run off or uncontrolled disposal may cause drainage congestion.	53 Adopt a site clearance procedure that separates topsoil and stores it under appropriate conditions for reuse as instructed by the Engineer in charge at the site. 54 Wastes and construction debris will not be disposed in a manner that these would end up in drainage canals. 55 The on-site storage of excessive quantities of unwanted spoil and aggregate materials should be avoided. 56 Where storage is necessary, the Contractor shall ensure heaps and stockpiles are located at sites that they do not permit direct runoff into watercourses and are on land sloping at less than 1.5%. 57 All heaps shall be of a size and stability that will ensure the risk of mass movement during period of heavy rainfall is minimized.	Contractor	PIU, PMU, PMU, PMCSDRC
Ambient Air Quality	Degradation of ambient air quality due to sources (mobile, stationary, area) of emissions from the subproject	58 Take every precaution to reduce the levels of dust at construction site, and not exceeding the pre-project ambient air quality standards; 59 Fit all heavy equipment and machinery with air pollution control devices that are operating correctly; 60 Vehicles travelling to and from the construction site must adhere to speed limits to avoid producing excessive dust; 61 Reduce dust by spraying stockpiled soil, excavated materials, and spoils; 62 Cover with tarpaulin vehicles transporting soil and sand; 63 Cover stockpiled construction materials with tarpaulin or plastic sheets; 64 Heavy equipment and transport vehicles shall move only in designated areas and roads; 65 Water spraying to access roads, camp sites and work sites to reduce dust emissions; 66 Machines and vehicles must be regularly examined and maintained to comply with requirements of technical specifications; 67 All vehicles, equipment, and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		requirements of DOE. Copies of conformance will be submitted regularly to the PMCSDRC; 68 Repair and maintain access roads, as necessary; 69 Monitor air quality according to the environmental monitoring plan; 70 Clean wheels and undercarriage of vehicles prior to leaving construction site; 71 Prohibit burning firewood in work and labor camps (promote liquified petroleum gas for cooking purposes and electric heater for heating purposes); 72 Use vehicles that have government-issued permits and registrations; and 73 Prohibit open burning of solid waste.		
Ambient Noise Level	Construction activities generate noise that could disturb receptors such as the workers themselves and others in nearby community.	74 Provide prior information to the local public, including households, near the site, if any, that may be affected, about the work schedule; 75 Use equipment that emits the least noise, well-maintained and with efficient mufflers. Install silencers if necessary and practical; 76 Restrict noisy activities to day time when background noise is relatively higher; 77 Avoid use of noisy equipment or doing noisy works at night time, especially near residential houses if any; 78 Limit engine idling to a maximum of one minute; 79 Spread out the schedule of material, spoil and waste transport; 80 Minimize drop heights when loading and unloading coarse aggregates; 81 Avoid use of horns unless it is necessary to warn other road users or animals of a vehicle's approach; and 82 Implement a complaints handling system of the grievance redress mechanism.	Contractor	PIU, PMU, PMU, PMCSDRC
Construction Waste Generation	Construction activities generate considerable quantities of waste soil and other solid wastes. Indiscriminate disposal of the soil and waste, excess construction material, concrete, packing materials,	83 Use excess spoils to elevate low lying portions of the site; 84 The Contractor should take every opportunity to reduce the amounts of waste generated and collect recyclable material for processing by local operators; 85 Contractor shall implement waste segregation on site; 86 Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of properly;	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	containers, lubricants and oils may affect the soil, landscape and aesthetics of local environment and the worker's and community's health and safety.	87 Construction waste should also be disposed of properly. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future; 88 Clean construction waste such as excess soil or rubble should be used in landscaping or elevating low lying areas on site as part of the land development and site preparation; 89 Maintain waste auditing by recording the quantity in tons and types of waste and materials leaving site during the construction phase. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future; 90 Waste fuels/oils may be generated from equipment used on-site during construction and may be classified as hazardous waste. Such wastes will be stored in an are that is protected with lining, secure, and bunded 110% by volume on-site prior to collection by authorized transporters; and 91 Remove all wreckage, rubbish, or temporary structures which are no longer required.		
Construction of Drainage System / Open channel for storm / treated water discharge	Construction activities generate considerable quantities of waste soil and other solid wastes. Indiscriminate disposal of the soil and waste, excess construction material, concrete, packing materials, containers, lubricants and oils may affect the soil, landscape and aesthetics of local environment and the worker's and community's health and safety.	92 Use excess spoils to elevate low lying portions of the site; 93 The Contractor should take every opportunity to reduce the amounts of waste generated and collect recyclable material for processing by local operators; 94 Contractor shall implement waste segregation on site; 95 Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of properly; 96 Construction waste should also be disposed of properly. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future; 97 Clean construction waste such as excess soil or rubble should be used in landscaping or elevating low lying areas on site as part of the land development and site preparation; 98 Maintain waste auditing by recording the quantity in tons and types of waste and materials leaving site during the construction phase. If there is no available disposal site, Contractor should be able to segregate these at the site. These wastes will be dealt with by the facility once it becomes operational in the future;	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		99 Waste fuels/oils may be generated from equipment used on-site during construction and may be classified as hazardous waste. Such wastes will be stored in an are that is protected with lining, secure, and bunded 110% by volume on-site prior to collection by authorized transporters; and 100 Remove all wreckage, rubbish, or temporary structures which are no longer required. 101 Adequate measures for intercepting and collecting water for discharge at downstream end.		
Aquatic Resources	Any discharge from the site will impact the quality of the nearest stream	102 Use excess spoils in low lying areas at the site; 103 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; 104 Silt traps to be provided at construction area 105 No equipment or machinery shall be operated outside the work areas; 106 Avoid spillage of fuels, chemicals and lubricants. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume; 107 Ensure that drains are not blocked with excavated soil; 108 Locate stockyards away from the nearest streams 109 For effluents from construction camps and offices, provide treatment arrangements such as retention ponds and septic tanks which should be incorporated in the facility designs; 110 Monitor water quality according to the environmental monitoring plan; 111 Clean up of the area after the completion and prior to the onset of monsoon season; and 112 Avoid or stop site clearance and grading works during heavy rains. Avoid scheduling of excavation work during the monsoon season. Earthworks should be undertaken during dry season.	Contractor	PIU, PMU, PMU, PMCSDRC
Physical Cultural Resources	While Lama District is not a potential archaeological area, there is a possibility of chance finds during excavation activities.	113 Implement the following measures in the event of a chance finds during excavation activities: **113.1** Strictly follow the protocol by coordinating immediately with PIU and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works; **113.2** Stop work immediately to allow further investigation if any finds are suspected; and	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		113.3 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.		
Occupational Health and Safety	Safety risks and health issues arise from storage, handling and transport of hazardous construction material. Construction workers are also at risk of accidents due to moving vehicles, and other construction related activities. Workers are also exposed to high level of pollution from dust, exhaust of vehicles and machinery and noise. Further, if workers do not keep to regulated working hours, the risk of accident events will be higher due to fatigue. Insufficient supply and improper use of personal protective equipment (PPE) and lack of safety procedures may cause injuries or fatal accidents. Spread of COVID-19 is also a risk to manage among workers.	114 All relevant provisions of the Bangladesh Labor Act, 2006 and relevant WHO guidelines will be adhered to, concerning the provision of adequate measures to avoid contracting and/or spreading diseases during construction phase; 115 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; and EHS Guidelines on Waste Management Facilities.[30] These practices include recommended measures to prevent, minimize and control health and safety issues including pathogens from inflicting workers through training and use of appropriate PPEs, clothing and equipment when working in waste management facilities. 116 Work area and facility may present hazardous working conditions in some places due to lack of oxygen and flammable nature of methane emissions which will be detrimental to the health and safety of workers. Put in place standard operating procedures with appropriate equipment, and workers are provided with necessary training and personnel protection equipment to safeguard health and safety 117 Follow established occupational health and safety protocol on emerging infectious diseases such as the corona virus disease (COVID-19). See Appendix 3 for a sample guidance note in responding to COVID-19; 118 A readily available first aid unit, including an adequate supply of sterilized dressing material and appliances, will be provided as per the factory rules. Suitable transport will be provided to facilitate the transfer of injured or ill persons to the nearest hospital; 119 Other first aid medical equipment and nursing staff will be made available or arranged on-call;	Contractor	PIU, PMU, PMU, PMCSDRC

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

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		120 The Contractor will, at his own expense, conform to all disease prevention instructions as may be given by PMU/PMU and/or PIU; 121 Provide regular health check-ups, sanitation and hygiene, health care, and control of epidemic diseases to the workforce; 122 The Contractor shall provide at cost all labor and materials and construct/install and maintain site safety, hard barricading, flexible green net, signboards, temporary day/light traffic diversions throughout the construction activities according to the specifications and provide free of charge personal protective equipment (PPE) to all the laborers working at the construction site; 123 Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards; 124 Make available first aid kits, ambulance facilities, and fire extinguishers in camp sites, if any; 125 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 126 Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.		
Community Health and Safety	While the site is far from residential areas and busy areas of the Pourashava, some community people may still chance to roam near or within the site. Thus, there is also a serious threat to these pedestrians, other community people, and including animals, due to moving heavy equipment or electrocution at the site. There may also be risk of accidental fall of these community people	127 Code of conduct for workers includes restricting workers in designated areas, no open defecation, no littering, no firewood collection, no fire except designated places, no trespassing, no residence at construction sites, and no obligation to potentially dangerous work; 128 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; 129 Follow established community health and safety protocol on emerging infectious diseases such as COVID19. See Appendix 3 for a sample guidance note in responding to COVID19; 130 Implement measure to prevent proliferation of vectors of diseases at work site;	Contractor	PIU, PMU, PMU, PMCSDRC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	or animals in excavated areas.	131 Maintain a complaint logbook in worker's camp and take action promptly of complaints. Follow the established GRM of the overall project (CTCRP); 132 Schedule transportation activities by avoiding peak traffic periods; 133 Clean wheels and undercarriage of haul trucks prior to leaving construction site; 134 Educate drivers: limit speed not more than 30 km/h in settlements and avoid use of horn; 135 Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement; 136 Provide adequate space and lighting, temporary fences, reflectorized barriers and signages at the work site; and 137 Ensure Contractor has staff trained on emergency response.		
Post-construction Clean-up and Reinstatement	Construction debris, spoils, and excess construction materials may pose hazards to properties, community and environment if left unattended after construction.	138 Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; 139 All damaged roads leading to the site shall be reinstated to original condition; 140 All disrupted utilities restored; 141 All affected structures rehabilitated/compensated; 142 The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up; 143 All hardened surfaces within the construction camp area shall be ripped; 144 All imported materials removed, and the area shall be top-soiled and revegetated; 145 The Contractor must arrange the cancellation of all temporary services; 146 Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	Contractor	PIU, PMU, PMU, PMCSDRC
Operation Phase				
Littering and Clandestine Dumping	Waste collection, storage, and transport of solid wastes could lead to littering and indiscriminate dumping in the streets of	147 Encourage use of containers or bags for waste at the point of collection for each household and establishment; 148 Implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage;	Operator of IWTP Facility	DPHE, Lama Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	Lama Pourashava and along the path of solid waste transports leading to the IWTP facility.	149 Use vehicles appropriate for the geographic conditions and waste types to maximize reliability of collection (e.g., compactor trucks may be appropriate for neighborhoods with wide streets and low-density trash, while smaller vehicles may be appropriate for neighborhoods with narrow streets and higher-density garbage); 150 Encourage separation of recyclable materials at the point of generation, so that the collection points do not become sorting points for informal sector waste pickers; 151 Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter; 152 Clean vehicles used for waste hauling before transportation of any goods, including compost; 153 Encourage residents to put waste out at designated times and locations; and 154 Where possible, block off access to dumping sites and penalize illegal dumpers.		
Air Emission from Storage and Transport	Waste collection, storage, and transport of solid wastes could lead to air emission causing nuisance and respiratory health risks to workers and residents of Lama Pourashava.	155 Establish frequent waste collection schedules; 156 Select vehicles and containers that minimize air emissions during waste loading and unloading; 157 Institute a washing program for waste collection vehicles and for company-owned waste collection and transfer containers; 158 Promote the use of bags to reduce the odors from soiling of waste collection and transport equipment; 159 Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions; 160 Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure; 161 Drivers should also be instructed on the benefits of driving practices which reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits; 162 Sweep waste management areas and roads frequently and use water spray for dust control where needed; 163 Pre-treat wastes as needed (e.g., solidification, encapsulation, or wetting sufficient to reduce dust but without forming leachate);	Operator of IWTP Facility	DPHE, Lama Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		164 Use enclosed waste handling and storage areas for malodorous wastes. Enclosed waste storage and handling areas are preferred for all wastes; 165 Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions (e.g., bag filter); 166 Remove, treat, or dispose of all biological/malodorous wastes in an expeditious manner; and 167 Use odor-neutralizing sprays where necessary.		
Noise and Vibration	Operation of the various subcomponents of the IWTP facility will potentially produce noise and vibration that could harm the welfare of the workers and communities surrounding the facility.	For the IWTP Facility: 168 Construct a buffer zone between the facility and the external environment; 169 Maintain site roads in good condition to reduce noise and vibration from vehicle movements; 170 Use acoustic screens around fixed/mobile plant and equipment; 171 Select equipment that has low noise emission levels; 172 Fit silencing equipment to plant, e.g. baffles/mufflers; and 173 Use buildings to contain inherently noisy fixed plant equipment (e.g., locate waste shredder in the tipping hall, and enclose tipping hall on all sides) and consider use of sound-insulating materials in construction.	Operator of IWTP Facility	DPHE, Lama Pourashava
Fire and Explosions	Accumulation of various forms of gases in the Composting Plant and landfill gas from the landfill cells could potentially lead to fire and explosion affecting the lives of workers in the facility and any passersby in the surrounding areas.	For Composting Plant: 174 Avoid conditions that can lead to spontaneous combustion (e.g., moisture between 25 – 45 percent and temperatures above about 93ºC. This can be achieved for example by keeping windrows (if windrows is adopted) less than about 3m high and turning them when the temperature exceeds 60ºC); and For Landfill: 175 Ensure landfill gas collection and control system is working efficiently. Collect biogas for use or treatment (e.g. energy recovery or flaring).	Operator of IWTP Facility	DPHE, Lama Pourashava
Surface Water and Groundwater Quality	Landfill operation could pollute nearby water bodies or groundwater due to discharge or percolation of generated leachate from the facility operations, wastewater	For all subcomponents (MRF, Composting Plant, FSTP, Landfill): 176 Ensure all dedicated sanitation facilities at site such as septic tanks are maintained; For the Composting Plant: 177 Maintain ideal composting conditions such as:	Operator of IWTP Facility	DPHE, Lama Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	from routine cleaning and maintenance of heavy equipment and vehicles, and wastewater as a result of domestic use at the facility.	8. Carbon: nitrogen (C:N) ratio between 25:1 and 35:1; 9. Moisture content of 50 to 60 percent of total weight during treatment (and less than 50 percent for marketing following screening); 10. Balance between particle size and void space to promote rapid decomposition. Void space should be sufficient to achieve a 10 to 15 percent oxygen level within the pile in aerobic systems; 11. Optimum temperature levels which can range between 32 and 60 degrees Celsius. Pathogen destruction can be achieved by attaining and maintaining a temperature of 55 degrees Celsius for three days in a vessel composting system or 15 days in a windrow system; and 12. pH of between 6 and 8; <u>For the FSTP</u>: 178 If using anaerobic digestion process, maximize recycling of wastewater to the reactor; 179 If using anaerobic digestion process, measure total organic carbon (TOC), chemical oxygen demand (COD), nitrogen (N), phosphorus (P) and chlorine (Cl) levels in the inlet and outlet flows from an anaerobic digester. When a better control of the process is required, or a better quality of the waste output, monitoring of additional parameters may be necessary; 180 If using anaerobic digestion process, operate the anaerobic digester under thermophilic digestion conditions, in order to increase the pathogen destruction, biogas production rate (hence higher energy recovery) and the retention time; <u>For the Landfill and LCTS</u>: 181 Regularly check and ensure the leachate collection and treatment system (LCTS) is efficiently functioning per design; 182 During dry season, recirculate collected leachate back into the landfill mass, with any excess treated to compliance level prior to discharge; 183 Maintain site drainage system and; ensure no section is blocked or damaged;		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		184 Minimize the daily exposed working face and use perimeter drains and landfill cell compaction, slopes and daily cover materials to reduce infiltration of rainfall into the deposited waste; 185 Prevent run-on of precipitation into the active area of the landfill (e.g., by use of berms or other diversions); systems should be designed to handle the peak discharge from a 25-year storm; and 186 Collect and control run-off from the active area of the landfill; the system should be designed to handle the discharge from a 24-hour, 25-year storm. Runoff is typically treated together with leachate from the site.		
Ambient Air Quality	Landfill operation could affect the air quality in the are due to generation of gaseous pollutants from the landfill, and generation of gaseous pollutants and noise from the use of heavy equipment and vehicles at the site.	For all subcomponents (MRF, Composting Plant, FSTP, Landfill): 187 Ensure proper operation and cleanliness of the treatment facilities; 188 Regularly inspect and maintain backup power supplies to ensure uninterrupted operation during power failure; and 189 Proper and regular maintenance of generator sets and vehicles; For the Landfill: 190 Periodically monitor the generated landfill gases, including their concentrations, and ensure landfill gas collection/trap system is efficiently functioning. Landfill gasses include harmful substances, such as hydrogen sulfide, methane gas. Monitoring of landfill gasses is essentially required to protect the health and safety of operation staff and the nearby communities; 191 Ensure inspection of conditions of lift stations; and 192 Regularly the associated automatic transfer switch of the backup power at the lift stations to ensure uninterrupted operation during power failure.	Operator of IWTP Facility	DPHE, Lama Pourashava
Community and Occupational Health and Safety	Operation of the IWTP facility could affect the health and safety of workers and community people in the area due to the following:	193 For all components [Waste Collection and Transport, Secondary Storage and Transport, and IWTP Facility (MRF, Composting Plant, FSTP, Landfill)]: 194 Apply insecticide or chemicals as necessary to control proliferation of disease vectors; 195 Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “B” (in consultation with appropriate physicians);	Operator of IWTP Facility	DPHE, Lama Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	○ Nuisance odors and disease vector infestation from the landfill operations; ○ Increased traffic volume along the access roads to the project site, threat to road/public safety, and community and occupational safety and health risks from the use of heavy equipment and vehicles; and ○ Possible increase in crime incidence with the influx of workers ○ Lack of oxygen and risks related to flammable methane emissions	196 Maintain work areas to minimize slipping and tripping; 197 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; and EHS Guidelines on Waste Management Facilities.[31] These practices include recommended measures to prevent, minimize and control health and safety issues including pathogens from inflicting workers through training and use of appropriate PPEs, clothing and equipment when working in waste management facilities. 198 199 Work area and facility may present hazardous working conditions in some places due to lack of oxygen and flammable nature of methane emissions which will be detrimental to the health and safety of workers. Put in place 200 standard operation procedures with appropriate equipment, and workers are provided with necessary training and personnel protection equipment to safeguard health and safety. 201 Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate PPE; 202 Provide all the personal protective equipment like gum boots, nose mask, gloves etc. for the protection of workers; 203 The workplace will be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment will be periodically inspected and maintained in good working condition; 204 Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work; 205 Medical check-up will be conducted on regular basis and the health conditions will be monitored; 206 First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility;		

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

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		207 Maintain good housekeeping in waste processing and storage areas; 208 Conduct detailed identification and marking of all electrical connections prior to any maintenance work; 209 Use specially trained personnel to demount electrical parts; 210 Provide safe means of access and egress from confined places, such as stairs and ladders, and safety ropes; 211 Avoid operating combustion equipment for prolonged periods unless the area is actively ventilated; and 212 Avoid exposure to excessive noise levels beyond permissible limits set out by local and international regulations. For the FSTP: Use functioning vacuum trucks for removal of fecal sludge to avoid manual works; For the Landfill: 213 Apply of soil cover as soon as possible during the landfill operation; 214 The landfill activities should be carried out properly and effectively to reduce the emission of unpleasant odor. It is possible for odor levels to increase on a sunny day following a downpour. At this instance, immediately undertake soil cover to minimize odor problem. Spraying deodorants or other appropriate measures shall be taken if the odor level is high in the peripheral area;		
Decommissioning / Abandonment Phase				
Abandonment Plan	Without proper abandonment plan, the landfill facility will be a potential source of air, water and groundwater pollution, and may also pose community health and safety risks in the future.	In the interim, all closure and rehabilitation works shall be in accordance with an approved closure plan by the government through the DOE. Any equivalent plan applicable for the facility as may be required or promulgated by new laws or regulations in the future will be followed. In the event that no specific plan is required during the abandonment phase, the project will ensure that the planning for closure of the facility includes the elements per EHS Guidelines on Waste Management Facilities, as follows: Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future land use (as defined in consultation with	Operator of IWTP Facility	DPHE, Lama Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		local communities and government agencies), closure schedule, financial resources, and monitoring arrangements; Evaluation, selection, and application of closure methods consistent with post- closure use and which should include the placement of a final cover to prevent further impacts to human health and the environment; Application of final cover components that are consistent with post closure use and local climatic conditions. The final cover should provide long term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs; and Financial instruments in place to cover the costs of closure and post-closure care and monitoring.		
Other potential issues	Possible seepage of leachate	Proper drainage must be ensured to minimized seepage of rainwater into the landfill cells that may enhance generation of leachate. Water quality monitoring of the nearby Harikhola khal and Bhairab river, and groundwater sources shall continue during the abandonment phase of the facility.	Operator of IWTP Facility	DPHE, Lama Pourashava
	Possible release of landfill gases	Monitoring of the landfill gases shall be carried out until the time as it is ensured that the level of landfill gases is low enough against the impact level to the surrounding environment. Appropriate measures, such as periodic burning of methane gas, may be taken to promote releasing gases and earlier decomposition.	Operator of IWTP Facility	DPHE, Lama Pourashava

ADB = Asian Development Bank; DDC = Detailed Design Consultant, DPHE = Local Government Engineering Department; PIU = Project Implementation Unit; PMCSDRC = Project Management and Supervision Consultant; PMU = Project Management Unit; PMU = Regional Project Management Unit; SPS = Safeguard Policy Statement; IWM = Integrated Waste Management

C. Environmental Monitoring Program

243. Monitoring of mitigation measures during construction is the responsibility of the Lama PIU and PMU supported by the PMCSDRC Environmental Specialist, while monitoring of mitigation measures during operation phase is the responsibility of Lama Pourashava and DPHE. Table 28 shows the proposed Environmental Monitoring Program for this subproject, which specifies the various monitoring activities, indicating location, frequency of monitoring and responsibility.

Table 28: Environmental Monitoring Program

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
PRE-CONSTRUCTION					
Secure Environmental Compliance Certificate (ECC) from Department of Environment	PMU office	PMU, PMCSDRC	Copy of approved ECC	Before construction activities	PMU, PMCSDRC
IEEs and EMPs are included in bid and contract documents	PMU office	PMU, PMCSDRC	Copies of bid and contract documents	Before approval tender document	PMU, PMU, PMCSDRC
Site-specific EMP (SEMP) submitted by Contractor for approval by PIU	PIU office	Contractor, PIU	Copy of approved SEMP	Before construction activities commence	PMU, PMU, PMCSDRC
Spoil management plan (SMP) submitted by Contractor for approval by PIU	PIU office	Contractor, PIU	Copy of approved SMP	Before construction activities commence	PMU, PMU, PMCSDRC
Secure all other necessary permits and licenses from relevant government agencies		Contractor	Copies of permits and licenses	Before construction activities commence	PIU, PMCSDRC
Conduct of baseline ambient air quality and noise level monitoring	Subproject site	Contractor	Site visits and observations, Contractor records, Results of noise level measurements, Results of laboratory analyses (if necessary for ambient air quality)	Before construction activities commence	PMU, PMU, PIU, PMCSDRC
Conduct of baseline surface water and groundwater quality monitoring	Subproject site	Contractor	Contractor records, Results of laboratory analyses (if necessary)	Before construction activities commence - Surface water sampling at the upstream and downstream of river Matamuhuri - Groundwater sampling in nearest available well in the area.	PMU, PMU, PIU, PMCSDRC
CONSTRUCTION					
Implementation of SEMP; including implementation of community and occupational health and safety measures.	Subproject site	Contractor	Site visits, Contractor records,	Weekly or as needed	PMU, PMU, PIU, PMCSDRC

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
Conduct of ambient air quality and noise level monitoring Ambient air - particulate matter (PM10 and PM2.5) Equivalent day and nighttime noise levels (parameters will be finalized after environmental clearance certificate (ECC) issued by Department of Environment))	Subproject site (Specific site locations around the IWTP site boundaries, composting and SWM areas, etc. to be confirmed during the detailed design stage)	Contractor	Site visits and observations, Contractor records, Results of noise level measurements, Sampling, and results and results of laboratory analyses (if necessary for air quality) Standard monitoring protocols and methods of sampling to be followed. Government approved agencies for external monitoring to be commissioned)	Quarterly or as needed	PMU, PMU, PIU, PMCSDRC
Conduct of surface water quality monitoring Suspended solids, oil and grease, biological oxygen demand (BOD), and coliforms. (parameters will be finalized after environmental clearance certificate (ECC) issued by Department of Environment))	Subproject site (Water quality measurements to include upstream and downstream locations)	Contractor	Site visits and observations, Contractor records, Results of laboratory analyses (if necessary)	At least semi-annual or as needed - Surface water sampling at the upstream and downstreams of Matamuhuri river	PMU, PMU, PIU, PMCSDRC
Conduct of groundwater quality monitoring pH, Total Hardness (as CaCO3), Chlorides, Dissolved solids, Phenolic compounds (as C6H5OH), Sulphate (as SO4), Nitrate (as NO3), Iron, Heavy metals (parameters will be finalized after environmental clearance certificate (ECC) issued by Department of Environment))	Two monitoring wells (downstream and upstream)	Contractor	Sampling and results of laboratory analyses (if necessary for air quality) Standard monitoring protocols and methods of sampling to be followed. Government approved agencies for external monitoring to be commissioned)	At least semi-annual or as needed	PMU, PMU, PIU, PMCSDRC
Develop and apply archaeological protocol to protect chance finds	Subproject site	Contractor, PMU, PIU,	Contractor records	Once until protocol is approved	PMU, PMU, PIU,

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
		PMCSDRC			PMCSDRC
Provide EHS training for all personnel	Subproject site	Contractor	Contractor records; Interviews to workers	Monthly	PIU, PMCSDRC
Keep accident reports and records	Subproject site	Contractor	Contractor records; Interviews to workers and community people	Monthly	PIU, PMCSDRC
Employ workforce from communities near sites	Subproject site	Contractor	Contractor records	Monthly	PIU, PMCSDRC
Implementation of EHS measures at construction camps	Construction camp site	Contractor	Site visits; Interviews to workers at camp	Monthly	PIU, PMCSDRC
OPERATION AND MAINTENANCE					
Maintenance of all solid waste collection and transport equipment	Pourashava-wide	Operator of waste collection and transport	Site observations	Monthly	DPHE / Pourashava PIU
Maintenance of all facilities at IWTP facility	Subproject site	Operator of IWTP facility	Site observations	Monthly	DPHE / Pourashava PIU
Prevent run-off/deposit of foreign materials (oil, grease, solid waste, plastics) into watercourses, and clean drain periodically; dispose of materials removed from drains	Subproject site	Operator of IWTP facility	Site observations	Monthly	DPHE / Pourashava PIU
Environmental Monitoring (groundwater quality, surface water, ambient air quality, noise level, compost) **Air quality.** Particulate matter (PM10 and PM2.5) Sulphur dioxide, Methane, Ammonia (24 hour average) and Carbon monoxide (1hour average **Noise levels.** Equivalent day and nighttime noise levels **Surface water quality.** pH, Total Hardness (as CaCO3), Chlorides, Dissolved solids, Phenolic compounds (as C6H5OH),	Subproject site	Operator of IWTP facility	Results of laboratory analyses (if necessary) Results of noise level measurements,	Air quality - Semi-annually. Noise level – Semi-annually, night and day Surface water – Semiannually with sampling at the upstream and downstreams of Matamuhuri river Groundwater – semi-annually at upgradient and downgradient	DPHE / Pourashava PIU

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
Sulphate (as SO4), Nitrate (as NO3), Iron, Heavy metals **Groundwater quality.** pH, Total Hardness (as CaCO3), Chlorides, Dissolved solids, Phenolic compounds (as C6H5OH), Sulphate (as SO4), Nitrate (as NO3), Iron, Heavy metals Compost: heavy metals - Arsenic Cadmium Chromium Copper Lead Mercury Nickel Zinc (all parameters will be finalized after environmental clearance certificate (ECC) issued by Department of Environment))				monitoring wells.	
Implementation of operation phase mitigation measures per EMP	Subproject site	Operator of IWTP facility	Site observations	Monthly	DPHE / Pourashava PIU

EHS = environmental, health and safety; EMP = environmental management plan; IEE = initial environmental examination; DPHE = Department of Public Health and Engineering; PMCSDRC = project management construction supervision and design review consultant; PIU = project implementation unit; PMU = project management unit; SMP = spoil management plan; TMC = traffic management plan.

D. Capacity Development Training

244. The PMCSDRC Environment Specialist and Social Safeguard Specialist will be responsible for training the PMU, PMU, PIU and contractors. Training modules will need to cover safeguards awareness and management in accordance with both ADB and government requirements as specified below:

Environmental Safeguards

(i) sensitization on ADB's safeguard policy on environment;
(ii) introduction to environment and environmental considerations in urban infrastructures;
(iii) review of IEEs and integration into the project detailed design;
(iv) Physical cultural resources, and heritage assessment studies
(v) improved coordination within nodal departments; and
(vi) monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites.

Social Safeguards

(i) sensitization on ADB's policies on Involuntary Resettlement and Indigenous People;
(ii) introduction to social safeguards assessment and document requirements;
(iii) Consultation and participations requirements;
(iv) Project GRM and ADB's Accountability Mechanism; and
(v) monitoring and reporting system.

245. **Methodology**. Capacity building activities will be achieved through combination of practical methodologies available such as lecture and workshop training by experts, on-the-job training and mentoring, and continuing team meetings and exercises. The PMCSDRC Environment Specialist will spearhead the designing of specific programs appropriate for the target participants or stakeholders, including the execution of these programs during the different implementation phases of the Project, which includes the subproject. Pre-training and post-training assessment will be an integral part of the overall program to measure its effectiveness, and identify any other needed interventions to improve effectiveness, if necessary.

246. As fundamental component for the capacity building program, basic lectures and seminar training sessions will be provided by the PMCSDRC Environment Specialist to strengthen the awareness of project stakeholders on the requirements of ADB SPS and government environmental laws, rules and regulations. Modules will be prepared and customized based on the skills set and needs of the different stakeholders. The entire training will cover basic principles of environmental assessment and management mitigation plans and programs, implementation techniques, monitoring methods and tools. A proposed lecture and seminar training program along with the frequency of sessions is presented in the following table.

Table 29: Sample Lecture and Seminar Training Program for Environmental Management

Items	Pre-construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staff	Experiences and best practices sharing

Items	Pre-construction	Construction	
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and Government of Bangladesh and how the project will meet these requirements	To build the capacity of the staff for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and Government of Bangladesh	To share the experiences and best practices aimed at learning lessons and improving implementation of EMP
Contents	Module 1: Orientation ADB Safeguards Policy Statement Government of Bangladesh Environmental Laws and Regulations Module 2: Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements Review of environmental assessment report to comply with ADB requirements Incorporation of EMP into the project design and contracts	Roles and responsibilities of officials/contractors/consultants towards protection of the environment Environmental issues during construction Implementation of EMP Monitoring of EMP implementation Reporting requirements	Experiences on EMP implementation – issues and challenges Best practices followed
Duration	1 day	1 day	1 day on a regular period to be determined by PMU and PMCSDRC
Participants	PMU, PMU and PIU staff (technical and environmental) involved in the project implementation	PMU, PIU, Contractors	PMU, PMU, PIU, Contractors

E. Environmental Management and Monitoring Plan Implementation Cost (Indicative)

247. Most of environmental mitigation and enhancement measures are integrated into the design and cost are included as part of the civil works contract. Some items need to be incorporated in the Bill of Quantities (BOQ) of this subproject including the environmental monitoring costs. The environmental costs presented in table below are tentative provisions based on experience of undertaking similar works under different DPHE projects. For the details of environmental costs under civil works contract, individual contract package bid document may be consulted. Contractors will bear the direct costs of all mitigation measures during construction, which will be included in the tender and contract documents; this includes features built into facility designs in order to prevent environmental impacts from arising. The Operators during operation phase will bear the costs related to mitigation measures during operation. Costs related to environmental supervision during construction will be borne by the PIU, the PMU (for the activities of the environmental consultants) and by the contractors (for monitoring work carried out by the

EHS Officer/s). During the operation phase, monitoring costs will be borne by the Lama Pourashava and/or the PIU.

Table 30: Indicative Environmental Management Plan and Monitoring Plan Budget

(The following items are rough estimates and some costs of Contractor in BOQs (and Operator during operation phase) and other budgets of PMU, or PIU may not be included. These activity items and costs need to be reviewed and finalized by PMU during the detailed design phase):

SL.	Particulars	Parameter	Unit	Quantity	Rate (BDT)	Amount (BDT)
A. Mitigation Measures during Design/Pre-construction Phase						
B. Mitigation Measures during Construction Phase						
1.	Environmental mitigation/ enhancement measures integrated into the designs and costs included as part of civil works	To be Covered under BOQ of Construction Document				
2	Drain diversion or laying of outfall pipeline from IWT Plant to Matamuhuri River on the downstream of intake	To be Covered under BOQ of Construction Document				
2.	Pollution Control Measure	Air, dust, noise and water pollution control measure	Lump sum	1	100,000.0	100,000.00
3.	Occupational Health and Safety including COVID-19 H&S measures	PPE such as vest, helmet, gumboot, mask and first aid box	Lump sum	1	200,000.0	200,000.00
					Sub Total (B. Mitigation Measures)	**300,000.00**
C. Monitoring Measures during Construction						
1.	Air Quality	SPM, PM2.5, PM10, SO2, NOx and CO (twice/year for 2 years)	No.	4	25,000.0	100,000.00
2.	Noise Level	Leq (dB) (twice/year for 2 years during day and night)	No.	8	3,000.0	24,000.00
3.	Surface Water Quality	Water temp., DO, BOD5, COD, Nitrate, phosphate, salinity, fecal coliform and heavy metals (Cr, Cd, Pb)	No.	16	15,000.0	240,000.00

SL.	Particulars	Parameter	Unit	Quantity	Rate (BDT)	Amount (BDT)
		(twice/year for 2 years at upstream and downstream locations of Harikhola khal and Bhairab river)				
4.	Groundwater Quality	GW level, pH, TDS, TSS, hardness, Ammonia, Nitrate, Phosphate, and Coliforms (twice/year for 2 years at upgradient and downgradient sampling locations) (for baseline data establishment)	No.	8	10,000.0	80,000.00
5.	Soil quality	Cr, Cd, Pb and Oil and Grease (Before, in the middle of and after the Construction period)	No.	3	15,000.0	45,000.00
				Sub Total (C. Monitoring Measures during Construction)		**489,000.00**
D. Monitoring Measures during Operation						
1.	Air Quality	SPM, PM2.5, PM10, SO2, NOx and CO (twice/year for 20 years)	No.	40	25,000.0	1,000,000.00
2.	Noise level	Leq (dB) (twice/year for 20 years during day and night)	No.	80	3,000.0	240,000.00
3.	Surface Water Quality	Water temp., DO, BOD5, COD, Nitrate, phosphate, salinity, fecal coliform and heavy metals (Cr, Cd, Pb) (Twice a year for 20 years at the upstream and downstream of Sangu river)	No.	160	15,000.0	2,400,000.00
4.	Groundwater Quality	GW level, pH, TDS, TSS, hardness, Ammonia, Nitrate, Phosphate, and Coliforms (twice/year for 20 years at the upgradient and downgradient sampling wells)	No.	80	10,000.0	800,000.00

SL.	Particulars	Parameter	Unit	Quantity	Rate (BDT)	Amount (BDT)
					Sub Total (D. Monitoring Measures during Operation)	**4,440,000.0**
E. Capacity Building						
1.	Introduction and sensitization to environmental issue	Pre-construction	LS	-	-	100,000.00
2.	Project training on hazards, health, safety, and environmental issues	Pre-construction and Construction	LS	-	-	100,000.00
3.	EMP Implementation	Construction (2 years) Operation (20 years)	LS	-	-	600,000.00
					Sub Total (E. Capacity Building)	**800,000.00**
					Grand Total (A+B+C+D+E)	**60,29,000.00**
					Total (in $) @ BDT 86.225 per $	**69,921.00**

IX. MONITORING AND REPORTING

248. PMU will monitor the overall progress of EMP implementation of the entire Project through the different subproject jurisdictions, including the integrated waste management subproject in Lama Pourashava. The PMU, PMU and PIU will undertake their respective roles in site inspections and document review to verify compliance with the EMP and SEMP, and progress toward the final outcome. The Contractor will conduct day-to-day implementation of the SEMP.

249. The Contractor will submit monthly reports to the PIU/PMU. The monthly reports will include compilation of copies of monitoring sheets accomplished and duly signed by the Contractor's EHS Officer (or equivalent) on a daily basis. A sample daily monitoring sheet which can be used by the Contractor is in Appendix 6. This monitoring sheet is indicative which can be further enhanced depending on the actual situations at subproject construction site.

250. The PIU/PMU will submit quarterly environmental monitoring reports to PMU, which will include summary of monthly monitoring activities of Contractor and results of any independent monitoring or inspection activities of the PIU and/or PMU. In the conduct of these independent inspection activities, PIU and/or PMU will be supported by PMCSDRC in this regard. A sample inspection checklist is in Appendix 7. This checklist is indicative which can be further enhanced depending on the actual situations at subproject construction site.

251. PMU shall consolidate quarterly reports from the PIUs including PIU in Lama Pourashava, and results of its independent monitoring or inspection activities. PMU shall accomplish semi-annual environmental monitoring report (SEMRs) starting from the effectivity date up to the end of construction phase, which shall be submitted to ADB for review and disclosure on ADB website. The template for the SEMR is attached as Appendix 8. The PMU shall prepare and submit annual environmental monitoring report during the operation phase until ADB issues a project completion report. During operation phase, PMU with the support of Operator/PIU will prepare and submit environmental monitoring reports annually to ADB, for review and disclosure, until ADB issues a PCR. Submission of these reports to ADB will be within thirty (30) days from the end date of reporting period.

X. CONCLUSION AND RECOMMENDATION

252. The subproject will result in environmental benefits because of improved solid waste management for Lama Pourashava. While the nature and magnitude of potential environmental impacts inherent to operation of IWTP facilities are obvious, these impacts are avoided, mitigated or reduced with the selection of site that has the least proximity to environmental and human receptors, and the institution of best available practical technologies and engineering designs ensuring all emissions and effluents from the facility operations comply with national and international standards. Measures to mitigate the impacts of climate change are likewise considered in the preliminary design and will be confirmed during the detailed design phase with due consideration of all the recommendations in this IEE report.

253. Lama town is subdivision headquarter town in Bandarban district, is one of the hill districts in Chattogram Hill Tracts which is predominantly covered with hilly forest areas (61% of geographic area). Subproject components are in Lama pourashava and its immediate surroundings. These were converted into urban use or agricultural use since many years. Pourashava and surrounding areas comprises developed areas with residential and commercial areas, and also has considerable undeveloped and agricultural lands, mainly comprises of hills and valleys. Hills have notable vegetation and tree cover, which is again mostly with trees of

commercial value or with horticultural crops. Proposed site of 5 acre area for fecal sludge treatment and solid waste management facility is located in the north of the town, about 5 km from the town center. Site is surrounded by agricultural fields, and there are no houses or habitation within 200 m of site. Site is about 500 m from the main road connecting Lama. Matamuhuri River flows at the edge of the Town. There are no endangered fish or river species in the subproject area of influence. There are no forests and protected areas in the vicinity of the project sites. Preliminary screening via Integrated Biodiversity Assessment Tool (IBAT) indicated presence of various protected species in the wider area of Bandarban district and CHT. Movement of these species is mainly limited to forests and protece4d areas, although there is a chance of animals venturing out. Further biodiversity screening and precautionary measures suggested in the EMP.

254. During construction phase, the subproject is unlikely to cause significant adverse impacts to environment and people, and potential negative environmental impacts associated with construction activities can be mitigated to standard levels without difficulty through proper engineering practice, and the incorporation or application of recommended mitigation measures and procedures in the EMP and SEMP.

255. Proposed project is at feasibility / preliminary design stage, which is mostly based on secondary sources of information, data and site visits. Detailed site investigations are in progress, and detailed design of the subproject will be completed prior to the bidding. IEE therefore suggested various design related measures and included in the EMP for integration into the design to avoid, minimize and/or mitigate the potential impact. Important measures are:

Overall facility

- Designs should be based on detailed site-specific surveys investigations
- Further investigations on the drain should be done during the detailed design, and Location Clearance Certificate from the DOE shall be secured prior to bidding. This is important, as per Landfill criteria, no water body, river or lake should be within 200 m of landfill site.

- Facility design will ensure proper surface drainage system within internal and peripheral drains to facilitate runoff. Design will ensure separation of runoff from contaminated areas and clean areas.
  - Protection of drain from leaching of leachate via ground/soil
  - Diversion of contaminated runoff to treatment plant.
  - Peripheral drains will be provided to avoid entry of runoff from uphill and surrounding areas into facility and will ensure safe passage of upstream runoff into the drain.
  - Treated leachate will be recirculated and not discharged into drain
  - Wastewater from FSTP will be utilized within the site for plantation or facility operation, and there be no discharge into drains.
  - Following two alternatives are suggested to include in the design. These alternatives will be examined during the detailed design, and appropriate alternative will be implemented. This will avoid risk of polluting the water source.

    a. Intercept the drain close to river Matamuhuri and divert the same to downstream of intake (~ 500 m or as appropriate during finalized during the detailed design), by constructing an open concrete channel along the bank of the river, or through a pipe buried along the river, duly considering river high flood level, taking measures to avoid erosion of riverbed at discharge point
    b. Laying of an outfall pipe from the IWT facility to nearest drain or river Matamuhuri to directly discharge runoff and treated wastewater into river downstream of intake

(~ 500 m or as appropriate during finalized during the detailed design). This may be laid within the access road right of way.

- Provide adequate drainage management system including providing peripheral drains and bunds to divert runoff from upper areas
- Provide proper fencing / walls around the facility, with green buffer zone all around •

Compost plant

- Ensure compost plant design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.
- Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;
- Use acoustic screens around fixed/mobile composting plant and equipment;
- The material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate;
- If windrows system is selected, design and maintain the slope and orientation of windrows and/or leachate drains such that free drainage of leachate to a collection drain is facilitated and ponding of leachate is avoided; shape the piles and windrows to maximize run-off and hence reduce infiltration;
- If windrows system is selected, use windrow turning equipment that is specially designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles;
- Store leachate in a lined earthen basin or in aboveground storage tanks;
- Provide a fire alarm system, including temperature sensors in the waste being treated; and
- Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.

Fecal sludge treatment plant

- Ensure fecal sludge treatment plant design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on and EHS Guidelines on Water and Sanitation and Waste Management Facilities.
- Design septage collection system with appropriate collection vehicles and equipment to service all households; no manual handling of septage, and no intermediate transfer of septage to other vehicles
- Design the septage treatment facility to meet the effluent discharge standards

Landfill

- Ensure landfill design in compliance with applicable national standards and follow internationally recognized standards such as the World Bank's EHS Guidelines on Waste Management Facilities.
- Install catch fences and netting to trap windblown litter;
- Provide perimeter planting, landscaping, or fences to reduce wind. Indigenous/native species will be preferred in planting;
- Construct temporary banks and bunds immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest

downwind crest, and/or fully enclose of the tipping area within a mobile litter net system; and
- Use of low-permeability landfill liners to prevent migration of leachate as well as landfill gas;
- Ensure water table depth requirement of at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development;
- Inclusion of a leachate collection and treatment system
- Installation of groundwater monitoring wells
- Inclusion of landfill gas collection system, use of landfill gas as fuel if practical, or treat before discharge

256. This IEE which is based on feasibility / preliminary design will be updated by PMU during the detailed design, and submitted to ADB for review, clearance and disclosure. Accordingly, PMU will ensure the following:

- Confirmation of full compliance of the proposed landfill site with the siting requirements of Bangladesh Solid Waste Management Rules, 2021
- Site specific surveys and baseline information on – soil and geotechnical, groundwater, surface water, and air
- Site development plan, which shall include site layout, final site preparation/construction methodology, number of cells, phasing, bunding, cover materials, landscaping, etc.;
- Final engineering calculations on which the site development plan is based;
- Technical description of other allied subcomponents/infrastructures to be built, such as access road, office building, accommodation facilities, weighbridge, wheel cleaner, perimeter fence, etc.;
- Groundwater and surface water management, which shall include groundwater control measures, surface water collection system, and groundwater and surface water monitoring points;
- Lining systems, that shall describe the kind of liners to be installed in consideration of the type of wastes to be landfilled (hazardous, non-hazardous);
- Leachate collection and treatment system as recommended in this IEE, that shall include leachate volume quantification, composition/content analysis, leachate collection and removal system, storage, treatment process, and recirculation (if required as part of design);
- Landfill gas collection and management as recommended in this IEE, that shall include gas quantification, landfill gas control, collection, venting or flaring, and other safety measures related to landfill gas management;
- Capping design and construction; and
- Complete final design description of the other allied subcomponents such as the materials recovery facility, composting plant, and fecal sludge treatment plant; with consideration of the design-related recommendations enumerated above.

257. **Conclusion and Recommendations.** This IEE has been prepared in accordance with ADB SPS requirements for projects classified as Category B for the environment. On the premise of the preliminary design and information, this IEE study has been concluded and no further special study or detailed environmental assessment needs to be undertaken to comply with ADB SPS. However, per Environmental Conservation Rules of Bangladesh (ECR, 1997), the project is categorized as “Red” category. Subsequent to LCC, preparation of a full-scale environmental impact assessment (EIA) based on DOE approved terms of reference is mandatory. No bids will be invited for the project until LCC is issued by the DOE. Approval of the EIA and issuance of the Environmental Clearance Certificate (ECC) must be obtained from the DOE prior to award of

contract. The following are recommendations applicable to the subproject to ensure no significant impacts:

- Conduct detailed site investigations and prepare detailed designs duly integrating the design measures suggested in the EMP
- Obtain location clearance certificate prior to issuance of bids
- Obtain environmental clearance certificate prior to issuance of bids or award of contract; integrate any conditions, recommendations and/standards specified in ECC into subproject design, construction and operation
- The updated/final IEE report will incorporate results of detailed engineering design and of any additional baseline studies on biodiversity as required and will be submitted to ADB for approval and disclosure at ADB website.
- Engage biodiversity expert during detailed design to conduct confirmatory field survey, and updated IEE and EMP
- Implement measures recommended by biodiversity study
- Updated IEE shall be approved by ADB prior to bidding, and approved IEE shall form part of bidding and contract documents
- Update and implement the recommendations from the biodiversity expert report.
- Conduct safeguards induction to the contractor upon award of contract.
- PIU and PMCSDRC to strictly supervise EMP implementation.
- Ensure contractor appoints qualified environment, health and safety (EHS) officers prior to start of works.
- Implement appropriate community and occupational health and safety measures during construction phase; ensure that excavated trenches are properly protected to avoid any damage / disruption to adjacent structures or buildings
- Documentation and reporting on a regular basis as indicated in the IEE.
- Continuous consultations with stakeholders.
- Timely disclosure of information and establishment of GRM.
- Involvement of contractors, including subcontractors, in first level GRM.

Appendix 1: Rapid Environmental Assessment (REA) Checklist

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 Safeguards Division (SDSS) for endorsement by the Director, SDSS and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. 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.

Country/Project Title:	BAN- Chattogram Hill Tract Inclusive and Resilient Urban Water Supply and Sanitation Project / Lama Sanitation Subproject
Sector Division:	SARD/SAUW

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
• Densely populated?		P	The proposed FSM / SWM site is located in isolated area 500m from the main road of the pourashava area.
• Heavy with development activities?		P	There are no heavy development activities in the area.
• Adjacent to or within any environmentally sensitive areas?			
1. Cultural heritage site		P	Based on desk review of locations and field verifications by PMU, there is no environmentally sensitive cultural heritage site within or near the subproject site.
2. Protected Area		P	Based on desk review of locations and field verifications by PMU, there is no protected area encompassing or near the subproject site.
3. Wetland		P	Based on desk review of locations and field verifications by PMU, there is no protected wetland near the subproject site.
4. Mangrove		P	Based on desk review of locations and field verifications by PMU, there is no mangrove near the subproject site.
5. Estuarine		P	Based on desk review of locations and field verifications by PMU, there is no estuarine near subproject site.
6. Buffer zone of protected area		P	
7. Special area for protecting biodiversity		P	Based on desk review of locations and field verifications by PMU, there is no special area for protecting biodiversity encompassing or near the subproject site.

Screening Questions	Yes	No	Remarks
8. Bay		P	Based on desk review of locations and field verifications by PMU, there is no bay near the subproject site.
B. Potential Environmental Impacts Will the Project cause…			
• impacts associated with transport of wastes to the disposal site or treatment facility	P		This is anticipated impact in IWM operations. However, the EMP includes measures on how to mitigate these impacts. For example, all IWM transport vehicles will be regularly maintained, used according to design capacities only (no overloading), use of cover, use of PPEs by vehicle operators, etc.
• impairment of historical/cultural monuments/areas and loss/damage to these sites?		P	Not applicable.
• degradation of aesthetic and property value loss?	P		Subproject location may impact the property values of lands nearby. However, this scenario will also bring other business opportunities for land owners near the facility.
• nuisance to neighboring areas due to foul odor and influx of insects, rodents, etc.?	P		During construction phase, these impacts may persist. However, these impacts will be mitigated with the implementation of related measures in the EMP. During the operation phase, these impacts will be substantially mitigated due to expected efficient operation of the landfill facility. O&M Manual to be developed under the subproject will include odor and pest control.
• dislocation or involuntary resettlement of people?		P	Not anticipated
• disproportionate impacts on the poor, women and children, Indigenous Peoples, or other vulnerable groups?		P	Not anticipated. The subproject is a pro-poor and gender-inclusive undertaking as it aims to provide better IWM for the communities, including those less privileged (low-income) population of the town..
• risks and vulnerabilities related occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	P		Anticipated during construction activities. However, impacts are temporary and short in duration. These can be mitigated through the implementation of related measures in the EMP, and such measures will be updated during the detailed design stage.
• public health hazards from odor, smoke from fire, and diseases transmitted by flies, insects, birds and rats?	P		This is a potential impact during the operation phase of the subproject. However, the O&M Manual to be developed under the subproject will include fire, odor and appropriate pest control.
• deterioration of water quality as a result of contamination of receiving waters by leacheate from land disposal system?	P		This is a potential impact for any landfill disposal facility. However, the design will ensure liner will be provided for the landfill cells, and leachate treatment plant will be an integral part of the facility.
• contamination of ground and/or surface water by leach ate from land disposal system?	P		This is a potential impact for any landfill disposal facility. However, the design will ensure liner will be provided for the landfill cells, and leachate treatment plant will be an integral part of the facility.

Screening Questions	Yes	No	Remarks
• land use conflicts?		P	Not anticipated. The landfill facility will be located in an area appropriate for the purpose and in accordance with the site selection criteria imposed by the local government and Department of Environment.
• pollution of surface and ground water from leach ate coming form sanitary landfill sites or methane gas produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?	P		These impacts are anticipated. However, the EMP defines measures to mitigate these impacts. The EMP will be updated during the detailed design stage. Leachate management measures will be incorporated in the preliminary design. Detailed design will include construction of impermeable layer at the base of the site and inner side slope of the embankment for groundwater protection (subject to detailed geological investigation during detailed design).
• inadequate buffer zone around landfill site to alleviate nuisances?		P	Not anticipated. Initial layout plan provides buffer zone and greenery
• road blocking and/or increased traffic during construction of facilities?		P	Not anticipated. The subproject site is far from the busy area of the town. Nonetheless, the EMP provides measures in any case of traffic disturbance in the area. These measures will be updated during the detailed design stage.
• noise and dust from construction activities?	P		The impacts are negative but short-term, site-specific within a relatively small area and reversible through mitigation measures. The EMP defines these mitigation measures and will be updated during the detailed design stage.
• temporary silt runoff due to construction?	P		Due to excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants. The impacts are negative but short-term, site-specific within a relatively small area and reversible through mitigation measures. The EMP defines these mitigation measures and will be updated during the detailed design stage.
• hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation?	P		This is a potential operational issue in most IWM facilities. However, appropriate institutional development and capacity building for Lama Pourashava is included under the subproject, including the guarantee for permanent employees and line budget for the efficient management of the IWM facilities.
• emission of potentially toxic volatile organics from land disposal site?	P		Some VOCs may be released from mismanaged organic wastes at the site. However, the EMP provides measures to mitigate this impact and will be updated during detailed design stage. The O&M manual for the facility will also define all measures to ensure efficient functioning of all components and avoid release of toxic gases.

Screening Questions	Yes	No	Remarks
• surface and ground water pollution from leach ate and methane gas migration?	P		This is a potential impact for any landfill disposal facility. However, the design will ensure liner will be provided for the landfill cells, and leachate treatment plant will be an integral part of the facility. During the O&M phase, these components will be monitored to ensure their efficient functioning. Greenhouse gases like methane may be released from mismanaged organic wastes. However, the EMP provides measures to mitigate this impact, which will be updated during the detailed design stage.
• loss of deep-rooted vegetation (e.g. tress) from landfill gas?		P	Not anticipated. There are no deep rooted vegetations such as trees near the landfill site.
• chances of explosion from accumulated landfill gas?		P	Not anticipated. Expected GHG generation is insignificant. Preliminary design includes gas vents
• contamination of air quality from incineration?		P	Not applicable. The subproject will not include incineration.
• public health hazards from odor, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.?	P		This is a potential impact during the operation phase of the subproject. However, the O&M Manual to be developed under the subproject will include fire, odor and appropriate pest control.
• health and safety hazards to workers from toxic gases and hazardous materials in the site?	P		These hazards are expected in operation of landfill facilities. However, the EMP defines measures to mitigate these hazards following international best practices such as the EHS Guidelines on Waste Management Facilities, which will be updated during the detailed design stage. Personal protective equipment will be provided to workers. Regular training will also be conducted to ensure that workers are aware of construction hazards and risks of chemicals during O&M.
• large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		P	Not anticipated. Labor requirements will be sourced locally.
• social conflicts if workers from other regions or countries are hired?		P	Not anticipated. Labor requirements will be sourced locally.
• 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?	P		Fuels and other chemicals that may be used during the construction and operation of the subproject and may raise risks of explosions or fires at the sites. However, the EMP defines measures to manage these risks, including the implementation of proper handling and storage of these chemicals. These will be updated during the detailed design stage

Screening Questions	Yes	No	Remarks
• community safety risks due to both accidental and natural hazards, especially where the structural elements or components (e.g., landfill or incinerator) 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?	P		These risks are potential in the operation of the landfill facility. However, the EMP defines measures in order to manage these risks based on international best practices for IWM such as the EHS Guidelines on Waste Management Facilities. These will be updated during the detailed design stage. Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the landfill site.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: BAN: Emergency Assistance Project – Additional Financing

Sector:

Subsector:

Division/Department:

Screening Questions		Score	Remarks[32]
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?	1	Flooding events have occurred in the past
	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.)?	1	Project needs to consider extreme rainfall events
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)?	0	
	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 frequency may aggravate under current Climate Change scenario
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?	0	

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 to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high-risk project.

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

Other Comments:_____

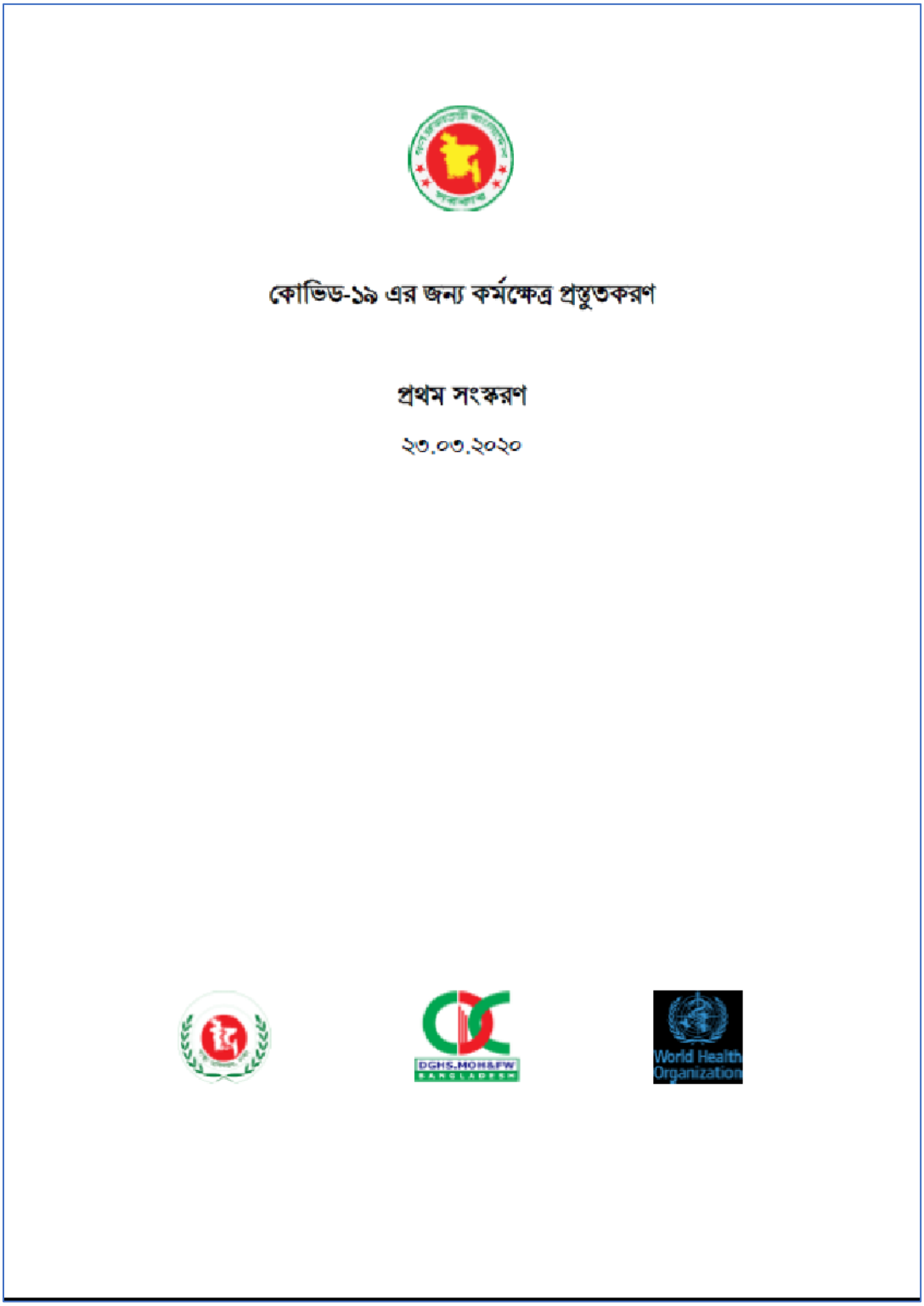
_____

Prepared by: PMU

[32] 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.

Appendix 2: IBAT Report

Appendix 3: Bangladesh Government guideline in response to COVID-19 in worksites



কোভিড-১৯ এর জন্য কর্মক্ষেত্র প্রস্তুতকরণ

প্রথম সংস্করণ

২৩.০৩.২০২০

DGHS.MOH&FW
BANGLADESH

World Health Organization

কোভিড-১৯ এর জন্য কর্মক্ষেত্র প্রস্তুতকরণ

২০২০ সালের জানুয়ারি মাসে বিশ্ব স্বাস্থ্য সংস্থা (WHO) একটি নতুন ধরণের করোনা ভাইরাস জনিত রোগের প্রাদুর্ভাব ঘোষণা করে, যার সূচনা হয় চীনের হুবেই প্রদেশে। বিশ্ব স্বাস্থ্য সংস্থা (WHO) এর বিবৃতি অনুযায়ী করোনা ভাইরাস রোগটি (কোভিড-১৯) বিশ্বের অন্যান্য দেশে ছড়িয়ে পড়ার একটি উচ্চ ঝুঁকি রয়েছে।

বিশ্ব স্বাস্থ্য সংস্থা (WHO) এবং জনস্বাস্থ্য কর্তৃপক্ষ বিশ্বব্যাপী কোভিড-১৯ এর প্রাদুর্ভাব নিয়ন্ত্রণের জন্য কাজ করছে। তবে দীর্ঘমেয়াদী সাফল্য এখন পর্যন্ত অর্জিত হয়নি। এই রোগের বিস্তার রোধ করতে হলে ব্যবসায়ী, চাকুরীজীবীসহ সমাজের সর্বস্তরের মানুষকে অবশ্যই কার্যকরি ভূমিকা পালন করতে হবে।

কোভিড-১৯ যেভাবে ছড়ায়

কোভিড-১৯ আক্রান্ত রোগীর হাঁচি, কাঁশির মাধ্যমে রোগটি সংক্রমিত হয়ে থাকে। হাঁচি, কাঁশির মাধ্যমে রোগটির জীবাণু নিকটবর্তী বস্তুর পৃষ্ঠতল - যেমন ডেস্ক, টেবিল বা টেলিফোন/ মোবাইল ইত্যাদির উপর পড়ে যা সহজেই মানুষের হাতের সংস্পর্শে আসে, পরবর্তীতে এই জীবাণু যুক্ত হাত দ্বারা চোখ, নাক বা মুখ স্পর্শ করার মাধ্যমে তারা আক্রান্ত হতে পারে । আবার যারা কোভিড-১৯ আক্রান্ত ব্যক্তির এক মিটারের মধ্যে অবস্থান করে, তারাও হাঁচি-কাশি হতে ছিটকে আসা ক্ষুদ্র কনার সাথে মিশ্রিত জীবাণু দ্বারা আক্রান্ত হতে পারে। কোভিড-১৯ এ সংক্রমিত হলে বেশিরভাগ ব্যক্তি হালকা/সাধারণ লক্ষণগুলি অনুভব করে এবং নিজ থেকেই সুস্থ হয়ে যায়। কিছু রোগীর ক্ষেত্রে গুরুতর অসুস্থতা লক্ষ্য করা যায় এবং হাসপাতালে নেওয়ার প্রয়োজন হতে পারে। সাধারণত ৪০ বা তদোর্ধ্ব বয়সী রোগী, রোগ প্রতিরোধ ক্ষমতা কম এমন ব্যক্তির (যেমন- ক্যান্সার, ডায়াবেটিস, হৃদরোগ এবং ফুসফুসের রোগে আক্রান্ত ব্যক্তি) ক্ষেত্রে ঝুঁকির মাত্রা বেশী।

আমরা এখানে যা জানব-

১. কর্মক্ষেত্রে কোভিড-১৯ এর বিস্তার রোধ করার সহজ উপায়।

২. সভা, সমাবেশ এবং জনসমাগমে কোভিড-১৯ এর ঝুঁকিগুলি এড়িয়ে চলার উপায়।

৩. কর্তৃপক্ষ ও কর্মীগণের ভ্রমণকালীন সময়ে সাবধানতা।

৪. কোভিড-১৯ ছড়িয়ে পড়লে কর্মক্ষেত্র প্রস্তুতকরণ।

১. কর্মক্ষেত্রে কোভিড-১৯ এর বিস্তার রোধ করার সহজ উপায়

যে সকল কর্মক্ষেত্রে কোভিড-১৯ এর সংক্রমণ ছড়িয়ে পড়েনি সেখানকার দায়িত্বপ্রাপ্ত কর্মকর্তাগণ তাদের নিজ কর্মক্ষেত্রে নিম্নোক্ত বিষয়গুলো নিশ্চিত করবেন-

- কর্মস্থল পরিষ্কার-পরিচ্ছন্ন এবং স্বাস্থ্যকর কিনা তা নিশ্চিতকরণঃ
  জীবাণুনাশক দিয়ে ডেস্ক ও টেবিলের পৃষ্ঠতল এবং নিত্য ব্যবহার্য বস্তু (যেমন- টেলিফোন, কীবোর্ড) নিয়মিত মুছতে হবে। কারন পৃষ্ঠতলে থাকা জীবাণু দ্বারা সহজে সংক্রমনের সম্ভাবনা থাকে।
- কর্মচারী, ঠিকাদার এবং গ্রাহকদের নিয়মিত এবং যথাযথভাবে হাত ধোয়ার অভ্যাস করানোঃ
  সাবান-পানি দিয়ে হাত ধোয়া, কেননা সাবান দিয়ে হাত পরিষ্কার করলে ভাইরাস ধ্বংস হয় এবং কোভিড-১৯ এর বিস্তারে বাধা সৃষ্টি হয়।

- কর্মক্ষেত্রের প্রবেশপথে বা আশেপাশে সহজে দৃষ্টিগোচর হয় এমন স্থানে হ্যান্ড স্যানিটাইজার রাখার ব্যবস্থা করা।
- সঠিকভাবে হাত ধোয়ার নির্দেশনা সম্বলিত পোস্টার দৃষ্টিগোচর স্থানে প্রদর্শন করা এবং স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষের সাহায্য নিন।
- হাত ধোয়ার ব্যাপারে উৎসাহিত করার জন্য পেশাদার জনস্বাস্থ্য কর্মকর্তার দিকনির্দেশনা, বিভিন্ন সভায় প্রদত্ত সচেতনতামূলক বার্তা এবং ইন্টারনেটে ব্যবহৃত গ্রহনযোগ্য এবং বিশ্বাসযোগ্য তথ্যাদি ব্যবহার করা।
- কর্মী, ঠিকাদার এবং গ্রাহকদের সাবান ও পানি দিয়ে হাত ধোয়ার ব্যবাস্থা নিশ্চিত করা।
- কর্মক্ষেত্রে শ্বাস-প্রশ্বাস জনিত স্বাস্থ্যবিধি প্রচার করা-
  - ✓ শ্বাস প্রশ্বাসজনিত পরিচ্ছন্নতার ব্যাপারে পোস্টার প্রদর্শন। কেননা, শ্বাস প্রশ্বাসের পরিচ্ছন্নতা কোভিড-১৯ সংক্রমণ রোধ করে।
  - ✓ শ্বাস প্রশ্বাসজনিত পরিচ্ছন্নতায় উৎসাহিত করার জন্য কর্মক্ষেত্রে পেশাদার জনস্বাস্থ্য কর্মকর্তার দিকনির্দেশনা, বিভিন্ন সভায় প্রদত্ত সচেতনতামূলক বার্তা এবং ইন্টারনেটে ব্যবহৃত গ্রহনযোগ্য এবং বিশ্বাসযোগ্য তথ্যাদি ব্যবহার করা।
  - ✓ কর্মস্থলে কর্মচারীদের বিশেষ করে যাদের সর্দি বা কাশি আছে তাদের জন্য ফেস মাস্ক/কাগজের টিস্যু/রুমাল সহজলভ্য করা ও তাদের ব্যবহৃত ফেস মাস্ক/কাগজের টিস্যু/রুমালের যথাযথ ব্যবস্থাপনা এবং ধ্বংস করা নিশ্চিত করা।
- জরুরী পেশাদারী কাজে ভ্রমণে যাওয়ার আগে কর্মচারী এবং ঠিকাদারদের "ভ্রমণ সম্পর্কিত জাতীয় নির্দেশনা" জেনে নেওয়ার পরামর্শ দেয়া।
- কর্মচারী, ঠিকাদার এবং সেবা গ্রহণকারীদের এই মর্মে অবহিত করা যে, যদি কোনভাবে কোভিড-১৯ তাদের নিজ নিজ এলাকায় ছড়িয়ে পড়তে শুরু করে (হালকা কাশি বা স্বল্প জ্বর ৯৯ ডিগ্রি ফারেনহাইট বা তার সামান্য বেশি হয়) তাহলে তাদেরকে বাড়িতেই থাকতে হবে বা বাড়িতে থেকেই কাজ করতে হবে। এসময় চিকিৎসকের পরামর্শ অনুযায়ী সাধারণ ঔষধ যেমন প্যারাসিটামল, আইবুপ্রোফেন বা অ্যাসপিরিন ইত্যাদি ঔষধগুলি গ্রহণ করা যেতে পারে।
- যদি কারো কোভিড-১৯ এর খুব সাধারণ লক্ষণও দেখা দেয় তাহলে তাকে অবশ্যই সার্বক্ষণিক ঘরের মধ্যে থাকতে হবে। একথা দৃঢ়ভাবে প্রচার করতে হবে।
- কর্মস্থলে উপরোক্ত বার্তা সম্বলিত পোস্টার প্রদর্শন করুন এবং অন্যান্য মাধ্যমে যেমন স্থানীয় যোগাযোগের চ্যানেলগুলিতে (ক্যাবল অপারেটর/কমিউনিটি রেডিও) প্রচার করুন।
- স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষ কর্তৃক অনুমোদিত এবং প্রস্তুতকৃত বার্তা প্রচারের সামগ্রীসমূহের ব্যবহার নিশ্চিত করুন।
- সংবেদনশীল এই সময়ে, কর্মীদের অসুস্থতাজনিত ছুটির অনুমোদন নিশ্চিত করতে হবে।

উপরে উল্লেখিত ব্যবস্থা গ্রহনের মাধ্যমে কোভিড-১৯ এর বিস্তার রোধ করা সম্ভব।

২. সভা, সমাবেশ ও জনসমাগমে কোভিড-১৯ এর সম্ভাব্য ঝুঁকিগুলি এড়িয়ে চলার উপায়

সভা এবং সমাবেশ আয়োজকদের কোভিড-১৯ এর সম্ভাব্য ঝুঁকি নিয়ে ভাবতে হবে কারণ-

- সভায় বা সমাবেশে উপস্থিত অনেকেই অজান্তে এই ভাইরাস বহন করতে পারে যার ফলে অন্যরা তাদের সংস্পর্শে এসে কোভিড-১৯ এ সংক্রমিত হতে পারে।
- অধিকাংশ মানুষের জন্য কোভিড-১৯ মারাত্মক না হলেও অনেকের জন্য এটা মারাত্মক ও জীবনঘাতী হতে পারে। প্রতি ৫ জনের ১ জন কোভিড-১৯ আক্রান্ত রোগীর হাসপাতালে চিকিৎসা প্রয়োজন।

কোভিড-১৯ ঝুঁকি প্রতিরোধ বা হ্রাস করার জন্য বিবেচিত মূল বিষয়গুলি নিম্নরূপঃ

ক) সভা বা অনুষ্ঠানের পূর্বে-

- কোন সভা করার পূর্বে সভা স্থানের যথাযথ কর্তৃপক্ষের পরামর্শ মোতাবেক ব্যবস্থা গ্রহণ করা।
- সভা বা অনুষ্ঠানে সংক্রমণ প্রতিরোধের জন্য একটি প্রস্তুতি পরিকল্পনা গ্রহণ করা।
- সকলের উপস্থিতেতে সভা বা অনুষ্ঠান আয়োজনের প্রয়োজন কিনা তা বিবেচনা করা। টেলিকনফারেন্স বা ইন্টারনেটের মাধ্যমে অনলাইনে সভা আয়োজন করা সম্ভব কিনা তা যাচাই করে দেখা।
- সভা বা অনুষ্ঠানটি ছোট পরিসরে করা যেতে পারে কি না সেটি বিবেচনা করা যাতে লোক সমাগম কম হয়।
- জনস্বাস্থ্য এবং স্বাস্থ্যসেবা কর্তৃপক্ষের সাথে আগেই যোগাযোগ করা এবং তাদের সকল রকম তথ্য দিয়ে সহযোগিতা করা। তাদের পরামর্শ ও সুপারিশ মেনে চলতে হবে।
- সভায় কোভিড-১৯ এর সংক্রমণ প্রতিরোধের যথাযথ ব্যবস্থাপনার নিমিত্তে সকলের জন্যে টিস্যু, সাবান এবং হ্যান্ড স্যানিটাইজারসহ সকল প্রয়োজনীয় সামগ্রীর পর্যাপ্ত সরবরাহ নিশ্চিত করা। প্রয়োজনে উপকরণগুলোর প্রি-অর্ডার করা।
- শ্বাসতন্ত্রের সমস্যার উপসর্গ কারো মাঝে দেখা দিলে তার জন্য মেডিক্যাল/সার্জিক্যাল মাস্ক সরবরাহের ব্যবস্থা রাখতে হবে।
- যেখানে কোভিড-১৯ ভাইরাস বিস্তার লাভ করছে সেখানে সক্রিয় পর্যবেক্ষণ নিশ্চিত করতে হবে। সভায় অংশগ্রহণকারীদের আগাম পরামর্শ দিতে হবে যে, যদি তাদের কারো মধ্যে কোভিড-১৯ সংক্রমনের এর কোন লক্ষণ দেখা যায় বা কেউ যদি অসুস্থতা বোধ করেন তাহলে সভায় তাদের উপস্থিত হওয়া কাম্য নয়।
- সভা/ অনুষ্ঠানের আয়োজক অবশ্যই অংশগ্রহণকারী, খাবার পরিবাশনকারী এবং দর্শকদের মোবাইল/ টেলিফোন নম্বর, ই-মেইল ও তাদের বাসস্থানের বিস্তারিত ঠিকানা সংগ্রহ করবেন। যদি কোন অংশগ্রহণকারী সন্দেহজনক সংক্রামক ব্যাধিতে আক্রান্ত হয়ে থাকেন তাহলে তার সকল তথ্য স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে সরবরাহ করতে হবে এবং তথ্য প্রদান নিশ্চিত করবেন। **কোন অংশগ্রহণকারী তার কোন তথ্য স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে প্রদানে অস্বীকৃতি জানালে তিনি ঐ অনুষ্ঠান বা সভায় অংশগ্রহণ করতে পারবে না।**
- সভায় অংশগ্রহণকারী কারো মধ্যে কোভিড-১৯ সংক্রান্ত যে কোন ধরনের উপসর্গ (শুকনো কাশি, জ্বর, অসুস্থতা) দেখা দিলে নিম্নোক্ত ব্যবস্থা গ্রহণ করতে হবে-
    - অসুস্থ বোধ করছে বা লক্ষণ রয়েছে এমন ব্যক্তিকে জনসমাগম হতে বিচ্ছিন্ন করে নিরাপদে রাখার জন্য একটি কক্ষ বা অঞ্চল চিহ্নিত করতে হবে।
    - সেখান থেকে অসুস্থ ব্যক্তিকে কিভাবে নিরাপদে স্বাস্থকেন্দ্রে/হাসপাতালে স্থানান্তরিত করা যায় তার পরিকল্পনা থাকতে হবে।
    - যদি সভায় বা অনুষ্ঠানে অংশগ্রহণকারী কোন সদস্য, কর্মী বা পরিসেবা প্রদানকারীর কোভিড-১৯ টেস্টের ফল পজিটিভ হয় সেক্ষেত্রে কি করণীয় তা পূর্বেই ঠিক করে রাখতে হবে।

- কর্মক্ষেত্রের স্বাস্থ্যসেবা প্রদানকারী অথবা জনস্বাস্থ্য কর্তৃপক্ষ অথবা স্বাস্থ্য বিভাগকে গৃহীত সকল পরিকল্পনাগুলো সম্পর্কে পূর্বেই অবহিত করতে হবে।

খ) সভা বা অনুষ্ঠান চলাকালীন সময়ে -

- আয়োজিত সভা বা অনুষ্ঠানে অংশগ্রহণকারীদেরকে মৌখিক বা লিখিত ভাবে কোভিড-১৯ সংক্রান্ত সকল তথ্য প্রদান করতে হবে। অনুষ্ঠানের নিরাপত্তার স্বার্থে আয়োজক কর্তৃক গৃহীত পদক্ষেপ সম্পর্কে অংশগ্রহনকারীদের অবহিত করতে হবে।
- স্পর্শহীন সম্বোধনের উপায়গুলি প্রচার ও অনুশীলন করতে হবে এবং অন্যের সংস্পর্শ যথাসম্ভব পরিহার করতে হবে।
- সভায় অংশগ্রহণকারীদের নিয়মিত হাত ধোয়া বা হ্যান্ড রাব বা অ্যালকোহল সমৃদ্ধ হ্যান্ড-স্যানিটাইজার ব্যবহারে উৎসাহিত করতে হবে।
- অংশগ্রহণকারীরা যেন হাঁচি বা কাঁশি দেয়ার সময় টিস্যু ব্যবহার করে অথবা কনুইয়ের ভাঁজে হাঁচি-কাশি দেয় সে বিষয়ে বারবার অবহিত করতে হবে এবং পরবর্তীতে সেই টিস্যু বা কাপড় যেন ঢাকনা যুক্ত পাত্রে ফেলে দিতে পারে সেই ব্যবস্থা করতে হবে।
- জরুরি অবস্থায় যোগাযোগের জন্য অংশগ্রহণকারীদের একটি ঠিকানা অথবা হটলাইন নম্বর সরবরাহ করতে হবে যাতে তারা পরামর্শের জন্য যোগাযোগ করতে পারে বা কোন তথ্য দিতে পারে।
- অনুষ্ঠানের ভেন্যুটিতে সহজে দৃশ্যমান হয় এমন একাধিক জায়গায় অ্যালকোহল সমৃদ্ধ স্যানিটাইজার বা হ্যান্ড রাব রাখার ব্যবস্থা করতে হবে।
- আসনগুলো এমনভাবে সাজাতে হবে যাতে অংশগ্রহণকারীরা পরস্পরের থেকে কমপক্ষে এক মিটার দূরে অবস্থান করতে পারে।
- পর্যাপ্ত বাতাস চলাচলের সুব্যবস্থা নিশ্চিত করার জন্য যখনই সম্ভব ভেন্যুর জানালা এবং দরজা খুলে রাখতে হবে।
- যদি কেউ অসুস্থতা অনুভব করে তবে পূর্বপরিকল্পিত প্রস্তুতি অনুসরণ করুন বা জরুরি নাম্বারে যোগাযোগ করুন।
- সভাস্থলের আঞ্চলিক পরিস্থিতি বা অংশগ্রহণকারীদের সাম্প্রতিক ভ্রমণের উপর নির্ভর করে অসুস্থতাবোধ করা ব্যক্তিকে একটি সম্পূর্ণ বিচ্ছিন্ন কক্ষে রাখতে হবে। তাকে একটি মাস্ক সরবরাহ করুন যাতে বাড়ি ফিরার পথের অন্য কাউকে সংক্রমিত না করে। অন্যথায় পূর্বনির্ধারিত সনাক্তকরণ কেন্দ্রে নিয়ে যান।
- সকল অংশগ্রহনকারীকে তাদের সহযোগিতার জন্য ধন্যবাদ জ্ঞাপন করতে হবে।

গ) সভা বা অনুষ্ঠান পরবর্তী করনীয় -

- কমপক্ষে এক মাসের জন্য সমস্ত অংশগ্রহণকারীদের নাম এবং যোগাযোগের ঠিকানা সংগ্রহে রাখুন। যাতে অনুষ্ঠান পরবর্তীতে অসুস্থ হয়ে পড়া যে কোন অংশগ্রহনকারীকে জনস্বাস্থ্য কর্তৃপক্ষ সহজেই খুঁজে বের করতে পারে।
- যদি সভা বা অনুষ্ঠানে কোন সন্দেহভাজন কোভিড-১৯ রোগীকে পাওয়া যায় তবে তাকে আলাদা করতে হবে। অন্যান্য অংশগ্রহণকারীদের এ বিষয়ে জানাতে হবে এবং তাদেরকে পরবর্তী ১৪ দিন পর্যন্ত কোন ধরনের লক্ষণ দেখা যায় কিনা তা প্রতিদিন পর্যবেক্ষণ করার ও দিনে দু'বার করে দেহের তাপমাত্রা পরিমাপের পরামর্শ দিতে হবে।

- যদি তাদের কারো হালকা কাশি বা জ্বর (যেমন ৩৭.৩ ডিগ্রি সেন্টিগ্রেড/ ৯৯.২ ডিগ্রী ফারেনহাইট বা তার বেশি) হয় তবে তাদেরকে বাড়িতে থাকা এবং পরিবার হতে সাময়িকভাবে বিচ্ছিন্ন থাকার পরামশকরতে হবে । এর অর্থ হল পরিবারের সদস্যসহ অন্যান্য ব্যক্তিবর্গের সাথে ঘনিষ্ঠ যোগাযোগ (কমপক্ষে ১ মিটার দূরত্ব) এড়িয়ে চলতে হবে।
- স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে সভায় অংশগ্রহনকারীদের সাম্প্রতিক ভ্রমণ এবং উপসর্গের বিশদ তথ্য প্রদান করতে হবে।
- সকল অংশগ্রহনকারীকে তাদের সহযোগিতার জন্য ধন্যবাদ জ্ঞাপন করতে হবে।

৩. কর্তৃপক্ষ ও কর্মীগণের ভ্রমণকালীন সময়ে সাবধানতাঃ

ক) ভ্রমণের আগে-

- কোভিড-১৯ সংক্রমিত এলাকার সর্বশেষ পরিস্থিত সম্পর্কে সংশ্লিষ্ট সংস্থার কর্মকর্তা এবং কর্মচারীদের অবশ্যই জেনে নিতে হবে।
- সর্বশেষ তথ্যের ভিত্তিতে সংস্থার কর্মকর্তা-কর্মচারীদের আসন্ন ভ্রমণ পরিকল্পনা সম্পর্কিত সুযোগ সুবিধা এবং ঝুঁকিগুলো মূল্যায়ন করতে হবে।
- কোভিড-১৯ ছড়িয়ে পড়া এলাকায় অসুস্থ এবং ঝুঁকিতে থাকা কর্মচারীদের প্রেরণ করা যথাসম্ভব এড়িয়ে চলতে হবে।
- কোভিড-১৯ আক্রান্ত এলাকায় ভ্রমণের পূর্বে সংশ্লিষ্ট কর্মচারীদেরকে কোভিড-১৯ সম্পর্কে বিজ্ঞ এবং উপযুক্ত কোন ব্যাক্তি (যেমন- সংস্থার স্বাস্থ্যসেবা প্রদানকারী, স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষ) দ্বারা ঐ স্থানের সুযোগ সুবিধা সম্পর্কে অবহিত করতে হবে।
- ভ্রমণ করতে যাওয়া কর্মচারীদের হ্যান্ড রাব / হ্যান্ড স্যানিটাইজার এর ছোট বোতল (১০০ মিলি এর নীচে) সরবরাহ করতে হবে যাতে তারা নিয়মিত হাত পরিষ্কার রাখতে পারে।

খ) ভ্রমণের সময়:

- বারবার হাত ধোয়ার বিষয়ে উৎসাহিত করতে হবে এবং হাঁচি-কাশি আছে এমন লোকদের কাছ থেকে কমপক্ষে এক মিটার/তিন ফুটের অধিক দূরে থাকতে সংশ্লিষ্ট কর্মকর্তা-কর্মচারীদের নির্দেশ দিতে হবে।
- ভ্রমণের সময় কর্মচারীদের কেউ অসুস্থ বোধ করলে তার জন্য করনীয় এবং কার সাথে যোগাযোগ করবেন তা জানিয়ে দিতে হবে।
- কর্মকর্তা-কর্মচারীরা যেখানে ভ্রমণ করবেন সেখানকার স্থানীয় কর্তৃপক্ষের নির্দেশাবলী যেন সঠিকভাবে মেনে চলে সেটা নিশ্চিত করতে হবে যেমন- যদি স্থানীয় কর্তৃপক্ষ তাকে কোন জায়গায় যেতে নিষেধ করেন তাহলে সেখানে না যাওয়া। কর্মকর্তা-কর্মচারীদের স্থানীয় ভ্রমণ, চলাচল বা বড় সমাবেশ সম্পর্কিত বিধিনিষেধ মেনে চলতে হবে।

গ) ভ্রমণ থেকে ফিরে আসলে:

- কোভিড-১৯ ছড়িয়ে পড়া এলাকা থেকে ফিরে আসা কর্মচারীদের কোভিড-১৯ এর উপসর্গ পর্যবেক্ষণের জন্য ১৪ দিনের নজরদারিতে (কোয়ারেন্টাইনে) রাখতে হবে। তাদের শরীরের তাপমাত্রা দিনে দুবার করে মাপতে হবে। এসময় তারা বাড়িতেই অবস্থান করবে।

- যদি তাদের হালকা কাশি বা সামান্য জ্বর হয়ে থাকে (যেমন- তাপমাত্রা ৯৯.২ ডিগ্রি ফারেনহাইট বা তার বেশি) তবে তাদের বাড়িতে থাকা পরিবারের সদস্যসহ অন্যান্য লোক হতে বিচ্ছিন্ন হতে হবে। এর অর্থ পরিবারসহ অন্যান্য লোকের সংস্পর্শ এড়িয়ে চলতে হবে (কমপক্ষে এক মিটার দূরত্ব বজায় রাখতে হবে)
- টেলিফোনের মাধ্যমে স্বাস্থ্যসেবা প্রদানকারী বা স্থানীয় জনস্বাস্থ্য বিভাগকে তাদের সাম্প্রতিক ভ্রমণ এবং রোগের লক্ষণগুলি সম্পর্কে বিশদ তথ্য প্রদান করতে হবে।

৪. কোভিড-১৯ ছড়িয়ে পড়লে কর্মক্ষেত্র প্রস্তুতকরণঃ

কর্মক্ষেত্রে কোন কোভিড-১৯ এ আক্রান্ত সন্দেহভাজন ব্যক্তি অসুস্থ হয়ে পড়লে কি করণীয় তার একটি পরিকল্পনা তৈরি করতে হবে।

- কর্মস্থলে-
  - ✓ অসুস্থ ব্যক্তিকে এমন কোন স্থানে রাখতে হবে যেখানে তারা অন্যদের থেকে বিচ্ছিন্ন (Isolated) থাকবে। সেই সাথে অসুস্থ ব্যক্তির সাথে যথাসম্ভব কম সংখ্যক মানুষ যেন যোগাযোগ করে নিশ্চিত করতে হবে এবং স্থানীয় স্বাস্থ্যসেবা প্রদানকারী কর্তৃপক্ষের সাথে যোগাযোগ করতে হবে।
  - ✓ কর্মস্থলে অন্যান্য ঝুঁকিপূর্ণ ব্যক্তিদের কীভাবে চিহ্নিত করা যায় তা বিবেচনা করতে হবে। লক্ষ্য রাখতে হবে যেন কেউ নিগ্রহ বা বৈষম্যের শিকার না হয়। সম্প্রতি কোভিড-১৯ আক্রান্ত অঞ্চল ভ্রমণ করেছেন এমন কর্মীদের মধ্যে যারা অন্যান্য গুরুতর অসুস্থ হওয়ার ঝুঁকিতে রয়েছে (যেমন-ডায়াবেটিস, হৃদরোগ, ফুসফুসের রোগ এবং বেশি বয়স) তাদেরকে উচ্চঝুঁকিপূর্ণ হিসেবে অগ্রাধিকার দিতে হবে।
  - ✓ কোভিড-১৯ প্রতিরোধে আপনার করা পরিকল্পনাটি সম্পর্কে স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে জানাতে হবে এবং প্রয়োজনে তাদের মতামত গ্রহণ করতে হবে।
- দপ্তর বা সংস্থায় নিয়মিত টেলিযোগাযোগের মাধ্যমে কর্ম সম্পাদনের ব্যবস্থা করতে হবে। কোভিড-১৯ এর প্রাদুর্ভাব ঘটলে স্বাস্থ্য কর্তৃপক্ষ গণপরিবহন এবং জনসমাগম এড়াতে জনগণকে পরামর্শ দিতে পারে; সেক্ষেত্রে টেলিযোগাযোগ কর্মীদের নিরাপত্তা নিশ্চিত করার পাশাপাশি ব্যবসা বা কর্মক্ষেত্রকে সচল রাখতে সহায়তা করবে।
- কোন সংস্থা বা প্রতিষ্ঠান যে এলাকায় অবস্থিত সেখানে কোভিড-১৯ এর প্রাদুর্ভাব ঘটলে তার জন্য একটি দুর্যোগকালীন ব্যবস্থাপনার পরিকল্পনা তৈরি করতে হবে যা-
  - ✓ প্রনয়নকৃত দুর্যোগকালীন ব্যবস্থাপনার পরিকল্পনা সংশ্লিষ্ট সংস্থাকে সমাজ বা কর্মক্ষেত্রে ছড়িয়ে পড়া কোভিড-১৯ মোকাবেলার সামর্থ্য করবে। অন্যান্য জরুরী স্বাস্থ্যসেবা প্রদানকারী সংস্থার ক্ষেত্রেও এই পরিকল্পনা প্রযোজ্য।
  - ✓ পরিকল্পনাটি এমন হতে হবে যেন অসুস্থতা বা স্থানীয় চলাচলে প্রতিবন্ধকতার জন্য উল্লেখযোগ্য সংখ্যক কর্মী, ঠিকাদার এবং সরবরাহকারীর অনুপস্থিতিতেও প্রতিষ্ঠানটি সচল থাকে।
  - ✓ পরিকল্পনাটির বিষয়ে আপনার কর্মকর্তা-কর্মচারী ও ঠিকাদারদের জানাতে হবে এবং দুর্যোগকালে তারা কি করবে আর কি করবে না তা তাদেরকে অবহিত করতে হবে। এক্ষেত্রে মূল বিষয়গুলোর উপরে অধিক গুরুত্ব আরোপ করতে হবে।
  - ✓ পরিকল্পনাটিতে যেন কোভিড-১৯ আক্রান্তের মানসিক স্বাস্থ্য ও সামাজর উপর কি প্রভাব পরে সে বিষয়টি আলোচিত হয় তা লক্ষ্য রাখতে হবে। কোভিড-১৯ সম্পর্কিত সঠিক তথ্য প্রাপ্তি এবং সহায়তা প্রদান নিশ্চিত করতে হবে।

- ✓ যেসব ক্ষুদ্র ও মাঝারী ব্যবসা প্রতিষ্ঠানগুলো জরুরীক্ষেত্রে নিজস্ব কর্মীদের স্বাস্থ্য ও কল্যাণের বিষয় নিশ্চিত করতে সমর্থ নয় তাদেরকে আগ্রিম স্থানীয় স্বাস্থ্যসেবা প্রদানকারীদের সাথে যৌথ পারস্পরিক সহযোগীতার পরিকল্পনা করতে হবে।
- ✓ এই পরিকল্পনা তৈরির জন্য স্থানীয় ও জাতীয় পর্যায়ের জনস্বাস্থ্য কর্তৃপক্ষ সহযোগীতা প্রদানেরও প্রস্তাব দিতে পারে।

মনে রাখা জরুরী:

কোভিড-১৯ এর জন্য প্রস্তুত হওয়ার সময় এখনই। এক্ষেত্রে সাধারণ সতর্কতা এবং সঠিক পরিকল্পনা গ্রহণ কোভিড-১৯ প্রতিরোধে বড় ভূমিকা রাখতে পারে। অবিলম্বে নেয়া সঠিক পদক্ষেপ আপনার কর্মক্ষেত্র ও কর্মচারীদের রক্ষা করতে সহায়তা করবে।

COVID-19 Health and Safety Guidance for the Construction Workforce

COVID-19 Health and Safety Guidance for the Construction Workforce

INSTRUCTIONS

Contractors are required to ensure health and safety of the workers and employees in accordance with environmental health and safety (EHS) provisions of the contract which is in line with ADB SPS 2009 and Bangladesh Labor Law 2006 (Chapter VIII). A supplementary EHS guidelines was prepared to ensure that workers and employees are safe from Pandemic COVID-19 infection while working at the constriction sites. This guideline should be used as a supplement to the project's Environmental Health and Safety (EHS) guidelines for the workers. Contractors are encouraged to prepare a site-specific Environmental Health and Safety (EHS) guidelines for reopening the sites and mobilizing labor and resources and get it approved by Executing Agency. The EHS guidelines and COVID-19 EHS guidelines should be available at worksite all the time with no exception.

Prerequisites for Reopening Worksite

1. Consider reopening at limited scale by identifying and engaging essential labor force
2. Avoid worker intensive works as much as possible; encourage use of equipment
3. Engage fulltime EHS professional to oversee the implementation of EHS guidelines
4. Engage a medical professional to prepare health record of the workers and daily health checkup
5. Ensure coverall Personal Protective Equipment (PPE) for medical professional
6. Prepare a list of equipment and vehicles to be used frequently and ensure routine disinfection
7. Make available thermometer, soap, hand sanitizer, disinfectant, and PPE (mask, gloves, boot) at worksite and camp
8. Place adequate number of washbasins, disinfectant tub, dispenser for sanitizer
9. Establish electronic payment system (e.g., BKash, Nagad, Rocket) to pay the daily wage
10. Follow the guidance as provided below.

Locate the closest medical facility equipped with COVID -19 and contact them.

Place washbasins and disinfectant tub for shoes.

Engage EHS professional. Engage Medical professional (fulltime/ part-time).

Place a few COVID-19 signed covered trash bin for disposal of used PPEs.

Supply soap and sanitizer to labor and staff for after office for disinfection.

Worksite Entrance Protocol

Everyone entering the worksite must wear a mask and gloves.

During worksite entry que, maintain physical distance of minimum 1m (3ft).

Every personnel should wash their hands with soap for 20 seconds. Display hand washing protocol at entrance.

Spray bottom of shoes of every personnel entering worksite/ campsite with disinfectant. Disinfect all vehicles entering site.

use thermometer gun to check temperature. If body temperature found > 37°C send to the designated medical facility.

Worksite Management

Frequently clean and disinfect highly used tools, machineries and surfaces (e.g. tables, toilets) by workers.

Mandatory morning briefing on COVID awareness at site maintaining physical distance.

Use alcohol-based wipe to clean tools, equipment, vehicle before and after use.

Discourage gathering at site. Discourage unnecessary entrance and exit at site.

Camp Management

1. Provide soap, sanitizer, washing facility and safe water at the workers' dwelling. Encourage frequent hand washing.
2. Ensure separate covered bin for disposal of used PPEs.
3. Protect against heat, cold, damp, noise, fire, and disease-carrying animals.
4. Maintain good housekeeping and social distancing in kitchens, meal rooms, canteens.
5. Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.
6. Ensure ample ventilation at the camp.

Place covered waste bins at worksite

Do not forget to dispose your used PPEs in the bins!!

Work at Site Awareness

Inform the designated ESH/Medical personnel immediately if any person starts showing the symptoms of COVID-19.

Encourage respiratory etiquette, including covering coughs and sneezes. Don't touch nose/eye/ mouth if not washed recently, do not spit.

Encourage the workers at camp to go out for supplies not more than once a week.

Shorten toolbox meetings. Initiate remote meeting protocol to avoid physical contact.

Stay informed. Get news from WHO and Government news outlets. Ask your EAs. Ask ADB.

COVID-19 Health and Safety guidance for the construction workforce

COVID-19 Health and Safety Guidance for the Construction Workforce

USE OF THIS DOCUMENT

This document should be used as a supplement to the Environmental Health and Safety (EHS) Manual for the workers. Make all the documents available at site all the time. Executing Agencies (EAs) are responsible for providing both documents to the contractors. Contractors should provide both documents at site. The current document should be used in conjunction with ESH manual. Consider this document as 'live document' which should be updated as new information available. A site-specific version of this document should be adopted for specific project sites.

Section 1: Pre-requisite for reopening/opening worksite/campsite:

- Plan to open/reopen worksite at limited scale (i.e., only essential works at worksite). Map essential/unavoidable works that must be attended at this moment. Identify and engage essential labor force initially. Increase labor force step by step as necessary. Do not engage labor until necessary preparation is done as stipulated in the next paragraphs.
- Locate the closest medical establishment equipped with COVID -19 response facilities. Establish contact with the medical facility and make agreements with them for cases of potential COVID patient from the work site.
- Engage a full time EHS professional at site. Also engage a part-time/fulltime medical professional based on the workforce and project size/type.
- Prepare list of potential workforce/labors. With the help of the EHS/medical professional prepare health records of the labors to be engaged. Seek assistance from registered medical centers if required. Keep the record at site office.
- Purchase thermometer gun, soap, hand sanitizer, disinfectants and PPEs (mask, hand gloves, hard shoes etc.) and keep it at worksite office. Disinfectants can be diluted bleaching power as directed by Environmental Protection Agency (EPA).
- Establish site entrance protocol as depicted in **Section 2** below. Redesign the site safety notices/signboards/protocol according to the guidelines provided in this document.
- Arrange washbasin, soap and clean water at the entrance of every worksite/campsite. Also keep either a disinfectant tub for shoes or keep disinfectant spray that must be sprayed under the boots/hard shoes of the persons entering worksite. Put signboard/poster in front of the washbasin instructing the workers/staff/site visitors to wash both hands for 20 seconds. The board/poster should also display proper hand washing techniques as per WHO guidelines.
- Provide every personnel working in the site with mask, hand gloves and hard shoes for their personal use. Strictly follow the HSE manual at site. The Contractor must have a copy of the HSE manual at site. For assistance contact with relevant EAs.
- Identify and note a list of commonly used machines/tools and surfaces (e.g., tables, doorknobs, handrail etc.) by workers and camp site dwellers.
- Make arrangements of electronic payment system affordable for the workers (e.g., bKash, Nogod, Rocket etc.). Update company polices of paid sick leave, medical allowance and medical insurance.

Section 2: Worksite entrance protocol

1) Everyone entering the worksite must wear a mask, gloves and hard shoes. Strictly follow and implement the EHS manual at worksite.
2) At the entrance of the worksite/camp site every personnel must wash their hands for 20 second with maintaining a distance of at least 1m (3 ft) from each other. At this rate 180 person can enter the site in an hour. Depending on this calculation (hourly rate 180pax per washbasin) the Contractor can calculate the number of washbasins

he/she needs to provide. The wash basins should maintain at least 1.5m distance from each other and the entrance que must maintain 1m distance from each other.

3) Spray bottom of shoes of every personnel entering worksite/campsite with disinfectant or provide shoe storage for worker storing shoe in poly bag before entering the worksite.
4) Procure and use a thermometer gun to check temperature of everyone entering the site. If body temperature is found > 37 degrees, send this person to the designated medical facility for further examination and follow instruction of the medical person in-charge.
5) Prepare disinfectant using ICCDR, B or EPA registered household disinfectant formula (e.g. diluted bleaching powder) and disinfect vehicles upon entry to the worksite/campsite.

Section 3: Daily worksite protocols

- A designated EHS and medical person should stay all time during work. The EHS/Medical person should also monitor campsite. He/she will be in charge of ensuring physical distances (minimum 1m) among workers, disinfecting surfaces that are commonly used and investigate workers/site personnel health and safety.
- The designated EHS/medical person (or assistant) must frequently clean and disinfect highly used tools and machineries by workers and surfaces including doorknobs, handrails, toilets, work surfaces, and common areas such as tables, assembly place etc.
- At the start and end of the day disinfect the total worksite. For campsite, disinfect the total area before the workers/camp dwellers are back from site.
- Always check if the stock of disinfectant, PPEs, medical supplies are sufficient.
- Encourage site personnel/camp dwellers to not touch their eyes, mouth or nose if not washed thoroughly with soap recently. Also discourage hand shaking or hugs.
- Arrange a mandatory site brief on COVID awareness in the morning. The session must be conducted by the EHS/medical professional.
- Encourage workers/site personnel/camp dwellers to inform the designated ESH/Medical personnel immediately if any colleague starts showing the symptoms of COVID-19.
- While worksites are commonly well ventilated (if not make sure the work sites are well ventilated), ensure that the camp sites including the rooms designated for the camp dwellers are well ventilated and spacious.
- Before sharing common tools/machines at worksite, ensure to disinfect.
- Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing.
- Keep the day-to-day toolbox meetings as short as possible. Ensure physical distance during meetings.
- Increase use for internet/phone-based meetings/site visits as much as possible to avoid travelling and physical communication.
- Restrict worksite personnel to go outside unnecessarily. Also restrict campsite personnel to go outside without any valid cause.
- If any person related at worksite/campsite fall victim to COVID-19 or being kept isolated for pre-caution, consider paid leave with no exception allowed.

Section 4: Everyday training

- Train workers on how to properly put on, use/wear, and take off protective clothing and equipment. The on-site EHS/Medical person should be in-charge of these trainings. These trainings must maintain the WHO's social distancing protocol. Make these trainings mandatory at worksites. Provide 10-15 minutes of a workday for such 'training and encouragement' activities.
- Encourage respiratory etiquette, including covering coughs and sneezes. Train the site personnel as needed.
- Contact with EAs/ADB designated professional for any help with training material/knowledge/miscellaneous.

Section 5: Campsite management

- Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home). Encourage frequent hand washing and social distancing at campsite.
- Ensure a separate covered bin in place at every campsite/worker's dwelling for disposal of used PPEs.
- Check and ensure if camps are well ventilated and protected against heat, cold, damp, noise, fire, and disease-carrying animals.
- Maintain good housekeeping and social distancing in kitchens, meal rooms, canteens and toilets. Make sure campsites are using sanitary toilets.
- Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.

Section 6: Knowledge management and documentation

1) During CODIV-19 outbreak new information is coming everyday as the science develops. Site management needs to evolve as new information/current protocol emerges. It is difficult for site medical/EHS professional to keep up with the new knowledge/information that is coming every day in absence of fast internet. Hence, he/she should keep in close contact with the designated EAs/ADB professional for updated information and protocol. This documents also needs to be considered as live document and should be updated as necessary.

Emergency response team (COVID-19)

EMERGENCY/CRISIS RESPOSE TEAM
(Roles and Responsibilities)

A. Overview

An integrated approach to emergency response involves a range of stakeholders, including the primary responder (i.e., the Contractor), supervision consultants, the secondary responder (i.e., EA/IAs) and the tertiary responder (i.e., Donor agencies (e.g., ADB)) along with the local authorities, regulatory agencies and the general public. Such a system therefore requires robust processes regarding information dissemination, training, and designation of responsibility, management actions, monitoring, control, and corrective actions. The Emergency/Crisis Response Team therefore needs to be fully equipped and well communicated.

B. Organization chart of crisis response team

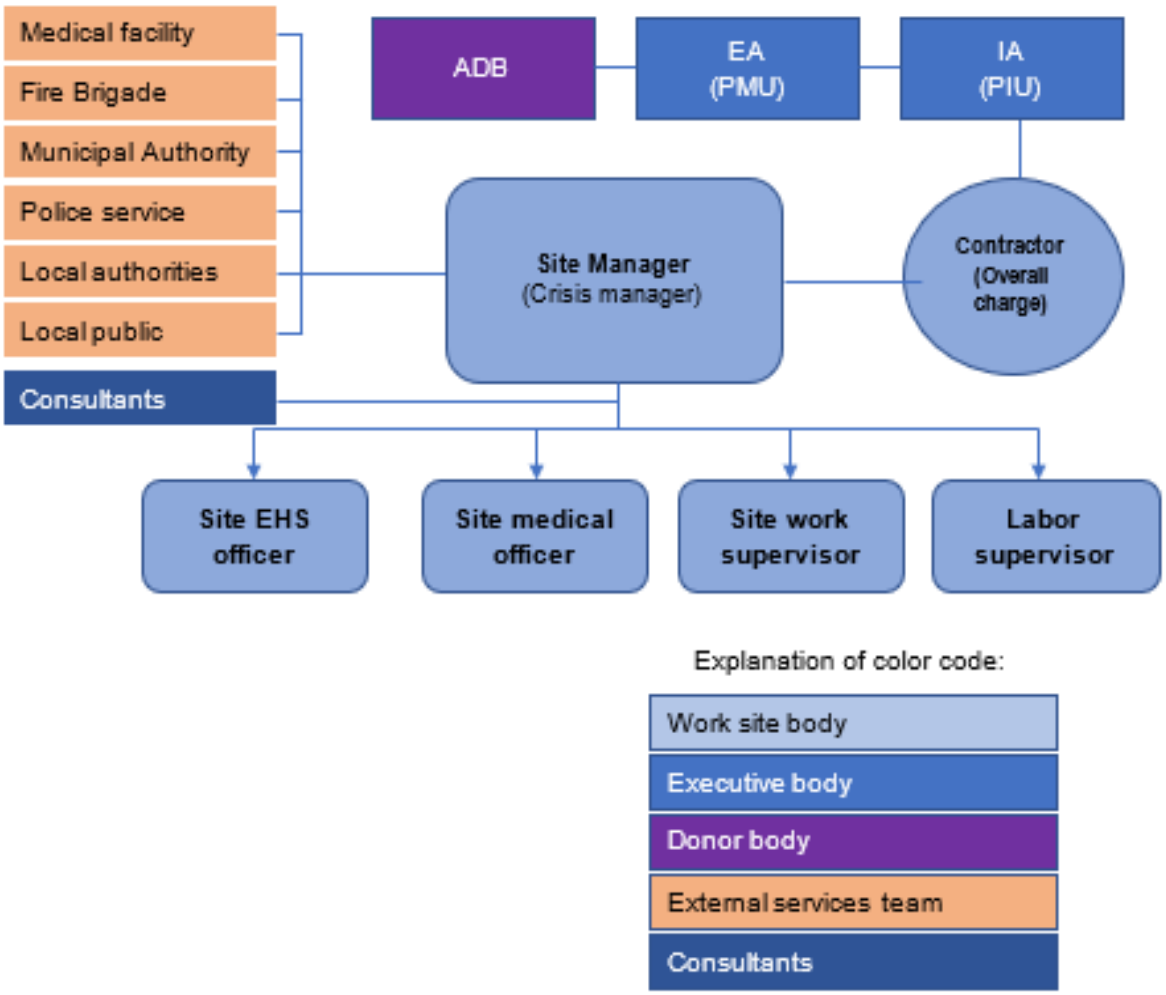


Figure: Organization chart of the crisis management team

Table: Crisis response team

No.	Name	Designation	Mobile no.
1		Site Manager	
2		EHS officer	
3		Medical officer	
4		Worksite supervisor	
5		Labor supervisor	
6		Contractor	
7		Local hospital	
8		Local police station	
9		Local fire brigade	
..			

Appendix 4: Public Consultation

No.	Meeting Date	Meeting with	Issues Discussed
1	08 Feb. 2022	Prominent residents and representatives of Lama Town	Discussions covered issues confronting the population, water supply and sanitation issues in particular. The residents wanted project (both water supply and sanitation) to be implemented immediately and indicated their willingness to cooperate in all respects for achieving successful implementation.
			
2	20 Nov. 2021	Discussion with Mayor, Lama Pourashava and other officials of the Lama Pourashava	Discussions covered the finalization of locations of the various sub-project components and role that the Pourashava can play in project execution. The suggestions have been incorporated in the Project Preparatory documents.
			
4	08 Nov. 2021	All Key Stakeholders – details to be obtained. Chittagong Hill Tracts Regional Council -	A day-long stakeholder workshop was held at Cox Bazaar in which all the participants were invited exclusively for the purpose. A presentation was made on the project to cover all technical and safeguards issues. A presentation on

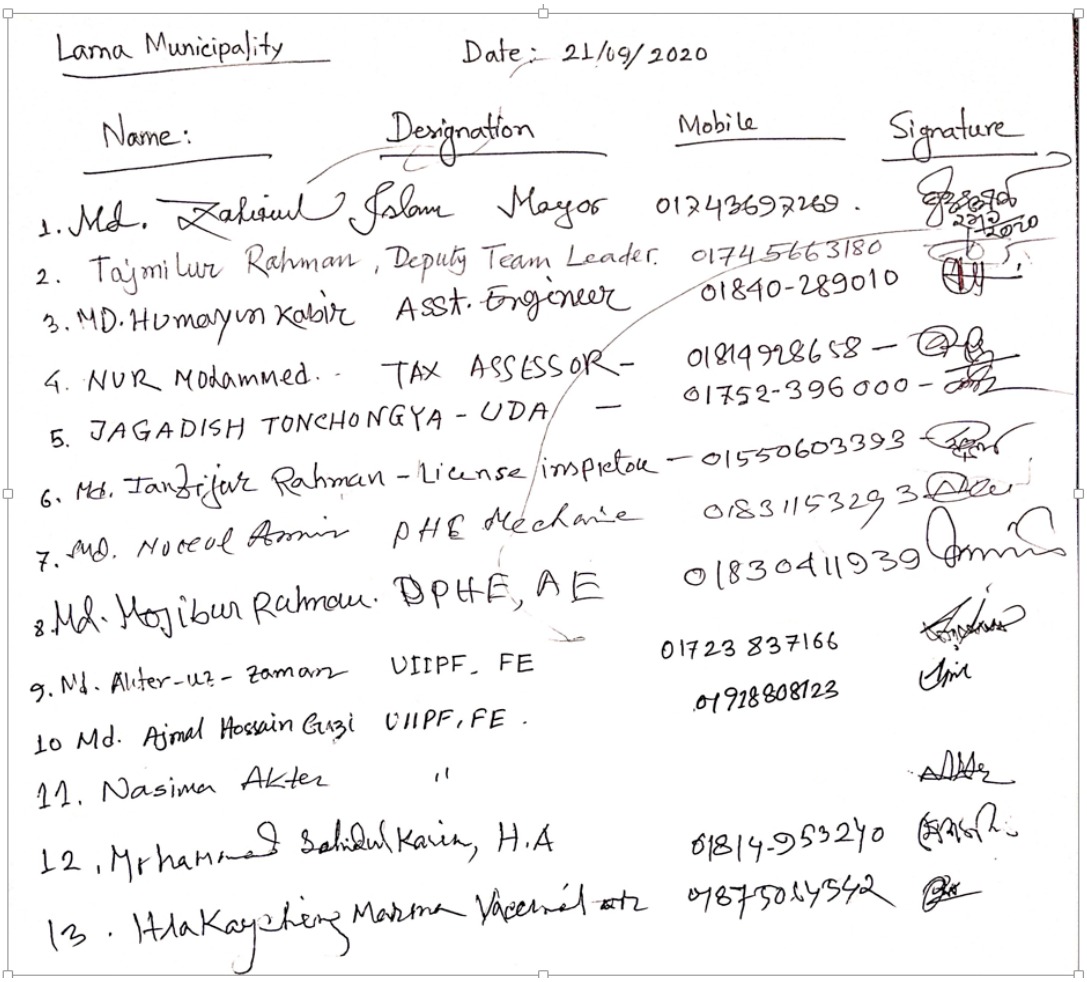
No.	Meeting Date	Meeting with	Issues Discussed
		Chairperson District Commissioners – Rangamati and Bandarban; Mayor – Rangamati; Mayor – Bandarban; Mayor – Lama Officials of DPHE from the Hill Division and Dhaka Division.	Environmental Safeguards was delivered and the importance of complying with ADB SPS 2009 and the GOB requirements were explained. Suggestions from the participants were made to include training and capacity building activities in the project. The suggestions have been incorporated in the IEE.
		 **Photograph taken at the Stakeholder Consultation Workshop**	
5	April 2021	Focus Group Discussions (6 Nos.) with Women Groups, Women-Men Combined Groups, Diverse Groups including indigenous women and men.	Major suggestions provided by the households for the water and sanitation services are: • Adequate supply of safe water • Improvement of water quality and quantity • Installation of a meter or pre-paid system so that people can pay as per usage. • Better sanitation facilities including fecal sludge management and solid waste management. The following suggestions were made to for better project implementation: • Ensure people's participation in the monitoring / maintenance committee; • Increase women's participation in decision making on water and sanitation services; • Improving the effectiveness of the Water-Sanitation Committees in the Municipality; • Improve participation of NGOs and other voluntary organizations.

Photographs of Consultations

	
Choto Nonarbil Para	Consultation with shopkeeper of Maddypara
	
Bazar of Noyapara, Lama	Member para
	
Bazar Para	Bazar Para

	
Member Para	Consultation with land owners at Linejhiri (9/3/2022)

Attendance Sheets of Consultations held with Lama Pourashava and Stakeholders' Workshop



Lama Municipality Date: 21/09/2020

Name:	Designation	Mobile	Signature
1. Md. Zahirul Islam	Mayor	01743697269.	
2. Tajmilur Rahman	Deputy Team Leader	01745663180	
3. MD. Humayun Kabir	Asst. Engineer	01840-289010	
4. NUR Mohammed	TAX ASSESSOR	01819928658	
5. JAGADISH TONCHONGYA	UDA	01752-396000	
6. Md. Tanbijur Rahman	License inspector	01550603393	
7. MD. Nooral Amin	PHE Mechanic	01831153293	
8 Md. Mojibur Rahman	DPHE, AE	01830411939	
9. Md. Akter-uz-zaman	UIIPF. FE	01723 837166	
10 Md. Ajmal Hossain Gazi	UIIPF, FE.	01918808123	
11. Nasima Akter	"		
12. Mrhammad Sahidul Kabir	H.A	01814-953240	
13. Hla Kaycheing Marma		01875014542	

Urban Infrastructure Improvement Preparatory Facility (DPHE Component)
TA Consultant for Feasibility Study, Detailed Design and Procurement Services
Project Office: DPHE Bhabon, 14 Shaheed Captain Monsur Ali Sarani, Kakrail, Dhaka-1000

NJS AQUA

Stakeholders' Consultation workshop on "Secondary Towns Inclusive Water Supply and Sanitation Project"

ATTENDANCE REGISTRATION

SL No.	Date	Name	Designation	Organization	Mobile No.	E-mail	Signature
	8-11-21	Jungsuippu Chy	Chairman RHDC		015567779		
	8-11-21	Md. Mezanur Rahomon	Field Engineer DPHE.UIIPF.	DPHE	01922205445	mezuife gmail.com	
	"	Arm Sarful [illegible]			01716206557		
	"	Purnanda Chakma	SAE, DPHE RANGAMATI	DPHE RANGAMATI	01632642779		
	"	Md. Rajjak Islam	Urban Dev. Specialist (consultant)	ADB	01713046774		
	"	Bipul TRipura	Member of Hill District council		01732803773		
	"	Anupam Dey	XEN, DPHE Rangamati	DPHE	01974316502		

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NJS AQUA

Stakeholders' Consultation workshop on "Secondary Towns Inclusive Water Supply and Sanitation Project"

ATTENDANCE REGISTRATION

SL No.	Date	Name	Designation	Organization	Mobile No.	E-mail	Signature
1.	08.11.2021 Sarmistha Acharjee	Sarmistha Acharjee	ExEN	DPHE Bandarban	01972786620	acharjee.dphe@gmail.com	
2.	08.11.2021	Md. Monjel Hossin	AE	DPHE Bandarban	01553517323	monjel.dphe@gmail.com	
3.	08.11.2021	Tanvir Ahsan	Director	TA Hub, BMGF	01713036090	tanvir@devconltd.com	TA
4.	08.11.2021	Touhidul Islam	Secretary	Bandarban Parushava	01550601520	touhidul.islam.info@gmail.com	
5.	08.11.2021	Nasima Akter	Social Safeguard Specialist	DPHE UIIPF	01715038835	akternasima09@yahoo.com	
6.	08.11.2021	Srinath Areical	Environmental Safeguard Specialist	DPHE UIIPF	+91 974097 8471	srinath@climatesd.co.in	
7.	08.11.2021	Akbar Hossain chy	Mayor	Rangamati	0174663573 3		

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Project Office: DPHE Bhabon, 14 Shaheed Captain Monsur Ali Sarani, Kakrail, Dhaka-1000

NJS

AQUA

Stakeholders' Consultation workshop on "Secondary Towns Inclusive Water Supply and Sanitation Project"

ATTENDANCE REGISTRATION

SL No.	Date	Name	Designation	Organization	Mobile No.	E-mail	Signature
8.	08.11.2021	Purnandu Chakma	SAE	DPHE, RANGAMATI	01632642779		[signature]
9.	08.11.2021	John Shipp	Team leader	NJS	013	johnp2003@yahoo.com	[signature]
10.	08.11.2021	David Khan	WSNS	NJS	01713202763	david@esolveint.com	[signature]
11.	08.11.2021	Tajmilur Rahman	DTL	NJS-AQUA	01745663180	tajmilurrahman@yahoo.com	[signature]
12.	08.11.2021	A.T.M. Kawsar Hossain	CEO BHDC	BHDC	01711313402	bhdcbd@gmail.com	[signature]
13.	08.11.2021	~~Kyaw Shwe Hla~~ Kyaw Shwe Hla	Chairman	BHDC	01755599993		[signature]
14	08.11.2021	Dr. Abdullah Al Muyeed	COO/CWIS-FSM com	DPHE	01930095588	—	[signature]

Urban Infrastructure Improvement Preparatory Facility (DPHE Component)
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Project Office: DPHE Bhabon, 14 Shaheed Captain Monsur Ali Sarani, Kakrail, Dhaka-1000

NJS AQUA

Stakeholders' Consultation workshop on "Secondary Towns Inclusive Water Supply and Sanitation Project"

ATTENDANCE REGISTRATION

SL No.	Date	Name	Designation	Organization	Mobile No.	E-mail	Signature
	08.11.2021	MD. ASHRAFUL ISLAM	CEO	Rangamati Hill district council	01873-772826	ashrafuyl15321@gmail.com	[signature]
	08.11.2021	MD. Zahirul Islam	Mayor	Lama Municipality	01843-698269	lamapourashava119@gmail.com	[signature]
	08.11.2021	Zulkar Naeim Manik	SAE	"	01836241842	zulkarnaeim@gmail.com	[signature]
	08.11.2021	NOOR Mohammed	Assessor	"	01819928658		[signature]
	08.11.2021	Mohammud Khorshed Alam Pradan	Assistant Engineer	DPHE, Lama	01813733041	mihirpradan@gmail.com	[signature]
	08.11.2021	Sourav Das	Mayor Acting	Bandarban Pourashava	01558422293		[signature]

Joint Venture: NJS Consultants Co. Ltd., Japan - AQUA Consultant & Associates Ltd., Bangladesh

Urban Infrastructure Improvement Preparatory Facility (DPHE Component)
TA Consultant for Feasibility Study, Detailed Design and Procurement Services
Project Office: DPHE Bhabon, 14 Shaheed Captain Monsur Ali Sarani, Kakrail, Dhaka-1000

NJS

Stakeholders' Consultation workshop on "Secondary Towns Inclusive Water Supply and Sanitation Project"

ATTENDANCE REGISTRATION

SL No.	Date	Name	Designation	Organization	Mobile No.	E-mail	Signature
	8.11.21	Md. Abdul Awal	Office Manager	AQUA	01829864482		
	11	Md. Saifulla	Admin officer	11	01913-512310		
	8.11.21	Md. Akter uz zaman	Office Manager	AQUA	01723837166		
	08.11.202	Md. Shafiqul Hassan	Project Director	UIIPF (DPHE Component project)	01756409946		

Appendix 5: Sample Grievance Redress Form

(To be available in English or other local languages)

The DPHE welcomes complaints, suggestions, queries, and comments regarding the project implementation. We encourage any person or group with a grievance to provide their name and contact information to get in touch with you for clarification and feedback.

Should you choose to include your details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date		**Place of registration**				
Contact Information/Personal Details						
Name		Gender	Male	Female	Age	
Home Address						
Village / Town						
District						
Phone no.						
E-mail						
Complaint/Suggestion/Comment/Question Please provide details of the grievance (who, what, where, and how): _____ _____ ***Note: You may attach a document, letter, or note in the grievance form.**						
How do you want us to reach you for feedback or updates on your comment/grievance?						

OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode: (i) Note/Letter (ii) E-mail (iii) Verbal/Telephonic	
Reviewed by: (Name, Signature, Position)	
Action Taken:(Date, Venue of Meeting, Other details)	
Whether Action Taken Disclosed:	(i) **Yes** (ii) **No**
Means of Disclosure:	

GRIEVANCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainant	Type of Complaint	Place	Status of Redress	Remarks

Appendix 6: Sample Daily Inspection/Monitoring Checklist of Contractor

Monitoring and Reporting Template
Environmental Health and Safety Monitoring

A. Environmental Health and Safety Checklist

Sl no.	Item	Exist in the worksite?		Recommendation And/ or Remarks	Time frame to comply
		Yes □	No □		
1	Site readiness (e.g., is worksite fenced and can be distinguished from general establishment? Is the an EHS professional at site? Has he/she been fulltime professional? Has he/she been present at site every day?)				
2	Site access (e.g., is site access road wide and easily accessible?)				
3	Signboard with safety warnings (e.g., with general EHS safety signboards, are COVID 19 response signboards visible at every corner of worksite?)				
4	Lighting (e.g., is every corner of the worksite is well lit?)				
5	Appropriate PPEs (Helmet, Safety Shoe, Vest, Ear plug, Musk etc.) e.g. Is every person in site is wearing appropriate PPEs?				
6	Fall protection measures (e.g., is the fall protection measures at worksite appropriate and adequate?				
7	Fire extinguishers (e.g., are they at site? How many? Are they placed at vulnerable/most accessible places?)				
8	Housekeeping (e.g., are all workers health records kept? Is the EMP and EHS manual at site? Has the morning briefing on EHS conducted? Is there any vehicle record/material register/attendance register/complain register kept?)				
9	Garbage bins (e.g., are there garbage bins at site? Are the numbers adequate? Is waste thrown to bins? Are the bins well places?				
10	Drinking water supply (e.g., safe drinking water for worksite been supplied? Is drinking water adequate?				
11	Sanitation facilities (e.g., is there separate male and female toilets established? Are they adequate? Hand wash materials and water being provided at toilets? Are those toilets sanitary?				
12	Dust protection measures (e.g., is mask provided for worksite personnel? Is water sprayed frequently as needed to suppress dust? Are sand class materials covered with plastic sheets?				
13	Noise barrier and reduction equipment (e.g., how much noise is generated by site? Does it exceed maximum human exposure limit? Are workers provided with noise reduction gears such as ear mufflers?)				
14	Shelter (e.g., is there a site office or shelter good enough to take shelter during rain or storm event?)				
15	First aid box (e.g., is there a first aid box at site? Are the contents of the first aid box adequate for primary treatment? Is the first aid box handled by at EHS/medical professional				
16	Toolbox meetings (e.g., are toolbox meeting regularly arranged? Are records kept?)				

17	Others (many other checklists can be formulated by the EHS professional on board)				
COVID -19 protocols on top of usual EHS checklist (this applied to campsite also)					
18	COVID-19 posters/signboards (e.g., are COVID-19 awareness/protocol posters are showing all visible corners of the site?)				
19	Entrance protocol (e.g., Is the COVID-19 worksite entrance protocol been followed as stipulated in the COVID -19 response guidance? Are adequate soaps, water has been kept at site entry? Are workers at entrance que using mask, hand gloves and hard shoes? Are disinfectant spray kept at site entry to disinfect underneath the boots of entering persons?)				
20	Vehicle entry protocol (e.g., has the vehicle disinfection protocol has been initiated?)				
21	Social distancing (e.g., are the workers maintaining social distancing all the time?)				
22	Sharing tools/machineries (e.g., are the tools and machineries are wiped to disinfect before sharing/working?				
23	Disinfecting work area (e.g., is the worksite/ common surfaces, toilets etc. are disinfected before worksite opened in the morning? Has record being kept? Has the worksite been disinfected yesterday after closing for the day?)				
24	Restriction on worksite entry and exit (e.g., has workers being discouraged to travel frequently out of worksite or entering? Has records being kept?)				
25	Stock of disinfectant (e.g., is the stock of disinfectants, soap, PPEs are adequate at worksite?)				

*Attach photos
**Enter additional criteria as required for site specific measures

Reported by (ESC)	**Checked by (TL)**	**Approved by (EA/IA)**
Name Designation Signature Date	Name Designation Signature Date	Name Designation Signature Date
Received and agreed to comply by the representative of the Contractor	**Name** **Designation** **Signature** **Date**	

B. Accident/ Incident Investigation Report

Class of Incident		Reported	
☐ Injure ☐ Property/ Plant Damage		Yes ☐ No ☐ Details:	
		Further Action Required	
☐ Near Miss ☐ Environmental		☐ Report to Authorities ☐ Other	
Details of Incident			
Date of Incident		Time of Incident	am ☐ pm ☐
Witness Name		Witness Contact	
Nature of Incident			
Location of Incident			
Description of Incident			
Details of damage to equipment/property			
Injured Person/s (if applicable)			
Name			
Address Date of Birth Occupation Referred/transferred to		Employer	
Recommended Preventive Action			
Details			
Completed by			
Name		Position	
Signature		Date	

C. Safety patrol/inspection report form

SITE SAFETY PATROL REPORT AND INSTRUCTION						
Date						
Inspector						
No	**Location**	**Comment/instruction**	**Photo**	**Corrective action**	**Deadline**	**Responsible person**

Reported by (ESC)	**Checked by (TL)**	**Approved by (EA/IA)**
Name Designation Signature Date	Name Designation Signature Date	Name Designation Signature Date
Received and agreed to comply by the representative of the Contractor	**Name** **Designation** **Signature** **Date**	

Appendix 7: Sample Inspection Checklist for PMU/PMU/PIU

SAMPLE INSPECTION CHECKLIST

(Note**:** This checklist is indicative which can be further enhanced depending on the project circumstances.)

[NAME OF ADB PROJECT]
SITE INSPECTION CHECKLIST

Subproject / Location:_____ Date: _____

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
1.	Supervision and Management On-Site	Yes	No	NA	
	a. Is an EHS supervisor available?				
	b. Is a copy of the SEMP available?				
	c. Are daily toolbox talks conducted on site?				
2.	The Facilities	Yes	No	NA	
	a. Are there a medical and first aid kits on site?				
	b. Are emergency contact details available on-site?				
	c. Are there PPEs available? What are they?				
	d. Are the PPEs in good condition?				
	e. Are there firefighting equipment on site?				
	f. Are there separate sanitary facilities for male and female workers?				
	g. Is drinking water supply available for workers?				
	h. Is there a rest area for workers?				
	i. Are storage areas for chemicals available and with protection? in safe locations?				
3.	Occupational Health and Safety	Yes	No	NA	
	i) Are the PPEs being used by workers?				
	ii) Are excavation trenches provided with shores or protection from landslide?				
	iii) Is breaktime for workers provided?				
	iv) How many for each type of collection vehicle is in current use?				
4.	Community Safety	Yes	No	NA	
	a. Are excavation areas provided with barricades around them?				
	b. Are safety signages posted around the sites?				
	c. Are temporary and safe walkways for pedestrians available near work sites?				
	d. Is there a record of treated wastewater quality testing/measurement?				
5.	Solid Waste Management	Yes	No	NA	
	a. Are excavated materials placed sufficiently away from water courses?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
	b. Is solid waste segregation and management in place?				
	c. Is there a regular collection of solid wastes from work sites?				
6.	Wastewater Management	Yes	No	NA	
	(i) Are there separate sanitary facilities for various types of use (septic tanks, urination, washing, etc.)?				
	(ii) Is any wastewater discharged to storm drains?				
	(iii) Is any wastewater being treated prior to discharge?				
	(iv) Are measures in place to avoid siltation of nearby drainage or receiving bodies of water?				
	(v) Are silt traps or sedimentation ponds installed for surface runoff regularly cleaned and freed of silts or sediments?				
7.	Dust Control	Yes	No	NA	
	a. Is the construction site watered to minimize generation of dust?				
	b. Are roads within and around the construction sites sprayed with water on regular intervals?				
	c. Is there a speed control for vehicles at construction sites?				
	d. Are stockpiles of sand, cement and other construction materials covered to avoid being airborne?				
	e. Are construction vehicles carrying soils and other spoils covered?				
	f. Are generators provided with air pollution control devices?				
	g. Are all vehicles regularly maintained to minimize emission of black smoke? Do they have valid permits?				
8.	Noise Control	Yes	No	NA	
	○ Is the work only taking place between 7 am and 7 pm, week days?				
	○ Do generators operate with doors closed or provided with sound barrier around them?				
	○ Is idle equipment turned off or throttled down?				
	○ Are there noise mitigation measures adopted at construction sites?				
	○ Are neighboring residents notified in advance of any noisy activities expected at construction sites?				
9.	Traffic Management	Yes	No	NA	
	a. Are traffic signages available around the construction sites and nearby roads?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
	b. Are re-routing signages sufficient to guide motorists?				
	c. Are the excavation sites along roads provided with barricades with reflectors?				
	d. Are the excavation sites provided with sufficient lighting at night?				
10.	Recording System	Yes	No	NA	
	a. Do the contractors have recording system for SEMP implementation?				
	b. Are the daily monitoring sheets accomplished by the Contractor EHS supervisor (or equivalent) properly compiled?				
	c. Are laboratory results of environmental sampling conducted since the commencement of construction activities properly compiled?				
	d. Are these records readily available at the site and to the inspection team?				

Other Issues: _____

_____

_____

_____

Prepared by: _____

Name, Designation and Signature

Appendix 8: Semi-annual Environmental Monitoring Report Template

1. Introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009

2. Project Safeguards Team

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

3. Overall project and subproject/package progress and status

- Indicate (i) status of design – preliminary design or final design, (ii) status of implementation - under bidding, contract awarded but no works yet, contract awarded with works, civil works completed, or O&M

Package Number	**Components/List of Works**	**Type of Contract** *(specify if DBO, DB or civil works)*	**Status of Implementation** *(specify if Preliminary Design, Detailed Design, On-going Construction, Completed Works, or O&M phase)*[1]	**Contract Status** *(specify if under bidding or contract awarded)*	**If On-going Construction**	
					%Physical Progress	**Expected Completion Date**

- For package with awarded contract, provide name/s and contact details of Contractor/s' nodal person/s for environmental safeguards.

Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	IEE Cleared by ADB *(provide date)*	Contractor	HSE Nodal Person	Email Address	Contact Number

4. STATUS OF IEE PER SUBPROJECT/PACKAGE

- Provide status of updated/final IEE[2] per package.

Package-wise Implementation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director?[3] *(Yes/No)*	Remarks
	Not yet due *(detailed design not yet completed)*	Submitted to ADB *(provide date of submission)*	Disclosed on project website *(provide link)*	Final IEE provided to Contractor/s *(Yes/No)*		

5. Compliance status with National/State/Local statutory environmental requirements[4]

Package No.	Statutory Environmental Requirements[5]	Status of Compliance *(Specify if obtained, submitted and awaiting approval, application not yet submitted)*	Validity Date(s) *(if already obtained)*	Action Required	Specific Conditions that will require environmental monitoring[6]

6. Compliance status with environmental loan covenants

Schedule No. and Item *(see Project Loan Agreement and list provisions relevant to environmental safeguards, core labor standards and occupational health and safety)*	Covenant	Status of Compliance	Action Required

7. Compliance status with the environmental management plan (refer to EMP tables in approved IEE/s)

- Confirm in IEE/s if contractors are required to submit site-specific EMP (SEMP)/construction EMPs (CEMP). If not, describe the methodology of monitoring each package under implementation.

- Provide over-all compliance of the contractors with SEMP/CEMP. This should be supported by contractors' monthly monitoring reports to PIU(s) and/or verification reports of PIU(s) or project consultants. Include as appendix supporting documents such as **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.

Overall Compliance with SEMP/CEMP

Package No.	Status of SEMP/CEMP Implementation *(Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)*	Action Proposed and Additional Measures Required

- Provide description based on site observations and records:
  - 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 including if these were intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach 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 condition. Attach photograph.
  - Describe management of stockpiles in each work site (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs.
  - Provide information on workers labor camp(s). Provide photographs.
  - Provide information on work-related accidents and incidents. Describe actions implemented.
  - Provide information on if there are any activities being undertaken out of working hours and how that is being managed.

- Provide list of trainings on environmental safeguards, core labor standards, and OSH conducted during the reporting period. Include ADB-organized workshop, trainings, seminars, etc.)

Trainings, Workshops and Seminars Conducted

Date	Topic	Conducted by	No. of Participants (Total)	No. of Participants (Female)	Remarks

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).

Summary of Environmental Monitoring Activities (for the Reporting Period)[7]

Impacts *(List from SEMP/CEMP)*	**Mitigation Measures** *(List from SEMP/CEMP)*	**Parameters Monitored** *(As identified in the SEMP/CEMP)*	**Method of Monitoring** *(Visual, Actual Sampling, etc.)*	**Location of Monitoring** *(Provide GPS Coordinates)*[8]	**Date of Monitoring Conducted**	**Person Who Conducted the Monitoring**
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

8. Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS

- Confirm records of pre-work condition of roads, agricultural land or other infrastructure prior to starting to transport materials and construction.

Package No.	**Status of Pre-Work Conditions** *(Recorded / Not Recorded)*	**Baseline Environmental Conditions (air, water, noise) Documented** *(Yes / No)*	**Action Proposed and Additional Measures Required**

- Provide information on monitoring activities conducted during reporting period. If not conducted, provide justification. Compare results with baseline and internationally recognized standards.[9]

Air Quality Monitoring Results

Site No.	**Date of Testing**	**Site Location** *(Provide GPS Coordinates)*[10]	**Parameters** *(as required by statutory clearances or as mentioned in the IEE)*			**Remarks**
			PM10 µg/m3	**SO2 µg/m3**	**NO2 µg/m3**	

Water Quality Monitoring Results

Site No.	Date of Sampling	Site Location	Parameters *(as required by statutory clearances or as mentioned in the IEE)*						Remarks
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	

Noise Quality Monitoring Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) *(as required by statutory clearances or as mentioned in the IEE)*		Remarks
			Day Time	Night Time	

9. INFORMATION DISCLOSURE AND CONSULTATIONS

- Confirm PMU/PIU/contractors provide project-related information to stakeholders, communities and/or affected people before and during construction works.[11]
- Provide information on consultations conducted during reporting period such dates, topics discussed, type of consultation, issues/concerns raised, safeguards team member present. Attach minutes of meetings (ensure English translation is provided), attendance sheet, and photos.

Date of Consultation	Location	Number of Participants *(specify total, male and female)*	Issues/Concerns Raised	Response to issues/concerns

10. Grievance Redress Mechanism

- **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (package-wise if applicable).
- **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during 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).

11. SUMMARY OF KEY ISSUES/CONCERNS Identified during the reporting period AND REMEDIAL ACTIONS

- Provide corrective action plan which should include all issues/concerns, actions required to be implemented, responsible entities, and target dates.

12. STATUS OF CORRECTIVE ACTIONS FROM PREVIOUS SEMR(S)

- Provide information on corrective actions to be implemented as reported in the previous SEMR(s). Include status of implementation of feedbacks/comments/suggestions as provided by ADB, if any.

Corrective Action Plan Status

Issues/Concerns	Corrective Action	Status	Remarks

13. APPENDIXES
(i) Photos
(ii) Records of consultations
(iii) Copies of environmental clearances and permits (if not provided in the previous SEMR)
(iv) Environmental site inspection report (if not provided in the previous SEMR)
(v) Other

[1] If on-going construction, include %physical progress and expected date of completion
[2] IEE prepared based on preliminary design and cleared by ADB with condition that updated/Final IEE based on detailed design will be submitted.
[3] Works will not be allowed until SEMP/CEMP is approved by project implementation unit or project management unit.
[4] 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.
[5] Specify statutory requirements: environmental clearance? Permit/consent to establish? Forest clearance? Workers/Labor permit, etc.
[6] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*
[7] Attach Laboratory Results and Sampling Map/Locations
[8] If GPS coordinate is not available, provide landmark(s) and/or chainage.
[9] ADB Safeguard Policy Statement (SPS) Appendix 1, para 33: During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in the SPS.
[10] If GPS coordinate is not available, provide landmark(s) and/or chainage.
[11] Check EMP requirement on information disclosure. At a minimum, PIU thru the Contractor should notify communities/affected persons/sensitive receptors 7 days and again 1 day before start of works.

Appendix 9: Solid Waste Management Plan

Consequences	Mitigation measures	Records	Reporting	Responsibility
Debris disposal	– The debris disposal site should be identified which are preferably barren or low-lying areas away from settlements. – Prior concurrence will be taken from concerned Govt. Authorities or landowner – Due care should be taken during site clearance and disposal of debris so that public/ private properties are not damage or effected, no traffic is interrupted. – All efforts should be made to use debris in road construction or any other public utilities. – The debris should be stored at site ensuring that existing water bodies and drains within or adjacent to the site are kept safe and free and no blocking of drains occurs.	■ Generation and disposal quantity with location of disposal ■ Recyclables waste generation and disposal ■ Domestic waste disposal locations details	The waste generation and disposal details will form part of quarterly report to the PIU	**Prime Responsibility:** Contractor will be responsible for waste management and reporting **Supervisory Responsibility**: CSE/PIU/PMCSDRC
Dust	a) All dust prone material should be transported in a covered truck. b) All liquid waste like oils and paint waste should be stored at identified locations and preferably on a cemented floor. c) Provision of spill collection pit will be made in the floor to collect the spilled oil or paint. These should be sold off to authorized recyclers. d) All domestic waste generated at construction camp preferably be composted in portable mechanized composter. The composted material will be used as manure. In case composting is not feasible, the material will either be disposed off though municipal waste disposal system or disposed of through land burial. The dump site must be covered up with at least six-inch-thick layer of soil.	Visual inspection by CSE/PMCSDRC supervisor and note as checklist record	The waste generation and disposal details will form part of quarterly report to the PIU	**Supervisory Responsibility**: CSE/PIU/PMCSDRC

Consequences	Mitigation measures	Records	Reporting	Responsibility
	e) Only appropriately design and compliant landfills will be used for disposing waste			
Oil/chemical spills	▪ All efforts should be made that no chemical/ oily waste spill over to ground or water bodies. ▪ All precautions should be followed for emergency preparedness and occupational health & safety during construction and handling a waste. ▪ Provision of fire extinguishers will be made at the storage area	Visual inspection by CSE/PMCSDRC supervisor and note as checklist record	The waste generation and disposal details will form part of quarterly report to the PIU	**Supervisory Responsibility**: CSE/PIU/PMCSDRC
Traffic movement with waste	a) Adequate traffic control signals and barriers should be used in case traffic is to be diverted during debris disposal. All efforts should be made to ensure avoidance of traffic jam, which otherwise results in air pollution, noise pollution and public unrest. b) Hazardous waste and chemicals should be stored in a dedicated storage area that has: 1) weather protection, 2) solid impermeable surface and drainage to treatment system, 3) security fence/lock, 4) primary and secondary containment with 110% volume for liquids.	Visual inspection by CSE/PMCSDRC supervisor and note as checklist record	The waste generation and disposal details will form part of quarterly report to the PIU	**Supervisory Responsibility**: CSE/PIU/PMCSDRC
Domestic waste	1) Domestic waste shall only be disposed of at the approved, appropriately designed, compliant waste management facility (landfill). Land burial of waste shall not be permitted.	Visual inspection by CSE/PMCSDRC supervisor and note as checklist record	The waste generation and disposal details will form part of quarterly report to the PIU	**Supervisory Responsibility**: CSE/PIU/PMCSDRC

Appendix 10: Spoil Management Plan

A. Spoil Types

Spoil is defined as any earthen material that is surplus to requirements or unsuitable for reuse in fill and embankments (such as unsuitable rock and soil material) or material that is contaminated. This plan has been prepared to facilitate the beneficial reuse of all material, ensuring that none is disposed off-site, except if unsuitable for reuse.

Fill is defined as earthen material excavated from one location along the corridor (for example, for a detention basin or cut excavations) and relocated elsewhere as compacted fill. Cut and fill material will generally not be stockpiled but will be removed from the excavation site and transported directly to the construction face for immediate reuse as compacted fill. Unsuitable excavated material will primarily be transported to identified locations within the road corridor for reuse or, if space is not available, will be stored temporarily off-site for reuse later.

Select material is defined as earthen material of comparatively higher quality, necessary for engineered backfill and incorporation in upper earthworks layers as part of the overall pavement design. Typically, on the HEA project this will include high strength sandstone and low/medium strength claystone, siltstones and sandstones. Wherever possible, select material will be sourced on site, and stockpiled as necessary until incorporated in the works. However, preliminary investigations suggest that a considerable proportion of the select material required for the project will need to be sourced from off site.

Unsuitable (non-contaminated) material on the construction project is generally composed of silty, sandy, gravely and organic clays; sandy silts; clayey, silty and gravely sands and carbonaceous rock.

This material will be reused on the project in the following ways:

- widen embankments where possible;
- land contouring;
- landscaping mounds;
- landscape treatments; and
- noise mounds (if required).
-

Topsoil will be stripped and recovered for reuse in landscaping and revegetation. On average, the top 100mm of topsoil will be collected for future use.

B. Spoil strategy

The following provides an overview of the spoil management strategy for achieving the key spoil management objectives:

Appendix 1 Minimize the amount of spoil generated: This requirement will be achieved by ensuring that the design minimizes the volume of spoil generated from excavation (a key driver for this is the need to minimize our construction footprint in order to reduce clearing). It should be noted that the minimization of spoil generation is a standard process in developing designs and planning construction activities as there are significant financial savings in minimizing spoil generation and management.

Appendix 2 Classify the spoil generated using recognized guidelines and its geotechnical characteristics: There is no Waste Classification Guidelines to follow in Bangladesh. The geotechnical characteristics of spoil therefore are important to consider as it will determine the potential engineering uses of spoil.

Appendix 3 Maximize the beneficial reuse of spoil on site based on its classification (both contamination category and geotechnical characteristics): Some of the spoil

generated is expected to be able to be reused on site and will be suitable as general fill across the site. Some spoil may be unsuitable; however, this may be used for inclusion in capped landscaping mounds or features. Some spoil material, mainly due to its geotechnical characteristics will not be suitable for reuse.

Appendix 4 Maximize the beneficial reuse of spoil off site based on its classification (both contamination category and geotechnical characteristics): Whilst it is the general intention to try and re-use all material on-site some of the spoil generated may be able to be reused off site on other projects. Further investigation into the needs of the numerous nearby mine sites will continue in this regard. Some spoil material due to its geotechnical characteristics will not be suitable for reuse.

Appendix 5 Dispose of spoil off site based on its contamination classification: Spoil unable to be reused on site or off site would be disposed of at a facility that has the appropriate development approval and Environment Protection License to receive and store the relevant waste classification of the spoil.

Appendix 6 Manage the excavation, storage, transport reuse and disposal of spoil to minimize impacts and meet other environmental requirements: This includes implementing mitigation measures to manage potential impacts on traffic and soil and water, dust generation and contamination of spoil (e.g. onsite - dust control, erosion and sedimentation controls, monitoring and validation for contamination and Potential Acid Sulphate Soils, offsite – tracking and monitor spoil/fill movements and quality (contamination), haulage routes, impacts on public safety and roads and public amenity, noise impacts and required compliance requirements (i.e. approvals and consents/licenses).

C. Spoils generating activities

Spoil generated by construction will primarily come from excavation works. The spoil is expected to vary in content with silty, sandy, gravely and organic clays; sandy silts; clayey, silty and gravely sands and carbonaceous rock.

The activities associated with the generation and management of spoil and fill materials are:

- Clearing of vegetation;
- Selection of material;
- Clearing of topsoil;
- Excavation of earthen material;
- Blasting of earthen material (if required);
- Transport of earthen material;
- Storage/stockpiling of spoil, topsoil and mulch; and
- Reuse of spoil, topsoil and mulch.

Appendix 11: Generic Traffic Management Plan (TMP)

A. Principles

One of the prime objectives of the Contractor's **TMP** is to ensure the safety of all the road users along the work zone, and to address the following issues:

(a) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(b) protection of work crews from hazards associated with moving traffic;
(c) mitigation of the adverse impact on road capacity and delays to the road users;
(d) maintenance of access to adjoining properties; and
(e) Addressing issues that may delay the project.

B. Operating Policies for TMP

The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

- Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
- Inhibit traffic movement as little as possible.
- Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
- Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
- Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
- Train all persons that select, place, and maintain temporary traffic control devices.
- Keep the public well informed.
- Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

Figure A1 to Figure A6 illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the Impact Due to Street Closure

Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

a) Approval from the ULB/CMC/Public Works Department (PWD) to use the local streets as detours;
b) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
c) Determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
d) Determining if additional traffic control or temporary improvements are needed along the detour route;
e) Considering how access will be provided to the worksite;
f) Contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
g) Developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

If full road-closure of certain roads within the area is not possible, due to inadequate capacity of the detour arrangements, the full closure can be restricted to weekends with the construction commencing on Thursday night and ending on Sunday morning prior to the morning peak period. The traffic management guidelines are as follows:

- Review construction schedule and methods;
- Identify initial traffic recirculation and control policy;
- Identify routes for traffic diversions;
- Analyze adverse impact & mitigation at the detours;
- Begin community consultation for consensus;
- Finalize or determine alternate detours;
- Identify temporary parking (on and off -street);
- Discuss with CMC, owner, community for use;
- Coordinate with the Traffic Police to enforce traffic and diversions;
- Install traffic control devices (traffic cones, signs, lightings, etc.);
- Conduct campaigns, publicity, and notify public about street closure; and
- Develop a mechanism to address public grievances regarding disruptors of traffic, utilities, etc.

D. Public Awareness and Notifications

As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

The PIU will also conduct an awareness campaign to educate the public about the following issues:

1 Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
2 defensive driving behavior along the work zones; and
3 Reduced speeds enforced at the work zones and traffic diversions.

It may be necessary to conduct the awareness programs/campaigns on road safety during construction. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the Contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- Explain why the brochure was prepared, along with a brief description of the project;
- Advise the public to expect the unexpected;
- Educate the public about the various traffic control devices and safety measures adopted at the work zones;
- Educate the public about the safe road user behavior to emulate at the work zones;
- Tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- Indicate the office hours of relevant offices.

E. Install Traffic Control Devices at the Work Zones and Traffic Diversion Routes

The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

Figure A1to Figure A6illustrate typical set-ups for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics. The Contractor would need to consider such Traffic Management situations for these typical arrangements and others that may occur during road construction works. The Contractor would need to coordinate closely with the road management and road police authorities and submit their Traffic Management proposals, with not less than a month’s prior notice, to the PIU for obtaining prior approval, before any closure of roads are considered.

- Work on Shoulder or Parking Area;
- Work with Land Closure: Low Traffic;
- Work on Lane Closure With Yield Sign on Two Lane: Low Volume;
- Work on Lane Closure With Single Flag Operator on Two Lane : Low Volume;
- Lane Closure: Two Flag Operators on Two Lane Road; and
- Street Closure with Detour.

The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

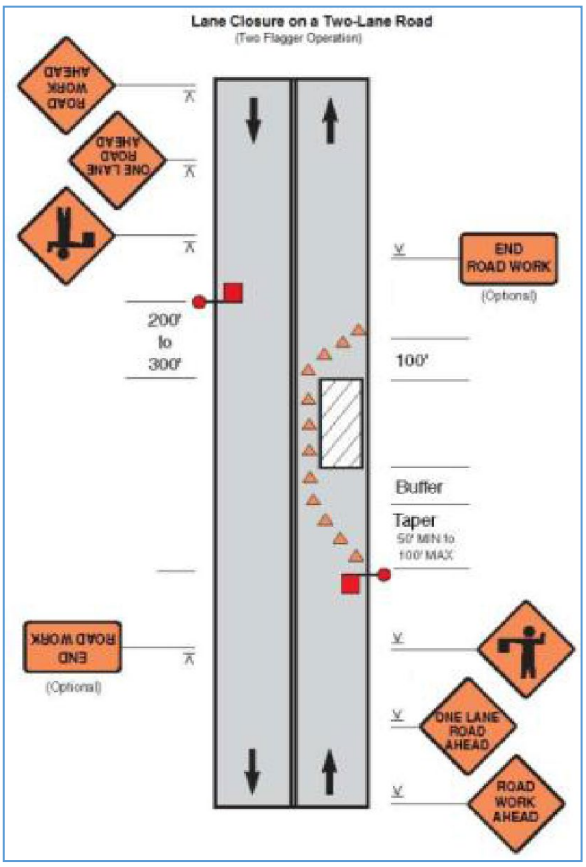

Figure A5 Lane Closure: Two Flag Operators on Two Lane Road

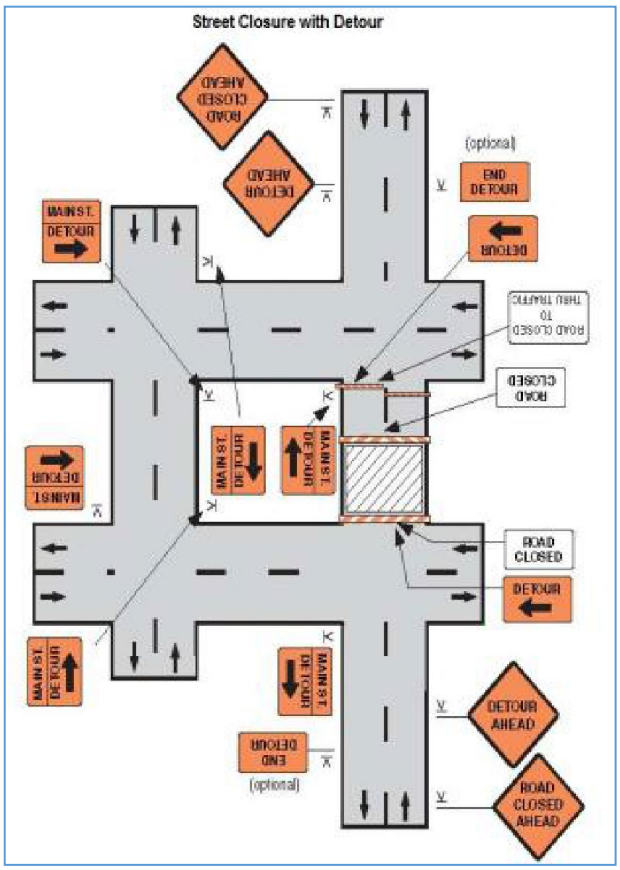

Figure A6Street Closure with Detour