Initial Environmental Examination

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Bangladesh: Coastal Towns Climate Resilience Sector Project – Integrated Waste Management for Bagerhat Pourashava

Prepared by the Local Government Engineering Department of the Government of Bangladesh for the Asian Development Bank.

CURRENCY EQUIVALENTS
(as of 16 June 2022)

Currency Unit	=	Bangladesh Taka (BDT)
BDT1.00	=	$0.01066
$1.00	=	BDT 93.816

ABBREVIATIONS

ADB	–	Asian Development Bank
DOE	–	Department of Environment
EA	–	executing agency
EIA	–	environmental impact assessment
ECA	–	Environmental Conservation Act
ECR	–	Environmental Conservation Rules
ECC	–	environmental clearance certificate
EMP	–	environmental management plan
GOB	–	Government of Bangladesh
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
IEE	–	initial environmental examination
MOEFCC	–	Ministry of Environment and Forests, and Climate Change
NGO	–	nongovernment organization
O&M	–	operation and maintenance
PIU	–	project implementation unit
PMU	–	project management unit
RPMU	–	regional project management unit
ROW	–	right-of-way
SPS	–	safeguard policy statement
WHO	–	World Health Organization

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

Bangladesh is one of the most vulnerable countries in the world with high exposure to a multitude of climate-related hazards. The natural hazards interact with physical and socioeconomic factors, including its low-lying delta and coastal areas, high population density, poverty levels, and lack of resilient infrastructure, resulting in high disaster risk with widespread impacts on both rural and expanding urban areas. The coastal towns are the most vulnerable to increasing climate risks.

Proposed Coastal Towns Climate Resilience Sector Project (CTCRSP). The ADB supported the Coastal Towns Climate Resilience Sector Project (CTCRSP) which will strengthen climate resilience and disaster preparedness in 22 (twenty-two) vulnerable coastal pourashavas (project towns) of Bangladesh. The towns were selected based on their vulnerability, population size, density, and level of past investments. The project takes a holistic and integrated approach to urban development and will (i) provide climate-resilient municipal infrastructure, and (ii) strengthen institutional capacity, local governance, and knowledge-based public awareness, for improved urban planning and service delivery considering climate change and disaster risks. Investments will benefit the poor and women. Municipal infrastructure will include (i) elderly (older persons), women, children, and persons with disabilities (EWCD) friendly cyclone shelters constructed with early warning system; (ii) roads including emergency access roads and roads with stormwater drainages, footpath, bridges and culverts rehabilitated, or constructed for improved connectivity, and access to emergency services in the event of disasters triggered by natural hazard, including footpath, drains bridges and culverts which are critical for accessing emergency services; (iii) climate-resilient infrastructure for improved urban flood risk management including stormwater drains, nature-based solutions, water bodies restoration, and integrated waste management (IWM) developed; (iv) gender-responsive and socially inclusive urban public spaces improved; ; and (v) slum improvement programs for basic service improvement implemented in each pourashava following poverty reduction action plan and (vi) EWCD-friendly sanitation facilities constructed for poor households. Slum improvement models currently being implemented in ADB projects, such as the Third Urban Governance and Infrastructure Improvement Project, will be replicated with necessary improvements.[1] Output 1 will also support development of EWCD-friendly socio-economic infrastructures including (i) development of gender responsive markets; (ii) bus terminals; and (iii) other priority roads, bridges, culverts, and boat landing stations.

The project will cover and prioritize the following 22 towns as beneficiaries: Bagerhat, Patuakhali, Morelganj, Mehendiganj, Paikgacha, Kolaroya, Patharghata, Goaranadi, Charfashion, Borhanuddin, Betagi, Jhalokathi, Muladi, Chalna (Dacope), Banaripara, Bedorganj, Shorupkathi, Lalmohon, Nolchiti, Jajira, Kuakata and Bakerganj. The Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) acting through its Local Government Engineering Department (LGED) will be the Executing Agency. Pourashavas are the implementing agencies of the project.

Description and Scope of Subproject. The proposed subproject is an integrated waste management (IWM) scheme that will serve Bagerhat Pourashava in the Bagerhat Sadar Upazila of Bagerhat District in Bangladesh. Per preliminary design, the subproject will have a design capacity of about 21 tons of solid wastes per day based on the 2031 solid waste generation scenario for Bagerhat Pourashava. The components of the subproject include (i) primary waste collection and transport; (ii) secondary storage and transport; and (iii) resource recovery and

[1] ADB. 2014. *Third Urban Governance and Infrastructure Improvement Project*. Manila.

landfill 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.

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, the capacity of the household waste collection fleet needs to be increased by the procurement of thirty (30) improved rickshaw vans 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. Collection will be done on a daily basis 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 two (2) vacuum trucks for collection of fecal sludge from septic tanks of households and transporting to the fecal sludge treatment plant that is part of the resource recovery and landfill facility component under the subproject.

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 forty (40) demountable containers, each with capacity of about 1.5 – 2 cu.m. This will bring a total secondary storage capacity of 60 – 80 cu.m. for the entire Pourashava. These 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 at least three containers to cater to the segregated wastes desired (biodegradable, non-biodegradable, hazardous). To cater to these demountable containers, the secondary transport fleet will need seven (7) demountable container carrier trucks that will be used to transport the demountable containers to and from the resource recovery and landfill facility.

Resource Recovery and Landfill Facility. The total area of the for the facility is about 2.02 hectares (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 resource recovery and landfill 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 will occupy a total area of 735 sq.m. 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 resource recovery and landfill facility component of the subproject. It will occupy a total area of 819 sq.m. Based on feasibility study, compost plant with a capacity of 3 tons/day of biodegradable wastes has been proposed at the initial stage. The earmarked land for the compost plant can accommodate a total of 7-8 tons/day of biodegradable wastes in future. 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. 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.

Fecal Sludge Treatment Plant. The FSTP is an integral part of the resource recovery and landfill facility component of the subproject. The FSTP will occupy an area of 168 sq.m. Based on feasibility study, the FSTP will have a design capacity of 5 cu.m./day. 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, one with capacity of 1 cu.m. and the other 0.75 cu.m. Collection of fecal sludge will be on needs or on call basis and/or on scheduled basis. No desludging will be allowed beyond 5 cu.m. 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 resource recovery and landfill facility component of the subproject. Per preliminary design, it will have two landfill cells that will occupy an area of 3,864 m^2 and a leachate collection and treatment plant (LCTP) that will occupy an area of 455 $m^{2.}$ 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.

Location of the Subproject. The proposed subproject will be located in Bagerhat Pourashava under Bagerhat Sadar Upazila in Bagerhat District of Khulna Division. Bagerhat Pourashava is about 278 km away by road from Dhaka City. It was established in 1958 and became an 'A' category Pourashava in 1991. It is located between 22.40°N 89.48°E. It occupies an area of 8.63 km^2 and consists of 9 wards, 8 mouzas and 31 mahallas. The Pourashava area is bounded by Fakirhat and Chitalmari upazilas on the north, Morrelganj upazila on the south, Kachua upazila on the east, Rampal and Fakirhat upazila on the west. Main rivers are Bhairab, Chitra, Daudkhali, Poylahar, Putimari. The primary waste collection and storage, and secondary storage and transport components of the subproject will cover the entire Pourashava. The resource recovery and landfill facility component will be located at Majhidanga Mouza under the Kara Para union, which is situated in the north of the municipality (Ward No. 01 boundary) and about 2.75 km north of the core commercial and residential areas. The area of the facility is within an agricultural zone, and the site is bounded by a khal (Harikhola khal) and agricultural lands including pockets of waterlogging areas (ponds) used for pisciculture. These ponds are not natural water bodies and are formed during monsoon due to their low elevations. Some of these ponds are adjacent the boundary of the site. There are 11 houses located within 200 m of the proposed site, and a mosque at 120 m from the proposed site. There are no archeologically sensitive areas within 2 km of the site.

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. The entire Bagerhat Pourashava has been the study area for this IEE. Available baseline data from various secondary sources were used in the assessment, while other data are to be collected or gathered during the detailed design phase. A summary of baseline conditions is in the following table.

Parameters	Description
Topography and Geology	The topography of Bagerhat Pourashava is mostly flat. This area is located in the Ganges tidal flood plain. The boundary between this unit and the Ganges floodplain is traditional. The tidal landscape has a low ridge and a basin relief crossed by innumerable tidal rivers and creeks. Local differences in elevation generally are less than 1m compared with 2-3m on the Ganges floodplain. The tract is of recent origin, raised by the deposition of sediments formed due to soil erosion in the Himalayas. The substratum consists mainly of Quaternary Era sediments, sand and silt mixed with marine salt deposits and clay.
Soil	Soil texture is the relative proportions of sand, silt and clay. It is very important for agriculture crop production. Maximum area in the Bagerhat region is covered with clay texture (64%) and the rest is clay loam texture (36%). Geographically, the soil can be classified into three: the Ganga Polol, the Mixed Ganga Polol and the Ganga Kotal Polol.
Climate and meteorology	Ambient mean temperature is about 18°C-19°C in winter and 28°C-29° C in summer and the annual average rainfall is around 2000 mm. Monsoon occurs from June to September when there is heavy to very heavy rainfall. Tropical cyclones and storms do occur during summer in the month from April to June and then from September to November. Comparatively the humidity is very high in the coastal region rather than other districts of Bangladesh. Average relative humidity in Bagerhat area varies seasonally from 70% to 90%. Prevailing wind in the area are

Parameters	Description
	the Southerly wind from the Bay of Bengal during monsoon and Northwesterly wind from Himalayas during winter.
Hydrology	A number of khals (canals) run through the Pourashava which serve as drainage arteries. The existing primary drainage system in Bagerhat is characterized by open and natural canals traversing various parts of the Pourashava. Secondary and tertiary drains are all connected to these natural canals at various locations. The drainage system is not well planned despite recent efforts to improve the drainage system. Due to insufficient holding capacity, these drains and canals overflow and cause flooding in various parts of the Pourashava during periods of heavy rains. More severe flooding occurs when there is an extreme tide and water flows back up the drains.
Ambient air quality	The subproject is located in an area where air pollution has not been a problem. There are no available data for Bagerhat, but site visits and visual observations conducted in the area showed no sources of emission that could significantly deteriorate air quality. Apart from vehicular emission, other potential sources are the wood burning associated with some businesses, sawmills, ice mills and rice mills. However, it is perceived that emissions from these sources do not degrade the ambient air quality to significant extent. To validate this observation, baseline ambient air quality will be measured during the detailed design phase of the subproject.
Ambient Noise Level	The subproject area is within peri-urban to urban setting. The noise levels in the Pourasahva are similar to that of any other small urban area. Noise may only be attributed to vehicles plying the roads, machineries and other related activities, and is normally in the range of 55 to 75 dB(A). Volume of traffic passing through the Pourashava roads is not significant and traffic jams are very much infrequent. To validate this observation, baseline ambient noise level will be measured during the detailed design phase of the subproject.
Surface Water Quality	Surface water bodies in the subproject area have varied uses, including their use for pisciculture, irrigation, and navigation. Visual observations reveal that many of the natural khals are now becoming more polluted due discharge of community and household wastes through the secondary and tertiary drains. There is no available surface water quality data for these natural drainages in the Pourashava, including the Harikhola khal and Bhairab river that are near the proposed resource recovery facility and landfill site. Harikhola khal is a small canal that traverses the agricultural lands near the northern boundary of the Pourashava. It is used for irrigation and pisciculture by the locals, but normally dries up during dry season. It has width that varies from 5 – 10m. About 150m section of this khal tracks the southwestern boundary of the site, and from which it further flows down 700m to the confluence point with Bhairab river. Bhairab river is a perennial river in Bangladesh crossing various towns as it flows down meeting with other river systems and eventually to the Bay of Bengal. Bhairab river is about 250m from the northern boundary of the proposed resource recovery and landfill facility. Baseline surface water quality data gathering at the upstreams and downstreams of the Harikhola khal and Bhairab river will be undertaken during the detailed design phase.
Groundwater quality	Groundwater table in the inner coastal towns of Bangladesh (including Bagerhat) is shallowest during monsoon season in the range of 1 – 3 m. During dry season, the depth does not vary as much in the range of 1 – 4 m due to its proximity to the coastal zone. Ground water quality is influenced by salinity and iron. Water in most shallow aquifer has the presence of arsenic with elevated salinity, and contaminated with iron, which makes the water not suitable for drinking purposes. The deeper part of the aquifer at a depth of 80m to 100m is where the Pourashava sources its drinking water, though relatively small compared to the demand. Specific to the resource recovery facility and landfill site, baseline groundwater quality data gathering will be undertaken during the detailed design phase.

Parameters	Description
Natural hazards	Subproject area is in the coastal region fronting the Bay of Bengal in the south. Similar to most areas of Bangladesh, the subproject location has long been exposed to various climatological (e.g., drought), hydrometeorological (e.g., cyclones, storm surge, flood), and other geophysical (e.g., landslides and erosion) hazards. Being in the coastal area makes it susceptible to cyclones and storm surges, floods, medium to high levels of soil salinity, and sea level rise.
Socio-economic conditions	In 2011, the population of the Bagerhat Pourashava was 49,073 (BBS, 2011), with a population density is 3,088 persons per km2. The Pourashava has been experiencing lower annual average population growth than the national average urban population growth over a long period in the past (1981-2011). Employment is identical to the rest of the country where employed population is engaged in different occupations. According to BBS 2011, 88% of the populations are engaged in agriculture sector. Here agricultural sector includes farmer, agricultural labor, fishers, day labors, etc. About 5% population is engaged in salaried service sector such as in government and private sector jobs. Landownership pattern can be an indicator to understand the poverty incidence in a given area. Statistics shows that in Bagerhat region there are 76% smallholders, 19% medium and only 5% large landholders (BBS 2009). In the study area, arable land is mainly used for crop production. Generally small and medium holders cultivate variety of crops at those lands. They cannot produce crops or paddy due to drainage congestion.
Land use	There is dominance of agricultural land (about 44% of the total) followed by residential land use (about 32%). Basing on the percentage of land under different use categories the ranking is: Agriculture (40.23%), Residential (33.94%), Water bodies (9.51%), Transportation (8.01%), Administrative (3.55%), Recreational & Open Space (1.73%), Commercial (1.25%), Educational (0.77%), Community Facility (0.35%), Health (0.31%), mixed use (0.22%), Utility Service (0.10%) and Industrial (0.03%).
Physical cultural resources	The subproject components are in Bagerhat Pourashava, which is within the Bagerhat District that is rich in historical, cultural and archaeological sites. The world-renowned Historic Mosque City of Bagerhat is a UNESCO World Heritage Site that is on the western side of Bagerhat Pourashava. The core area of Bagerhat Pourashava is about 1.5 km away from the nearest structure of Historic Mosque City of Bagerhat (Zinda Pir Mosque), while the proposed site for the resource recovery and landfill facility is about 2 km from the nearest structure (Sebak Danga Monument)

The Integrated Biodiversity Assessment Tool (IBAT) was used to determine the presence of protected or key biodiversity areas, and endangered biodiversity species around the subproject site (default area of analysis of 50 km radius). Screening results show that there is no ecologically sensitive area within at least 10-km radius of the subproject location. Forty-eight IUCN Red List species of concern are identified within the 50-km radius default area of analysis. The subproject site is in the periphery of a built-up area (Bagerhat *Pourashava*/Town) and surrounded by agricultural lands actively cultivated, communities and other urban infrastructures such as highways; hence the probability of these species being found at the site is very low. This is also confirmed in the IUCN Wildlife Distribution Map for Bangladesh and the Bangladesh Forest Department's map of protected areas.

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 as a result 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 resource recovery and landfill 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 and every 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.

Assessment further reveals that Bagerhat District where the pl Bagerhat *Pourashava* is located is a heritage-rich area in Bangladesh. Proposed landfill site is 2 km away from this area. However, the possibility that underground cultural heritage relics or assets, particularly those belonging to the Historic Mosque City of Bagerhat, could be found anywhere in the subproject area. Therefore, as additional precautionary measure and in addition to a chance finds procedure, a heritage assessment study to reconfirm that proposed project site away from protected monuments (at least 1.5-2 km) and is not in archeologically sensitive area, and develop detailed site-specific chance find protocols

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) or regional project management unit (RPMU).

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. The Ministry of Local Government, Rural Development and Cooperatives through the Local Government Engineering Department (LGED) will be the executing agency. The *Pourashavas* that will be the recipients of the project are the implementing agencies. LGED will establish a project management unit (PMU) comprising officials including an Environmental Safeguard Officer/Focal Person who is a permanent employee of LGED. The PMU will be strengthened by a project management and supervision consultant (PMSC) team composed of external experts or consultants in environmental and social safeguards, including experts on finance, procurement, technical areas, and contract management. Regional PMUs and project implementation units (PIUs) will be established at the Divisional Level and *Pourashava* Levels, respectively. For the subproject, Bagerhat *Pourashava* will serve as the PIU. The PMU, RPMU for Khulna Division and PIU will have responsibility for overseeing subproject management, including overseeing EMP implementation. 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 resource recovery and landfill facility will be awarded to a third-party contractor under a Build-Operate 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 RPMU 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 CTCRSP, 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 or at the RPMU level (or at the Division level) for resolution. 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, RPMU, PIU 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 in order 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. PMU, with support from PMSC, will be responsible for monitoring the project implementation and compliance with EMP requirements. The Contractor will submit monthly reports to the PIU/RPMU with jurisdiction over the subproject. The PIU/RPMU will submit quarterly environmental monitoring reports to PMU. The PMU shall consolidate quarterly reports from the PIUs/RPMUs and prepare semi-annual environmental monitoring report (SEMRs) which shall be submitted to ADB. PMU and ADB will post the cleared SEMRs on the project website and ADB website, respectively. ADB will monitor the project on an ongoing basis until a project completion report is issued.

Conclusion and Recommendations. The subproject will result in environmental benefits because of improved solid waste management for Bagerhat Pourashava. While the nature and magnitude of potential environmental impacts inherent to operation of resource recovery and landfill 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 resource recovery and landfill facility was procured by Bagerhat municipality in 2017 for the same purpose and has been using it for solid waste dumping by crude open dumping method, which actually deteriorated the surroundings. The proposed facility will therefore improve the existing situation and will have various measures to prevent surface and groundwater pollution, 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. 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.

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[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."

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.

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. Site is not in compliance with the recently notified landfill location guidelines of DOE. Bagerhat 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 prior to the effectivity of the new landfill location guidelines. In its meeting on 5 June 2022, DOE has approved/endorsed the issuance of LCC and provided specific recommendations to be considered during the construction of the facility. With the approval of issuance of LCC, PMU will undertake a full-scale environmental impact assessment (EIA) based on DOE-approved terms of reference. The EIA will be submitted to DOE for the issuance of Environmental Clearance Certificate (ECC) for the subproject.

With the approval of the issuance of LCC, bids may be invited for the subproject. However, approval of the EIA and issuance of the ECC must be obtained from the DOE prior to award of contracts.

During detailed design, the PMU shall undertake a field verification and validation on the proximity of subproject sites from the different heritage sites via an engagement of heritage expert to conduct heritage assessment study, in particular the overground and underground structures of the Historic Mosque City of Bagerhat. Heritage Assessment Study will also develop detailed site-specific chance find protocols.

Important design considerations included in EMP for development of overall facility at the site:

- Land development and site preparation by raising to a level higher than the surrounding area and based on the recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject;
- Ensure that raised ground-level will meet minimum 1.5 m distance between shallow groundwater level and bottom clay liner in the landfill;
- Channelize the Harikhola channel section close to proposed site with impervious material (such as cement concrete) at least for a length of 500-1000 m; conduct detailed site survey and select appropriate section to channelize;
- Relocate the houses (11 numbers) located within 200 m of the facility as per the resettlement plan;
- Construct high embankments/high walls around the landfill with a buffer zone of plantations; and
- 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.

For the composting plant:

During the final detailed design, PMU, through its design team, will institute the following recommended design considerations to control and monitor environmental impacts per World Bank's EHS Guidelines on Waste Management Facilities and to ensure compliance with the requirements of ADB SPS:

- 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;
- 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.

For the fecal sludge treatment plant:

During the final detailed design, PMU, through its design team, will institute the following recommended design considerations to control and monitor environmental impacts per World Bank's EHS Guidelines on Waste Management Facilities and EHS Guidelines on Water and Sanitation, and to ensure compliance with the requirements of ADB SPS:

- Use appropriate collection vehicles. A combination of vacuum tanker trucks with long suction hose pipe, and smaller hand-pushed vacuum tugs may be needed to service all households;
- 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;

- 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
- 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.

For the Landfill:

During the final detailed design, PMU, through its design team, will consider and institute the following recommendations to ensure compliance with the requirements of ADB SPS:

- 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:
  - Construct a buffer zone between the facility and the external environment or locate facilities away from sensitive receptors;
  - 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;
  - Use acoustic screens around fixed/mobile plant and equipment;
  - Select equipment that has low noise emission levels; and
  - 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 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[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 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. 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).

[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 1×10^{-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]).

  - 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.
  - 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:
  - Compaction and covering of waste promptly after discharge from the vehicle delivering the waste;
  - 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;
  - Disposal of odorous sludge in covered trenches;
  - Restriction on the acceptance of loads known to be particularly odorous;
  - Restriction on tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors);
  - Sealing of sump covers; and
  - 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.

When detailed design is complete, the PMU will finalize/update this draft IEE accordingly to include revised and/or new information and corresponding assessments related to the following:

- Confirmation of full compliance of the proposed landfill site with the siting requirements of Bangladesh Solid Waste Management Rules, 2021;
- Supplemental primary baseline data on surface water and groundwater quality in the area;
- 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 from where 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 needs to be updated during the detailed design phase to reflect the final design ensuring the compliance with the design measures suggested in the draft IEE. The updated IEE shall be submitted to ADB for review, clearance and disclosure during detailed design phase but prior to start of construction.

CTCRSP should ensure that any revision or modification in the design during the final detailed design phase will not lead to a Category A classification based on ADB SPS categorization criteria (e.g., inclusion of biomedical waste treatment, burn technologies such as incineration, pyrolysis, etc., which may trigger Category A). As such, it is recommended that CTCRSP exert all efforts to maintain the Category B classification.

I. INTRODUCTION

A. Background

1. The ADB supported the Coastal Towns Climate Resilience Sector Project (CTCRSP) which will strengthen climate resilience and disaster preparedness in 22 (twenty-two) vulnerable coastal pourashavas (project towns) of Bangladesh. The towns were selected based on their vulnerability, population size, density, and level of past investments. The project takes a holistic and integrated approach to urban development and will (i) provide climate-resilient municipal infrastructure, and (ii) strengthen institutional capacity, local governance, and knowledge-based public awareness, for improved urban planning and service delivery considering climate change and disaster risks. Investments will benefit the poor and women. Municipal infrastructure will include (i) elderly (older persons), women, children, and persons with disabilities (EWCD) friendly cyclone shelters constructed with early warning system; (ii) roads including emergency access roads and roads with stormwater drainages, footpath, bridges and culverts rehabilitated, or constructed for improved connectivity, and access to emergency services in the event of disasters triggered by natural hazard, including footpath, drains bridges and culverts which are critical for accessing emergency services; (iii) climate-resilient infrastructure for improved urban flood risk management including stormwater drains, nature-based solutions, water bodies restoration, and integrated waste management (IWM) developed; (iv) gender-responsive and socially inclusive urban public spaces improved; and (v) slum improvement programs for basic service improvement implemented in each pourashava following poverty reduction action plan and (vi) EWCD-friendly sanitation facilities constructed for poor households. Slum improvement models currently being implemented in ADB projects, such as the Third Urban Governance and Infrastructure Improvement Project, will be replicated with necessary improvements.[5] The Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) acting through its Local Government Engineering Department (LGED) will be the Executing Agency. Pourashavas are the implementing agencies of the project.

2. Coastal towns are particularly at risk from the impacts of climate change due to high levels of poverty and limited capacity of *pourashavas* (urban local governments) to invest in resilience. The *pourashavas* lack resilient infrastructure, clubbed with haphazard urbanization, lack of stormwater drains, poor solid waste management system further worsens the condition of these towns. Most of the coastal towns are situated on the riverbanks of low-lying tidal zones at an average elevation of 1.0–1.5 meters (m) from the sea level[6] and coastal flooding is a key hazard faced by these towns. Inadequate basic municipal infrastructure to respond to increasing climate risk threatens both quality of life and the economic growth of coastal towns. This calls for an integrated approach for coastal town development that promotes risk-informed planning and investment for building resilience.

B. Coastal Towns Climate Resilience Sector Project

3. The project will be aligned with the following impacts: higher and sustainable growth trajectories achieved in the face of the various weather-related natural hazards and risks, and improved livability of coastal towns.[7] The outcome of the project will be climate and disaster

[5] ADB. 2014. *Third Urban Governance and Infrastructure Improvement Project*. Manila.

[6] Sowmen Rahman and Mohammed Ataur Rahman. Climate Extremes and Challenges to Infrastructure Development in Coastal Cities in Bangladesh. Volume 7, March 2015, Pages 96–108

[7] Government of Bangladesh, General Economics Division, Bangladesh Planning Commission Ministry of Planning. 2020. Making Vision 2041 a Reality – Perspective Plan of Bangladesh, 2021–2041. Dhaka.

resilience of coastal towns strengthened including benefiting the poor and women. The project directly supports achieving project outcomes through three outputs.

4. **Output 1: Municipal infrastructure for resilience improved.** Municipal infrastructure will include (i) 25 elderly, women, children, and persons with disability friendly cyclone shelters with early warning system; (ii) 247.7 kms roads with drainage, bridges, and culverts rehabilitated or constructed for improved connectivity and access to emergency services in the event of disasters caused by natural hazards including access to cyclone shelter; (iii) climate-resilient infrastructure including 201.0 stormwater drainages, at least 3 nature-based solutions, water bodies restoration, and 4 integrated waste management (IWM) developed rehabilitated or constructed for improved urban flood risk management including; (iv) gender-responsive and socially inclusive urban public spaces improved; (vi) slum improvement program implemented; and (vi) EWCD-friendly sanitation facilities constructed for poor households. Output 1 will also support development of EWCD-friendly socio-economic infrastructures including (i) local markets; (ii) bus terminals; and (iii) other priority roads, bridges, culverts, and boat landing stations.

5. **Output 2: Resilient livelihood improved.** Output 2 includes: (i) climate vulnerable households covered in the graduation program in six project towns; (ii) women, including person with disabilities, reported increased skills for resilient livelihood; and (iii) inventory of productive assets of vulnerable households documented and insured. The Graduation Approach and Program will be adopted to ensure livelihood resilience.[8]

6. **Output 3: Institutional capacity, governance, and climate-awareness strengthened.** Output 3 includes: (i) risk-informed urban development plans and poverty reduction action plans of project towns submitted to *pourashavas* council; (ii) staff of LGED and *pourashavas* including 90% eligible women staff reported increased knowledge on climate and disaster risk assessment to inform the urban development plans and to enforce development control regulations linked with natural hazards; (iii) knowledge and capacity of LGED and *pourashavas'* staff including 90% of women staff on nature-based solutions and green solution application developed;[9] (iv) disaster management committee on disaster preparedness measures, cyclone shelter management committees, and standing committees on women and children affairs, poverty reduction and slum improvement in project *pourashavas* operationalized for improving municipal governance and sustainable service delivery;[10] (v) revenues enhancement plan adopted by each project *pourashava* to improve municipal finance systems; (vi) computerized tax records and billing systems made functional; (vii) annual gender responsive operation and maintenance (O&M) plans approved and at least 75% of the required annual budget is allocated and spent; and (viii) gender responsive urban space guidelines developed. Output 3 supports to enhance public awareness, behavior change, and community mobilization in light of emergencies such as coronavirus disease (COVID-19) and cyclone Amphan in 2020. It will also support training and capacity building of LGED and *pourashavas* to institutionalize information technology-based remote

[8] The graduation program originated in Bangladesh and has since been adopted in several countries as a holistic, time-bound interventions to lift households from poverty through: (i) social assistance to support immediate needs; (ii) livelihood promotion; (iii) financial inclusion; and (iv) social empowerment.

[9] Nature-based solutions promote actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits. (Source: IUCN (2020). Guidance for using the IUCN Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of Nature-based Solutions. First edition. Gland, Switzerland: IUCN.).

[10] A risk-informed performance-based budget allocation strategy will be adopted to promote governance-led infrastructure improvement to ensure sustainable urban services. The *pourashava* will need to fulfil a set of performance criteria to receive fund for infrastructure improvement. Performance criteria is elaborated in project administration manual (footnote 27).

monitoring through strengthening LGED's geographic information systems section, monitoring and evaluation unit, and project management unit.

7. The proposed CTCRSP is to be implemented in 22 *pourashavas* (local governments). District wise location of the CTCRSP towns is summarized in Table 1.

Table 1: District wise *Pourashavas* where Project (CTCRSP) will be implemented

District	Town (Pourashava)	District	Town (Pourashava)
Barisal	Bakerganj	Bhola	Charfassion
	Mehendiganj		Lalmohan
	Banaripara		Borhanuddin
	Muladi	Jhalokathi	Jhalokathi
	Gouranadi		Nalchity
Bagerhat	Bagerhat	Satkhira	Kalaroa
	Morelganj	Khulna	Paikgacha
Patuakhali	Patuakhali		Chalna (Dacope)
	Kuakata	Pirojpur	Swarupkathi
Shariatpur	Zanjira	Barguna	Patharghata
	Bhedarganj		Betagi

C. Purpose of the Initial Environment Examination

8. The objective of the IEE is to provide guidance to LGED, 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.

D. Methodology

9. This IEE report was prepared following the requirements of the ADB SPS, 2009. Site visits, stakeholder consultations, and primary and secondary data collection were conducted to assess the existing environmental conditions of the project site and the potential environmental impacts that may occur during project implementation. Baseline environmental monitoring for air quality, noise level, surface water quality and groundwater quality will be conducted before the start of construction activities. The Integrated Biodiversity Assessment Tool (IBAT) was used to screen potential risks on the protected areas or critical habitat that may exist around the project sites.

10. 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 resource recovery and landfill facility at the proposed location. Their views were incorporated into the IEE and in the planning and development of the subproject.

11. The following summarizes the activities conducted in relation to the preparation of this IEE report:

(i) Review of project- and subproject-related documents and literature;
(ii) Site visits to the subproject site to review the existing environmental conditions and develop baseline information for the subproject area;
(iii) Consultation with executing and implementing agencies to discuss subproject components, benefits, and impacts;

(iv) Analysis of typical environmental impacts of subproject components and identification of suitable measures to mitigate potential impacts; and
(v) Review and develop institutional arrangements and capacity building needs for implementation of environmental management and monitoring.

E. Structure of IEE Report

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

(i) **Executive Summary.** This chapter describes concisely the critical facts, significant findings, and recommended actions.
(ii) **Introduction.** Presents a brief overview of the assignment along with its background, objectives, scope of work and methodology etc.
(iii) **Policy, Legal, and Administrative Framework.** This chapter discusses the national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party.
(iv) **Description of the Project.** This chapter describes the proposed project; its major components; and its geographic, ecological, social, and temporal context, including any associated facility required by and for the project.
(v) **Analysis of Alternative**. Analyzes the environmental situation “With and Without project”.
(vi) **Description of the Environment.** This chapter describes relevant physical, biological, and socioeconomic conditions within the study area. It also looks at current and proposed development activities within the project's area of influence, including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data.
(vii) **Anticipated Environmental Impacts and Mitigation Measures.** This chapter predicts and assesses the project's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media, and physical cultural resources in the project's area of influence, in quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not require further attention; and examines global, transboundary, and cumulative impacts as appropriate.
(viii) **Information Disclosure, Consultation, and Participation**. This chapter (i) describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders; (ii) summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples; and (iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

(ix) **Grievance Redress Mechanism.** This chapter describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.

(x) **Environmental Management Plan.** This chapter deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions (mitigation, monitoring and performance indicators).

(xi) **Monitoring and Reporting.** Outlines the environmental monitoring program and reporting system including the cost of implementing the EMP.

(xii) **Conclusion and Recommendations.** Presents the conclusion and recommendations of the IEE study.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

13. 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 Safeguard Policy Statement 2009

14. ADB SPS provides guidance on the environment category of projects based on the degree of anticipated environmental impacts. 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.

15. ADB environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The initial process of categorization involves filling out a sector-specific rapid environmental assessment (REA) checklist. A project is classified based on the most environmentally sensitive component, and assigned with one of the four environmental categories (A, B, C, or FI) defined in the SPS. These categories are as follows:

(i) **Category A:** Project that is likely to have significant adverse environmental impacts which 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 (EIA), including an environmental management plan (EMP), is required.

(ii) **Category B:** Project with potential adverse environmental impacts that 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 (IEE), including an EMP, is required.

(iii) **Category C:** Project that is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

(iv) **Category FI:** Project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

16. **Screening and Categorization.** Subprojects are to be screened for their expected environmental impacts and are assigned to a specific category. Categorization is to be based on the most environmentally sensitive component. However, for subproject(s) with component(s) that can trigger Category A or with potentially significant adverse impacts that are diverse, irreversible, or unprecedented, project management unit (PMU) shall examine alternatives to the subproject's location, design, technology, and components that would avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks, and to meet Category B categorization. The rationale for selecting the subproject location, design, technology, and components will be properly documented, including cost-benefit analysis, taking environmental costs and benefits of the various alternatives considered into account. The "no action" alternative will be also considered.

17. Initial screening using ADB REA checklist was conducted for the resource recovery and landfill facility and access road, and results of the rapid assessment show that the project is unlikely to cause any significant adverse impacts, and therefore classified under Category B per ADB SPS. See **Appendix 1** for the filled REA Checklist. Thus, this IEE report has been prepared following ADB SPS requirements for project with Category B classification.

18. **Environmental Assessment.** Environmental assessment shall include a 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. This IEE may be used as a model document for other future IWM subprojects.

19. **Environmental Planning and Management.** The PMU shall prepare an 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.

20. **Public Disclosure**. The PMU shall submit the following to ADB for review, and disclosure on ADB website upon receipt of acceptable reports and endorsement from the PMU, so affected people, other[1112]

(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.

[12] 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.

21. **Consultation and Participation.** The PMU and PIU shall carry out meaningful consultation[13] 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.

22. **Grievance Redress Mechanism.** The 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. As of the ADB loan processing for the project, a grievance redress mechanism (GRM) has been established and discussed in detail in Chapter VI below.

23. **Monitoring and Reporting.** The 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 until ADB issues a project completion report.

24. **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.

25. **Pollution Prevention and Control Technologies**. During the design, construction, and operation of the subproject the PMU and PIU 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. These standards contain performance levels and measures that are normally acceptable and applicable to subprojects. 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, LGED through PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

26. **Occupational Health and Safety.** The PMU[14] shall ensure that workers[15] 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. PMU shall ensure to take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii)

[13] 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.

[14] In case where responsibility is delegated to subproject contractors during construction phase, PMU shall ensure that the responsibilities on occupational health and safety as described herein are included in the contract documents.

[15] Including nonemployee workers engaged by LGED through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

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

28. PMU 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.[16] PMU shall also adhere to necessary protocols in response to emerging infectious diseases such as the corona virus disease (COVID-19) consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

29. **Physical Cultural Resources**. The PMU is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. Such resources likely to be affected by the subproject will be identified, and qualified and experienced experts will assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a 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.

30. **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.

31. **Bidding and Contract Documents.** IEE, which contains the EMP, shall be included in bidding and contract documents and verified by PIU. The PMU and PIU shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all other conditions required by ADB,[17] and (ii) to submit to PIU, 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 SEMP; and (iv) budget for SEMP implementation, among others as may be required. No work can commence prior to approval of SEMP. A copy of the EMP and/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 and/or SEMP constitutes a failure in compliance and shall require corrective actions.

[16] World Bank Group, 2007. *Environmental, Health, and Safety General Guidelines*. Washington, DC.

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

32. **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) this IEE is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance of such updated IEE; and (iii) DOE-approved IEE (i.e., IEE in compliance with ECR, 1997) and 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 is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance for such updated IEE.

B. National Environmental Legislations

33. **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.

34. **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 2. summarizes the requirements for environmental clearance application for each category.

Table 2: 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.

35. Schedule 1 of ECR, 1997 provides the classification for industrial projects and types of development that are common in Bangladesh. Table 3 indicates the subproject's category and its likely classifications based on this schedule.

Table 3: 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 Bagerhat Pourashave	Resource Recovery and Landfilling Facility	Landfilling by industrial, household and commercial wastes	Red

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

37. **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,[18] which

[18] Government of Bangladesh. Department of Environment.

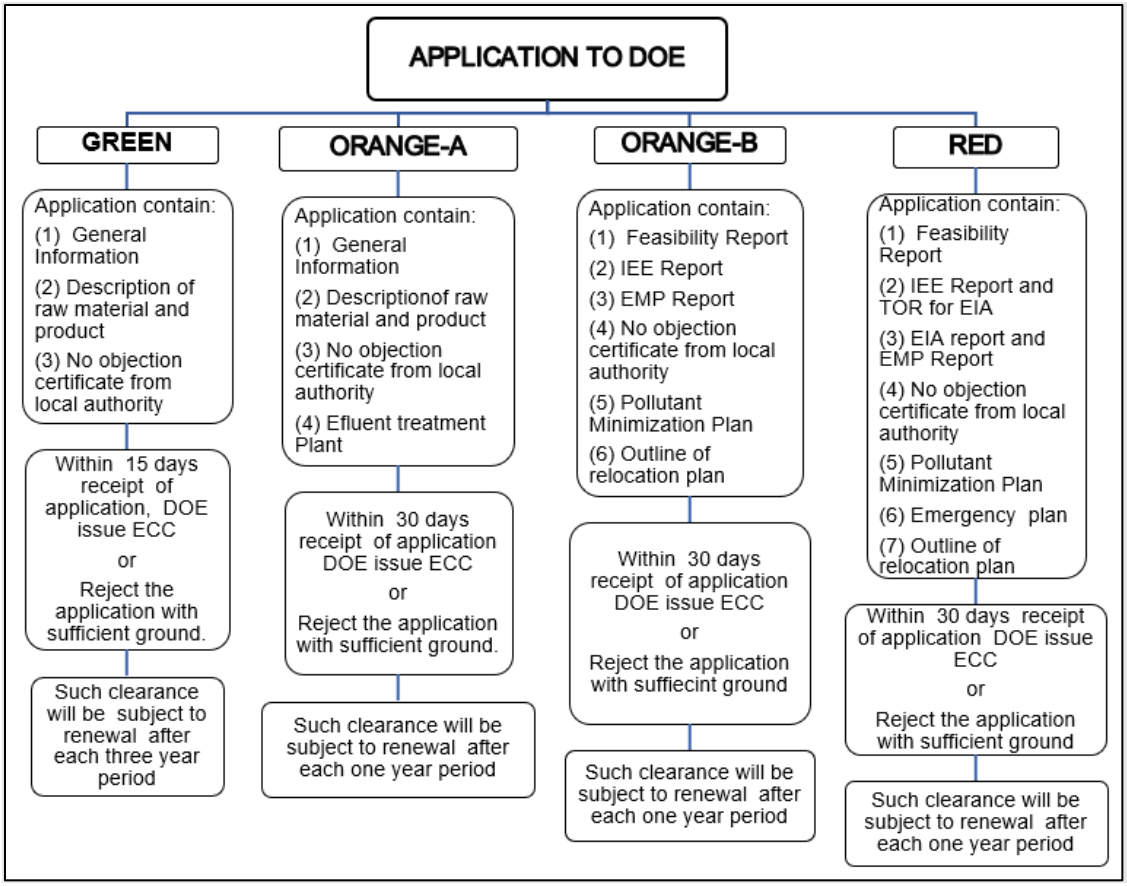
is revised from time to time. The accomplished application form is submitted to DOE together with requirements as enumerated in Table 2. The proponent is also required to pay equivalent application fee prescribed in Schedule 13 of ECR, 1997.

38. 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.

39. Figure 1 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 resource recovery and landfill 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. Bagerhat 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 prior to the effectivity of the new landfill location guidelines. In its meeting held on 5 June 2022, DOE has approved/endorsed the issuance of LCC for the subproject and provided specific recommendations to be considered during the construction of the facility. Copy of the minutes of meeting of the DOE is in Appendix 2.

40. With the approval of issuance of LCC, PMU will prepare a full-scale environmental impact assessment (EIA) based on DOE-approved terms of reference, and submit to DOE for the issuance of Environmental Clearance Certificate (ECC) for the subproject.

Figure 1: Government Environmental Clearance Process



DOE = Department of Environment, ECC = environmental clearance certificate, EIA = environmental impact assessment, EMP = environmental management plan, IEE = initial environmental examination, TOR = terms of reference.

41. **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.

Major component of the subproject is the construction and establishment of a resource recovery and landfill facility for Bagerhat Pourashava. The site of the facility is required to comply with the Rules, with requirements summarized in Table 4 below.

Table 4: 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.

42. **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 5 summarizes the applicable national and local laws, regulations, and standards for environmental assessment and management, including applicable international environmental agreements.

Table 5: 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 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.	Subproject will have site-specific impacts and will require implementation of mitigation measures to ensure protection and improvement of the environment.
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	Ensures Bangladesh water sources are free from any type of pollution. Pollution	The subproject is required to implement measures (e.g.,

Laws, Regulations, and Standards	Details	Relevance to the Project
Water Rule 2018	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.	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 resource recovery and landfill 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 establishments, rail and highway and for tea and rubber gardens.	Siting of subproject components need to comply with land use and zoning regulations
Bangladesh Labor Law, 2006	It is a comprehensive law covering labour 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 labourers, 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

Laws, Regulations, and Standards	Details	Relevance to the Project
		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
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	Relevant especially during the construction phase

Laws, Regulations, and Standards	Details	Relevance to the Project
	particular during the construction related work.	
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.

C. International Environmental Agreements

43. Table 6 below lists the relevant international environmental agreements that the government is party to, and their relevance to the subproject.

Table 6: 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 CTCRSP.
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 within few kilometers from the Historic Mosque City of Bagerhat, a UNESCO World 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.

44. **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).

45. **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, LGED through PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

46. 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 7: Applicable Ambient Air Quality Standards for Bangladesh Projects

Parameter	Bangladesh Ambient Air Quality Standard (µg/m³)[a]	WHO Air Quality Guidelines (µg/m³)	
		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/m³ = 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 8: 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 9: 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 10: 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

Sl. No.	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated Land
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
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:

(1) 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.”

(2) 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.

(3) 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.

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

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

(6) 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.

(7) 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 11: 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. The Subproject Scope and Components

47. The proposed subproject is an integrated waste management (IWM) scheme that will serve Bagerhat Pourashava in the Bagerhat Sadar Upazila of Bagerhat District in Bangladesh. Per preliminary design, the subproject will have a design capacity of 21 tons of solid wastes per

day based on the 2041 solid waste generation scenario for Bagerhat Pourashava. The components of the subproject include (i) waste collection and transport system at the household and community level; (ii) movable temporary waste storage and transport system; and (iii) resource recovery and landfill facility.

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

Table 12: Summary of Subproject Components

SL. No.	Name of Components / Subcomponents	No. of Units / Capacity	Purpose
1	**Primary Waste Collection and Transport**		
	Motorized Rickshaw Vans with Bins	30	For collection of solid wastes at the household level
	Vacuum Trucks	1 (1 m^3 cap.) 1 (0.7 m^3 cap)	For collection of septage at the household level and for transport to the fecal sludge treatment plant.
2	**Secondary Storage and Transport**		
	Demountable Containers	40 (1 – 1.5 m^3 cap. each)	For temporary storage of wastes collected from household level. These containers to be strategically located around the Pourashava area. The demountable containers will be used as alternate to traditional secondary transfer stations. These containers will function similar to transfer stations wherein collected wastes from household level will be brought to and temporarily stored in these containers. These same containers are then loaded to carrier trucks and transported to the Resource Recovery and Landfill Facility.
	Demountable Container Carrier Trucks	7	To transport the demountable containers to and from the resource recovery and landfill site.
3	**Resource Recovery and Landfill Facility**		
	Materials Recovery Facility	2.5 tons/day	For use as the initial management through further waste segregation, and recovery of reusable and/or recyclable materials from wastes.
	Composting Plant	5 tons/day	To process all biodegradable components of collected solid wastes and convert them into compost.
	Fecal Sludge Treatment Plant	5 m^3/day	To treat fecal sludge collected from households.
	Landfill Cells	To be determined during detailed design phase	To serve as the ultimate disposal place for all residual wastes.

SL. No.	Name of Components / Subcomponents	No. of Units / Capacity	Purpose
	Leachate Collection and Treatment System	To be determined during detailed design phase	To collect generated leachate from the landfill cells and treat the same to comply with effluent standards prior to disposal. The treatment system will also have a recirculation scheme that can be adopted during dry season.
	Landfill Gas Collection and Control System	To be determined during detailed design phase	To collect generated landfill gas from the landfill cells and bring this gas to either a flaring system or biogas collection system or a combination of both.
	Heavy Equipment Vehicles for Landfill	1 (bulldozer) 1 (excavator) 1 (front wheel loader)	For the management of solid wastes at the landfill site.

B. Subproject Location and Area

49. The proposed subproject will be located in Bagerhat Pourashava under Bagerhat Sadar Upazila in Bagerhat District of Khulna Division. Bagerhat Pourashava is about 278 km away by road from Dhaka City. It was established in 1958 and became an 'A' category Pourashava in 1991. It is located between 22.40°N 89.48°E. It occupies an area of 8.63 km^2 and consists of 9 wards, 8 mouzas and 31 mahallas. The Pourashava area is bounded by Fakirhat and Chitalmari upazilas on the north, Morrelganj upazila on the south, Kachua upazila on the east, Rampal and Fakirhat upazila on the west. Main rivers are Bhairab, Chitra, Daudkhali, Poylahar, Putimari.

50. **Location of waste collection and temporary storage**. It is envisaged that the waste collection will cover the entire Bagerhat 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 demountable containers which will likewise be procured and funded under the subproject. These demountable containers will be placed at strategic locations around the Pourashava. See Figure 2 below for the coverage area.

51. **Location of resource recovery and landfill facility**. The resource recovery and landfill 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. This facility will be located at Majhidanga Mouza under the Kara Para union, which is situated in the north of the municipality (Ward No. 01 boundary) and about 2.75 km north of the core commercial and residential areas. The area is within an agricultural zone, and the site is bounded by a khal (Harikhola khal) and agricultural lands including pockets of waterlogging areas (ponds) used for pisciculture. Some of these ponds are adjacent the boundary of the site. There are several houses near the boundary of the proposed site. A mosque is also found at about 120m from the boundary of the proposed site on the southeast direction. See Figure 2 below the map identifying the location relative to the Bagerhat Pourashava area, and Figure 3 for the vicinity map showing the different valued environmental components surrounding the facility.

Figure 2: Location Map of Bagerhat Pourashava

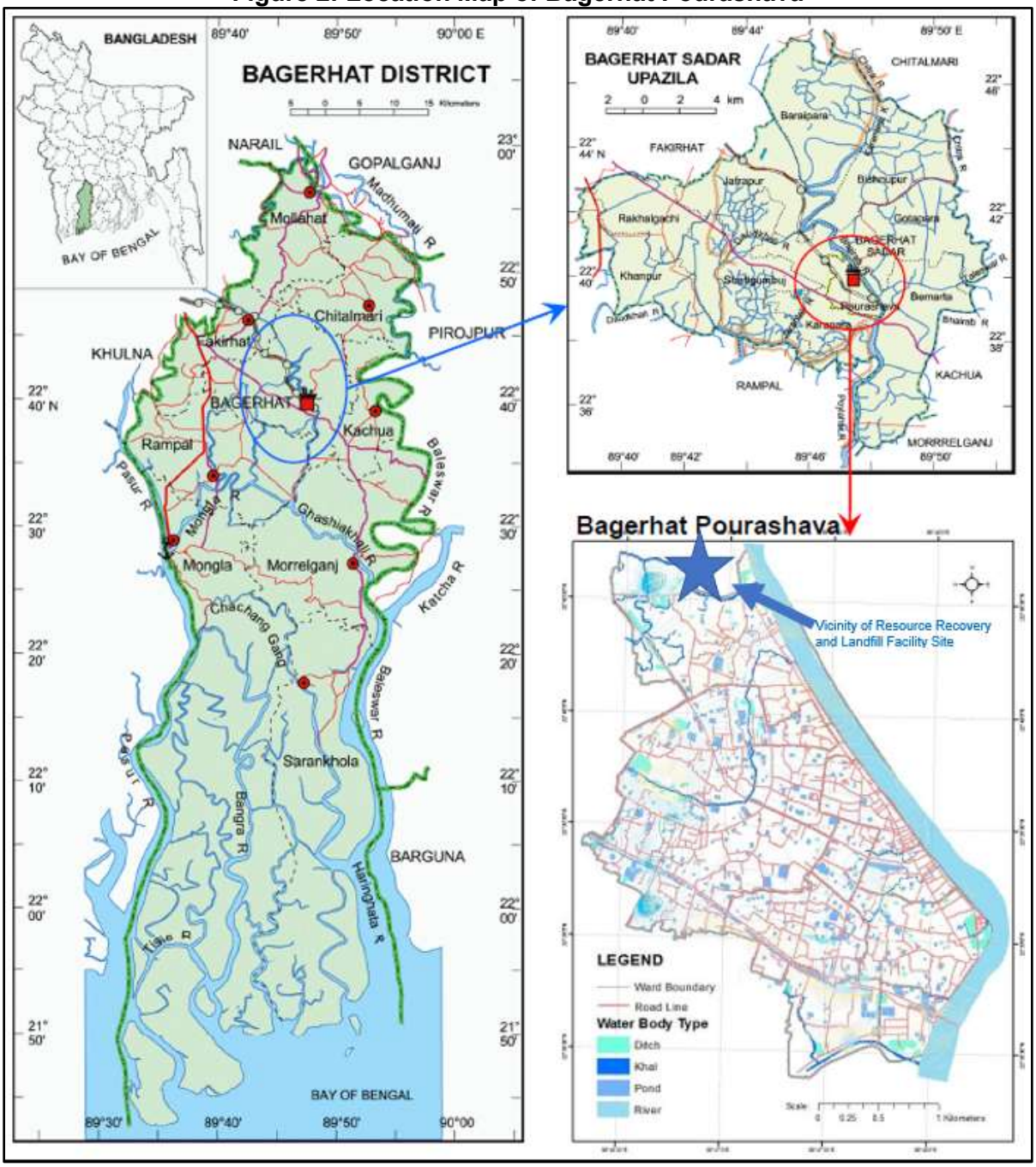
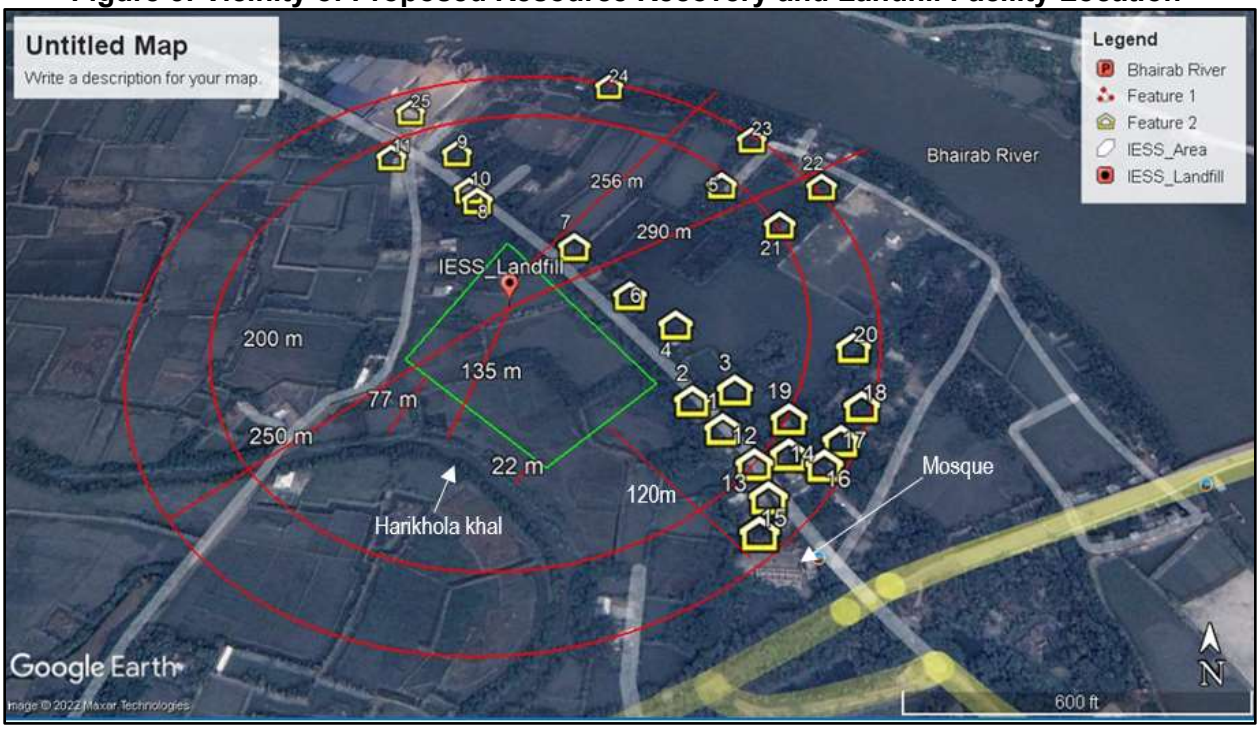


Figure 3: Vicinity of Proposed Resource Recovery and Landfill Facility Location



Source: Google Earth

52. **Existing Condition and Waste Management Practice**. Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The waste is generated from different source (domestic, commercial, industrial, street sweeping, health care facilities etc.). Three 'systems' of waste management are coexisting side by side in Bagerhat. First is the 'Formal system' that is based on the conventional system of collection transportation-disposal of waste carried out by the local authorities. In this system, the concept of transfer stations, resource recovery, minimization and recycling are absent. Second is the 'Community Initiative' that is based on primary solid waste collection by community-based organizations (CBOs) and nongovernment organizations (NGOs). `Community Initiative' of house-to-house waste collection in neighborhood started due to lack of satisfaction with the solid waste management service provide by local authorities. Currently 12 CBO initiatives of house-to-house waste collection is ongoing in the Pourashava area. For this service, BDT20-50 per month per household is collected by the waste collector. Third is the `Informal System' that is represented by the large informal labor force involved in the solid waste recycling trade chain.

53. In any of the afore mentioned systems, the wastes collected, other than those recycled and/or sold, eventually end up in the dumpsite without proper management. Figure below shows the actual condition at the dumpsite.

Table 13: Sample On-Ground Photos of Existing Condition at Proposed Site


Existing waste dumping


Access road traversing the site


Water-logging (ponding) within the site


Bhangari wala / waste pickers collecting plastic waste, glass westes, alluninium wastes form dumped wastes


Nearby settlements


Mosque (about 100m from the site boundary)

54. **Waste Generation Data**. The Bagerhat Pourashava Master Plan (2014) provides the estimation of the amount of present and future solid waste generation. Accordingly, generation as of 2011 was estimated at 14.74 tons/day and projected generation by 2031 was estimated at 21.22 tons/day. See below table.

Table 14: Solid Waste Generation in Bagerhat Pourashava

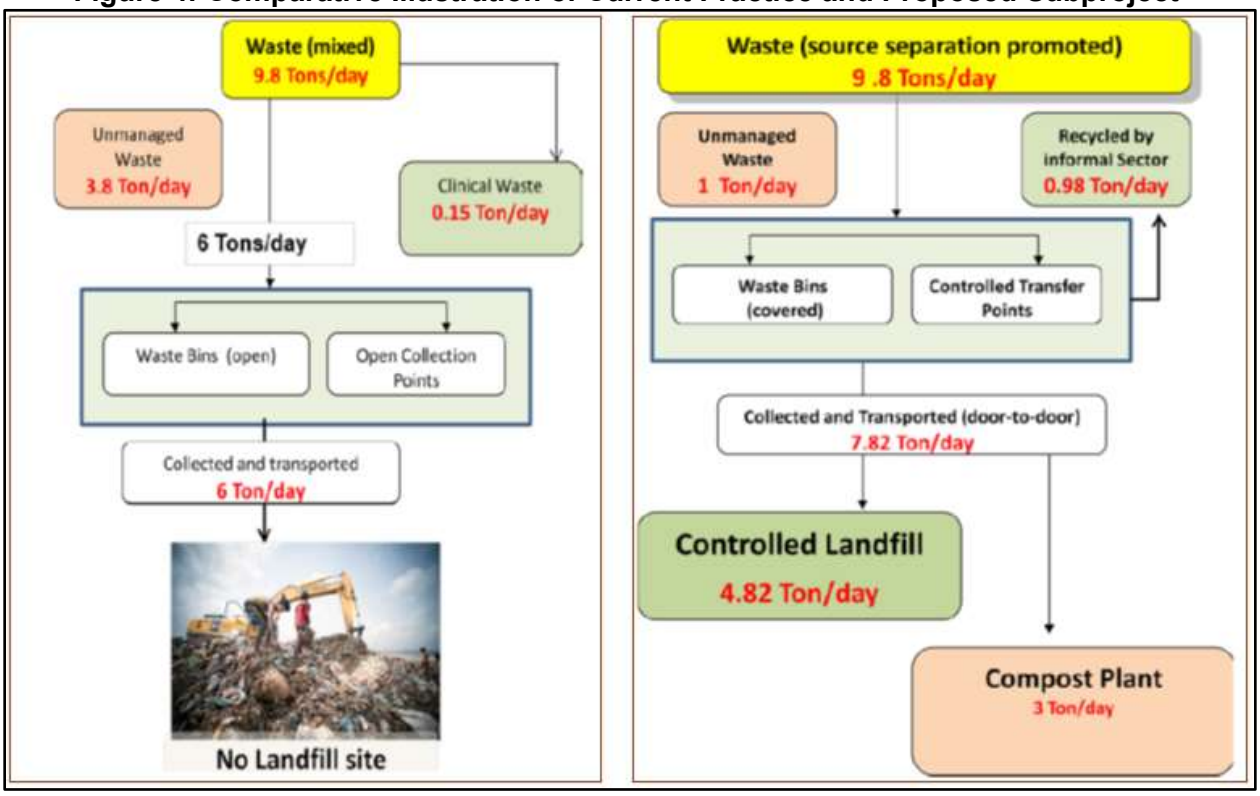
Ward No.	Estimated 2011	Projected Solid Waste Generation (Ton/day)			
		2016	2021	2026	2031
1	1.48	1.74	1.88	2.04	2.22
2	1.48	1.72	1.86	2.02	2.19

Ward No.	Estimated 2011	Projected Solid Waste Generation (Ton/day)			
		2016	2021	2026	2031
3	2.45	2.77	3.01	3.26	3.54
4	1.38	1.55	1.68	1.82	1.98
5	1.30	1.47	1.59	1.73	1.88
6	1.24	1.36	1.47	1.60	1.73
7	1.67	1.83	1.98	2.15	2.33
8	2.14	2.41	2.61	2.83	3.07
9	1.63	1.78	1.93	2.10	2.27
Total	14.74	16.62	18.03	19.56	21.22

Source: Master Plan for Bagerhat Paurashava, 2011-31

55. **The Subproject as Intervention.** In view of this unsustainable IWM practice, the proposed subproject is aimed at improving the entire IWM systems and infrastructures of Bagerhat Pourashava. Figure below illustrates a sample material balance and flow of waste between the current practice and the proposed system under the subproject. This example takes assumption that only 9.8 tons of wastes is collected per day. Apart from improving the waste collection and transport system, the subproject will be able to provide an environmentally sound disposal system by converting the open dumping practice into a reliable landfilling system. Further with the introduction of better managed resource recovery and recycling activities, the subproject will also be able to reduce the amount of residual wastes for final disposal by as much as 20%.

Figure 4: Comparative Illustration of Current Practice and Proposed Subproject



Source: CTEIP 2017

56. **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 vehicle and implements to ensure an efficient waste collection activities. Per recommendation of the feasibility study, the capacity of the household waste collection fleet

need to be increased by the procurement of thirty (30) improved rickshaw vans with bins for the house-to-house collection. These vans will complement the existing equipment currently in use and will be operated by the Pourashava. These primary waste collection vehicles will be deployed to the different areas of the town equitably based on area population density. Household level segregation of wastes (i.e., biodegradable, recyclables, and non-biodegradables/hazardous/toxic wastes) will be encouraged and be part of the continuing information and behavior change campaign by the PIU at the Pourashava level.[19] Collection will be done on a daily basis in the high density and market areas while every two days in low density areas.

57. Separately, the fecal sludge management will also be introduced with the procurement of two (2) vacuum trucks for collection and transport of fecal sludge from the households to the fecal sludge treatment plant that is part of the resource recovery and landfill facility component under the subproject. These vacuum trucks will also be operated by the Pourashava, but on needs or on call basis. The behavior change campaign will be conducted to raise awareness on the requirement and benefits of periodic desludging of septic tanks and also to increase the level of willingness to pay by the stakeholders with regard to associated costs, if any, of septic tank desludging.

58. **Secondary Storage and Transport**. Based on feasibility study, secondary storage and transport will adopt a movable temporary storage system with the use of covered 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, the use of demountable containers avoids the occurrence of littering and waste mismanagement normally experienced in traditional secondary transfer station operations.

59. Per recommendation, the secondary storage will need to be increased with the addition of forty (40) demountable containers, each with capacity of about 1.5 – 2 cu.m. This will bring a total secondary storage capacity of 60 – 80 cu.m. for the entire Pourashava. These 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 at least three containers to cater to the segregated wastes desired (biodegradable, non-biodegradable, hazardous). To cater to these demountable containers, the secondary transport fleet will need seven (7) demountable container carrier trucks that will be used to transport the demountable containers to and from the resource recovery and landfill facility.

60. Assuming current waste generation rate of 15 tons/day for the entire Pourashava and waste density to be 0.5 tons/cu.m., the volume of waste generated in the Pourashava would be about 30 cu.m. per day. While house-to-house collection could be done at least every day, the transport of the temporary storage containers (demountable containers) from/to the resource

[19] The PMU will engage an experienced expert organization to design the appropriate information and behavior change campaign strategy. The PIU will implement such strategy under the continuing guidance of the expert organization throughout the duration of subproject implementation. The campaign strategy will include outcomes on research on stakeholders to determine what will most likely motivate them and measurement of the campaigns' impacts (comparing baseline and post-campaign surveys), as well as incentives and penalties.

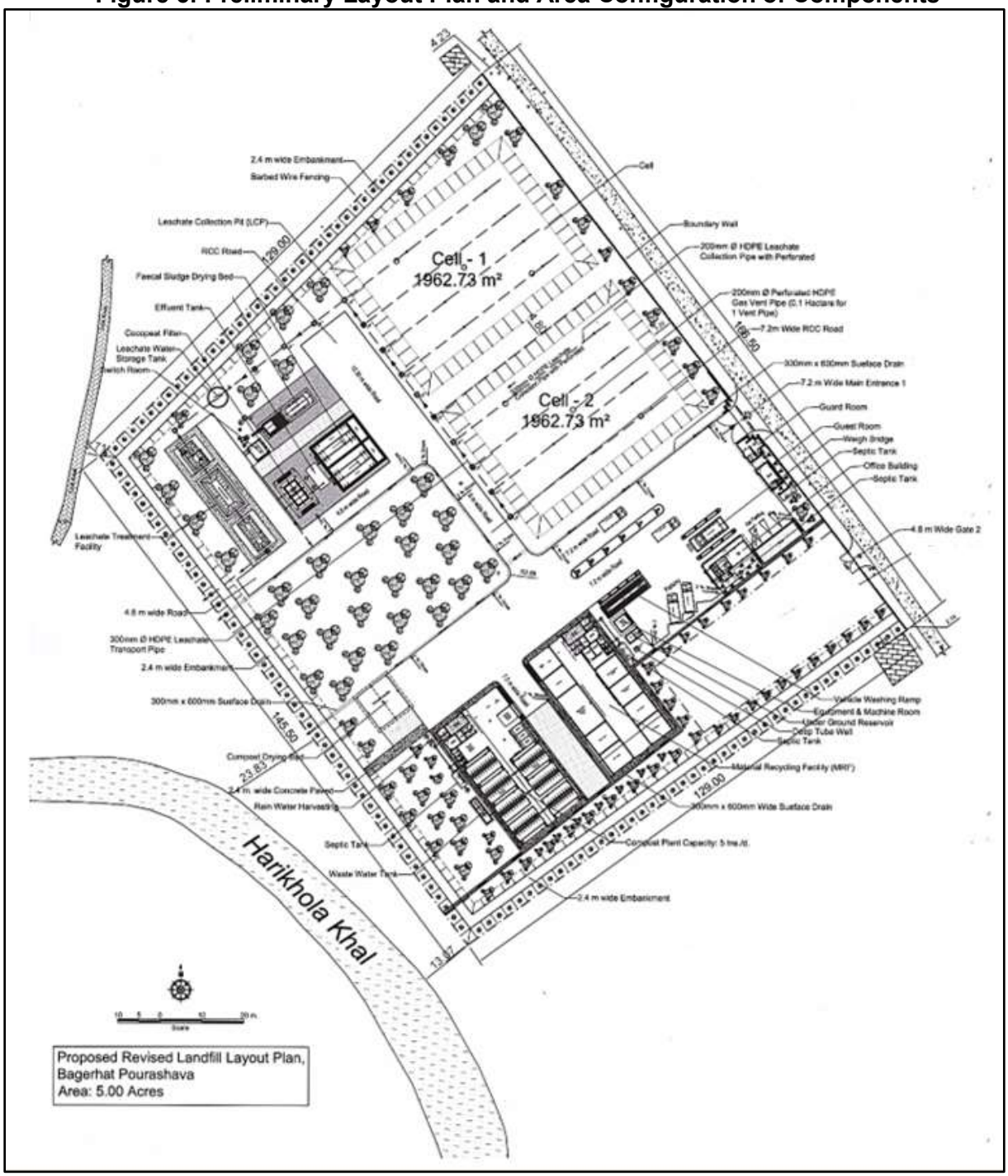
recovery and landfill facility should happen at the most every two days to avoid overfilling or overflow of wastes. Other specific operational details on the waste collection and storage will be finalized during the detailed design stage, with due consideration of related recommendations in this IEE report. The future operator (external entity to be engaged/contracted by Bagerhat Pourashava) will monitor the operation of the entire resource recovery and landfill facility, including the collection and transport of wastes.

61. **Resource Recovery and Landfill Facility.** The total area of the site is about 2.02 hectares (5 acres), which will be fully utilized by the proposed Resource Recovery and Landfill Facility. Table 15 below summarizes of the various components and subcomponents that will occupy the site. Figure 3 below shows the corresponding layout plan and rendering.

Table 15: Area Utilization of Components at Proposed Site

SL. No.	Name of Components / Structures	Area (m^2)	% of Total
	Primary Components		
1	Materials Recovery Facility	735	3.67
2	Composting Plant	819	4.09
3	Fecal Sludge Treatment Plant	168	0.84
4	Landfill Cells	3,864	19.30
5	Leachate Collection and Treatment System	455	2.27
6	Landfill Gas Collection and Control System		
	Other Allied Subcomponents of the Facility		
7	Office Building	56	0.28
8	Guest Room	23	0.11
9	Guard Room	24	0.12
10	Vehicle Washing Ramp	42	0.21
11	Equipment Machine Room	11	0.05
12	Underground Water Tank & Pump Store	9	0.04
13	Switch Room	15	0.07
14	Septic Tank	21	0.10
15	Rainwater Harvesting System	4	0.02
16	Weigh Bridge (Digital)	32	0.16
17	Reinforced Cement Concrete (RCC) Internal Roads	3,497	17.46
18	RCC Block Road	253	1.26
19	Other Pavement	158	0.79
20	Embankment	929	4.64
21	Green / Plantation	7,776	38.82
22	Open Space for other subcomponents or machines	1,140	5.69
Total		**20,031**	**100**

Figure 5: Preliminary Layout Plan and Area Configuration of Components



62. **Materials Recovery Facility**. The materials recovery facility (MRF) is an integral part of the resource recovery and landfill 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 will occupy a total area of 735 sq.m. to provide a wider area for proper segregation and storage of recyclable wastes.

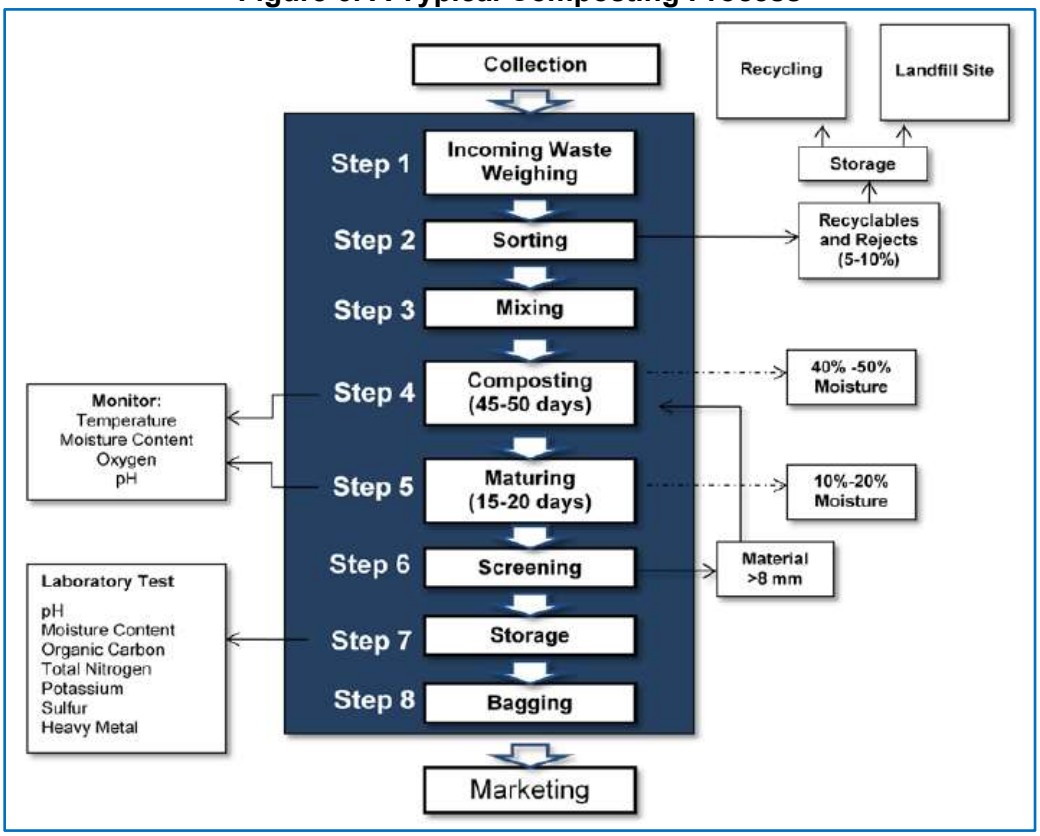
63. Operationally, the MRF will be maintained by a third party to be engaged by the Pourashava. It will aim to partner with the local NGOs/CBOs or recycling businesses in Bagerhat to ensure sustainable operation of the facility.

64. Plastic shredder and baling machine will be added to this MRF to increase the capacity and storage space. Dedicated storage area for toxic chemicals and hazardous wastes will be provided. Accordingly, these types of wastes will be transported to authorized treaters. Other specific technical and operational details of the MRF will be finalized during the detailed design stage, with due consideration of related recommendations in this IEE report.

65. **Composting Plant**. The composting plant is an integral part of the resource recovery and landfill facility component of the subproject. It will occupy a total area of 819 sq.m. Based on feasibility study, compost plant with a capacity of 3 tons/day has been proposed at the initial stage. The earmarked land for the compost plant can accommodate total 7-8 tons/day in future. 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 (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.

66. 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 6: A Typical Composting Process



67. **Fecal Sludge Treatment Plant**. The fecal sludge treatment plant (FSTP) is an integral part of the resource recovery and landfill facility component of the subproject. The FSTP will occupy an area of 168 sq.m. Based on feasibility study, the FSTP will have a design capacity of 5 cu.m./day.

68. 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, one with capacity of 1 cu.m. and the other 0.75 cu.m. Collection of fecal sludge will be on needs or on call basis and/or on scheduled basis. No desludging will be allowed beyond 5 cu.m. per day to avoid overloading the FSTP.

69. 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 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.

70. 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 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.

71. **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 resource recovery and landfill facility component of the subproject. Per preliminary design, it will have two landfill cells that will occupy an area of 3,864 m^2 and a leachate collection and treatment system (LCTS) that will occupy an area of 455 $m^{2.}$ A landfill gas collection and control system will also be installed. 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.

72. The contract for the establishment of the entire resource recovery and landfill facility will also be awarded under a build-operate 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.

C. Project Implementation Schedule

73. The preliminary design for the subproject has been prepared based on the concepts envisaged for an integrated waste management scheme appropriate for Bagerhat Pourashava. The detailed design phase may take about 6 – 12 months. Construction phase is expected to take 12 – 24 months. The post-construction will include a defect liability period of 12 months. The scheme is designed to have an operation phase period of about 20 years.

D. Resource Utilization

74. Gravel, sand, and aggregate will be required for civil construction part of this project, most of which are available in Bangladesh, which may, however, need to be transported over long distances. Reinforcing steel (both mild and high grade) is produced in the country. However, a guarantee of quality, quantity and delivery schedule is important. All these materials, and other construction materials will be sourced from legitimate entities authorized by the government.

IV. ANALYSIS OF ALTERNATIVES

75. Various options were explored during the IEE stage of the proposed integrated waste management (IWM) scheme for Bagerhat Pourashava. These options were weighed from all considerations such as cost, environment, and ease of implementation and maximum utilization of available infrastructure. The aim of alternatives analysis has been to arrive at a development option, which maximizes the benefits while minimizing the adverse impacts. The two alternatives considered were the “No Project Scenario” and “With Project Scenario”. More alternatives on technologies are presented along with environmental management plan.

76. **Without Project Alternative**. The ‘No Project Option’ with respect to the proposed subproject implies that the status quo is maintained. This option may be suitable alternative from an environmental perspective as it ensures non-interference with the existing environmental conditions. However, this option will involve several losses on the socioeconomic condition of the local population. The management of solid waste by the Bagerhat Pourashava is not satisfactory.

The local population will continue to face the constraints they are currently experiencing due to inefficient solid waste management system and open dumping. While the 'No Project Option' will avoid impacts of involuntary resettlement for the households affected by the subproject, it is still the least preferred from the socio-economic and partly environmental perspective due to the following factors:

(i) The socio-economic status, and water-borne/air-borne related health issues of the Bagerhat residents would remain unchanged;
(ii) The locally available skills on labor would remain under-utilized as no employment opportunities will be created for local population who would have otherwise worked at the project area;
(iii) Reduced health and sanitation state due to current bad condition of the solid waste management system; and
(iv) Opportunity to exploit tourism will decline.

77. **With Project Alternative.** Implementation of the project will contribute to improvement of socio-economic and health status of the local population. This will have a positive impact on local residents' quality of life. This alternative has the following advantages:

(i) There will be improved and assured health and sanitation facilities to the residents of the Bagerhat Pourashava;
(ii) Improved health and sanitation will stimulate socio-economic development of the area;
(iii) Soil waste management infrastructure will also result in savings on health facilities due to decline of water-borne and air-borne diseases; and
(iv) The project will provide cleaner and improved sanitation facilities in the locality. This alternative will have positive impact on land use (i.e., no open dumping), trees, noise and air qualities during operation phase.

78. **Site Selection.** Bagerhat Pourashava is a relatively small town in the southern coastal belt of Bangladesh. With a population of 49,073 (2011 census), it has an area of 8.63 km^2 only and its land use is majority residential and mixed commercial, institutional and urban infrastructures in the core areas. Agricultural lands and open fields are limited in some peripheral areas of the Pourashava, particularly in the northern boundary. With this small area and land use profile of the Pourashava, it is but appropriate to locate any solid waste management infrastructures such as landfill facility at the peripheries of the town away from these sensitive communities.

79. At present, Pourashava utilizes a land in the northernmost boundary as dumping site of solid wastes. This site of 5 acre was procured by Bagerhat Pourashava in 2017 for landfill purposes. This dumpsite does not have any proper management and dumping of solid wastes has been indiscriminate since its use beginning 2017. This has led to various environmental issues in the area to date, such as the land and water pollution affecting nearby agricultural fields, and the proliferation of disease vectors and prominent odor nuisance affecting nearby settlements. Therefore, the Pourashava proposed to improve the existing condition by establishing an integrated waste management facility including resource recovery and landfill facility at this site under this subproject. Accordingly, converting the existing open dumpsite into a well-managed resource recovery and landfill facility will solve the environmental problems now being faced at the site and vicinity.

80. **Technological options**. While the preliminary or concept design of the subproject has been prepared, the detailed design preparation is underway. Results of all alternatives analysis

on the technologies to be employed will be included in the updating or finalization of this IEE based on final detailed design.

V. 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. No sampling for air quality, noise and water quality was conducted. Baseline environmental monitoring for such will 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.

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, LGED, and Bagerhat Pourashava website;
(ii) relevant acts and extraordinary gazettes, and guidelines issued by Government of Bangladesh agencies;
(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

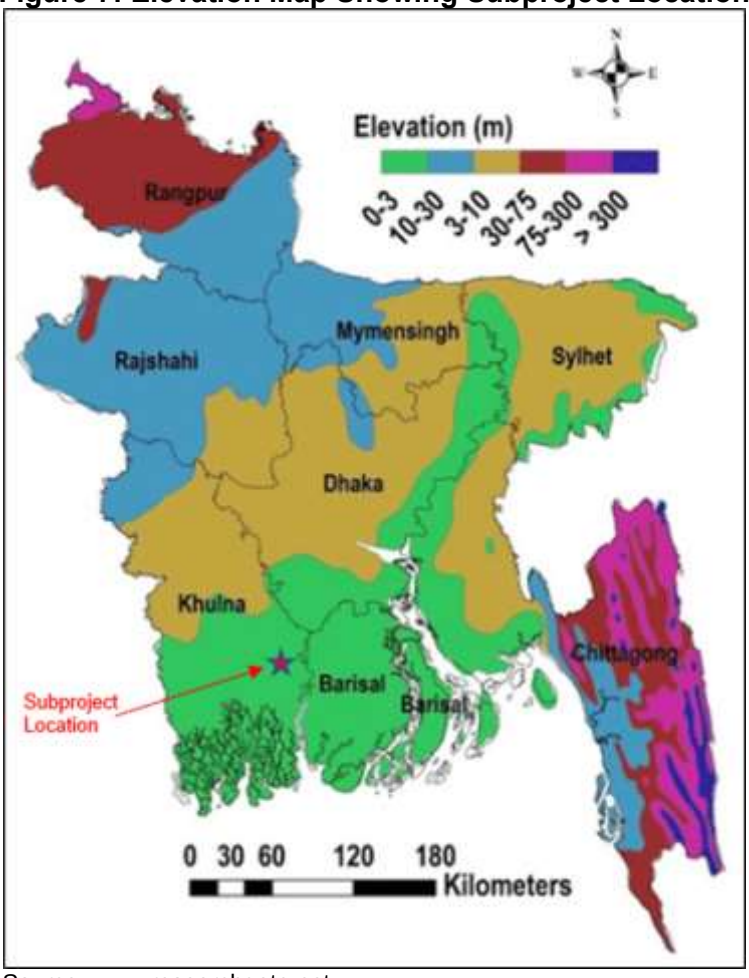
84. Impacts and risks were analyzed in the context of the project's area of influence, which encompasses the area where the resource recovery and landfill facility will be constructed, its immediate vicinity, access road, and the location of construction phase facilities such as the worker's camp, storage and disposal areas.

85. The primary impact will be confined mostly within the boundary of the proposed resource recovery and landfill facility construction area and immediate surroundings within about 50 to 100m from the boundary. Delivery of construction materials to the site would extend the PIA. This means that during transport of construction materials, the impact area is extended along the roads being traversed by the transporting equipment.

C. Physical Environment

86. **Topography.** The topography of Bagerhat Pourashava which covers the subproject drainage alignments is mostly flat, with differences in elevation not exceeding 1m. The subproject area is located in the Ganges tidal flood plain at about 0-3 masl. Elevation map showing the location of the subproject is in below figure.

Figure 7: Elevation Map Showing Subproject Location

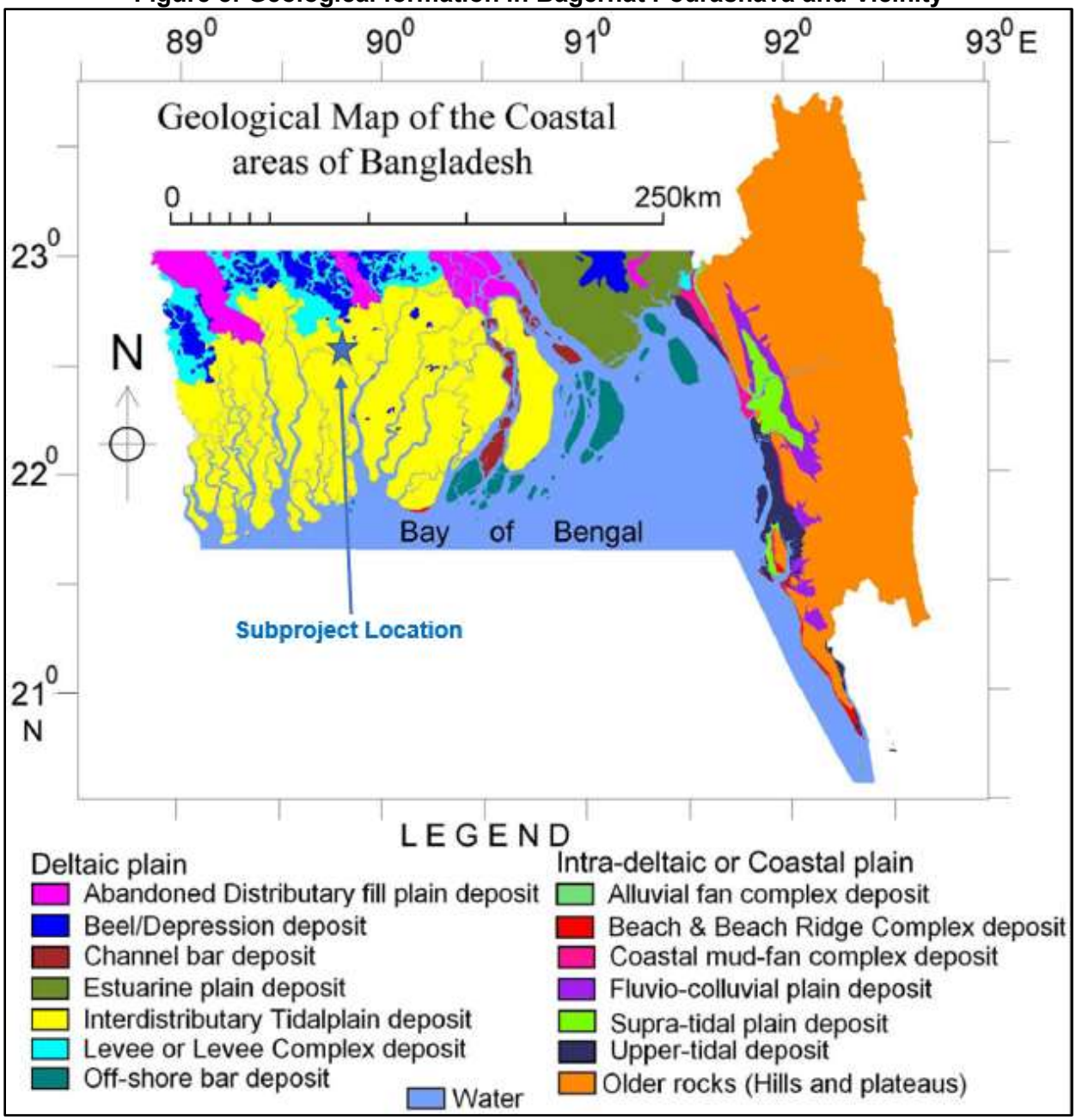


Source: www.researchgate.net

87. **Geology.** Bagerhat is located at the Lower Ganges Delta. The Ganges delta is formed by the confluence of the Ganges (local name Padma), Brahmaputra (Jamuna), and Meghna rivers and their respective tributaries. The Ganges unites with the Jamuna (main channel of the Brahmaputra) and later joins the Meghna, finally flowing into the Bay of Bengal. The Ganges Delta and its surroundings are one of the largest alluvial plains in the world. It faces the Bay of Bengal and rivers flowing in the low land take their source from the Himalayan mountains. The deposition of sediments was vastly controlled by quaternary sea level fluctuation, climatic conditions and tectonic activities (Umitsu 1987). The Bengal Basin was filled with sediments of Tertiary and Quaternary age (Morgan and McIntire1959; Umitsu 1985, 1987, 1993). Mainly the Ganges deltaic deposits of Late Holocene to recent age cover the study area. The modern deltaic plain in the western Bengal Basin can be divided into two regions: the Upper Delta plain of meander belts of the Ganges– Bhagirathi rivers in the north; and the lower delta plain with numerous tidal creeks in the south (Das et. al. 1996). The lower deltaic plain, formed in Pleistocene–Holocene time, is characterized by the presence of an extensive clay layer of varying thickness (15–76 m) which is

underlain by silt, sand, and gravel (Deshmukh and Goswami 1973). See Figure below for geological map of the region.

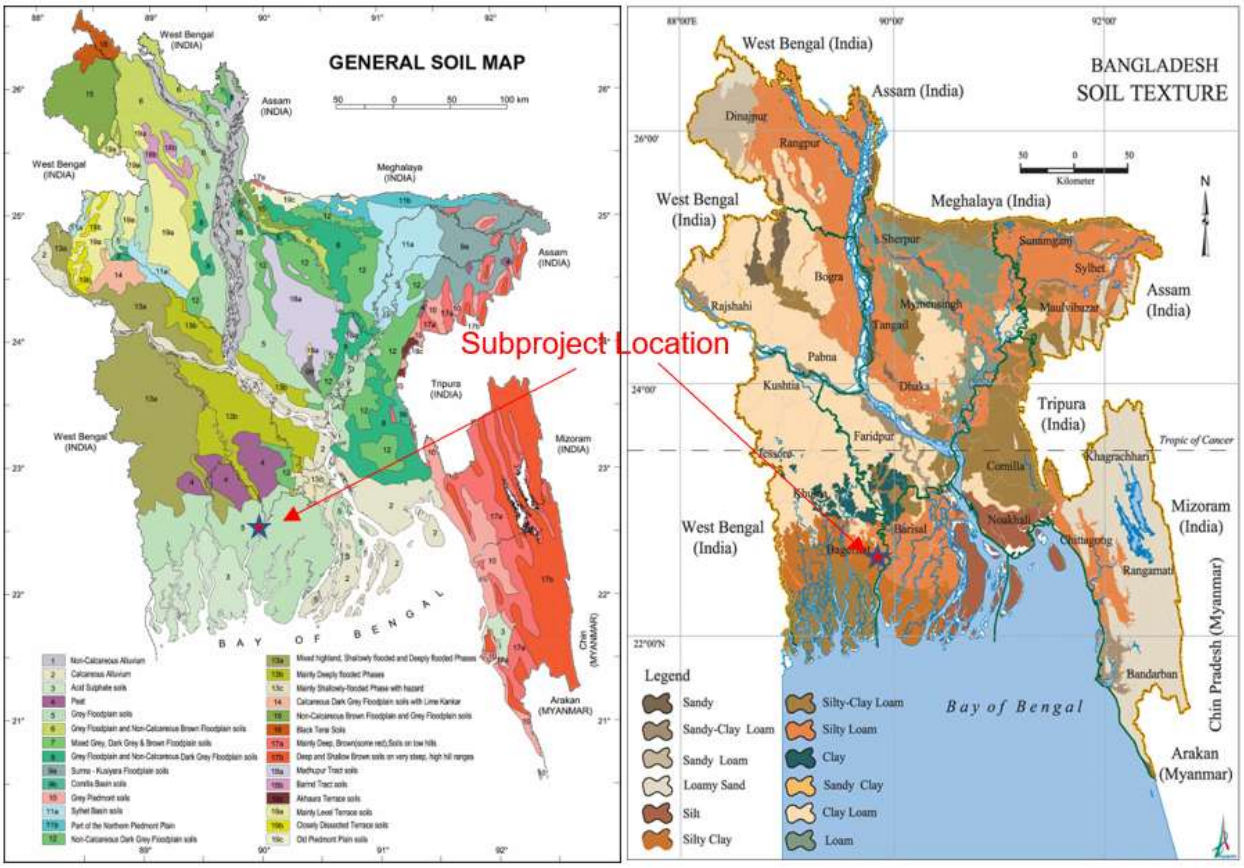
Figure 8: Geological formation in Bagerhat Pourashava and Vicinity



Source: Geological Survey of Bangladesh, 2017

88. **Soil.** Based on the general soil map and soil texture map of Bangladesh, Bagerhat District has grey floodplain soils with silty loam texture. The soils are non-saline throughout the year over substantial areas in the north and the east, but they become saline to varying degrees in the dry season in the southwest.

Figure 9: General soil map (left) and soil texture map (right) of Bangladesh



Source: FAO 1988 and Banglapedia.

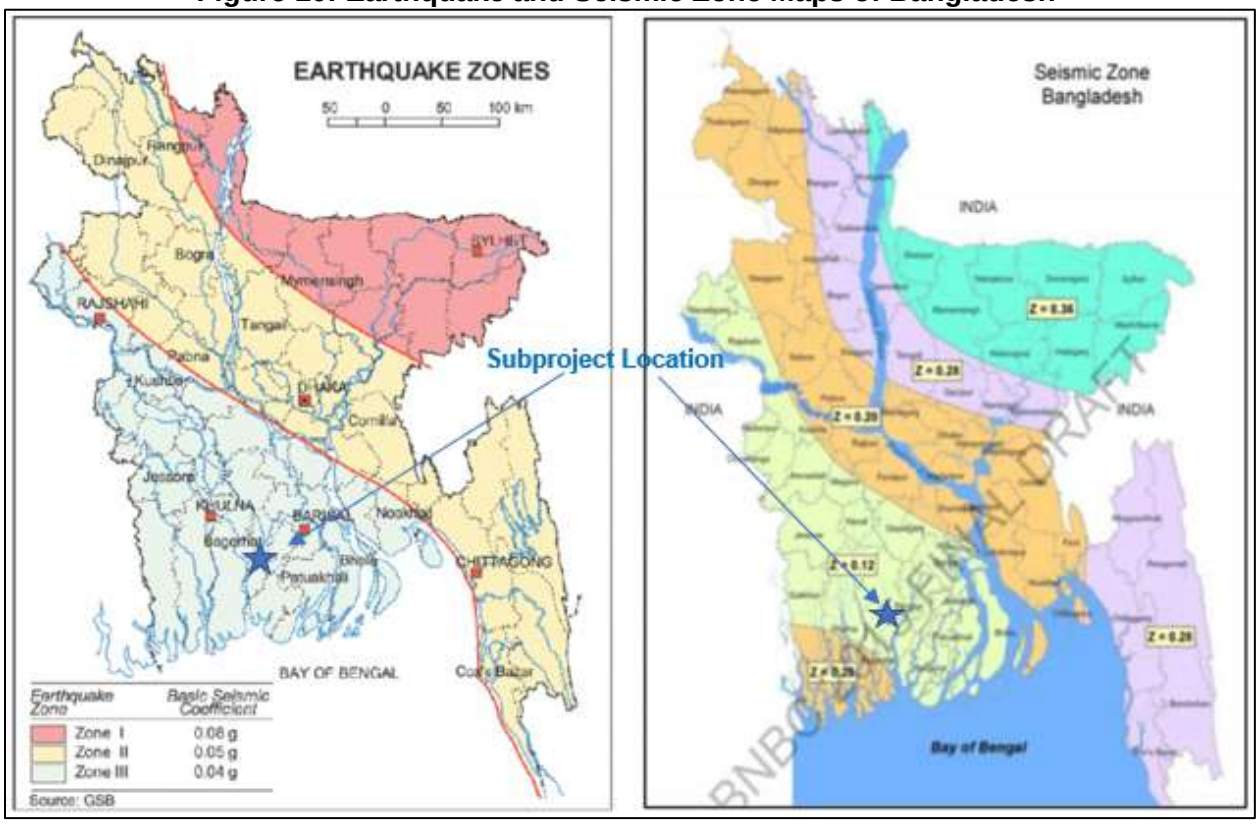
89. **Seismicity.** Twenty-six, 38 and 36 percent of Bangladesh falls within the high, moderate, and low risk zones in terms of earthquake vulnerability, respectively. The distribution of recorded earthquakes indicates a major clustering of seismicity around the Dauki Fault and scattering of other events along other major fault systems of Bangladesh. The magnitude of the earthquakes is moderate (4-6, magnitude in Richter scale) and majority of them are at shallow depth. Based on the Geological Survey of Bangladesh (GSB, undated[20]), Bagerhat falls in low intensity seismic zone (Zone-III, Basic Seismic Coefficient 0.04g).

90. The Bangladesh National Building Code (2010),[21] on the other hand, divides Bangladesh into four categories of seismic zone according to intensity, i.e., very high, high, moderate and low (Figure 10). Bagerhat falls within seismic zone 1 (Z = 0.12).

[20] Geological Survey of Bangladesh (GSB) (undated) Earthquake Zones of Bangladesh. Publication type: Map. Available at: http://www.gsb.gov.bd/site/view/commondoc/Geo-scientific%20Map/-, date accessed: 15 May 2020.

[21] Bangladesh National Building Code (BNBC) (2015) Bangladesh National Building Code (BNBC), Housing and Building Research Institute, Dhaka, Bangladesh.

Figure 10: Earthquake and Seismic Zone Maps of Bangladesh



Sources: Geological Survey of Bangladesh, 2001; Bangladesh National Building Code, 2010

91. **Climate and Temperature.** Bagerhat has a tropical climate (Figure 11). Bagerhat bears a hot summer and a mild winter. But almost all the area of the area is occasionally affected by cyclonic storm surges and tidal bores that originate from the Bay of Bengal during monsoon. The average annual temperature in Bagerhat is 26°C.Temperature rises steadily from January to April, remains fairly steady from April to October and then falls to reach the lowest in January. The average temperature shows that the minimum temperature has been increasing at the rate of 0.04^{o}C/year. Annual increase is in temperature is anticipated between 1.98-2.35^{o}C. Maximum temperature diagram for Bagerhat displays how many days per month reach certain temperatures. See Figure 12 below.

Figure 11: Koppen-Geiger Climate Classification and Location of Subproject (Yellow Star)

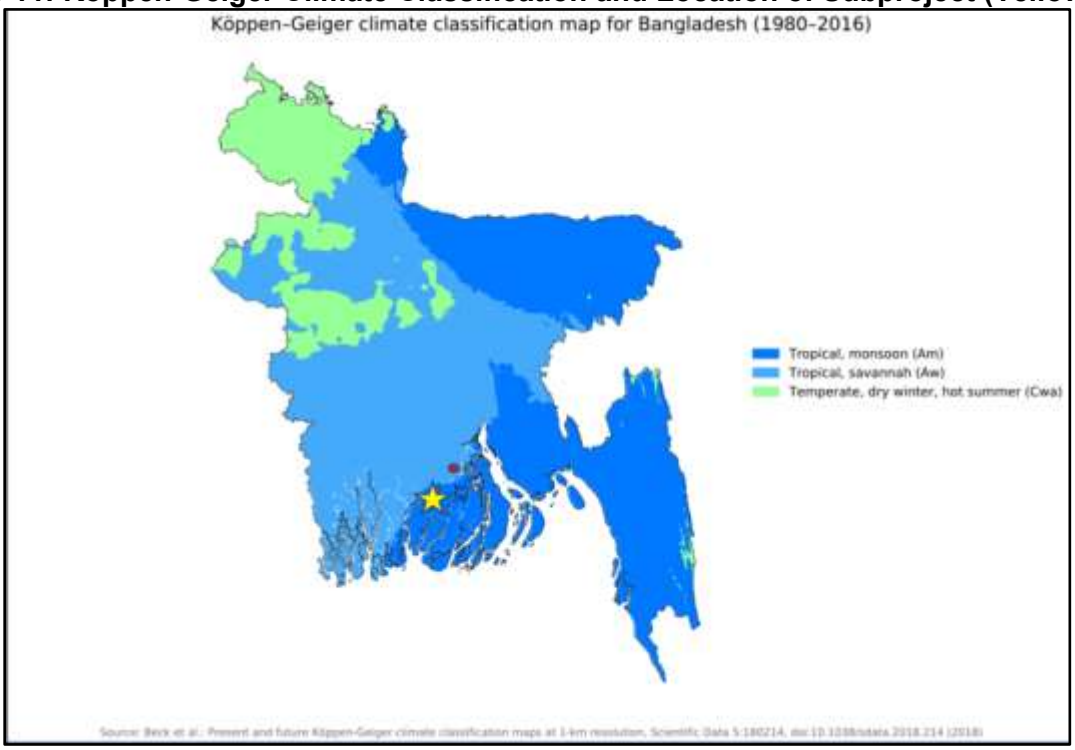
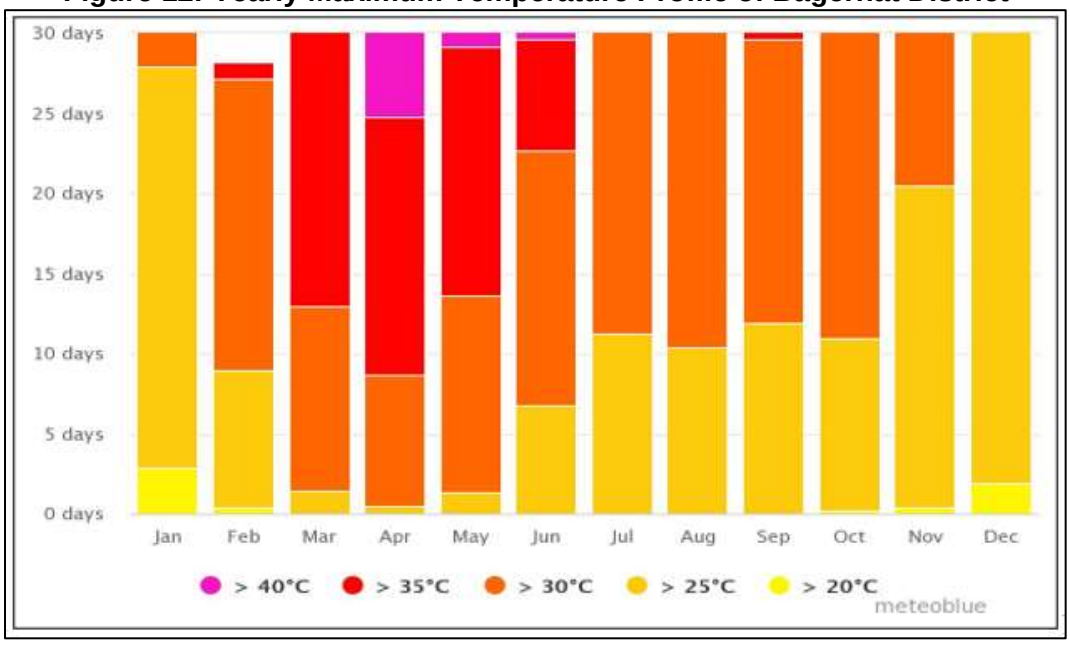


Figure 12: Yearly Maximum Temperature Profile of Bagerhat District

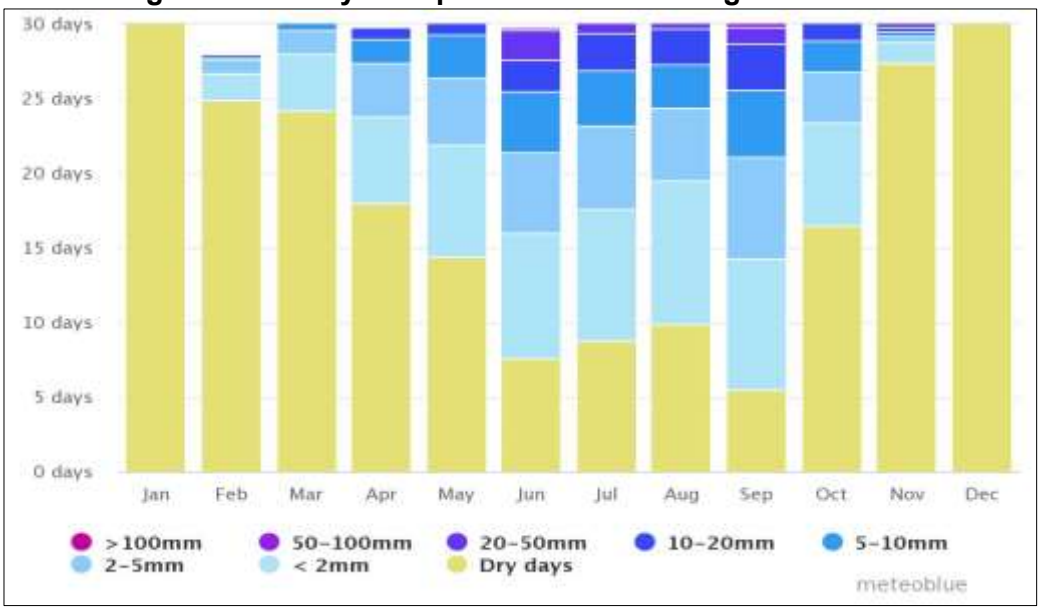


Source: www.meteoblue.com

92. **Rainfall.** In winter there is much less rainfall in Bagerhat than in summer. The monsoon starts from June and maximum rainfall of 2,069 mm was observed in year 1990; 2,102 mm in 2000 and 2,146 mm in 2010. The average annual rainfall is 1934 mm. The driest month is December with 8 mm. Most precipitation falls in July, with an average of 404 mm. The difference in precipitation between the driest month and the wettest month is 396 mm. The decadal average

increase in rainfall is about 1.84%. The seasonal distribution shows that most of the rainfall occurs in monsoon season 1,710 mm/ year between May and September which is 81% of annual rainfall. Monsoon rainfall is increasing about 3.0% per decade. Rainfall exhibits increasing trend in all seasons. In order to design Climate resilient infrastructure, the annual and monsoon projections for rainfall are 14.86 to 19% and 22.3 to 24.7% respectively for the year 2050 from the base year 2000. The precipitation diagram for Bagerhat shows on how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated. See

Figure 13: Yearly Precipitation Profile of Bagerhat District



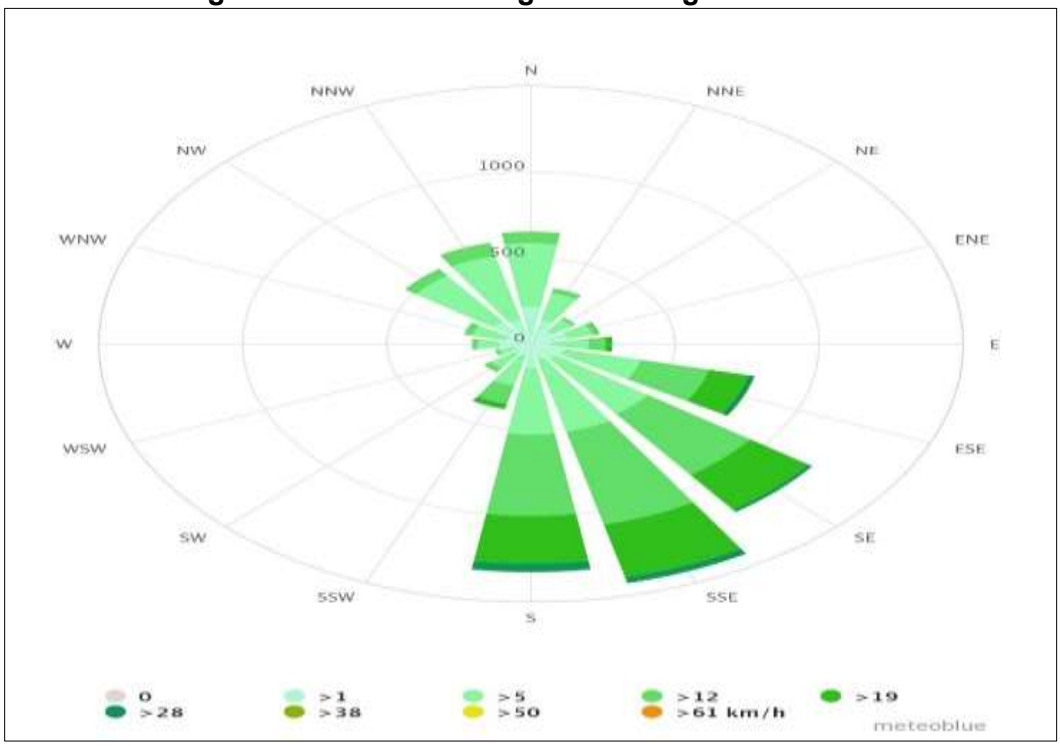
Source: www.meteoblue.com

93. **Humidity.** Comparatively the humidity is very high in the coastal region rather than other districts of Bangladesh. Average relative humidity in Bagerhat area varies seasonally from 70% to 90%. June, July and August are the most humid months (80 % to 90 %) while during January to March it remains lowest (20% to 30%).

94. **Evaporation.** Maximum evaporation occurs in month of May. The monthly average evaporation in this area varies from 3 to 5 mm/day in a year. The monthly maximum average evaporation occurs in the month of July, and it is 16 mm/ day (CEGIS).

95. **Prevailing Winds.** Like the country's wind characteristics, the region is characterized by Southerly wind from the Bay of Bengal during monsoon and Northwesterly wind from Himalayas during winter. As per Bagerhat BMD, wind speed in Bagerhat is the highest in April (around 167 kph) and the lowest in December (around 49.7 kph). During cyclone SIDR (2007) and AILA (2009), 1-minute sustained wind speeds were recorded as 260 kph and 120 kph respectively. SIDR caused more damage due to its high wind speed. The wind rose for Bagerhat shows how many hours per year the wind blows from the indicated direction.

Figure 14: Windrose Diagram for Bagerhat District



Source: www.meteoblue.com

96. **Ambient Air Quality.** The subproject is located in an area where air pollution has not been a problem. There are no available data for Bagerhat, but site visits and visual observations conducted in the area showed no sources of emission that could significantly deteriorate air quality. Apart from vehicular emission, other potential sources are the wood burning associated with some businesses, sawmills, ice mills and rice mills. However, it is perceived that emissions from these sources do not degrade the ambient air quality to significant extent. To validate this observation, baseline ambient air quality will be measured during the detailed design phase of the subproject.

97. **Ambient Noise:** The subproject area is within peri-urban to urban setting. The noise levels in the Pourasahva are similar to that of any other small urban area. Noise may only be attributed to vehicles plying the roads, machineries and other related activities, and is normally in the range of 55 to 75 dB(A). Volume of traffic passing through the Pourashava roads is not significant and traffic jams are very much infrequent. To validate this observation, baseline ambient noise level will be measured during the detailed design phase of the subproject.

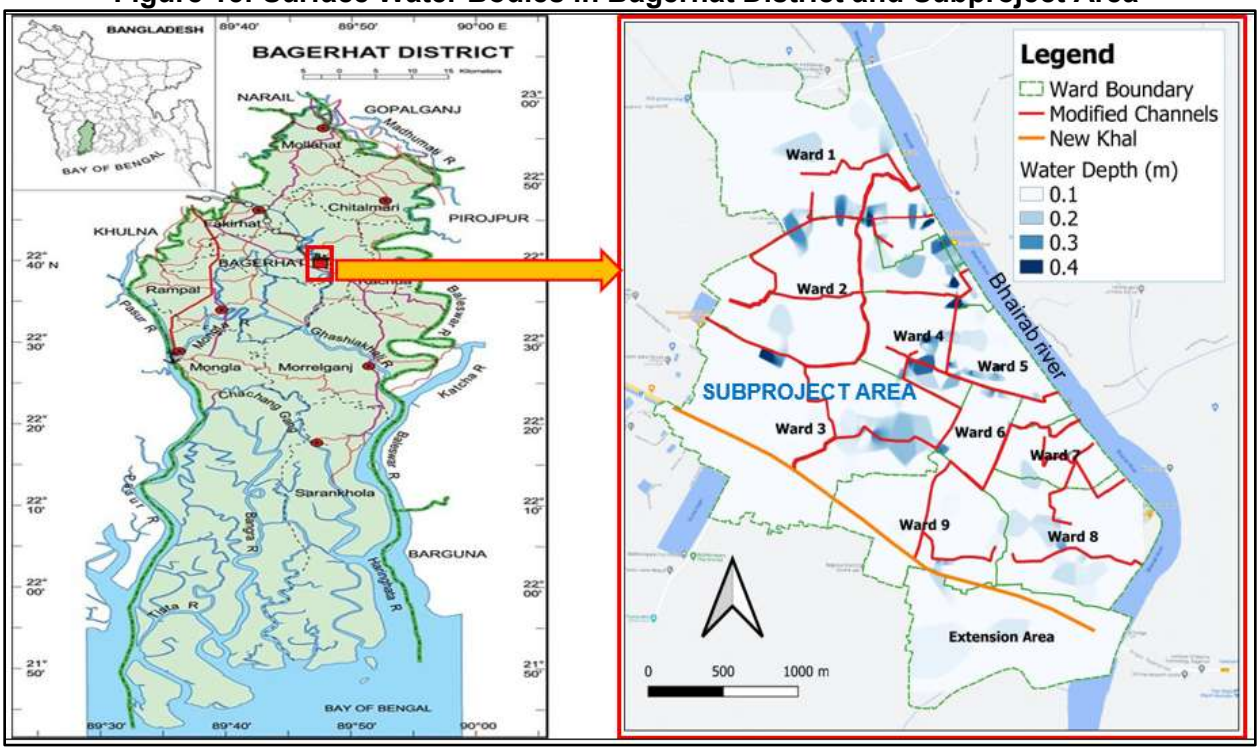
98. **Surface Water**. Surface water bodies in the subproject area have varied uses, including their use for pisciculture, irrigation, and navigation. Visual observations reveal that many of the natural khals are now becoming more polluted due discharge of community and household wastes through the secondary and tertiary drains. There is no available surface water quality data for these natural drainages in the Pourashava, including the Harikhola khal and Bhairab river that are near the proposed resource recovery and landfill facility site. Baseline surface water quality data gathering at the upstreams and downstreams of the adjacent Harikhola khal and Bahirab river will be undertaken during the detailed design phase.

99. Panguchi, Daratana, Madhumati, Pasur, Haringhata, Mongla, Baleswar, Bangra and Goshairkhali are the biggest and notable rivers of Bagerhat district. The relatively smaller Bhairab river is the main water body nearest and bordering the eastern side of the subproject area. See figure below. These rivers carry fresh water throughout the year in the northeast and east, but saltwater penetrates increasingly further inland towards the west, mainly in the dry season, but for most or the entire monsoon in the southwest.

100. Bhairab river is being utilized as a navigational corridor for many of the municipalities or cities of Bangladesh. Secondary water quality data for Bhairab river at the stretch adjacent the subproject area is not available. Baseline surface water quality sampling and analysis will be conducted before the start of construction activities.

101. There are ponds and khals (canals) that have been formed in Bagerhat town and serve as catchment of rainwater during monsoon season. Some of these ponds and khals (mostly located in the outskirts of the town) are utilized as fishponds of the local communities. As observed during the site visit, no ponds or khals are used for aquaculture within the subproject area.

Figure 15: Surface Water Bodies in Bagerhat District and Subproject Area

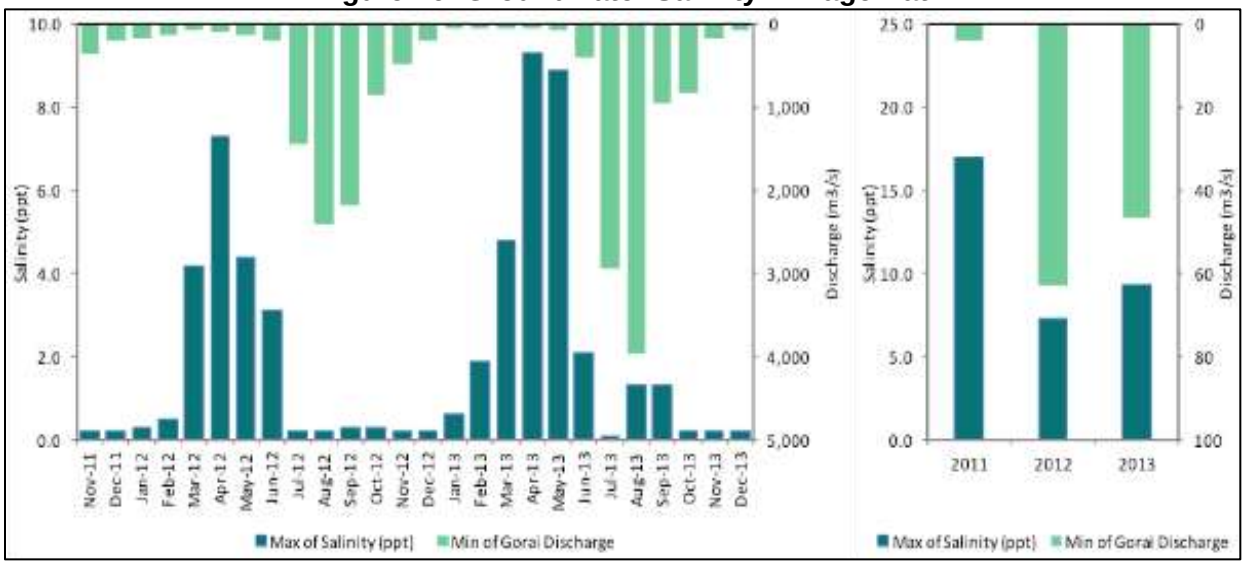


102. **Groundwater.** The study area falls within the Ganges-Brahmaputra-Meghna (GBM) delta. Silts and clays predominate in the upper few meters of the GBM delta system, forming a surficial aquitard, generally less than 10 m thick with typical specific yield values of 2–3%, and vertical permeability values in the range 3–8×10^3 m/d. The aquifers are mostly medium-to fine and medium-to-coarse sands, with permeability of 40–80 m/d. Short-term pumping tests on the Holocene aquifers indicate a leaky response, but for longer pumping periods the aquifer is best described as regionally unconfined. The principal mineralogical components of the Holocene sands are quartz, plagioclase feldspars, potassium feldspars, micas (muscovite, biotite and chlorite), and clays (smectite, kaolinite and illite). Deep clayey aquitards exist in coastal regions and the sands below the aquitards are commonly referred to as the deep aquifer. Based on a

recent study of sampled well depths, aquifers are considered as shallow (<70 m), inter-mediate (70 – 180 m) and deep (>180 m) aquifer (Majumdar and Shimada, 2019).[22] Based on the groundwater zoning map of 2010 of the Bangladesh Agricultural Research Council (Figure 12), Bagerhat District has groundwater depth of 0-5.3 meters.

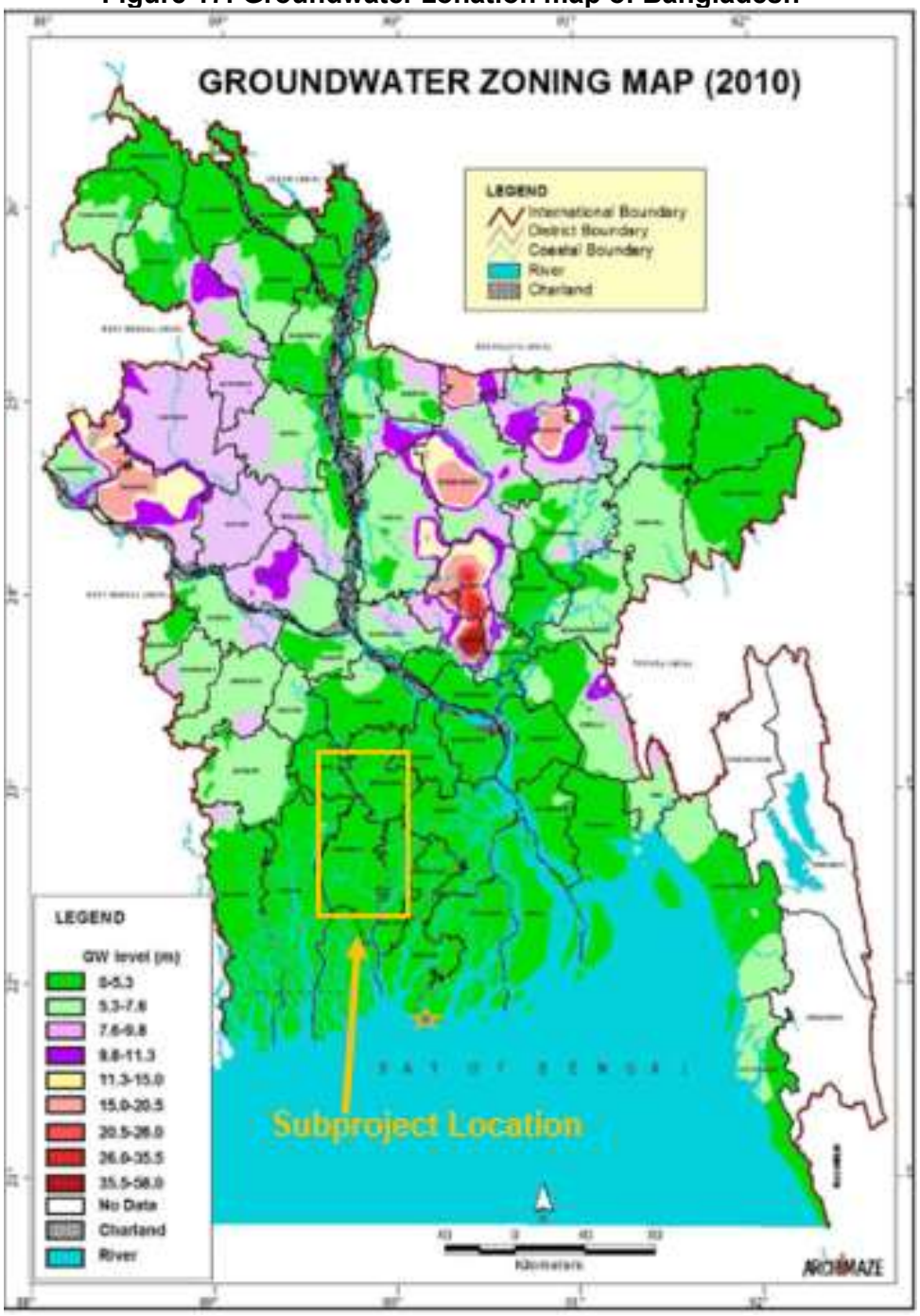
103. Ground water quality in the Bagerhat area is influenced by salinity and iron. Water in most shallow aquifer is somewhere saline and contaminated with arsenic and iron, which is not suitable for drinking purposes. The lower deep aquifer is found at a depth of 80 m to 100 m. Deep aquifers with fresh water in the Pourashava are exploited to meet the demand of water for inhabitants. There is no secondary groundwater quality data available for Bagerhat yet. However, salinity data is available through literature that is presented in figure below.

Figure 16: Groundwater Salinity in Bagerhat



[22] Majumder, Ratan & Shimada, Jun. (2019). Tracing Groundwater Flow Systems with Hydrogeochemistry in Bengal Delta Aquifers, Bangladesh. Indian Journal of Science and Technology, Vol 12(12), DOI: 10.17485/ijst/2019/v12i12/140862, March 2019.

Figure 17: Groundwater zonation map of Bangladesh[23]



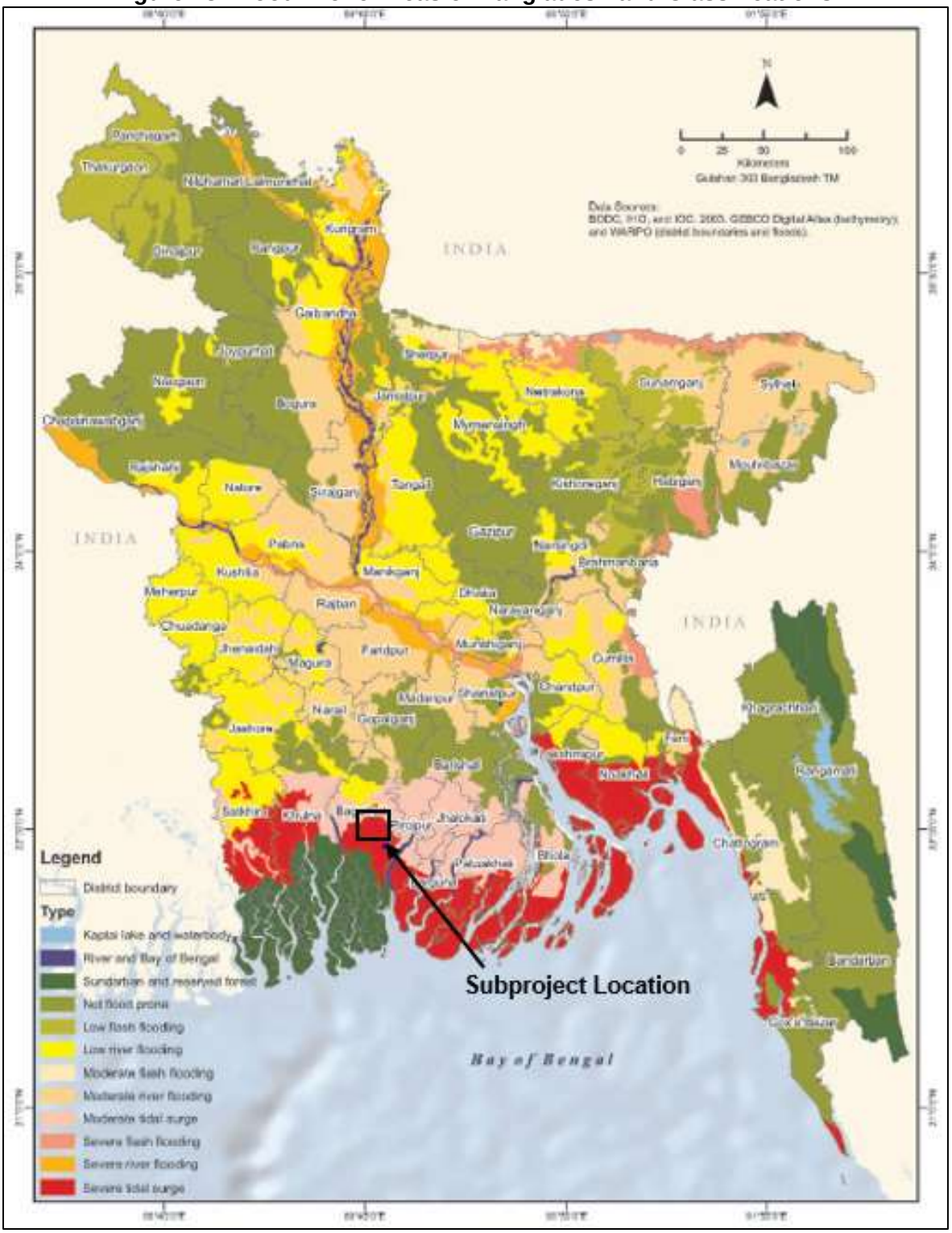
Source: Bangladesh agricultural research council, September 2015

104. **Natural Hazards**. Bagerhat District is in the coastal region fronting the Bay of Bengal in the south. Similar to most areas of Bangladesh, the district has long been exposed to various climatological (e.g., drought), hydrometeorological (e.g., cyclones, storm surge, flood), and other

[23]BARC (2015) Bangladesh agricultural research council, September 2015. URL http://www.barc.gov.bd/, date accessed: 15 May 2020.

geophysical (e.g., landslides and erosion) hazards. Being in the coastal area makes it susceptible to cyclones and storm surges, floods, medium to high levels of soil salinity, and sea level rise.

Figure 18: Flood Prone Areas of Bangladesh and Classifications.



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

105. **Air Quality**. Baseline data on air quality for the subproject area is not available. The subproject location is in a mixed-use area (residential, commercial and institutional). There are no heavy polluting industries in the area. Non-point sources of air pollution in the subproject site include emissions from vehicles, and dust from loose soil. The Contractor will be required to establish the baseline air quality before the start of construction.

106. **Noise Level.** Baseline data on noise is not available for the subproject area. The noise levels in the Pourashava are similar to that of any small urban area. In this urban location noise is due to vehicles, machinery and other related activities, and is normally in the range of 55 to 75 dB(A). The Contractor will be required to establish the baseline noise levels before the start of construction.

D. Biological Environment

107. **Terrestrial Fauna and Flora Species.** There are no forest areas within and in the immediate vicinities of Bagerhat Pourashava. Fauna species found in the subproject area are domestic animals and other species commonly found in the lowlands of Bangladesh.

108. **Aquatic Species**. The fish habitats are primarily classified under two broad categories, capture fishery and culture fishery. Internal *khals* as well as floodplains are considered as capture fish habitats. The culture fish habitats are of two types: Homestead fishponds and commercial fishponds. The main fish species reported in fish farming ponds are mainly major carps and exotic carps. At present major carps such as ruhu (*Labeorohita*),catla (*Catlacatla*)and mrigal (*Chirrhinuscirrhosus*) along with exotic carps such as silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodonidella*), bighead carp (*Aristichthysnobilis*) and common carp (*Cyprinuscarpio*) are cultured in ponds and gained much popularity because of its easy culture system, rapid growth, disease resistance and high market price. During field visit in March 2018, the consultant observed that culture fisheries (80%) dominate Bagerhat fish market. The rest is capture fisheries (20%). As observed during the site visit, no ponds or khals are used for aquaculture within the subproject area.

109. **Flora Species.** Flora species in various ecosystems and the aquatic floral species at subproject are summarized below.

(i) **Homesteads and Orchards:** Betel nut (areca catechu), kadam (anthocephalus chinensis), coconut (cocos nucifera), date palm (phoenix dactylifera), sofeda (achras sapota), mango (magnifera indica), jackfruit (artocarpus heterophyllus), fig, pome granade, guava (Psidium guajava), grapefruit (Citrus grandis), lemon (Citrus spp.), blackberries (Eugenia jambolana), plum, toddy palm, koroi (Albizia sp.), shisoo (Dalbergia shishu), shirish, rain tree (Samanea saman), eucalyptus (Eucalyptus spp.), bamboo (Bambusa spp.), babla (Acacia nilotica), jeol, neem (Azadirachta indica), jamrul (Syzygium javanicum), chalta (Dillenia indica), bel (Aegle marmelos), amra (Spondiaspinnata), amloki (Phyllanthus embelica), segun (Tectona grandis), etc.

(ii) **Roadside Plantation:** Date palm (Phoenix dactylifera), road chambol, koroi (Albizia spp.), krishnachura (Delonix regia), rain tree (Samanea saman), shisoo (Dalbergia shishu), babla (Acacia nilotica), akashmoni (Acacia moniliformis), banyan (Ficus bengalensis), mango (Magnifera indica), blackberries (Eugenia jambolana), raj koroi (Samanea saman), etc.

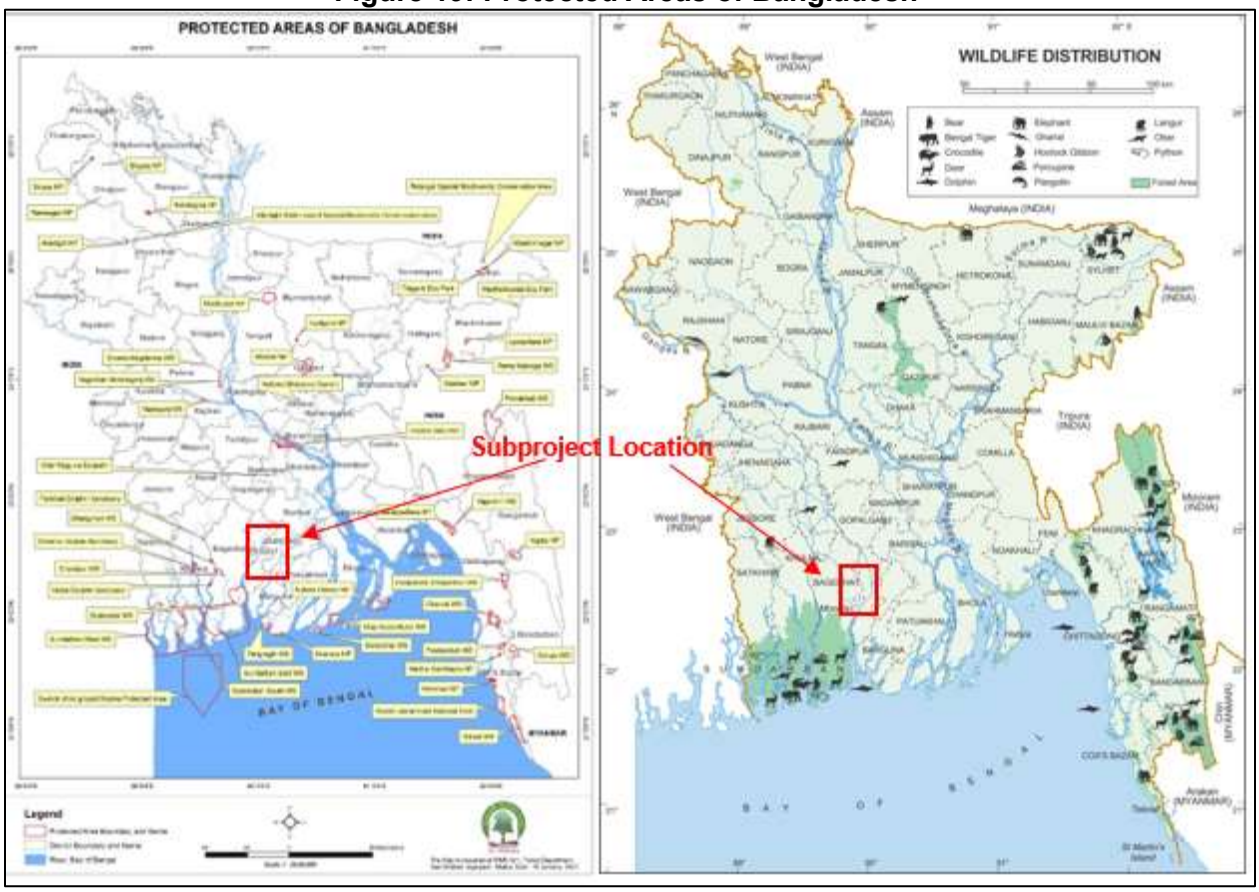
(iii) **Aquatic Flora**: The site vegetation is typically dominated by annuals or herbaceous perennials such as water-purslane (Ludwigiapalustris), smartweeds

(Persicaria spp.), rice cut-grass (Leersiaoryzoides), swamp-candles (Lysimachiaterrestris), ditch-stonecrop (Penthorumsedoides), or little spike-rush (Eleocharisacicularis).

110. **Protected Areas and Critical Habitats**. 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. There is no PA within 10km of the site (Figure 15).

111. 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). Screening results show there is no protected area within the 50-km radius of the site, which confirms the illustration in Figure 23. Results also show that there is no key biodiversity area (KBA) within the 10-km radius of the site. From the same IBAT screening, 48 IUCN Red List species of concern are identified within the default area of analysis of 50-km radius (see Appendix 3 for the results of IBAT screening). The subproject site is in the periphery of a built-up area (Bagerhat Pourashava/Town) and surrounded by agricultural lands actively cultivated, communities and other urban infrastructures such as highways; hence the probability of these species being found at the site is very low. This is also confirmed in the IUCN Wildlife Distribution Map for Bangladesh and the Bangladesh Forest Department’s map of protected areas. See Figure 19 below.

Figure 19: Protected Areas of Bangladesh



Sources: (Left) Forest Department, 2021; (Right) IUCN Wildlife Distribution in Bangladesh

E. Socio-economic Environment

112. **Demography**. In 2011, the population of the Pourashava was 49,073 (BBS, 2011)[24] with population density at 3,088 persons per km^2. Bagerhat Pourashava has been experiencing lower annual average population growth than the national average urban population growth over a long period in the past (1981-2011). The annual population growth rate varies significantly between various inter-census periods. The Pourashava has experienced 1.73 percent annual average population growth rate during the period of 1981-1991, which is higher than other inter-census periods over a 30-year period between 1981 and 2011. Infrastructure improvements will help sustain a reasonably higher growth of population in the Pourashava in the future.

113. The Pourashava is an old town with national heritage and may in future remain important for visitors and development as the Padma Bridge started functioning in 2019. These positive qualities in favor of the Pourashava may help Bagerhat Pourashava to sustain a higher growth rate than before. An average annual population growth of 2.0 percent, therefore, seems to be reasonable and may continue in the future. Table below shows the 2011 population and estimated population with five-year intervals from 2015 up to 2040. Information on population and number of households with average size of Bagerhat Pourashava is also presented in the table.

[24] This is the latest census data information available.

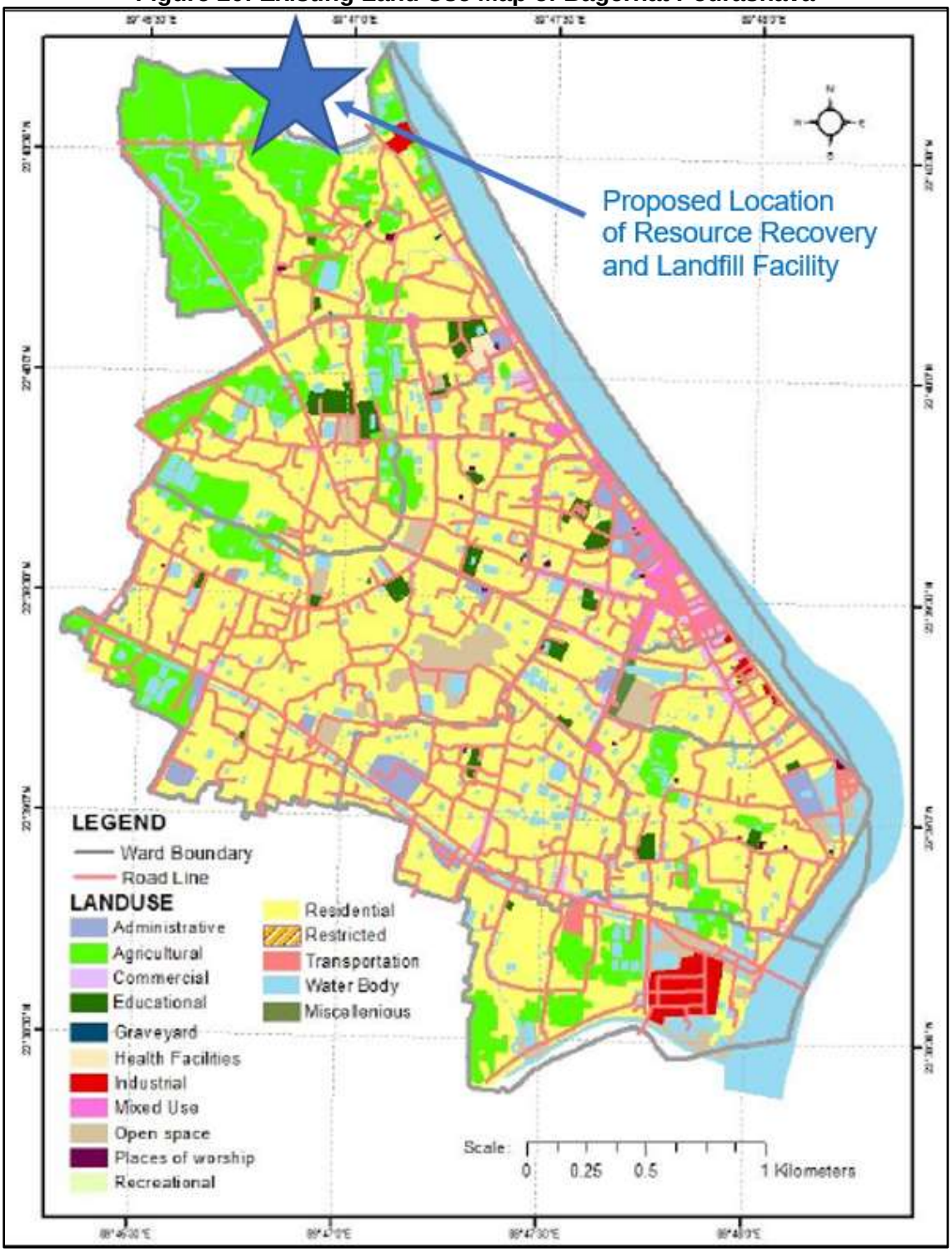
Table 16: Bagerhat Pourashava Population Data

Ward	Area (sq. km)	Household 2011	Population 2011	HH Size 2011	Density 2011	2015	2016	2020	2025	2030	2035	2040
1	1.326	1,200	5,339	4.45	4,026	5,779	5,895	6,381	7,045	7,778	8,587	9,481
2	0.970	1,200	5,406	4.51	5,573	5,852	5,969	6,461	7,133	7,876	8,695	9,600
3	1.548	1,988	7,688	3.87	4,966	8,322	8,488	9,188	10,144	11,200	12,366	13,653
4	0.390	1,118	4,530	4.05	11,615	4,903	5,001	5,414	5,977	6,599	7,286	8,045
5	0.338	1,053	4,297	4.08	12,713	4,651	4,744	5,135	5,670	6,260	6,911	7,631
6	0.209	1,005	3,869	3.85	18,512	4,188	4,272	4,624	5,105	5,636	6,223	6,871
7	0.260	1,359	5,210	3.83	20,038	5,639	5,752	6,226	6,874	7,590	8,380	9,252
8	0.740	1,737	7,394	4.26	9,992	8,004	8,164	8,837	9,756	10,772	11,893	13,131
9	0.706	1,322	5,340	4.04	7,564	5,780	5,896	6,382	7,046	7,779	8,589	9,483
Total	**6.487**	**11,982**	**49,073**	**4.10**	**7,565**	**53,118**	**54,181**	**58,647**	**64,751**	**71,490**	**78,931**	**87,146**

Source: BBS, 2011

114. **Land use pattern, status of housing and built-up infrastructure.** There is no forest area in this district and the land cover categories are generally basically settlements with few patches of agricultural lands. The subproject area is within these agricultural lands. See Figure 20. There is dominance of agricultural land (about 44% of the total) followed by residential land use (about 32%). Basing on the percentage of land under different use categories the ranking is: Agriculture (40.23%), Residential (33.94%), Water bodies (9.51%), Transportation (8.01%), Administrative (3.55%), Recreational & Open Space (1.73%), Commercial (1.25%), Educational (0.77%), Community Facility (0.35%), Health (0.31%), mixed use (0.22%), Utility Service (0.10%) and Industrial (0.03%).

Figure 20: Existing Land Use Map of Bagerhat Pourashava



115. **Livelihood and employment**. According to BBS 2011, 88% of the population are engaged in the agriculture sector. Agricultural sector for the region includes farmer, agricultural labor, fishers, day labors, etc. About 5% population is engaged in salaried service sector, which includes population who are working in the government and private sector.

116. **Access to electricity.** Bagerhat district including the subproject area in the Bagerhat Pourashava sources its electricity from the national grid. Electricity lines are strategically located in the Pourashava ensuring access to electricity by existing and future residential, commercial and institutional establishments.

117. **Sources of drinking water.** Tube wells are a major source of drinking water in urban areas of Bangladesh including urban areas in the Bagerhat district. About 78 percent coastal urban households use tubewell as source of drinking water (shallow 63% and deep 14%). Conventionally tube wells were considered as a dependable source of drinking water. But with increasing arsenic contamination, particularly in the shallow aquifer, the context has changed. This problem is more pronounced in the coastal zone like Bagerhat district. Besides, salinity in groundwater is also a major concern for many areas.[25]

118. **Sanitation**. Sanitation is crucial for healthy living that includes hygienic latrine facilities, proper management of solid waste and proper disposal of household wastewater and storm water. Proportion of urban households possessing sanitary latrines is slightly higher (70%) in the coastal zone (which include Bagerhat district) than in the country (67%). Also, extent of sanitation is much higher among urban households compared to rural households in the coastal zone (urban and rural together 46%). Sanitation coverage is the highest in Pirojpur (86%), followed by Jhalokati (84%) and Barisal (82%) and the lowest in Bagerhat (32%), followed by Cox's Bazar (53%). About 11 percent urban households have no latrine at all in the coastal zone compared to seven percent urban households in the country as a whole. (Footnote 14).

119. **Transportation**. Similar to other parts of Bangladesh, transport system in the Bagerhat district comprises a number of distinct modes and services, notably railways, roads, road transport, ports, inland water transport, coastal shipping, airports and airlines, etc. However, for Bagerhat Pourashava where the subproject area is located, roads and inland water transport are the dominant means of transport. There is no international or domestic airport in the district, and the two nearest domestic airports are Jessore Airport and Barisal Airport.

120. **Physical Cultural Resources**. Bagerhat is a heritage-rich district in Bangladesh. The Historic Mosque City of Bagerhat is a world-renowned heritage site in the district that was inscribed in the UNESCO World Heritage List in 1985. It is located near the western boundary of Bagerhat Pourashava. This area has become a local and international tourist destination in Bangladesh.

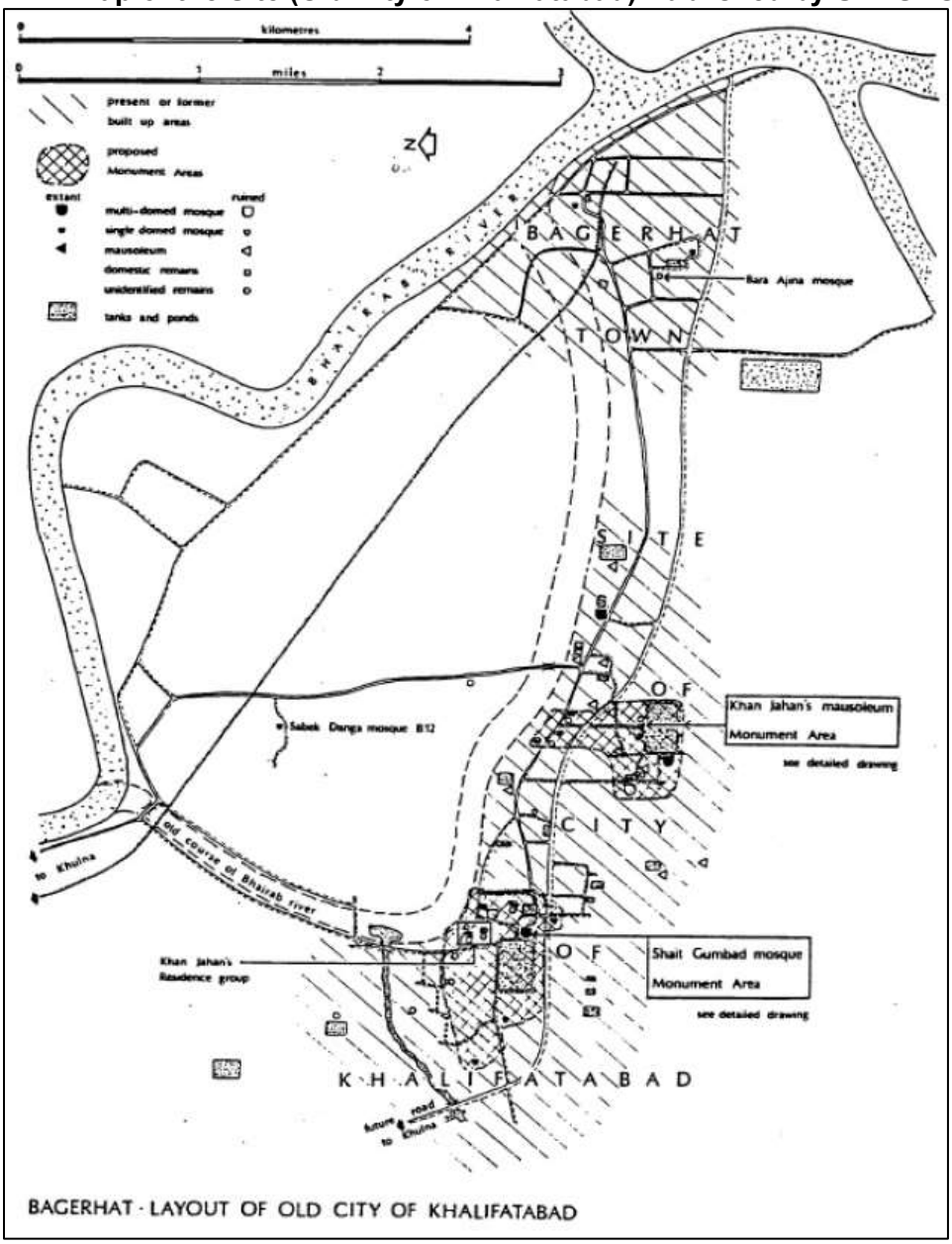
121. The Historic Mosque City of Bagerhat is an important evidence of medieval city in the southwest part of present Bagerhat district which is located in the southwest part of Bangladesh, at the meeting-point of the Ganges and Brahmaputra rivers. This ancient city was formerly known as Khalifatabad, which sprawls over on the southern bank of the old river Bhairab and flourished in the 15th century BC. See Figure 21 below for the old map of this city. It hosted some of the most significant buildings of the initial period of the development of Muslim architecture of Bengal, which include mosques, public buildings, mausoleums, bridges, roads, water tanks and other public buildings constructed from baked brick and are spread over a 50-square kilometer area encompassing Bagerhat town.[26] Remains of some of these structures still stand overground today, and some structural ruins are already buried underground. These overground structures include the ruins of Shaitgumbad Mosque, Singar Mosque, Bibi Begni's Mosque, Chuna Khola

[25] Water Resources Planning Organization (WARPO), Bangladesh Ministry of Water Resources. Living in the Coast, Urbanization. 2005. http://warpo.portal.gov.bd/sites/default/files/files/warpo.portal.gov.bd/page/aa04373f_0ca3_49a5_b77e_5108186638dc/living4.pdf

[26] UNESCO World Heritage Site. https://whc.unesco.org/en/list/321/

Mosque, Naygumbad Mosque, Ranavijaypur Mosque, Rezakhoda Mosque, Zindapir Mosque, Sabekdanga Monument and Khan Jahan's Tomb. The underground structural ruins are found in various parts of the district and a few of them are in the form of low mounds while some others are almost levelled down to the surrounding land surface. Examples of these underground ruins are Khan Jahaner Vasatbati, Bara Azina Masjid, Jahajghata, and Kotwali Chawtara.[27]

Figure 21: A Map of the Site (Old City of Khalifatabad) Published by UNESCO



[27] Bangladesh Department of Archaeology. http://archaeology.portal.gov.bd/site/page/4cb752e0-236c-4733-a6a7-85db53208e18/-

122. The core area of Bagerhat Pourashava is about 1.5 km away from the nearest structure of Historic Mosque City of Bagerhat (Zinda Pir Mosque), while the proposed site for the resource recovery and landfill facility is about 2 km from the nearest structure (Sebak Danga Monument) and about 4km away from the famous Sixty Dome Mosque complex. Thus, any impacts to these cultural heritage monuments due to the implementation of the various components of the subproject is not expected. Considering Bagerhat district as a rich cultural heritage area, there is a possibility that underground cultural heritage relics or assets could be found anywhere in the subproject area. Therefore, as additional precautionary measure, a chance finds procedure will be adopted and included in the environmental management plan of the subproject for any potential archaeological finds and ensure these are properly handled and preserved. Figure 22 below shows the map of the subproject area to this present day and relative distances to the different cultural heritage structures of Historic Mosque city of Bagerhat.

Figure 22: Map Showing Subproject Sites and Heritage Structures in the Historic Mosque City of Bagerhat

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

123. 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

124. **Environmental Benefits**. The operation of the resource recovery and landfill 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 Bagerhat Pourashava. Door to door collection of household wastes will be progressively extended reducing the incidents of open burning of solid wastes including plastic wastes.

125. **Socio-economic Benefits**. The operation of the MRF in the facility will increase or create the opportunity for 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

126. **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, Bagarehat municipality disposes the collected solid waste at a site in Majhidanga Mouza in the northern outskirts of the Municipality and about 2.75 km from core commercial and residential areas. This site, of 5 acres, was procured by the municipality in 2017 for landfill. Municipality has been using this site for dumping of solid waste by crude open dumping method, and the site at present is very poorly maintained and very unhygienic. The municipality now proposed to improve this site and develop into a proper waste processing cum landfill facility. The site has scattered development around, with few houses within 200 m. A stream / channel (Harikhola Khal) is flowing very close to the site in the south. From its review of the site and its suitability per applicable guidelines/standards, DOE approved/endorsed the issuance of a Location Clearance Certificate (LCC) for the proposed integrated waste management and landfill site. Based on this, PMU will undertake an EIA study based on a TOR to be approved by DOE. The EIA will then be submitted to DOE for the issuance of Environmental Clearance Certificate (ECC) for the subproject. Obtaining ECC prior to start of construction is must to comply with the regulatory framework.

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

(i) Obtain from the Department of Environment a Location Clearance Certificate for the selected site prior to invitation of bids;
(ii) The subproject is considered as a Red Category undertaking based on ECR 1997. As such, PMU to undertake an environmental impact assessment (EIA) and obtain from Department of Environment an ECC for the subproject.

2. Physical Cultural Resources

128. **Impact.** The subproject area is in Bagerhat Pourashava that is within Bagerhat District. Assessment reveals that Bagerhat District, and especially western outskirts of present Bagerhat Pourashava is a heritage-rich area in Bangladesh. Proposed landfill site is 2 km away from this

area. Although the site location in north of the town is not likely to be an potential heritage area, given the proximity, the possibility of underground cultural heritage relics or assets, particularly those belonging to the Historic Mosque City of Bagerhat, may not be ruled out. Therefore, as additional precautionary measure, a heritage assessment study to reconfirm that proposed project site away from protected monuments/area (at least 1.5-2 km) and is not in archeologically sensitive area, and develop detailed site-specific chance find protocols will be conducted during detailed design and IEE will be updated accordingly. As per the EARF criteria, no component sites/work sites located within 1km from the boundary of UNESCO World Heritage sites/areas can be included in the CTCRSP.

129. **Mitigation.** LGED through PMU shall undertake a heritage impact assessment, and integrate recommendations in site finalization, design, construction and operation. As per the EARF criteria, no component sites/work sites located within 1km from the boundary of UNESCO World Heritage sites/areas can be included in the CTCRSP.

3. Site Specific Design Considerations

130. **Impact.** Proposed resource recovery and landfill site is located in the outskirts of Bagerhat town, 2.75 km away from the core area. Site is mostly surrounded by agricultural fields and pisciculture (fihs) ponds, and there are about 11 houses scattered within 200 m of site. Harikhola Khal, a small stream/channel of 5 – 10m wide flows in the southwestern boundary of the site and joins Bhairab river after traversing 700 m. Channel is seasonal and dries up during the summers. Bairab river is about 250 m north of the site. It is used for irrigation and pisciculture by the locals, but normally dries up during dry season. It has width that varies from 5 – 10m. About 150m section of this khal tracks the southwestern boundary of the site, and from which it further flows down 700m to the confluence point with Bhairab river. Groundwater depth in and around Baragerhat is shallow 1-5 m especially during post monsoon season. It is necessary that groundwater level should be at least 2 meters below maximum level clay liner. Although the existing condition at the open dump is very poor due crude open dumping, and the proposed landfill facility will definitely improve the situation, to avoid any long term impacts, mitigation measures are needed to prevent pollution of surface water, groundwater, and any negative impacts on people living close to the site.

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

(i) Land development and site preparation by raising to a level higher than the surrounding area and based on the recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject;
(ii) Ensure that the raised ground-level minimum 2 m distance between shallow groundwater level and bottom clay liner in the landfill;
(iii) Channelize the Harikhola channel section close to proposed site with impervious material (such as cement concrete) at least for a length of 500-1000 m; conduct detailed site survey and select appropriate section to channelize;
(iv) Relocate the houses (11 numbers located within 200 m of the facility as per the resettlement plan);
(v) Construct high embankments/high walls around the landfill with a buffer zone of plantations;
(vi) Concrete roads to be provided to avoid wastewater penetration in the ground and to avoid attracting rodents and other pests to the facility;

(vii) 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;
(viii) The landfill site shall have a HDPE lining and clay layer to avoid percolation of leachate into the groundwater;
(ix) 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
(x) 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

132. **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.).

133. **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.[28] This set of guidelines provides all the necessary recommendations in designing a municipal solid waste 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) 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;
(ii) Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;
(iii) Use acoustic screens around fixed/mobile composting plant and equipment;
(iv) Select composting equipment that has low noise emission levels;
(v) Fit silencing equipment to plant, e.g. baffles/mufflers;
(vi) 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;
(vii) 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

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

and treating leachate;

(viii) 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;

(ix) 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;

(x) Store leachate in a lined earthen basin or in aboveground storage tanks;

(xi) Provide a fire alarm system, including temperature sensors in the waste being treated; and

(xii) 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

134. **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.).

135. **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[29] and EHS Guidelines on Water and Sanitation.[30] 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:

(i) Use appropriate collection vehicles. A combination of vacuum tanker trucks with long suction hose pipe, and smaller hand-pushed vacuum tugs may be needed to service all households;

(ii) 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;

(iii) 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

(iv) 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

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

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

the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements.

6. Landfill Design Considerations

136. **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.).

137. **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.[31] This set of 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

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

(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[32] 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 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;

(f) Use impermeable materials for roads, waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas.

(iv) Channelize the Harikhola canal section (500 m – 1,000 m long) close to proposed site with impervious material (such as cement concrete); conduct detailed site survey and select appropriate section to channelize

(v) 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

[32] 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 1×10^{-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]).

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.

(vi) 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.

(vii) Installation of bund walls around the facility site; and

(viii) 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. Mismanagement or Mishandling of Wastes in Existing Dumpsite

138. **Impact.** The proposed site for the resource recovery and landfill facility component of the subproject is the area currently being used as dumpsite by the Pourashava. Site preparation in the area could result to indiscriminate and unmanaged disposal of these wastes elsewhere, which could result to environmental pollution and nuisance.

139. **Mitigation**. Measures to ensure no further impacts occurs are as follows:

(i) Existing wastes found at the proposed site shall not be transferred elsewhere outside the boundary. The land development activities and site preparation shall ensure section-wise approach and dedicate a particular area where the existing dumped wastes can be temporarily stored;

(ii) Ensure this temporary location for the dumped wastes is free from flooding and away from the adjacent Harikhola khal/canal; and

(iii) Estimate the total volume of the solid wastes currently dumped at the site, and include 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.

8. Natural hazards such as earthquakes, floods, tidal surges and other climate change-related events

140. **Impact.** While the subproject area only experiences some minor earthquakes in recent years, there is still a likelihood that the resource recovery and landfill facility site will be impacted by a minor earthquake and damage the facility components during the operation phase. The risk of flooding is also high in the area[33] and any flood events due to either heavy precipitation or sea level rise / Bhairab river water overflow could 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 canal adjacent the site and the Bhairab river nearby.

141. **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 more strict, to ensure the structures can withstand earthquakes and climate-induced events in the future;
(ii) Land development and site preparation by raising to a level higher than the surrounding area and 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) Bund walls around the site with height sufficient enough to prevent entry of flash flood waters or overflows from the Hariknola khal and Bhairab river.

9. Issuance of Consents, Permits and Clearances

142. **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

143. **Mitigation**. To avoid any delays, LGED through the PMU to coordinate with the Department of Environment to start the EIA process alongside the finalization of the detailed design. To initiate the EIA process, LCC is required. In its meeting of 5 June 2022, DOE approved/endorsed the issuance of LCC and provided specific recommendations to be considered during the construction of the facility. Copy of the minutes of meeting on the approval/endorsement of the LCC are in Appendix 2.

10. Compliance with ADB Loan Agreement and Safeguard Policy Statement

144. **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.
145. **Mitigation**. LGED through the PMU will implement the following measures:

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

(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

146. **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).

147. **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

148. **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.

149. **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

150. **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.

151. **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

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

153. **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 LGED 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

154. **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.

155. **Mitigation.** PMU to ensure that Contractor contracts will include the following conditions:
(i) 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;
(ii) No new quarry sites shall be used for the subproject;
(iii) Verify suitability of all material sources and obtain approval of PMU/RPMU or PIU; and
(iv) Document all sources of materials and include in the monthly reporting to the PIU.

6. Community awareness

156. **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.

157. **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:

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

D. Construction Phase Impacts and Mitigation Measures

1. Soil Erosion and Sedimentation

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

159. **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:

(i) The Contractor shall minimize surface excavation works during the rainy season where practicable;
(ii) The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered;
(iii) 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;
(i) Channels, earth bunds, netting, tarpaulin and/or sandbag barriers shall be used on site to manage surface water runoff and minimize erosion;
(ii) 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
(iii) Monitor groundwater quality that could exist close to the working areas to ensure compliance.

2. Surface water Quality

160. **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 Harikhola khal and ultimately Bahirab river. Oil leakage from the operation of machineries and heavy equipment may also cause pollution to these surface water bodies.

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

(i) Provide temporary sedimentation canal and/or silt traps on the perimeter of the construction area, particularly on the southwestern side that is adjacent to Harikhola khal;
(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 PMSC; and
(xiii) Monitor water quality according to the environmental monitoring plan.

162. 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

163. **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.

164. **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.

165. **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.

166. **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

167. **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.

168. 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.

169. 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.

170. **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:

(i) Take every precaution to reduce the levels of dust at construction site, and not exceeding the pre-project ambient air quality standards;
(ii) Fit all heavy equipment and machinery with air pollution control devices that are operating correctly;
(iii) Vehicles travelling to and from the construction site must adhere to speed limits to avoid producing excessive dust;
(iv) Reduce dust by spraying stockpiled soil, excavated materials, and spoils;
(v) Cover with tarpaulin vehicles transporting soil and sand;
(vi) Cover stockpiled construction materials with tarpaulin or plastic sheets;
(vii) Heavy equipment and transport vehicles shall move only in designated areas and roads;
(viii) Water spraying to access roads, camp sites and work sites to reduce dust emissions;
(ix) Machines and vehicles must be regularly examined and maintained to comply with requirements of technical specifications;
(x) 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 PMSC;
(xi) Repair and maintain access roads, as necessary;
(xii) Monitor air quality according to the environmental monitoring plan;
(xiii) Clean wheels and undercarriage of vehicles prior to leaving construction site;
(xiv) Prohibit burning firewood in work and labor camps (promote liquified petroleum gas for cooking purposes and electric heater for heating purposes);
(xv) Use vehicles that have government-issued permits and registrations; and
(xvi) Prohibit open burning of solid waste.

6. Ambient Noise Level

171. **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.).

172. 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.[34]

173. **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;

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

(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

174. **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.

175. **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 Harikhola khal side;
(iii) Avoid disposal of any debris and waste soils in or near Harikhola khal or any ponds that are found adjacent or near the site;
(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;
(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.

8. Aquatic Resources

176. **Impact.** The water body close to the southwestern boundary of site is the Harkhola khal. Field information reveal that this water body serves as a source for irrigation water and as a zone for pisciculture by the locals. Any discharge from the site will impact the quality of the khal and thereby the commercial aquatic species propagated along this canal.

177. **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 Harikhola khal side;
(iii) Avoid disposal of any debris and waste soils in or near Harikhola khal or any ponds that are found adjacent or near the site;
(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 particularly the southwestern boundary that is close to Harikhola khal;
(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) Locate stockyards away from canals or the southwestern boundary that is close to Harikhola khal;
(x) 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;
(xi) Monitor water quality according to the environmental monitoring plan;
(xii) Clean up of the area after the completion and prior to the onset of monsoon season; and
(xiii) 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.

178. **Impacts to protected areas and critical habitats.** Subproject area is located within an area with human and development activities that is too far from ecologically sensitive areas. No impact is predicted. Therefore, no mitigation measure is necessary.

179. **Impact to Traffic.** The site for the resource recovery and landfill facility is located in the northern boundary of the Pourashava, which is about 300m away from the main highway. Besides, traffic movement is also very light in the area.

180. 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.

181. **Impacts on physical cultural resources (PCR) and chance finds.** The site for the resource recovery and landfill facility is located in an agricultural area that is bounded by open fields with practically no structures. Therefore, the subproject does not expect to encroach into or run over any physical cultural resources (PCRs). However, Bagerhat district where the

Pourashava is located is a heritage-rich area in Bangladesh. There is a possibility that underground cultural heritage relics or assets could be found anywhere in the subproject area. Therefore, as additional precautionary measure, a heritage impact assessment will be undertaken to provide insight into the impact of the development of the subproject on any heritage assets found in the area, particularly the structures belonging to the Historic Mosque City of Bagerhat. In addition, a chance finds procedure will be adopted and included as part of the measures. The Contractor will be required to implement the following measures in the event of a chance finds during excavation activities:

(i) Strictly follow the protocol by coordinating immediately with PIU and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works;
(ii) Stop work immediately to allow further investigation if any finds are suspected; and
(iii) Request authorized person from the Bangladesh Department of Archaeology to observe when excavation resumes for the identification of the potential chance finds, and comply with further instructions.

9. Occupational Health and Safety

182. **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.

183. **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;[35] and EHS Guidelines on Waste Management Facilities.[36] 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

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

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 4 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/RPMU 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

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

10. Community Health and Safety

184. **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.

185. **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;[37]

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

(iii) Follow established community health and safety protocol on emerging infectious diseases such as COVID19. See Appendix 4 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 (CTCRSP);
(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.

186. **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.

187. 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:

(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required;
(ii) All damaged roads leading to the site shall be reinstated to original condition;
(iii) All disrupted utilities restored;
(iv) All affected structures rehabilitated/compensated;
(v) 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;
(vi) All hardened surfaces within the construction camp area shall be ripped;
(vii) All imported materials removed, and the area shall be top-soiled and revegetated;
(viii) The Contractor must arrange the cancellation of all temporary services;
(ix) 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

188. Operation phase of typical resource recovery and landfill 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

189. **Impacts.** Waste collection, storage, and transport of solid wastes could lead to littering and indiscriminate dumping in the streets of Bagerhat Pourashava and along the path of solid waste transports leading to the resource recovery and landfill facility.

190. **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:[38]

(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.

2. Air Emission from Storage and Transport of Solid Wastes

191. **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 Bagerhat Pourashava.

192. **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;

[38] 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.

(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)

193. **Impacts.** Operation of the various subcomponents of the resource recovery and landfill facility will potentially produce noise and vibration that could harm the welfare of the workers and communities surrounding the facility.

194. **Mitigation.** The operator/s of the different subcomponents of the resource recovery and landfill 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 resource recovery and landfill facility

195. **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.

196. **Mitigation**. The operator or management of the resource recovery and landfill 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 Resource Recovery and Landfill Facility

197. **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.

198. **Mitigation**. The operator or management of the resource recovery and landfill 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

199. **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.

200. **Mitigation**. The operator or management of the resource recovery and landfill 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

201. **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.

202. **Mitigation**. The operator or management of the resource recovery and landfill 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

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

(i) Nuisance odors and disease vector infestation from the landfill operations;

(ii) 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

(iii) Possible increase in crime incidence with the influx of workers.

(iv) Lack of oxygen and risks related to flammable methane emission

204. **Mitigation**. The operator or management of the resource recovery and landfill 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

205. **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.

206. **Loss of employment.** Termination of employment is the main socio-economic impact during Decommissioning/Abandonment Phase. To address such adverse impact, the following measures shall be implemented:

(i) Provision of 6 months' notice about the impending termination of employment;
(ii) Provision of compensation for affected personnel; and
(iii) If possible, provision of re-training of personnel in preparation for other job openings.

G. Unanticipated Impacts during Construction and Operation

207. In the event of unanticipated environmental 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.

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation

208. 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.

209. 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.

210. 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

211. 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. Two consultations were conducted in the subproject area on 05 February 2022 and 27 February 2022.

212. These two consultations were held at Mazidanga, Karapara union, under Bagerhat Sadar, with the affected families living in nearby vicinity of the proposed site. The details such as salient features of technical provisions in projects, proposed project implementation schedule, benefits as well as possible inconveniences and envisaged adverse impacts; environmental and social, gender inclusion, community awareness and participation, have been shared; and the project grievance redress mechanism was also discussed. Key concerns raised by the participants during consultation meetings are as follows:

(i) Local residence complained about the bad odor.Few settlers reared pigs adjacent to the dumping site, and due to scavenging wastes, bad odor is generated which is difficult to tolerate by the local residence;
(ii) Most of the affected persons desire to leave the place if fair compensation is provided by the project to the affected families. There should not be any delay in compensation for their lost assets;
(iii) Some people fear that their residential structure will be dismantled without giving compensation so they are not interested move from here; the consultants and the pourashava authorities assured them that information dissemination will be held in timely manner with the affected families and compensation would be paid to them;
(iv) It was further explained that they will be pre-informed and will be given minimum 6 months notice to relocate from the place. Their land will not be acquired and they can continue to use the land for purposes other than residential;
(v) Most of the affected families want to resettle within 500 meters of the vicinity; and
(vi) The affected persons mentioned that they want to resettle and relocate as per their own choice not according to the pourashava's.

Table 17: List of Public Consultations Held for the Subproject Component

Sl. No.	Date	Location	Total participants	Female participants
1	05 February 2022	Mazidanga, Karapara union, Bagerhat Sadar	5	1
2	27 February, 2022	Mazidanga, Karapara union, Bagerhat Sadar	11	3
	Total		**16**	**4 (25%)**

213. Minutes of consultation meetings, signature sheets and photographs are attached in Appendix 5.

C. Future Consultations during Detailed Design Stage

214. Stakeholder consultations, including town-level consultations, will continue during the detailed design stage and throughout the project implementation. PMU and PMSC will ensure that consultations will be conducted as meaningful per definition of ADB SPS 2009. 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.

9. Information Disclosure

215. 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: [39]

(i) IEE report (including subproject EMP);
(ii) Updated IEE (including EMP) and corrective action plan prepared during project implementation, if any; and
(iii) Environmental monitoring reports.

216. 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 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 LGED after approval of the documents by Government and clearance from ADB. Disclosure will follow ADB's Access to Information Policy, 2018.

VIII. GRIEVANCE REDRESS MECHANISM

217. A common GRM will be in place for social, environmental, or any other grievances related to the project; the resettlement plans (RPs), RSECPs 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.

218. Across the *Pourashava,* awareness on grievance redress procedures will be generated through a public awareness campaign. The project implementation unit (PIU) under the guidance

[39] 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.

of Assistant Director RPMU 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 ensure that their grievances are addressed.

219. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes that will be installed by project *pourashavas* or through telephone hotlines at accessible locations, by e-mail, by post, WhatsApp or by writing in complaints register that will be kept in *pourashava* offices. **Appendix 6** 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 Assistant Directors from project management unit (PMU), RPMU 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.

220. **Grievance redress process**. In case of grievances that are immediate and urgent in the perception of the complainant, the Social Coordinator, Contractor and Social Safeguard and Environment Specialist from the project management and supervision consultants (PMSC) 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 safeguards assistant, contractors, PMU safeguards officer, PMSC environmental and social safeguards specialists will be posted at all construction sites at visible locations.

221. **1st Level Grievance, Pourashava Level PIU.** The contractors, PIU Safeguard and Gender Focal person can immediately resolve issues on-site or at *pourashava* level in consultation with each other and with the support of Administrative Officer of *Pourashava,* designated municipal ward councilor and will be required to do so within 7 days of receipt of a complaint/grievance. Assistance of ward level coordination committees (WLCC) will be sought if required for resolution of the issue, by any one or all of them jointly. The first level grievance redress team will comprise of the following members:

(i) Chief Executive Officer or in his absence *Pourashava* Secretary
(ii) Executive Engineer, *Pourashava* (Safeguard and Gender Focal person)
(iii) Administrative Officer, *Pourashava*
(iv) Municipal Ward Councilor (designated)
(v) EHS Supervisor/Social Coordinator, Contractor

222. The town-level grievance redress team shall have at least one women member. In addition, for project-related grievances, representatives of affected persons, community-based organizations (CBOs), and eminent citizens must be invited as observers in GRC meetings. In case of any impacts on small ethnic communities (SECs), in subproject towns (example: Kuakata), the grievance redress team must have representation of the affected SECs, the chief of the SEC group as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and/or an NGO working with SECs.

223. **2nd Level Grievance, RPMU, Division Level.** All grievances that cannot be redressed within 7 days at PIU level will be brought up to the RPMU level. Second level grievance redress team headed by the Deputy Project Director, RPMU supported by the Assistant Directors (environment, social safeguard and gender) and Construction Supervision and Safeguards

Engineers /Asst. Supervision and Safeguards Engineers, PMSC will attempt to resolve the grievance /complaint within 7 days. At the RPMU level, the composition of 2nd level grievance redress team will be as follows:

(i) Deputy Project Director
(ii) Assistant Director (Environmental Safeguards)
(iii) Assistant Director (Social Safeguards)
(iv) Assistant Director (Gender) *supported by* Construction Supervision and Safeguards Engineers /Asst. Supervision and Safeguards Engineers, PMSC

224. **3rd Level Grievance, PMU Level**. All grievances that cannot be redressed within 7 days at RPMU level will be brought up to the PMU level. The RPMU 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, social safeguard, environment safeguards and gender Assistant Directors, and PMSC, who will resolve the complaints/grievances within 15 days. The PMU level grievance team will comprise of:

(i) Project Director, PMU
(ii) Deputy Project Director (Safeguards)
(iii) Assistant Director (Environment)
(iv) Assistant Director (Social Safeguards)
(v) Assistant Director (Gender) *supported by* Social, Environment and Gender Specialist, PMSC

225. The grievance redress process is represented in Figure 23.

226. Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

227. **ADB Accountability Mechanism**. In the event that the established GRM is not in a position to resolve the issue, the affected person can also use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB Bangladesh Resident Mission (BRM). Before submitting a complaint to the Accountability Mechanism, it is necessary that an affected person makes a good faith effort to solve the problem by working with the concerned ADB operations department and/or BRM. Only after doing that, and if they are still dissatisfied, will the Accountability Mechanism consider the compliant eligible for review. The complaint can be submitted in any of the official languages of ADB's developing member countries. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

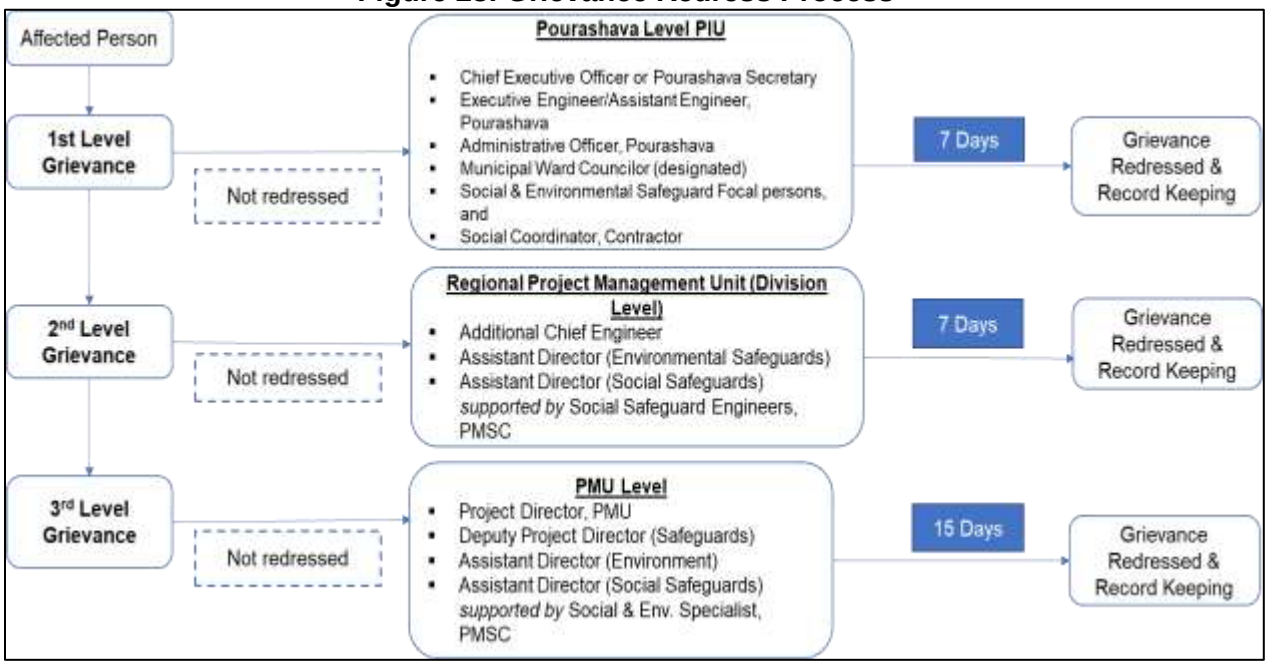
228. **Documentation and Record keeping.** All GRC documents will be maintained by Contractor and PMU. Record of all complaints received, and action taken will be maintained at both at the field level and the PMU. This information will be available for review and verification by supervision consultants and ADB or any third party. All the grievance records will be updated regularly and easily accessible on-site.

229. **Information dissemination methods of the GRM:** GRC procedures and operational rules will be publicized widely through community meeting and pamphlets in Bengali so that the

affected persons are aware of their rights and obligation, and procedures of grievance redress. Grievances received, and responses provided will be documented and reported back to the affected persons.

230. **Costs:** All costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the PMU.

Figure 23: Grievance Redress Process



GRC = grievance redressal committee; PIU = project implementation unit; PMSC = project management and supervision consultants; PMU = project management unit

Note: In case of project towns where impacts to SEC are assessed, the PIU-level grievance redress committee/team will have representation of the affected SECs.

IX. ENVIRONMENTAL MANAGEMENT PLAN

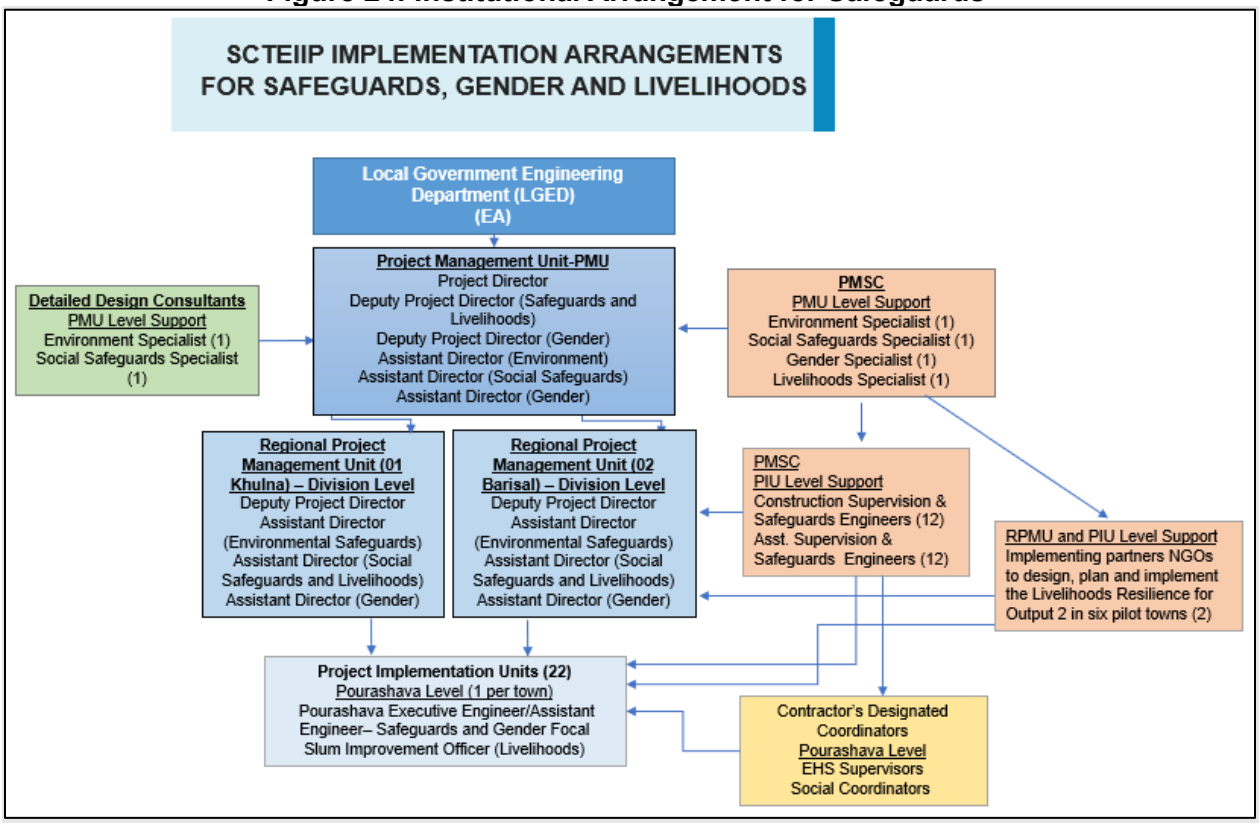
231. This environmental management plan (EMP) has been prepared in accordance with the ADB's Safeguard Policy Statement 2009. This EMP identifies the minimum requirements with regard to the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout design, construction and operation periods of the project, to avoid, minimize or offset the potential environmental impacts identified in the chapter on Anticipated 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.

D. Institutional Arrangement

232. The Ministry of Local Government, Rural Development and Cooperatives, acting through its Local Government Engineering Department (LGED), will be the Executing Agency. Pourashavas or towns selected to be beneficiaries of the project are the implementing agencies

233. Figure 24 below shows the institutional arrangement for safeguards of the overall project.

Figure 24: Institutional Arrangement for Safeguards



234. **Project Management Unit (PMU)**. A PMU will be created within LGED to support the management and supervision of the project. The PMU will coordinate environment safeguards planning and implementation and ensure that the environmental assessment and review framework is followed during subproject implementation. There will be an environmental safeguards focal person in the PMU who is a permanent staff of LGED. The PMU will be assisted by two consultant teams, namely: Detailed Design Consultant (DDC) and Project Management and Supervision Consultant (PMSC). DDC and PMSC will each include an Environment Specialist and a Heritage / Archaeological Expert who will support in the efficient overall implementation of environmental safeguards of the project, through tasks described in relevant paragraphs below. The PMU will work closely with the regional PMUs (RPMUs) and project implementation units (PIUs) at the Pourashava level. The PMU will have the following responsibilities:

(i) Ensure subprojects comply with the national and local statutory and legal environmental requirements, ADB SPS 2009, EARF and environmental safeguards provisions of the ADB loan covenant;
(ii) Ensure subprojects conform to exclusion criteria and subproject selection guidelines as stipulated in the EARF;
(iii) Review and approve the environmental categorization of future subprojects;
(iv) Review and approve subproject IEE reports, including EMPs, and ensure that subproject IEEs and EMPs are updated based on final detailed designs and submit to ADB for review, clearance, and disclosure prior to bid invitation;
(v) Engage competent heritage experts and oversee conduct of heritage assessment study in Bagerhat; ensure that no works/sites are located within 1 km from the boundary of any UNESCO notified heritage area or within monuments protected by department of archaeology, government of Bangladesh

(vi) Ensure that updated/final IEEs based on final detailed design are provided to the construction contractor prior to start of construction ;
(vii) Ensure that the IEEs including EMPs are updated in case of changes in detailed design that may occur during implementation phase, and submitted to ADB for review, clearance and disclosure;
(viii) Ensure that IEEs with EMPs are included in bidding documents and civil works contracts;
(ix) Ensure that the requirement for contractors to prepare their respective Health and Safety (H&S) Plans including COVID-19 H&S Plans is included in bidding documents and civil works contracts;
(x) Review and approve site-specific EMPs (SEMPs) of contractors;
(xi) Provide oversight on environmental management aspects of the project, and ensure EMPs and SEMPs are implemented by contractors;
(xii) Establish a system to monitor environmental safeguards of the Project including monitoring the indicators set out in the monitoring plan of the IEE;
(xiii) Facilitate timely and ensure overall compliance with all national and local government rules and regulations regarding site and environmental permits/clearances/approvals as well as any other environmental requirements as relevant;
(xiv) Review, monitor and evaluate effectiveness with which the EMPs, SEMPs, and Health and Safety Plans are implemented, and recommend necessary corrective actions to be taken;
(xv) With support from PMSC, consolidate quarterly monitoring reports from the RPMUs and/or PIUs and submit semi-annual environmental monitoring reports (SEMRs) to ADB;
(xvi) Ensure availability of budget for safeguards activities;
(xvii) Ensure adequate awareness campaigns, information disclosure among affected communities and timely disclosure of final IEEs/EMPs and SEMRs, including corrective action plans, if any, in project website and in a form accessible to the public;
(xviii) Address any grievances brought through the grievance redress mechanism (GRM) described in this IEE report in a timely manner;
(xix) Undertake regular review of safeguards-related loan covenants, and the compliance during project implementation; and
(xx) Organize periodic capacity building and training programs on safeguards for stakeholders, PMU, RPMUs, PIUs and contractors.

235. **Regional Project Management Units (RPMU), Division Level.** A regional project management units will be established at the Barisal (Division level), which will be responsible for overall implementation of the subprojects within the Division. The RPMU will be headed by Deputy Project Director. The RPMU will be staffed by an Assistant Director (Environment Safeguards), an Assistant Director (Social Safeguards) and an Assistant Director (Gender) who will assist the PMU safeguards and gender team in implementation of social and environment safeguard plans and gender action plan. The RPMU 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.

236. The regional level environmental safeguards Assistant Director and social safeguards Assistant Director will jointly oversee safeguards implementation by the *pourashava*/town level PIU, coordinate public consultations, information disclosure, regulatory clearances and approvals, implementation of resettlement plans, EMP implementation, and grievance redressal.

237. The key tasks of the RPMU on environmental safeguards, through the RPMU Assistant Director (Environmental Safeguards) as lead and PMSC as support, will be as follows:

(i) Supervise PMSC to coordinate with Jhalokati PIU, conduct consultations with affected persons and key stakeholders, and update PMU accordingly for all subproject locations;
(ii) Ensure and support preparation and/or updating of this IEE report by DDC and submit to PMU for review and approval and submission to ADB;
(iii) Support Jhalokati PIU to obtain no objection certificates and/or permits required for the subproject at the local or pourashava level, other than those certificates or permits that are to be obtained by the Contractor;
(iv) Provide all necessary support to heritage expert to conduct of heritage assessment study in Bagerhat, and coordinate with DDC to ensure that component sites are away from UNESCO heritage area (1.5-2 km), and in any case, no works/sites shall be located within 1 km from the boundary of the UNESCO heritage area or within monument/sites protected by department of archaeology, government of Bangladesh
(v) Supervise Jhalokati PIU to ensure no subproject civil works will commence until all relevant statutory requirements are obtained;
(vi) Support PMU to ensure IEE report is included in bidding documents and civil works contracts;
(vii) Guide Jhalokati PIU to ensure EMP of subproject is implemented effectively and efficiently;
(viii) Consolidate monthly environmental monitoring reports received from Jhalokati PIU (and other PIUs in the Division) and prepare quarterly environmental monitoring reports to PMU;
(ix) Guide Jhalokati PIU to conduct continuous public consultation and awareness with affected persons and other key stakeholders;
(x) Address any environment-related grievances brought about through the grievance redress mechanism promptly;
(xi) Organize an induction course for the training of contractors, preparing them on EMP implementation and monitoring, grievance redress mechanism and actions towards any unanticipated environmental impacts that may occur during implementation; and
(xii) Liaise with the district administration, and other division-level stakeholders, as and when required.

238. **Project Implementation Unit (PIU), *Pourashava*/Town Level.** The Jhalokati PIU will be established and staffed with a safeguards and gender focal person (Executive Engineer/Assistant Engineer, *pourashava*). The Jhalokati PIU will be assisted and will receive support from the RPMU environment, social and gender Assistant Directors and region level Construction Supervision and Safeguards Engineers, PMSC. The PIUs will be responsible for implementation of the IEE/resettlement plan/RSECP/gender action plan. The Executive Engineer (safeguards and gender focal person) with the support of Assistant Directors (social, environment and gender), RPMU and the Construction Supervision and Safeguards Engineers, PMSC will support PMU safeguards Assistant Directors in subproject implementation. The Executive Engineer/ Assistant Engineer (safeguards and gender focal person) at PIU level will be assisted by Sub-Assistant

Engineers (if available at the *pourashava* level) with the safeguard and gender tasks. The Slum Improvement Officer at the *pourashava* will be responsible for livelihood intervention tasks and responsibilities.

239. Key tasks and responsibilities of the PIUs on environmental safeguards, through the PIU safeguard and gender focal person as lead and division-level PMSC as support, are as follows:

(i) Ensure compliance with government and ADB requirements on environmental safeguards;
(ii) Provide all necessary support to heritage expert to conduct of heritage assessment study in Bagerhat, and coordinate with DDC to ensure that component sites are away from UNESCO heritage area (1.5-2 km), and in any case, no works/sites shall be located within 1 km from the boundary of the UNESCO heritage area or within monument/sites protected by department of archaeology, government of Bangladesh
(iii) With support from RMPU and Division-level PMSC, review and approve site-specific EMPs (SEMPs) prepared by Contractor;
(iv) Conduct regular site visits, including spot checks, to ensure the EMP and/or SEMP are properly implemented;
(v) Review monthly reports from Contractor;
(vi) Prepare quarterly reports on all aspects concerning environmental assessment, management, and monitoring;
(vii) Obtain approval of the quarterly reports from the Project Engineer, and submit approved reports to RPMU;
(viii) Address any grievances brought about through the GRM as described in the IEE report in a timely manner; and
(ix) Support all other environmental safeguards-related activities and tasks of the PMU/RPMU as may be needed.

240. **Detailed Design Consultants (DDC).** The project will be supported by the DDC, which will be staffed by an Environment Expert and a Social Safeguard Expert. DDC will support PMU in designing and planning of subproject components. The DDC will screen all subprojects for climate resilience, conduct technical surveys and detailed studies, heritage assessment studies, and prepare all engineering designs, bidding and safeguard documents. In collaboration with the PMSC Environmental Safeguards Specialist, the tasks of the DDC Environmental Safeguards Specialist and Heritage/Archaeological Expert are as follows:

(i) Screen and categorize final components of the subproject based on the EARF;
(ii) Update/Finalize the initial environmental examination (IEE) report including environmental management plans (EMP) based on final detailed design of the subproject and in accordance with ADB SPS and national laws, regulations, policies and guidelines; and
(iii) Ensure that technical design team works closely with the Heritage Expert; select subproject sites/work area as far as away from UNESCO heritage area in Bagerhat (1.5-2 km), and in any case, no works/sites shall be located within 1 km from the boundary of the UNESCO heritage area or within monument/sites protected by department of archaeology, government of Bangladesh
(iv) Ensure that all recommendations made in the heritage assessment study are in integrated into finalization of subproject sites, detailed designs, and construction methodologies

(v) Conduct due diligence of associated facilities and/or audit of existing facilities, if any, during the detailed design phase, as defined in ADB SPS;

241. **Project Management Supervision Consultant (PMSC).** The PMSC will provide project management and supervision services to support the PMU, including overall project management and administration, construction supervision and quality control, safeguard compliance, municipal services operation and maintenance, monitoring and evaluations, and other activities as appropriate. PMSC will have an Environment Specialist who will lead environmental safeguards tasks. Heritage/Archeological Expert will lead the heritage assessment study and implementation.

242. The key responsibilities of PMSC on environmental safeguards, (to be stationed at PMU level), with the support of heritage expert to be based in Bagerhat, are to fulfil collaborative tasks with the DDC Environment Specialist and Heritage Expert provide expert support to PMU, RMPU and PIU on the following.

(i) Screen and categorize final components of the subproject based on the EARF;
(ii) Update/Finalize the initial environmental examination (IEE) report including environmental management plans (EMP) based on final detailed design of the subproject and in accordance with ADB SPS and national laws, regulations, policies and guidelines;
(iii) Engage heritage expert to review the works sites before the start of works, and confirm on site by joint verification with PIU and heritage management authority that project component sites such as in Bagerhat are away from UNESCO notified heritage area, and no works are located within 1 km of the boundary and are not within the within monument/sites protected by department of archaeology, government of Bangladesh
(iv) Ensure that all recommendations made in the heritage assessment study are implemented
(v) Conduct due diligence of associated facilities and/or audit of existing facilities, if any, during the detailed design phase, as defined in ADB SPS;
(vi) Conduct of meaningful consultations and ensure issues/concerns/suggestions raised are incorporated in the design and updated/final IEE report;
(vii) Ensure relevant provisions from the updated/final IEE report and EMP are incorporated in the bid and contract documents;
(viii) Establish grievance redressal mechanism and ensure members of the grievance committee have the necessary capacity to resolve project-related issues/concerns;
(ix) Together with the social safeguards experts, conduct safeguards capacity building to ensure PMU, RPMU and PIU have the capacity to implement, monitor, and report on implementation of EMP, resettlement plans and indigenous peoples plans (if any); and
(x) Monitor implementation of EMP at all work sites, including all potential safeguard issues identified in the safeguard documentation mentioned above;
(xi) Monitor any unanticipated environmental risks or impacts that arise during construction, implementation or operation of the subproject that were not considered in the IEE report and EMP. Prepare corrective action plans and ensure that these are implemented by the Contractor and reported accordingly in environmental monitoring reports to ADB; and
(xii) Undertake all other tasks to ensure the subproject complies with ADB SPS and national environmental laws, rules, and regulations.

243. **Civil Works Contract and Contractor.** The IEE with EMP will form part of bidding and contract documents and verified by PMU. The Contractor will be required to designate an environment, health and safety officer (or equivalent) to ensure implementation of EMP during civil works. Contractor is to carry out all environmental mitigation and monitoring measures outlined in their contract and the IEE. The Contractor will be required to submit to PMU, for review and approval, a 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 per EMP; and (iv) budget for SEMP and EMP implementation. No works can commence until SEMP is approved by PMU.

244. Specifically, the Contractor will have the following responsibilities, among others that will be included in the bid and contract documents:

(i) Ensure that the infrastructure development works are carried out in an environmentally friendly manner, minimizing environmental impacts while ensuring the health and safety of all its workers and the minimizing disturbance to the surrounding environment and communities;
(ii) Consideration of ADB SPS, national regulations and the EMP during bid preparation and cost estimation;
(iii) Hire or designate a full time Environment, Health and Safety Officer (or equivalent) responsible for compliance to ADB SPS requirements, national regulations and the EMP. The officer/staff must have a clear terms of reference and responsibilities to ensure that all environmental and social concerns are properly managed;
(iv) Ensure regular reporting to the PIU on work progress and alert management on any potential issues or delays;
(v) Strictly follow National COVID 19 protocols and other COVID-19 related instructions issued by the government, and immediately report to the PIU upon detection of COVID positive cases at the subproject site;
(vi) Obtain the necessary permits and clearances, if any is required for the Contractor, to implement the subproject;
(vii) Ensure that all worker recruitment and OHS requirements are complied;
(viii) Take necessary corrective action to rectify any non-conformance, including actions related to grievances;
(ix) Institute an emergency plan for natural calamities/disasters and accidents at the site; and
(x) Follow chance finds procedures to discovery of any physical cultural artifact.
(xi) Comply with the requirements of heritage assessment study, and follow chance finds procedures to discovery of any physical cultural artifact.

245. A copy of the EMP/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/SEMP constitutes a failure in compliance and will require corrective actions.

246. PMU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the proposed project sites.

E. Environmental Management Plan (EMP)

247. The EMP is necessary on the grounds that it will manage the environment by offsetting the negative impacts with possible mitigation measures and enhancing the positive impacts within the allocated fund from the project. Thus, the main objectives of the EMP for the construction of the access road project are:

(i) Define the responsibilities of the project proponents in accordance with the three project phases (design, construction and operation);
(ii) Facilitate the implementation of the mitigation measures by providing the technical details of each project impact, and proposing an implementation schedule of the proposed mitigation measures;
(iii) Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
(iv) Identify training requirements at various levels and provide a plan for the implementation of training sessions;
(v) Identify the resources required to implement the EMP and outline corresponding financing arrangements; and Providing a cost estimate for all proposed EMP actions

248. The Environmental Management Plan (EMP) matrix is presented in Table 18. This summarizes the potential environmental impacts, mitigation measures, responsible entity for implementation and monitoring, and cost of implementation.

Table 18: Environmental Management Plan Matrix

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
Design Phase				
Compliance with Site Selection Criteria for Resource Recovery and Landfill 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.	• 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, DDC	PMU
Physical Cultural Resources	The subproject sites are within few kilometers away from structures of the Historic Mosque City of Bagerhat, there is a possibility that the implementation of the subproject may impact these structures, and that there is also the possibility of undiscovered underground archaeological assets that could be impacted.	• Conduct heritage assessment study and confirm that proposed project sites away from protected monuments (at least 1.5-2 km) and is not in archeologically sensitive area • Apply EARF subproject site selection criteria and confirm if it meets the requirements • ,Develop detailed site-specific chance find protocols	PMU, DDC	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	• Land development and site preparation by raising to a level higher than the surrounding area and based on the recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject; • Ensure that raised ground-level meets the minimum 1.5 m distance between shallow groundwater level and bottom clay liner in the landfill; • Channelize the Harikhola channel section close to proposed site with impervious material (such as cement concrete) at least for a length of 500-1000 m; conduct detailed site survey and select appropriate section to channelize; • Relocate the houses (11 numbers) located within 200 m of the facility as per the resettlement plan; • Construct high embankments/high walls around the landfill with a buffer zone of plantations; • Concrete roads to be provided to avoid wastewater penetration in the ground and to avoid attracting rodents and other pests to the facility;	PMU, DDC	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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 later 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.		
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.).	• When siting, consider the proximity of waste handling and storage areas to water supply wells for people and animals, irrigation canals, and surface water bodies that support aquatic life and the ability to prevent 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;	PMU, DDC	PMU

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.).	• Use appropriate collection vehicles. A combination of vacuum tanker trucks with long suction hose pipe, and smaller hand-pushed vacuum tugs may be needed to service all households; • 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; • 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 • For the dried fecal sludge, opt to dispose in the landfill facility. An option for land application should be 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.	PMU, DDC	PMU
Landfill Design	Inappropriate or insufficient design not following national and international best practices and standards could lead to not	• Ensure that the recommended methods to control and monitor noise and vibration per World Bank's EHS Guidelines on Waste	DDC	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	only environmental catastrophe but to community and occupational health and safety as well	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: (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.		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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 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 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: (f) The types, quantities, and concentrations of constituents in wastes managed in the landfill; (g) The mobility, stability, and persistence of waste constituents their reaction products in the unsaturated zone beneath the waste management area; (h) The detectability of indicator parameters, waste constituents, and reaction products in ground water; (i) The constituent concentrations in the groundwater background;		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		(j) 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: (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. • 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;		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		(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. • 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; and • Provide impervious liner to the Harikhola khal adjacent the site, with length sufficient to cover the stretch of canal starting from 50m upstream to 50m downstream relative to the boundary lines of the facility.		
Management of Existing Dumped Waste at Proposed Site	Site preparation in the area could result to indiscriminate and unmanaged disposal of these wastes elsewhere, which could result to environmental pollution and nuisance.	• Existing wastes found at the proposed site shall not be transferred elsewhere outside the boundary. The land development activities and site preparation shall ensure section-wise approach and dedicate a particular area where the existing dumped wastes can be temporarily stored; • Ensure this temporary location for the dumped wastes is free from flooding and away from the adjacent Harikhola khal/canal; and • Estimate the total volume of the solid wastes currently dumped at the site, and include 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.	PMU, DDC	LGED, Bagerhat Pourashava
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 recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject;	DDC	PMU

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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 • Bund walls around the site with height sufficient enough to prevent entry of flash flood waters or overflows from the Hariknola khal and Bhairab river.		
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	• LGED through the PMU to coordinate with the Department of Environment to start the EIA process, alongside the finalization of the detailed design. In its meeting on 5 June 2022, DOE approved/endorsed the issuance of LCC for the subproject. The LCC is a requirement to initiate the EIA process	PMU, DDC	PMU
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 ADB SPS and EMP requirements	• 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; • 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 • 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.	PMSC, PIU	PMU
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)	• Designate a full-time Environmental Health and Safety Officer (EHSO); • 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; • 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	Contractor	PMU, RPMU, PIU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		plan, and emergency preparedness and response plan, among others; • 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;		
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.	• 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, RPMU, PIU, PMSC
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.	• PMU to ensure that no construction activities shall be undertaken until all local (including national level) statutory requirements are complied with.	Contractor, PIU	PMU, RPMU, PMSC
Disruption of Existing Utilities	Construction activities may disrupt existing utilities installed underground, leading to undue disturbance to users of these utilities in the area.	• Conduct investigation at site to determine all the existing utilities that will likely be disturbed during construction phase; and • 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 LGED 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, RPMU, PMSC
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	• 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; • No new quarry sites shall be used for the subproject; • Verify suitability of all material sources and obtain approval of PMU/RPMU or PIU; and	Contractor, PIU	PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	unscrupulous sources could negatively impact the environment wherever these are illegally sourced.	• Document all sources of materials and include in the monthly reporting to the PIU.		
Community Awareness	Lack of community awareness on subproject activities, particularly prior to the construction phase, may result in potential community safety concerns and complaints.	• 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:: ○ Overview and updates on the proposed subproject; ○ Final detailed design of proposed subproject components; ○ Potential environmental and social impacts (positive and negative) of the subproject, and the proposed mitigation measures for the perceived negative impacts; and ○ Grievance redress mechanism and contact details of the subproject.	Contractor, PIU	PMU, RPMU, PMSC
Construction Phase				
Soil Erosion and Sedimentation	Excavation activities at the site will generate loose soil which can be carried through surface run-off during a rainfall.	• The Contractor shall minimize surface excavation works during the rainy season where practicable; • The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered; • 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; • Channels, earth bunds, netting, tarpaulin and/or sandbag barriers shall be used on site to manage surface water runoff and minimize erosion; • 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 • Monitor groundwater quality that could exist close to the working areas to ensure compliance.	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
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 contaminate or pollute Harikhola khal and ultimately Bahirab river. Oil leakage from the operation of machineries and heavy equipment may also cause pollution to these surface water bodies.	• Provide temporary sedimentation canal and/or silt traps on the perimeter of the construction area, particularly on the southwestern side that is adjacent to Harikhola khal; • All temporary discharge points shall be located, designed and constructed in a manner that will minimize erosion in the receiving channels; • 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; • 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; • Avoid scheduling of excavation work during the monsoon season. Earthworks should be scheduled during dry season; • Confine construction area including the material storage (sand and aggregate) so that runoff will not enter the site; • Ensure that drains are not blocked with excavated soil; • Stockyards at least 50 meters (m) away from watercourses; • Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume; • Daily control of machinery and vehicles for leakages; • No obstruction in flowing water; • 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 PMSC; and • 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: • Collection of recyclable solid wastes and supply to scrap vendors; • Ensure all the camp wastes and construction wastes are placed in the designated waste collection pits away from receiving water; • 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	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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.	• 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. • Prevent pollutants from contaminating the soil and the groundwater; • All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned; • Storage of lubricants and fuel at least 50 m from water bodies; • 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%; • Daily control of machinery and vehicles for leakages; • Collection of waste during construction activities; • Provide uncontaminated water for dust suppression; and • Enclose the construction area to prevent unauthorized access.	Contractor	PIU, PMU, RPMU, PMSC
Drainage Congestion	Construction material getting into surface run off or uncontrolled disposal may cause drainage congestion.	• 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.	Contractor	PIU, PMU, RPMU, PMSC
Ambient Air Quality	Degradation of ambient air quality due to sources (mobile, stationary, area) of emissions from the subproject	• Take every precaution to reduce the levels of dust at construction site, and not exceeding the pre-project ambient air quality standards; • Fit all heavy equipment and machinery with air pollution control devices that are operating correctly; • Vehicles travelling to and from the construction site must adhere to speed limits to avoid producing excessive dust;	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Reduce dust by spraying stockpiled soil, excavated materials, and spoils; • Cover with tarpaulin vehicles transporting soil and sand; • Cover stockpiled construction materials with tarpaulin or plastic sheets; • Heavy equipment and transport vehicles shall move only in designated areas and roads; • Water spraying to access roads, camp sites and work sites to reduce dust emissions; • Machines and vehicles must be regularly examined and maintained to comply with requirements of technical specifications; • 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 PMSC; • Repair and maintain access roads, as necessary; • Monitor air quality according to the environmental monitoring plan; • Clean wheels and undercarriage of vehicles prior to leaving construction site; • Prohibit burning firewood in work and labor camps (promote liquified petroleum gas for cooking purposes and electric heater for heating purposes); • Use vehicles that have government-issued permits and registrations; and • 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.	• Provide prior information to the local public, including households, near the site, if any, that may be affected, about the work schedule; • Use equipment that emits the least noise, well-maintained and with efficient mufflers. Install silencers if necessary and practical; • Restrict noisy activities to day time when background noise is relatively higher; • Avoid use of noisy equipment or doing noisy works at night time, especially near residential houses if any; • Limit engine idling to a maximum of one minute; • Spread out the schedule of material, spoil and waste transport; • Minimize drop heights when loading and unloading coarse aggregates; • Avoid use of horns unless it is necessary to warn other road users or animals of a vehicle's approach; and • Implement a complaints handling system of the grievance redress	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		mechanism.		
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, containers, lubricants and oils may affect the soil, landscape and aesthetics of local environment and the worker's and community's health and safety.	• Use excess spoils to elevate low lying portions of the site; • Avoid stockpiling of excavated soils near the Harikhola khal side; • Avoid disposal of any debris and waste soils in or near Harikhola khal or any ponds that are found adjacent or near the site; • The Contractor should take every opportunity to reduce the amounts of waste generated and collect recyclable material for processing by local operators; • Contractor shall implement waste segregation on site; • Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of properly; • 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; • 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; • 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; • 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 • Remove all wreckage, rubbish, or temporary structures which are no longer required.	Contractor	PIU, PMU, RPMU, PMSC
Aquatic Resources	The water body close to the southwestern boundary of site is the Harkhola khal. This water body serves as a source for irrigation water and as a zone for pisciculture by the locals. Any discharge from the site will impact the quality of the khal and thereby the commercial aquatic species propagated along this canal.	• Use excess spoils in low lying areas at the site; • Avoid stockpiling of excavated soils near the Harikhola khal side; • Avoid disposal of any debris and waste soils in or near Harikhola khal or any ponds that are found adjacent or near the site; • 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; • Silt traps to be provided at construction area particularly the southwestern boundary that is close to Harikhola khal; • No equipment or machinery shall be operated outside the work areas;	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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; • Ensure that drains are not blocked with excavated soil; • Locate stockyards away from canals or the southwestern boundary that is close to Harikhola khal; • 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; • Monitor water quality according to the environmental monitoring plan; • Clean up of the area after the completion and prior to the onset of monsoon season; and • 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.		
Physical Cultural Resources	While Bagerhat District is a potential archaeological area, there is a possibility of chance finds during excavation activities.	• 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.	Contractor	PIU, PMU, RPMU, PMSC
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	• 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; • 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.[40] These practices include recommended measures to prevent, minimize and control health and safety issues including pathogens from inflicting	Contractor	PIU, PMU, RPMU, PMSC

[40] 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
	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.	workers through training and use of appropriate PPEs, clothing and equipment when working in waste management facilities. • 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 • Follow established occupational health and safety protocol on emerging infectious diseases such as the corona virus disease (COVID-19). See Appendix 4 for a sample guidance note in responding to COVID-19; • 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; • Other first aid medical equipment and nursing staff will be made available or arranged on-call; • The Contractor will, at his own expense, conform to all disease prevention instructions as may be given by PMU/RPMU and/or PIU; • Provide regular health check-ups, sanitation and hygiene, health care, and control of epidemic diseases to the workforce; • 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; • Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards; • Make available first aid kits, ambulance facilities, and fire extinguishers in camp sites, if any; • 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 • Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.		

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
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 or animals in excavated areas.	• 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; • Follow International best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities; • Follow established community health and safety protocol on emerging infectious diseases such as COVID19. See Appendix 4 for a sample guidance note in responding to COVID19; • Implement measure to prevent proliferation of vectors of diseases at work site; • Maintain a complaint logbook in worker's camp and take action promptly of complaints. Follow the established GRM of the overall project (CTCRSP); • Schedule transportation activities by avoiding peak traffic periods; • Clean wheels and undercarriage of haul trucks prior to leaving construction site; • Educate drivers: limit speed not more than 30 km/h in settlements and avoid use of horn; • Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement; • Provide adequate space and lighting, temporary fences, reflectorized barriers and signages at the work site; and • Ensure Contractor has staff trained on emergency response.	Contractor	PIU, PMU, RPMU, PMSC
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.	• Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; • 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;	Contractor	PIU, PMU, RPMU, PMSC

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• 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.		
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 Bagerhat Pourashava and along the path of solid waste transports leading to the resource recovery and landfill facility.	• Encourage use of containers or bags for waste at the point of collection for each household and establishment; • Implement a regular collection schedule with sufficient frequency to avoid accumulation of garbage; • 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); • 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; • Cover collection and transfer vehicles along the entire route of transport to avoid windblown litter; • Clean vehicles used for waste hauling before transportation of any goods, including compost; • Encourage residents to put waste out at designated times and locations; and • Where possible, block off access to dumping sites and penalize illegal dumpers.	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava
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 Bagerhat Pourashava.	• Establish frequent waste collection schedules; • Select vehicles and containers that minimize air emissions during waste loading and unloading; • Institute a washing program for waste collection vehicles and for company-owned waste collection and transfer containers; • Promote the use of bags to reduce the odors from soiling of waste collection and transport equipment; • Optimize waste collection routes to minimize distance traveled and overall fuel use and emissions; • Waste collection and transport vehicle owners and operators should implement the equipment manufacturers' recommended engine	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		maintenance, along with the mechanical maintenance for the safe operation of the vehicle, including proper tire pressure; • 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; • Sweep waste management areas and roads frequently and use water spray for dust control where needed; • Pre-treat wastes as needed (e.g., solidification, encapsulation, or wetting sufficient to reduce dust but without forming leachate); • Use enclosed waste handling and storage areas for malodorous wastes. Enclosed waste storage and handling areas are preferred for all wastes; • 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); • Remove, treat, or dispose of all biological/malodorous wastes in an expeditious manner; and • Use odor-neutralizing sprays where necessary.		
Noise and Vibration	Operation of the various subcomponents of the resource recovery and landfill facility will potentially produce noise and vibration that could harm the welfare of the workers and communities surrounding the facility.	For the Resource Recovery and Landfill Facility: • Construct a buffer zone between the facility and the external environment; • Maintain site roads in good condition to reduce noise and vibration from vehicle movements; • Use acoustic screens around fixed/mobile plant and equipment; • Select equipment that has low noise emission levels; • Fit silencing equipment to plant, e.g. baffles/mufflers; and • 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 Resource Recovery and Landfill Facility	LGED, Bagerhat 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: • 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: • Ensure landfill gas collection and control system is working efficiently. Collect biogas for use or treatment (e.g. energy recovery or flaring).	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
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 from routine cleaning and maintenance of heavy equipment and vehicles, and wastewater as a result of domestic use at the facility.	For all subcomponents (MRF, Composting Plant, FSTP, Landfill): • Ensure all dedicated sanitation facilities at site such as septic tanks are maintained; 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; For the FSTP: • If using anaerobic digestion process, maximize recycling of wastewater to the reactor; • 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; • 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; For the Landfill and LCTS: • Regularly check and ensure the leachate collection and treatment system (LCTS) is efficiently functioning per design; • During dry season, recirculate collected leachate back into the landfill mass, with any excess treated to compliance level prior to discharge;	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
		• Maintain site drainage system and; ensure no section is blocked or damaged; • 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; • 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 • 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): • Ensure proper operation and cleanliness of the treatment facilities; • Regularly inspect and maintain backup power supplies to ensure uninterrupted operation during power failure; and • Proper and regular maintenance of generator sets and vehicles; For the Landfill: • 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; • Ensure inspection of conditions of lift stations; and • Regularly the associated automatic transfer switch of the backup power at the lift stations to ensure uninterrupted operation during power failure.	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava
Community and Occupational Health and Safety	Operation of the resource recovery and landfill facility could affect the health and safety of workers and community people in the area due to the following: a. Nuisance odors and disease vector infestation from the landfill operations; b. Increased traffic volume along the access roads to	• For all components [Waste Collection and Transport, Secondary Storage and Transport, and Resource Recovery and Landfill Facility (MRF, Composting Plant, FSTP, Landfill)]: • Apply insecticide or chemicals as necessary to control proliferation of disease vectors; • Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “B” (in consultation with appropriate physicians); • Maintain work areas to minimize slipping and tripping; • 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	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
	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 c. Possible increase in crime incidence with the influx of workers d. Lack of oxygen and risks related to flammable methane emissions	on Waste Management Facilities.[41] 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. • • 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 operation procedures with appropriate equipment, and workers are provided with necessary training and personnel protection equipment to safeguard health and safety. • 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; • Provide all the personal protective equipment like gum boots, nose mask, gloves etc. for the protection of workers; • 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; • Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work; • Medical check-up will be conducted on regular basis and the health conditions will be monitored; • First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility; • Maintain good housekeeping in waste processing and storage areas; • Conduct detailed identification and marking of all electrical connections prior to any maintenance work; • Use specially trained personnel to demount electrical parts; • Provide safe means of access and egress from confined places, such as stairs and ladders, and safety ropes; • Avoid operating combustion equipment for prolonged periods unless the area is actively ventilated; and • Avoid exposure to excessive noise levels beyond permissible limits set out by local and international regulations.		

[41] 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
		For the FSTP: Use functioning vacuum trucks for removal of fecal sludge to avoid manual works; For the Landfill: • Apply of soil cover as soon as possible during the landfill operation; • 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 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 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 Financial instruments in place to cover the costs of closure and post-closure care and monitoring.	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

Parameter	Environmental Impacts	Mitigation Measures	Institutional Responsibility	
			Implementation	Monitoring/ Supervision
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 Resource Recovery and Landfill Facility	LGED, Bagerhat 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 Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava
	Loss of employment	Provision of 6 months' notice about the impending termination of employment; Provision of compensation for affected personnel; and If possible, provision of re-training of personnel in preparation for other job openings.	Operator of Resource Recovery and Landfill Facility	LGED, Bagerhat Pourashava

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

F. Environmental Monitoring Program

249. Monitoring of mitigation measures during construction is the responsibility of the Bagerhat PIU and PMU supported by the PMSC Environmental Specialist, while monitoring of mitigation measures during operation phase is the responsibility of Bagerhat Pourashava and LGED. Table 19 shows the proposed Environmental Monitoring Program for this subproject, which specifies the various monitoring activities, indicating location, frequency of monitoring and responsibility.

Table 19: 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, PMSC	Copy of approved ECC	Before construction activities	PMU, PMSC
IEEs and EMPs are included in bid and contract documents	PMU office	PMU, PMSC	Copies of bid and contract documents	Before approval tender document	PMU, RPMU, PMSC
Site-specific EMP (SEMP) submitted by Contractor for approval by PIU	PIU office	Contractor, PIU	Copy of approved SEMP	Before construction activities commence	PMU, RPMU, PMSC
Spoil management plan (SMP) submitted by Contractor for approval by PIU	PIU office	Contractor, PIU	Copy of approved SMP	Before construction activities commence	PMU, RPMU, PMSC
Secure all other necessary permits and licenses from relevant government agencies		Contractor	Copies of permits and licenses	Before construction activities commence	PIU, PMSC
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, RPMU, PIU, PMSC
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 upstreams and downstreams of Harikhola khal and Bhariab river - Groundwater sampling in nearest available well in the area.	PMU, RPMU, PIU, PMSC
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, RPMU, PIU, PMSC

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
Conduct of 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 air quality)	Quarterly or as needed	PMU, RPMU, PIU, PMSC
Conduct of surface water quality monitoring	Subproject site	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 upstreams and downstreams of Harikhola khal and Bhariab river	PMU, RPMU, PIU, PMSC
Develop and apply archaeological protocol to protect chance finds	Subproject site	Contractor, PMU, PIU, PMSC	Contractor records	Once until protocol is approved	PMU, RPMU, PIU, PMSC
Provide EHS training for all personnel	Subproject site	Contractor	Contractor records; Interviews to workers	Monthly	PIU, PMSC
Keep accident reports and records	Subproject site	Contractor	Contractor records; Interviews to workers and community people	Monthly	PIU, PMSC
Employ workforce from communities near sites	Subproject site	Contractor	Contractor records	Monthly	PIU, PMSC
Implementation of EHS measures at construction camps	Construction camp site	Contractor	Site visits; Interviews to workers at camp	Monthly	PIU, PMSC
OPERATION AND MAINTENANCE					
Maintenance of all solid waste collection and transport equipment	Pourashava-wide	Operator of waste collection and transport	Site observations	Monthly	LGED / Pourashava PIU
Maintenance of all facilities at resource recovery and landfill facility	Subproject site	Operator of Resource recovery and landfill facility	Site observations	Monthly	LGED / Pourashava PIU
Prevent run-off/deposit of foreign materials	Subproject	Operator of	Site observations	Monthly	LGED /

Activities or Items to Monitor	Location	Responsible for Activities	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
(oil, grease, solid waste, plastics) into watercourses, and clean drain periodically; dispose of materials removed from drains	site	Resource recovery and landfill facility			Pourashava PIU
Environmental Monitoring (groundwater quality, surface water, ambient air quality, noise level)	Subproject site	Operator of Resource recovery and landfill 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 upstreams and downstreams of Harikhola khal and Bhariab river Groundwater – semi-annually at upgradient and downgradient monitoring wells.	LGED / Pourashava PIU
Implementation of operation phase mitigation measures per EMP	Subproject site	Operator of Resource recovery and landfill facility	Site observations	Monthly	LGED / Pourashava PIU

EHS = environmental, health and safety; EMP = environmental management plan; IEE = initial environmental examination; LGED = Local Government Engineering Division; PMSC = project management and supervision consultant; PIU = project implementation unit; PMU = project management unit; SMP = spoil management plan; TMC = traffic management plan.

G. Capacity Development Training

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

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

(ii) Social Safeguards
  (a) sensitization on ADB's policies on Involuntary Resettlement and Indigenous People;
  (b) introduction to social safeguards assessment and document requirements;
  (c) Consultation and participations requirements;
  (d) Project GRM and ADB's Accountability Mechanism; and
  (e) monitoring and reporting system.

251. **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 PMSC 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 CTCRSP, 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.

252. As fundamental component for the capacity building program, basic lectures and seminar training sessions will be provided by the PMSC 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 20: 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
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and	To build the capacity of the staff for effective implementation of the designed	To share the experiences and best practices

Items	Pre-construction	Construction	
	Government of Bangladesh and how the project will meet these requirements	EMPs aimed at meeting the environmental safeguard compliance of ADB and Government of Bangladesh	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 PMSC
Participants	PMU, RPMU and PIU staff (technical and environmental) involved in the project implementation	PMU, RPMU, PIU, Contractors	PMU, RPMU, PIU, Contractors

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

253. 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 LGED 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 Bagerhat Pourashava and/or the PIU.

Table 21: 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, RPMU 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						
1	Heritage Impact Assessment	Assessment to cover entire subproject site (Bagerhat Pourashava) and vicinity relative to heritage monuments in the Historic Mosque City of Bagerhat.	**Lump sum**	**1**	**1**	862,250.00
					Sub Total (A. Mitigation Measures)	**862,250.00**
B. Mitigation Measures during Construction Phase						
1.	Environmental mitigation/ enhancement measures integrated into the designs and costs included as part of civil works	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	300,000.0	300,000.00
					Sub Total (B. Mitigation Measures)	**400,000.00**
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,	No.	16	15,000.0	240,000.00

SL.	Particulars	Parameter	Unit	Quantity	Rate (BDT)	Amount (BDT)
		salinity, fecal coliform and heavy metals (Cr, Cd, Pb) (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 upstreams and downstreams of Harikhola khal and Bhairab 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	No.	80	10,000.0	800,000.00

SL.	Particulars	Parameter	Unit	Quantity	Rate (BDT)	Amount (BDT)
		the upgradient and downgradient sampling wells)				
Sub Total (D. Monitoring Measures during Operation)						**4,440,000.0**
E. Capacity Building						
1.	Introduction and sensitization to environmental issue	Pre-construction	LS	-	-	50,000.00
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)						**750,000.00**
Grand Total (A+B+C+D+E)						**6,541,250.00**
Total (in $) @ BDT 86.225 per $						**$75,862.57**

X. MONITORING AND REPORTING

254. PMU will monitor the overall progress of EMP implementation of the entire CTCRSP through the different subproject jurisdictions, including the integrated waste management subproject in Bagerhat Pourashava. The PMU, RPMU 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.

255. The Contractor will submit monthly reports to the PIU/RPMU. 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 7. This monitoring sheet is indicative which can be further enhanced depending on the actual situations at subproject construction site.

256. The PIU/RPMU 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 RPMU. In the conduct of these independent inspection activities, PIU and/or RPMU will be supported by PMSC in this regard. A sample inspection checklist is in Appendix 8. This checklist is indicative which can be further enhanced depending on the actual situations at subproject construction site.

257. PMU shall consolidate quarterly reports from the PIUs including PIU in Bagerhat 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 9. The PMU shall prepare and submit annual environmental monitoring report during the operation phase until ADB issues a project completion report. Submission of these reports to ADB will be within thirty (30) days from the end date of reporting period.

XI. CONCLUSION AND RECOMMENDATION

258. The subproject will result in environmental benefits because of improved solid waste management for Bagerhat Pourashava. While the nature and magnitude of potential environmental impacts inherent to operation of resource recovery and landfill 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.

259. 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.

260. 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. Site is not in compliance with the recently notified landfill location guidelines of DOE. Bagerhat 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 prior to the effectivity of the new landfill location guidelines. In its meeting held on 5 June 2022, DOE has approved/endorsed the issuance of LCC for the subproject and provided specific recommendations to be considered during the construction of the facility.. Copy of the minutes of meeting is in Appendix 2., With the approval of issuance of LCC, PMU will undertake a full scale environmental impact assessment (EIA) based on DOE approved terms of reference. The EIA will be submitted to DOE for the issuance of Environmental Clearance Certificate (ECC) for the subproject.

261. With the approval of issuance of LCC, bids may be invited for the subproject. However, approval of the EIA and issuance of the ECC must be obtained from the DOE prior to award of contracts.

262. During detailed design, the PMU shall undertake a field verification and validation on the proximity of subproject sites from the different heritage sites, in particular the overground and underground structures of the Historic Mosque City of Bagerhat. Therefore, as additional precautionary measure and in addition to a chance finds procedure, a heritage assessment study to reconfirm that proposed project site away from protected monuments (at least 1.5-2 km) and is not in archeologically sensitive area, and develop detailed site-specific chance find protocols.

263. Important design considerations included in EMP for development of overall facility at the site:

(i) Land development and site preparation by raising to a level higher than the surrounding area and based on the recommendations of the climate risk and vulnerability assessment or climate change assessment for the subproject;
(ii) Ensure that raised ground-level meets minimum 1.5 m distance between shallow groundwater level and bottom clay liner in the landfill;
(iii) Channelize the Harikhola channel section close to proposed site with impervious material (such as cement concrete) at least for a length of 500-1000 m; conduct detailed site survey and select appropriate section to channelize;
(iv) Relocate the houses (11 numbers) located within 200 m of the facility as per the resettlement plan;
(v) Construct high embankments/high walls around the landfill with a buffer zone of plantations; and
(vi) 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.

264. **For the composting plant**: During the final detailed design, PMU, through its design team, will institute the following recommended design considerations to control and monitor environmental impacts per World Bank's EHS Guidelines on Waste Management Facilities and to ensure compliance with the requirements of ADB SPS:

(i) 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;
(ii) Use impermeable materials for waste processing and storage areas, and vehicle washing areas, and install curbs to prevent runoff to permeable areas;
(iii) Use acoustic screens around fixed/mobile composting plant and equipment;
(iv) Select composting equipment that has low noise emission levels;
(v) Fit silencing equipment to plant, e.g., baffles/mufflers;
(vi) 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;
(vii) 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;
(viii) 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;
(ix) 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;
(x) Store leachate in a lined earthen basin or in aboveground storage tanks;
(xi) Provide a fire alarm system, including temperature sensors in the waste being treated; and
(xii) Design the facility for access by firefighting equipment, including clear aisles among windrows and access to an adequate water supply.

265. **For the fecal sludge treatment plant**: During the final detailed design, PMU, through its design team, will institute the following recommended design considerations to control and monitor environmental impacts per World Bank's EHS Guidelines on Waste Management Facilities and EHS Guidelines on Water and Sanitation, and to ensure compliance with the requirements of ADB SPS:

(i) Use appropriate collection vehicles. A combination of vacuum tanker trucks with long suction hose pipe, and smaller hand-pushed vacuum tugs may be needed to service all households;
(ii) 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;
(iii) 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

(iv) 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.

266. **For the Landfill**: During the final detailed design, PMU, through its design team, will consider and institute the following recommendations to ensure compliance with the requirements of ADB SPS:

(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 (footnote 25) 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 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;

(f) 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;
(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.

267. When detailed design is complete, the PMU will finalize/update this draft IEE accordingly to include revised and/or new information and corresponding assessments related to the following:

(i) Confirmation of full compliance of the proposed landfill site with the siting requirements of Bangladesh Solid Waste Management Rules, 2021;
(ii) Supplemental primary baseline data on surface water and groundwater quality in the area;
(iii) Site development plan, which shall include site layout, final site preparation/construction methodology, number of cells, phasing, bunding, cover materials, landscaping, etc.;
(iv) Final engineering calculations from where the site development plan is based;
(v) Technical description of other allied subcomponents/infrastructures to be built, such as access road, office building, accommodation facilities, weighbridge, wheel cleaner, perimeter fence, etc.;
(vi) Groundwater and surface water management, which shall include groundwater control measures, surface water collection system, and groundwater and surface water monitoring points;
(vii) 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);
(viii) 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);
(ix) 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;
(x) Capping design and construction; and
(xi) 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.

268. This IEE needs to be updated during the detailed design phase to reflect the final design ensuring the compliance with the design measures suggested in the draft IEE. The updated IEE shall be submitted to ADB for review, clearance and disclosure during detailed design phase but prior to start of construction.

269. CTCRSP should ensure that any revision or modification in the design during the final detailed design phase will not lead to a Category A classification based on ADB SPS categorization criteria (e.g., inclusion of biomedical waste treatment, burn technologies such as

incineration, pyrolysis, etc., which may trigger Category A). As such, it is recommended that CTCRSP exert all efforts to maintain the Category B classification.

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- Coastal Towns Climate Resilience Sector Project / Bagerhat IWM

Sector Division: SARD/SAUW

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?	P		The proposed is located within the pourashava area which is densely populated.
▪ Heavy with development activities?		P	There are no heavy development activities in the area.
▪ Adjacent to or within any environmentally sensitive areas?			
• 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.
• 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.
• Wetland		P	Based on desk review of locations and field verifications by PMU, there is no protected wetland near the subproject site.
• Mangrove		P	Based on desk review of locations and field verifications by PMU, there is no mangrove near the subproject site.
• Estuarine		P	Based on desk review of locations and field verifications by PMU, there is no estuarine near subproject site.
• Buffer zone of protected area		P	
• 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
• 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		Based on social safeguards due diligence, 11 main residential structures, four kitchen structures and two cattle sheds owned by eleven (11) households will be affected. A Resettlement Plan for these affected households has been prepared to ensure ADB SPS requirements on involuntary resettlement will be complied with.
▪ 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.

Screening Questions	Yes	No	Remarks
▪ 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.
▪ 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 Bagerhat 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[42]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	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

[42] 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: Minutes of Meeting on Approval of Issuance of Location Clearance Certificate

৫. **অরিক্স বায়োটেক লিমিটেড; প্লট নং-৩৭, ব্লক-০২, বঙ্গবন্ধু হাইটেক সিটি, কালিয়াকৈর, গাজীপুর** [শিল্প/প্রকল্প কার্যক্রম: বিভিন্ন প্লাজমা ডেরিয়েন্ট (Human Albumin, Human Immunoglobulin, Human Coagulation Factor) উৎপাদন]: উদ্যোক্তা কর্তৃক দাখিলকৃত আবেদনপত্র ও ইআইএ-র কার্যপরিধি সভায় আলোচনা করা হয়। সভায় বিস্তারিত আলোচনার পর আলোচ্য প্রকল্পের ইআইএ-র কার্যপরিধি প্রয়োজনীয় সংশোধন সাপেক্ষে নীতিগতভাবে অনুমোদনের সুপারিশ গৃহীত হয়। বিষয়টি সদর দপ্তর থেকে উদ্যোক্তাকে পত্র দ্বারা অবহিত করা হবে।

(ঘ) অবস্থানগত ছাড়পত্র: সুপারিশকৃত শিল্প/ প্রকল্পসমূহ

১. **Construction of Integrated Landfill and Resource Recovery Facility in Bagerhat Paurashava, Bagerhat** (শিল্প/প্রকল্প কার্যক্রম: সমন্বিত ল্যান্ডফিল): উদ্যোক্তা কর্তৃক দাখিলকৃত আবেদনপত্র, পরিদর্শন প্রতিবেদন এবং খুলনা অঞ্চল কার্যালয়ের মতামত ও অন্যান্য কাগজপত্র সভায় পর্যালোচনা করা হয়। পর্যালোচনান্তে আলোচ্য প্রকল্পের অনুকূলে বাগেরহাট জেলা কার্যালয় হতে নিম্নবর্ণিত বিশেষ শর্তের সাথে বিধি মোতাবেক প্রযোজ্য ও প্রচলিত শর্তে অবস্থানগত ছাড়পত্র প্রদানের সুপারিশ গৃহীত হয়।

ক) অবকাঠামোগত উন্নয়নের আওতায় অন্যান্য বিষয়ের মধ্যে আইইই প্রতিবেদনে বর্ণিত সকল মিটিগেশন মেজারস যথাযথভাবে বাস্তবায়ন করতে হবে।

খ) অত্র দপ্তরের অনুমোদিত ToR এর ভিত্তিতে ইআইএ সমীক্ষা সম্পন্ন করতে হবে এবং ইআইএ প্রতিবেদনে অন্যান্য বিষয়ের মধ্যে নিম্নবর্ণিত বিষয়গুলো অন্তর্ভুক্ত করতে হবে:

(১) Solid waste generation in the municipality with future projection;
(২) Details on landfill site with drawing, design calculation;
(৩) Solid waste collection, transport, transfer and segregation;
(৪) Detailed landuse around 5km of the project area with maps;
(৫) Leachate collection, treatment and discharge;
(৬) Fecal sludge treatment system (drawing, design and calculation);
(৭) Sludge treatment;
(৮) Details on compost plant & Material recovery facility (MRF);
(৯) Surface water quality;
(১০) Ground water quality;
(১১) প্রকল্প সাইটের লে-আউট প্ল্যান যাতে জমির সীমানা, প্রস্তাবিত স্থাপনা, সেড ইত্যাদি ১:২০০ স্কেলে প্রদর্শন;
(১২) প্রকল্পের পানি সরবরাহ লাইন, স্টর্ম ওয়াটার ড্রেন লাইন, Treatment Plant-এ আগত এবং Plant হতে নির্গত তরল বর্জ্যের লাইন, তরল বর্জ্যের চূড়ান্ত নির্গমন স্থল এবং তরল/পানি প্রবাহের দিক প্রদর্শনযুক্ত ড্রেনেজ লে-আউট প্ল্যান দাখিল।
(১৩) পরিশোধন প্রক্রিয়ার বিবরণে নিম্নবর্ণিত বিষয় উল্লেখ করতে হবে:
- অপরিশোধিত তরল বর্জ্যের গুণগতমান: pH, COD, BOD_5, TSS, Oil & Grease, Temperature;
- উৎপাদন প্রক্রিয়ায় প্রতিদিন সৃষ্ট মোট তরল বর্জ্যের পরিমান নির্ণয়;
- ডিজাইন ক্যাপাসিটি;
- পরিশোধন প্রক্রিয়ার প্রতিটি ধাপ প্রদর্শিত Schematic flow-diagram;
- পরিশোধন প্রক্রিয়ার প্রতিটি ধাপের বিস্তারিত বিবরণ, ডিজাইন প্যারামিটার এবং ক্যালকুলেশন।

(১৪) পরিশোধিত তরল বর্জ্যের ব্যবহার;

গ) স্লাজ ব্যবস্থাপনার জন্য Bangladesh Standard and Guidelines for Sludge Management অনুসারে Sludge Management Plan ইআইএ প্রতিবেদনে অন্তর্ভুক্ত করতে হবে।

ঘ) প্রকল্পের পেশাগত স্বাস্থ্য ও নিরাপত্তা এবং পরিবেশগত ব্যবস্থাপনার জন্য প্রশিক্ষণের প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

ঙ) ইআইএ প্রতিবেদনে দূষণ নিয়ন্ত্রণ ব্যবস্থা গড়ে তোলার বিষয়ে প্রয়োজনীয় কারিগরী ও আর্থিক প্রস্তাবনা অন্তর্ভুক্ত করতে হবে।

চ) ইআইএ অনুমোদিত না হলে নির্মাণ এবং আমদানীতব্য যন্ত্রপাতির অনুকূলে L/C খোলা যাবে না।

ছ) প্রকল্প চত্বরে উপযুক্ত প্রজাতির ফলদ ও বনজ গাছ লাগিয়ে সবুজায়ন করতে হবে।

জ) কর্মরত শ্রমিকদের পেশাগত স্বাস্থ্য রক্ষার্থে সব ব্যবস্থা যেমন: হেলমেট, নোজ মাস্ক, বুট, চশমা ইত্যাদির ব্যবস্থা করতে হবে।

ঝ) এই ছাড়পত্র ভূমির মালিকানা স্বত্ব নির্ধারণ করে না।

ঞ) পরিবেশগত ছাড়পত্র ব্যতিরেকে প্রকল্প চালু করা যাবে না।

Appendix 3: Result of Integration Biodiversity Assessment Tool Screening

IBAT

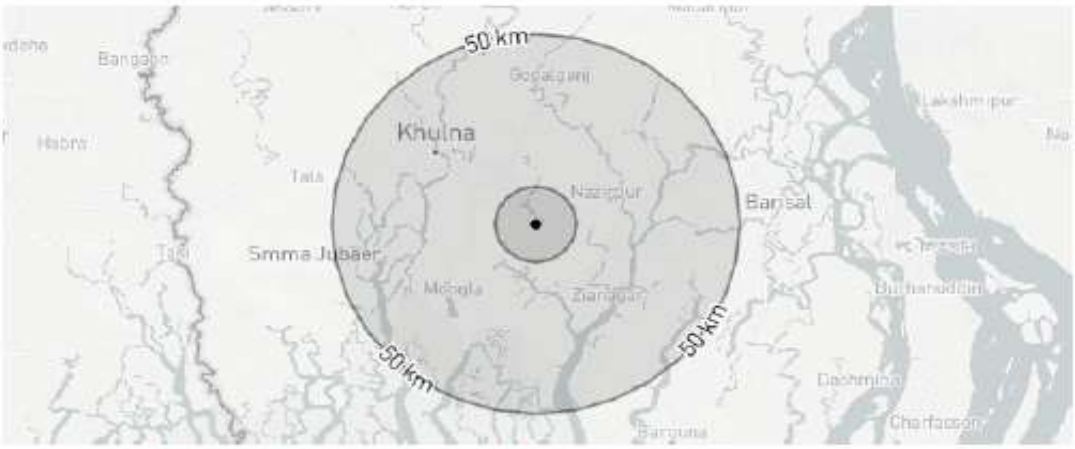
Integrated Biodiversity Assessment Tool
World Bank Group Biodiversity Risk Screen

BAN-SCTEIIP - BAGERHAT POURASHAVA

- **Country:** Bangladesh
- **Location:** [22.7, 89.8]
- **IUCN Red List Biomes:** Marine, Freshwater, Terrestrial
- **Created by:** Miguel Diangan

Overlaps with:

Protected Areas	1 km: 0	10 km: 0	50 km: 3	3
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	0
Key Biodiversity Areas	1 km: 0	10 km: 0	50 km: 0	0
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	0
IUCN Red List				48
Critical Habitat				Likely



Displaying project location and buffers: 1 km, 10 km, 50 km

WORLD BANK GROUP

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)

About this report

The recommendations stated alongside any Protected Areas and Key Biodiversity Areas identified in this report are determined by the following:

Protected Areas:

- 'Highest risk. Seek expert help' is stated if the report identifies a designation that includes either 'natural' or 'mixed world heritage site'.
- 'Assess for Critical Habitat' is stated if the report identifies a Strict Nature Reserve, Wilderness Area or National Park as coded by IUCN protected area categories Ia, Ib and II.
- 'Assess for biodiversity risk' is stated if the report identifies any other type of protected area.

Key Biodiversity Areas:

- 'Highest risk. Seek expert help' is stated if the report identifies an Alliance for Zero Extinction site.
- 'Assess for Critical Habitat' is stated if the report identifies Critically Endangered or Endangered species OR species with restricted ranges OR congregatory species as coded in the IUCN Red List of Threatened Species.
- 'Assess for biodiversity risk' is stated if the report identifies any other type of Key Biodiversity Area.

IBAT provides initial screening for Critical Habitat values. Performance Standard 6 (PS6) defines these values for Critical Habitat (PS6: para. 16) and legally protected and internationally recognized areas (PS6: para. 20). PS6 will be triggered when IFC client activities are located in modified habitats containing "significant biodiversity value," natural habitats, Critical Habitats, legally protected areas, or areas that are internationally recognized for biodiversity. References to PS6 and Guidance Note 6 (GN6) are provided to guide further assessment and detailed definitions where necessary. Please see https://www.ifc.org/ps6 for full details on PS6 and GN6.

The report screens for known risks within a standard 50km buffer of the coordinates used for analysis. This buffer is not intended to indicate the area of impact. The report can be used to:

- Scope risks to include within an assessment of risks and impacts
- Identify gaps within an existing assessment of risks and impacts
- Prioritize between sites in a portfolio for further assessment of risks and impacts
- Inform a preliminary determination of Critical Habitat
- Assess the need for engaging a biodiversity specialist
- Identify additional conservation experts or organizations to inform further assessment or planning

WARNING: IBAT aims to provide the most up-to-date and accurate information available at the time of analysis. There is however a possibility of incomplete, incorrect or out-of-date information. All findings in this report must be supported by further desktop review, consultation with experts and/or on-the-ground field assessment as described in PS6 and GN6. Please consult IBAT for any additional disclaimers or recommendations applicable to the information used to generate this report.

Please note, sensitive species data are currently not included in IBAT reports in line with the Sensitive Data Access Restrictions Policy for the IUCN Red List. This relates to sensitive Threatened species and KBAs triggered by sensitive species.

IBAT

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Priority Species

Habitat of significant importance to priority species will trigger Critical Habitat status (See PS6: para 16). IBAT provides a preliminary list of priority species that could occur within the 50km buffer. This list is drawn from the IUCN Red List of Threatened Species (IUCN RL). This list should be used to guide any further assessment, with the aim of confirming knownor likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species information collected by the project be shared with species experts and/or IUCN wherever possible in order to improve IUCN datasets.

IUCN Red List of Threatened Species - CR & EN

The following species are potentially found within 50km of the area of interest.
For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Eretmochelys imbricata	Hawksbill Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine
Batagur kachuga	Red-crowned Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Batagur dhongoka	Three-striped Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Carcharhinus longimanus	Oceanic Whitetip Shark	CHONDRICHTHYES	CR	Decreasing	Marine
Sphyrna lewini	Scalloped Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
Sphyrna mokarran	Great Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
Pristis zijsron	Green Sawfish	CHONDRICHTHYES	CR	Decreasing	Marine
Sonneratia griffithii		MAGNOLIOPSIDA	CR	Decreasing	Terrestrial, Marine

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Pristis pristis	Largetooth Sawfish	CHONDRICHTHYES	CR	Decreasing	Marine, Freshwater
Calidris pygmaea	Spoon-billed Sandpiper	AVES	CR	Decreasing	Terrestrial, Marine, Freshwater
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Batagur baska	Northern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Pelochelys cantorii	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Balaenoptera musculus	Blue Whale	MAMMALIA	EN	Increasing	Marine
Geoclemys hamiltonii	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Hardella thurjii	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Morenia petersi	Indian Eyed Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Orcaella brevirostris	Irrawaddy Dolphin	MAMMALIA	EN	Decreasing	Marine, Freshwater
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Rhincodon typus	Whale Shark	CHONDRICHTHYES	EN	Decreasing	Marine

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Varanus flavescens	Yellow Monitor	REPTILIA	EN	Decreasing	Terrestrial
Isurus oxyrinchus	Shortfin Mako	CHONDRICHTHYES	EN	Decreasing	Marine
Anoxypristis cuspidata	Narrow Sawfish	CHONDRICHTHYES	EN	Decreasing	Marine
Nilssonia gangetica	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Nilssonia hurum	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Platanista gangetica	South Asian River Dolphin	MAMMALIA	EN	Unknown	Freshwater
Eusphyra blochii	Winghead Shark	CHONDRICHTHYES	EN	Decreasing	Marine
Mobula eregoodoo	Longhorned Pygmy Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Stegostoma tigrinum	Zebra Shark	CHONDRICHTHYES	EN	Decreasing	Marine
Mobula tarapacana	Sicklefin Devilray	CHONDRICHTHYES	EN	Decreasing	Marine
Mobula thurstoni	Bentfin Devilray	CHONDRICHTHYES	EN	Decreasing	Marine
Isurus paucus	Longfin Mako	CHONDRICHTHYES	EN	Decreasing	Marine
Acropora rudis		ANTHOZOA	EN	Decreasing	Marine
Alopias pelagicus	Pelagic Thresher	CHONDRICHTHYES	EN	Decreasing	Marine

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Heritiera fomes		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Marine, Freshwater
Holothuria scabra	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Holothuria lessoni	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Thelenota ananas	Prickly Redfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater
Mobula birostris	Giant Manta Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Heliopais personatus	Masked Finfoot	AVES	EN	Decreasing	Terrestrial, Freshwater
Tringa guttifer	Spotted Greenshank	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
Aquila nipalensis	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Mobula mobular	Spinetail Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine

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Restricted Range Species

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Salvinia natans	Floating Fern	POLYPODIOPSIDA	LC OR LR/LC	Decreasing	Freshwater
Ophisternon bengalense	Bengal Mud Eel	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Bengala elanga	Bengala Barb	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Xenentodon cancila		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Batasio batasio		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oreichthys cosuatis		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oryzias dancena	Indian Ricefish	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Pseudosphromenus cupanus	Spiketail Paradise Fish	ACTINOPTERYGII	LC OR LR/LC	Stable	Freshwater
Oryzias carnaticus	Spotted Ricefish	ACTINOPTERYGII	LC OR LR/LC	Unknown	Marine, Freshwater
Macrobrachium scabriculum		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Macrobrachium rude		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Macrobrachium rosenbergii	Giant River Prawn	MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Leptocarpus fluminicola		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Fregetta tropica	Black-bellied Storm-petrel	AVES	LC OR LR/LC	Decreasing	Terrestrial, Marine

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Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

The following protected areas are found within 1 km and 10 km and 50 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Chandpai	50 km	II	Designated	Wildlife Sanctuary	Assess for critical habitat
Dhangmari	50 km	II	Designated	Wildlife Sanctuary	Assess for critical habitat
Sundarbans Reserved Forest	50 km	Not Reported	Designated	Ramsar Site, Wetland of International Importance	Assess for biodiversity risk

Key Biodiversity Areas

There are no key biodiversity areas to show for this report.

Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
REPTILIA	93	20	5	6	9	3	67	3
CHONDRICHTHYES	33	27	5	13	9	2	3	1
MAGNOLIOPSIDA	74	2	1	1	0	3	64	5
AVES	313	17	3	6	8	17	279	0

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Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
MAMMALIA	70	11	0	4	7	5	54	0
ANTHOZOA	8	2	0	1	1	2	3	1
HOLOTHUROIDEA	30	5	0	3	2	0	14	11
ACTINOPTERYGII	539	7	0	0	7	10	482	40
LILIOPSIDA	60	1	0	0	1	1	56	2
MALACOSTRACA	28	0	0	0	0	1	23	4
AMPHIBIA	20	0	0	0	0	0	20	0
INSECTA	93	0	0	0	0	0	91	2
HYDROZOA	2	0	0	0	0	0	2	0
GASTROPODA	124	0	0	0	0	0	114	10
POLYPODIOPSIDA	5	0	0	0	0	0	5	0
BIVALVIA	40	0	0	0	0	0	36	4
ARACHNIDA	2	0	0	0	0	0	2	0

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Recommended citation

IBAT PS6 & ESS6 Report. Generated under licence 159-26798 from the Integrated Biodiversity Assessment Tool on 06 February 2022 (GMT). www.ibat-alliance.org

Recommended Experts and Organizations

For projects located in Critical Habitat, clients must ensure that external experts with regional expertise are involved in further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservation organizations and/or academic institutes, especially with respect to potential developments in natural or Critical Habitat (GN6: GN23). Where Critical Habitats are triggered by priority species, species specialists must be involved. IBAT provides data originally collected by a large network of national partners, while species information is sourced via the IUCN Red List and affiliated Species Specialist Groups. These experts and organizations are listed below. **Please note that this is not intended as a comprehensive list of organizations and experts. These organizations and experts are under no obligation to support any further assessment and do so entirely at their discretion and under their terms. Any views expressed or recommendations made by these stakeholders should not be attributed to the IFC or IBAT for IFC partners.**

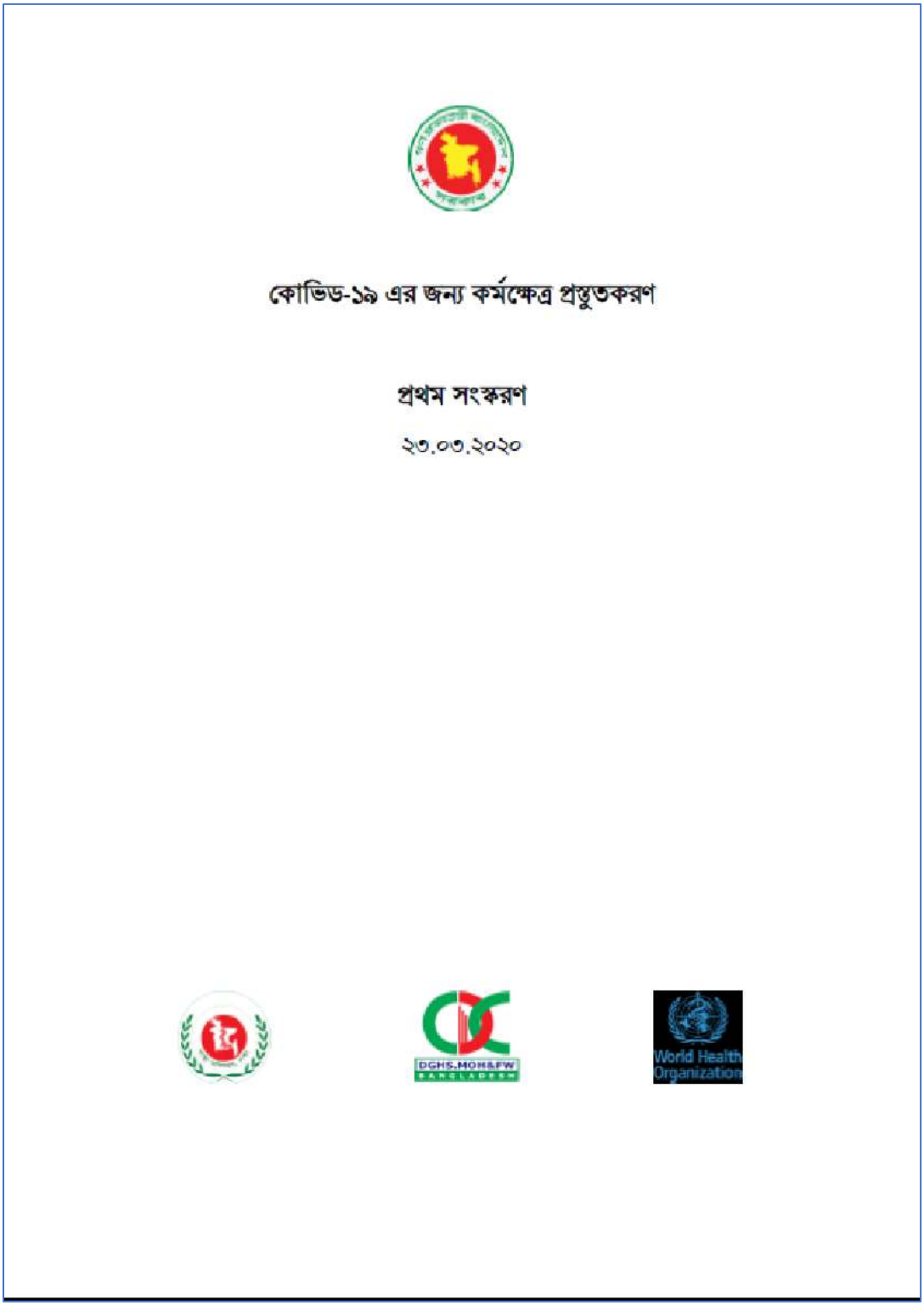
Birdlife Partners

URL: https://www.birdlife.org/worldwide/partnership/birdlife-partners

Directory for Species Survival Commission (SSC) Specialist Groups and Red List Authorities

URL: https://www.iucn.org/commissions/ssc-groups

Appendix 4: Bangladesh Government guideline in response to COVID-19 in worksites



কোভিড-১৯ এর জন্য কর্মক্ষেত্র প্রস্তুতকরণ

প্রথম সংস্করণ

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DGHS.MOHFW 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 পরামর্শকরতে 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:

1. 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.
2. 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.
3. Engage a full time EHS professional at site. Also engage a part-time/fulltime medical professional based on the workforce and project size/type.
4. 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.
5. 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).
6. 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.
7. 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.
8. 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.
9. Identify and note a list of commonly used machines/tools and surfaces (e.g., tables, doorknobs, handrail etc.) by workers and camp site dwellers.
10. 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

1. 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.
2. 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.
3. 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.
4. Always check if the stock of disinfectant, PPEs, medical supplies are sufficient.
5. 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.
6. Arrange a mandatory site brief on COVID awareness in the morning. The session must be conducted by the EHS/medical professional.
7. Encourage workers/site personnel/camp dwellers to inform the designated ESH/Medical personnel immediately if any colleague starts showing the symptoms of COVID-19.
8. 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.
9. Before sharing common tools/machines at worksite, ensure to disinfect.
10. Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing.
11. Keep the day-to-day toolbox meetings as short as possible. Ensure physical distance during meetings.
12. Increase use for internet/phone-based meetings/site visits as much as possible to avoid travelling and physical communication.
13. Restrict worksite personnel to go outside unnecessarily. Also restrict campsite personnel to go outside without any valid cause.
14. 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

1. 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.
2. Encourage respiratory etiquette, including covering coughs and sneezes. Train the site personnel as needed.
3. Contact with EAs/ADB designated professional for any help with training material/knowledge/miscellaneous.

Section 5: Campsite management

1. 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.
2. Ensure a separate covered bin in place at every campsite/worker's dwelling for disposal of used PPEs.
3. Check and ensure if camps are well ventilated and protected against heat, cold, damp, noise, fire, and disease-carrying animals.
4. Maintain good housekeeping and social distancing in kitchens, meal rooms, canteens and toilets. Make sure campsites are using sanitary toilets.
5. 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

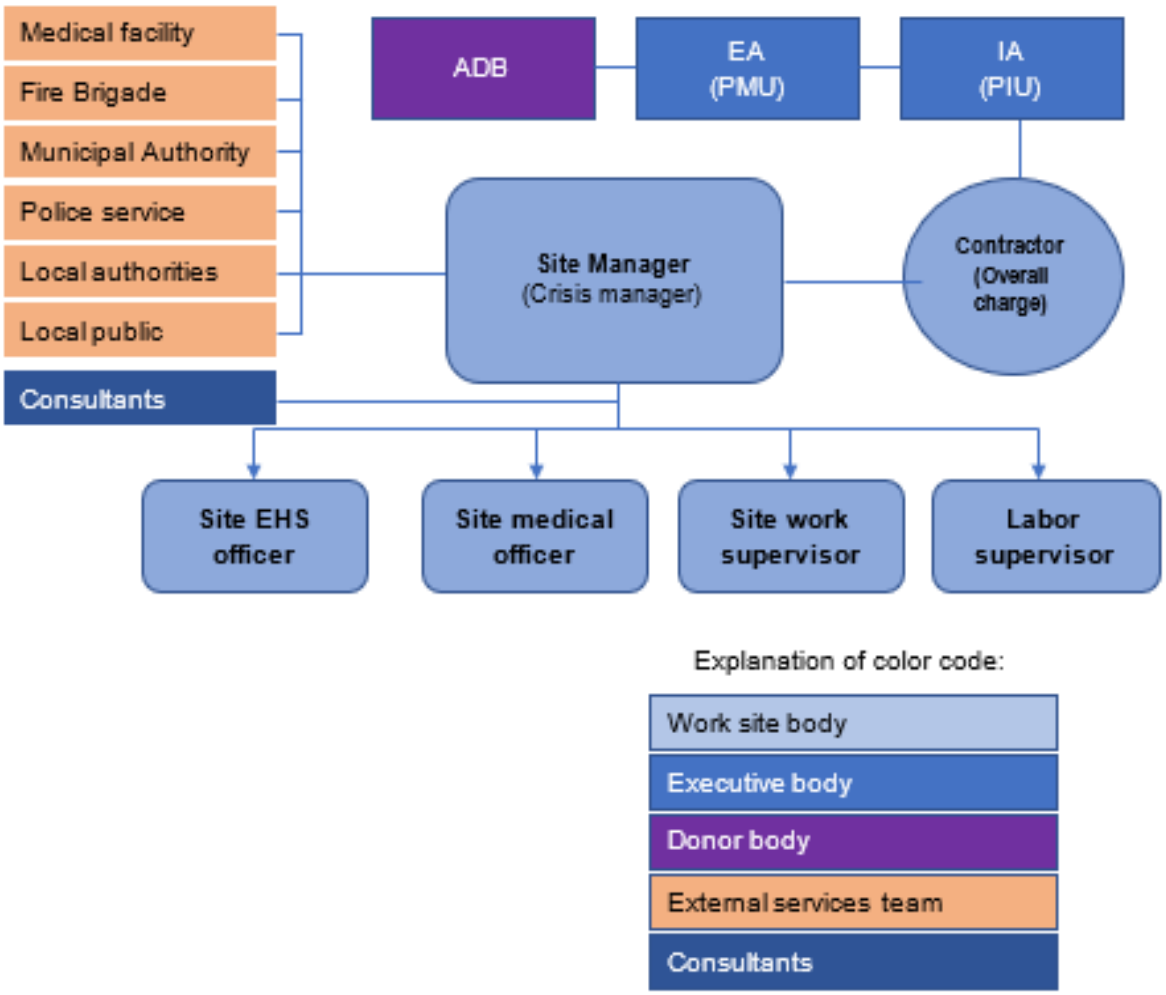


Figure: Organization chart of the crisis management team

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 5: Minutes of Consultation

Location: Mazidanga, Karapara union, Bagerhat Sadar
Date: 27.02.2022

Agenda of the meeting

- To identify the people's view about waste dumping center;
- Assessment of the impacts of the proposed interventions;
- People's opinion on resettlement and rehabilitation Plan

The waste dumping center located at Mazidanga village, 6 km away from the Bagerhat Pourashava. There are 10 HHs/families with 56 people have been living here before land acquisition for IWM center. Except 10 families, one commercial structure is found in the IWM direct impact/influence area. The affected family have been living here for more than one decade.

The affected people knew nothing before 2019 about IWM facility. It was informed to them that Bagerhat pourashava bought 5 acres (500 decimal) land in 2017-18 to construct a IWM center.

The dumping/SW management site is a low-lying area where pourashava has been depositing waste 18 tons per day (approximately) from 2019. One trucks and few van collect the garbage/waste and deposit twice per day.

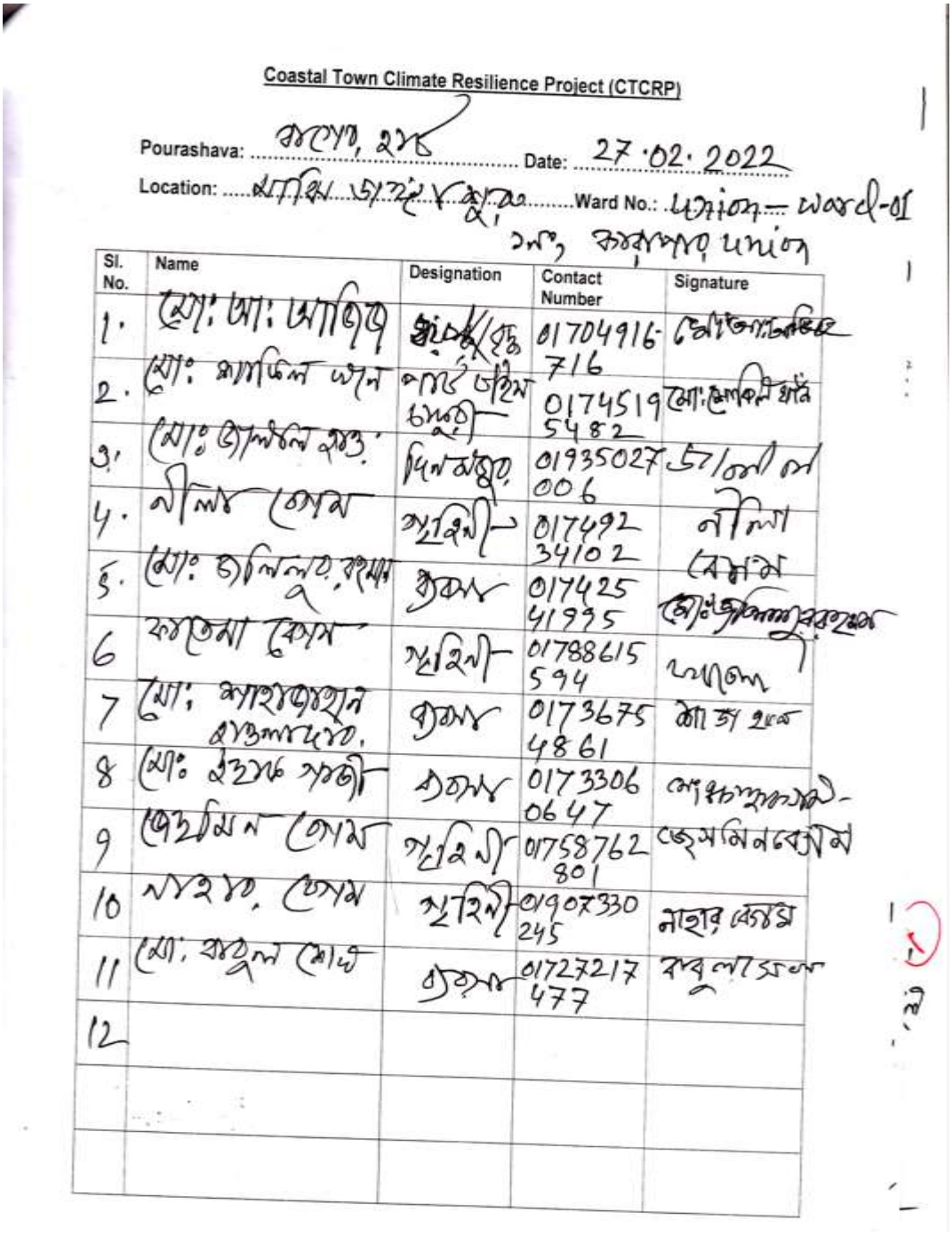
Impacts presently faced by affected households

- All the people said that they have been facing massive mal-odor from the site.
- Disturbance of flies & mosquitos is very common and unbearable
- Disturbances of rat & shrews at night time
- Disturbance dogs & crow at day time
- some people faces respiratory problem
- Pigs are deployed as scavenger which create malodour and pollution.
- All create air pollution

Concerns Raised

- Most of the people desire to leave the place if fair compensation is provided by the project to the affected families and, there shouldn't be any delay in compensation payment for their lost assets.
- Some people expressed the fear that their residential structure will be dismantled without giving compensation so they are not interested move from here; the consultants and the pourashava authorities assured them that they will be informed and regularly consulted and compensation would be paid to them. No displacement will occur before they are fully compensated.
- It was also mentioned that they will be pre-informed and will be given minimum 6 months time to relocate from the place. Their land will not be acquired and they can continue to use the land apart from residential purpose.
- Most of the affected families want to resettle within 500 meters of the vicinity.

- The affected persons mentioned that they want to resettle and relocate on their own choice not according to the pourashava's.
- Since the proposed site is already being used as as a solid waste dumping site, they are facing social exclusion, as no relatives want to visit them due to their proximity to the IWM facility.



Coastal Town Climate Resilience Project (CTCRP)

Pourashava: ..... Date: 27.02.2022

Location: .....Ward No.: .....

Sl. No.	Name	Designation	Contact Number	Signature
1.			01704916716	
2.			01745195482	
3.			01935027006	
4.			01749234102	
5.			01742541995	
6			01788615594	
7			01736754861	
8			01733060647	
9			01758762801	
10			01907330245	
11			01727217477	
12				

BAN-SCTEIIP: SUMMARY OF SAMPLE SUBPROJECT COMPONENTS
Bagerhat Solid Waste Management Site (Land filling site)
05 February 2022

Site Information	
Name of the area:	Dokkhin Majhidanga (mouja), 1 no ward, Karapaya Union Located at old Mnigong Doratan Road
Distance from the Municipality	3 km
Total land area:	10 bigha (33 decimal x 10) 6.257 acre
Location	22°40'41.80"N 89°46'52.94"E
Present condition	Cultivating land (partial) 2 Bigha and Wetland (Pisciculture) 5 bigha
Existing trees	Mehegoni -56, Coconut 32, Meghnish 23, Badam 5, Date trees 14, Banana
Land owners	7 land owners who have handed over the land to the Bagerhat Municipality
Surrounding area	Settlements 1 NGO Operating School 1 Mosque 7-10 settlers (local residence) with permanent structures Mainly agricultural land and pisciculture (Gher) River Bhairab is about 300 East from the site, a canal passed from the West of the site
Daily waste generates	18 MT Waste carries to the site by three-wheeler van (14-15/day) and a diesel driven truck (twice a day)
Environmental Impacts	Bad odor: Local residence complained about the bad odor Few settlers reared pigs adjacent to the dumping site, due to scavenging wastes-bad odors generates which is difficult to tolerate by the local residence Air pollution The diesel driven truck carries waste two times a day creates air pollution (insignificant). Occupational Health Land filling may cause health hazards to the local people or associated worker. Local NGO provided PPE (Gloves, Safety boots, metallic hook etc) as per safety Noise and vibration Due to the movement of waste loading truck twice daily noise and vibration generates

Starting Point (North) close to human settlement

Ending Point (North) demarking flag

Existing waste dumping site

Dumped municipality wastes (18 ton approximate daily)

Opposite site of the land filling site

Access road of the land filling site

Waterbody within the ladfilling site

Bhangari wala / weste pickers collecting plastic waste, glass westes, alluninium wastes form dumpted wastes

Nearby settlements

Mosque very close to the site

Discussion with waste collectors

Discussion with community femel representative

Discussion with municipality waste collector

Meeting with Mayor (Bagerhat Municipality) and Engineer

Second Coastal Towns Environmental Infrastructure Improvement Project
Bagerhat Subproject SCTEIIP
Site location: Bagerhat Municipality
Date: 05/02/2022 Time: 14:10

Sl.	Name	Occupation	Email & Mobile No	Signature
1.	Khan Habibur Rahman.	Mayor.	01726278480.	
2.	Mst. FARHANA AKTER	PRINCIPAL	01716-052600	
3.				
4.	T. H. Rezaul Hay Riju	Assistant Engineer	01722-646458.	
5.	Md. Jubaer Arafin	Environmental Specialist	01760389648	
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Second Coastal Towns Environmental Infrastructure Improvement Project

Bagerhat Subproject SCTEIIP

Site location: Bagerhat Waste Managet Area

Date: 05/02/2022 Time: 11:00 –

Sl.	Name	Occupation	Email & Mobile No	Signature
1.				
2.	[illegible]	Waste Picker + Staff, Mawa		
3.	[illegible]	Waste Picker	01924[illegible]2502	
4.	[illegible]	Local Resident	01751218496	
5.	Dilip Paul	Work Assistant (B.P.)		
6.	Md. Jubaer Arafin	Environmental Consultant	01760350648	
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Appendix 6: Sample Grievance Redress Form

(To be available in English or other local languages)

The LGED 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: ▪ Note/Letter ▪ E-mail ▪ Verbal/Telephonic	
Reviewed by: (Name, Signature, Position)	
Action Taken:(Date, Venue of Meeting, Other details)	
Whether Action Taken Disclosed:	▪ **Yes** ▪ **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 7: 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:	
☐ Near Miss	☐ Environmental	Further Action Required	
		☐ 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 8: Sample Inspection Checklist for PMU/RPMU/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	
	a. Are the PPEs being used by workers?				
	b. Are excavation trenches provided with shores or protection from landslide?				
	c. Is breaktime for workers provided?				
	d. 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	
	a) Are there separate sanitary facilities for various types of use (septic tanks, urination, washing, etc.)?				
	b) Is any wastewater discharged to storm drains?				
	c) Is any wastewater being treated prior to discharge?				
	d) Are measures in place to avoid siltation of nearby drainage or receiving bodies of water?				
	e) 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	
	a) Is the work only taking place between 7 am and 7 pm, week days?				
	b) Do generators operate with doors closed or provided with sound barrier around them?				
	c) Is idle equipment turned off or throttled down?				
	d) Are there noise mitigation measures adopted at construction sites?				
	e) 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 9: 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

- Photos
- Records of consultations
- Copies of environmental clearances and permits (if not provided in the previous SEMR)
- Environmental site inspection report (if not provided in the previous SEMR)
- 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 10: Solid Waste Management Plan

Consequences	Mitigation measures	Records	Reporting	Responsibility
Debris disposal	a. The debris disposal site should be identified which are preferably barren or low-lying areas away from settlements. b. Prior concurrence will be taken from concerned Govt. Authorities or landowner c. 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. d. All efforts should be made to use debris in road construction or any other public utilities. e. 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/PMSC
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. e. Only appropriately design and compliant landfills will be used for disposing waste	Visual inspection by CSE/PMSC 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/PMSC
Oil/chemical spills	a. All efforts should be made that no chemical/ oily waste spill over to ground or water bodies. b. All precautions should be followed for emergency preparedness and occupational health & safety during construction and handling a waste. c. Provision of fire extinguishers will be made at the storage area	Visual inspection by CSE/PMSC 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/PMSC
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	Visual inspection by CSE/PMSC 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/PMSC

Consequences	Mitigation measures	Records	Reporting	Responsibility
	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.			
Domestic waste	a. 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/PMSC 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/PMSC

Appendix 11: 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:

- 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.
- 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.
- 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.

- 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.
- 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.
- 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 12: 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:

(i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(ii) protection of work crews from hazards associated with moving traffic;
(iii) mitigation of the adverse impact on road capacity and delays to the road users;
(iv) maintenance of access to adjoining properties; and
(v) 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.

1) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
2) Inhibit traffic movement as little as possible.
3) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
4) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
5) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
6) Train all persons that select, place, and maintain temporary traffic control devices.
7) Keep the public well informed.
8) 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:

a) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
b) defensive driving behavior along the work zones; and
c) 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:

a) Explain why the brochure was prepared, along with a brief description of the project;
b) Advise the public to expect the unexpected;
c) Educate the public about the various traffic control devices and safety measures adopted at the work zones;
d) Educate the public about the safe road user behavior to emulate at the work zones;
e) 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
f) 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.

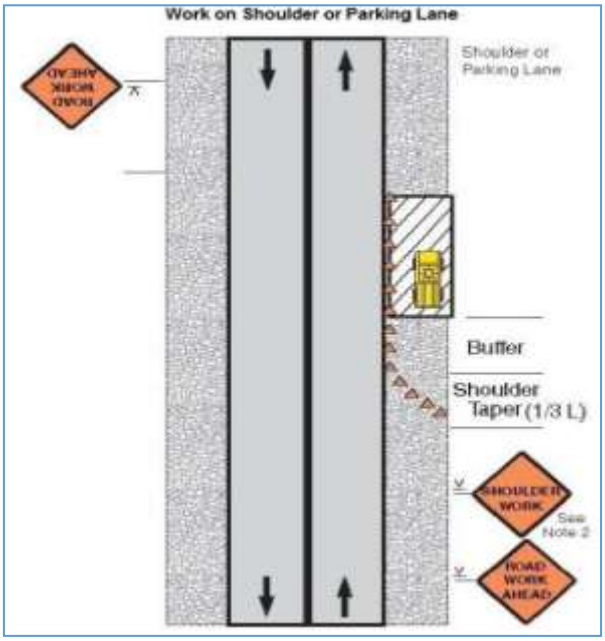


Figure A1 Work with shoulder or Parking area

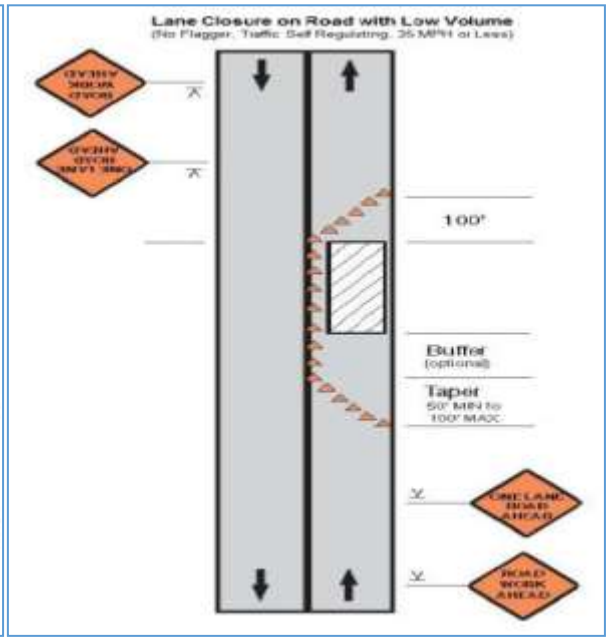


Figure A2Work with land closure: low traffic

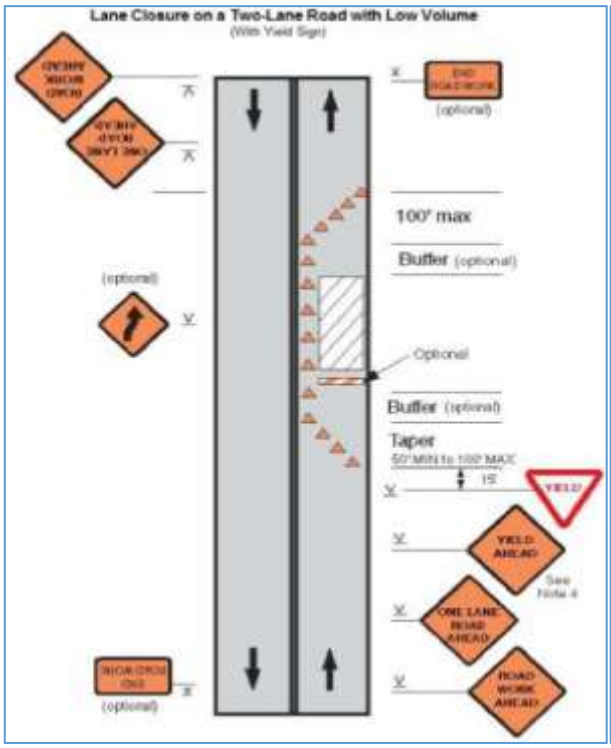


Figure A3 Work on Lane Closure with Yield Sign on Two Lane: Low Volume

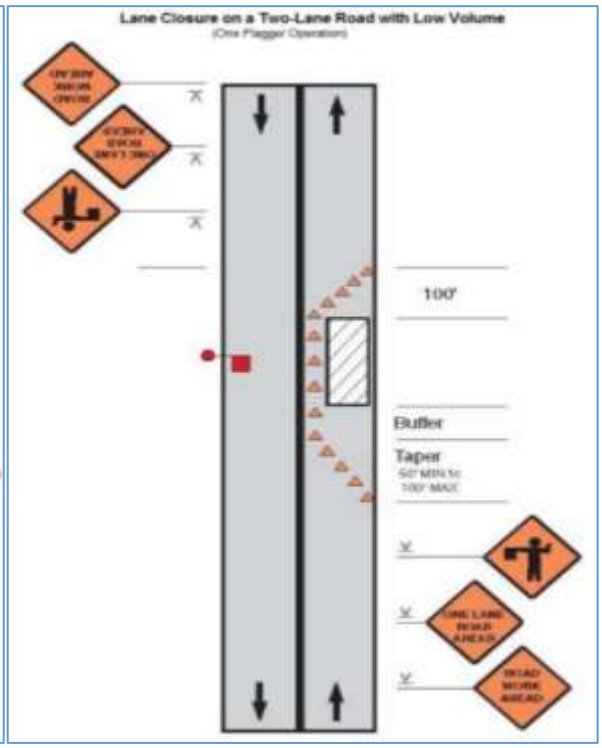


Figure A4 Work on Lane Closure with Single Flag Operator on Two Lane: Low Volume

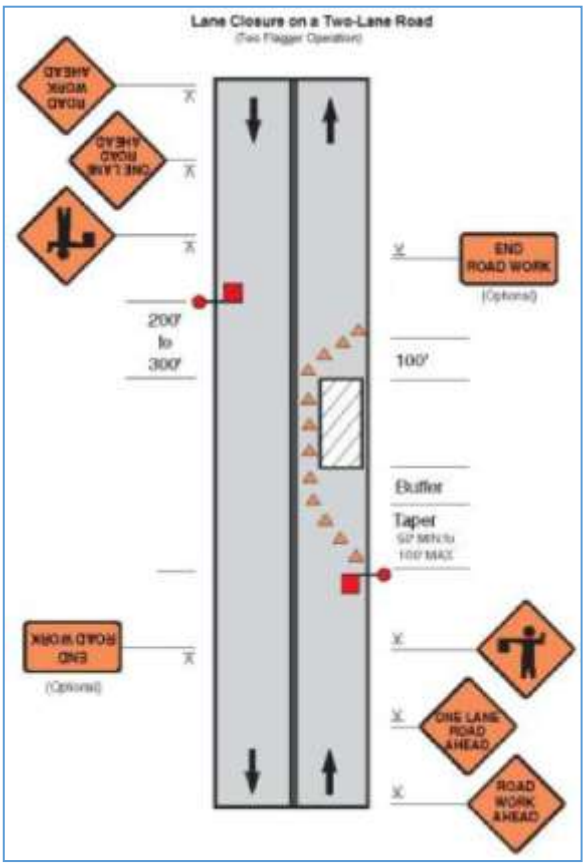


Figure A5 Lane Closure: Two Flag Operators on Two Lane Road

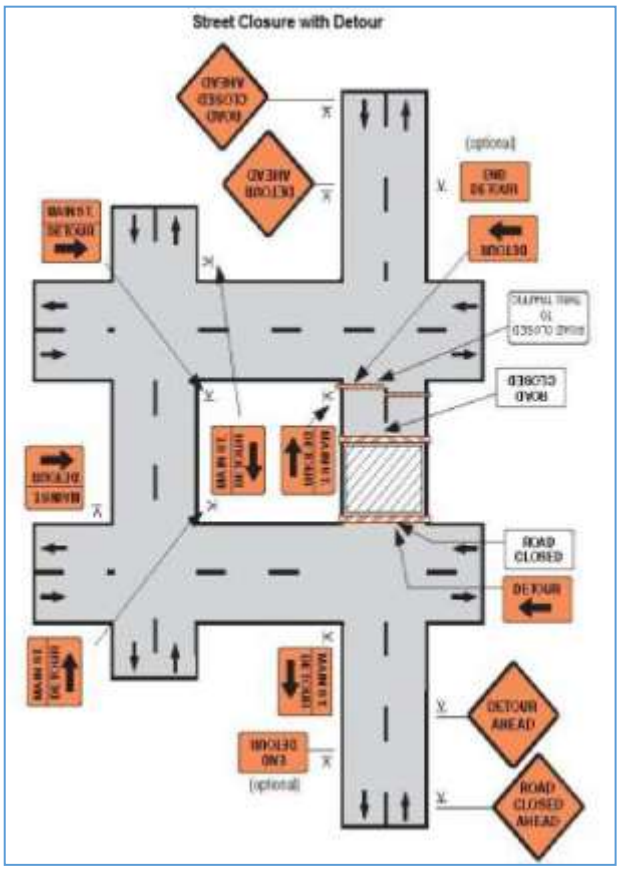


Figure A6Street Closure with Detour