Government of The People's Republic of Bangladesh
Local Government Engineering Department

Technical Assistance on Integrated Solid Waste Management Improvement Project

Preparation and Design Consultancy Services

Environment and Social Impact Assessment (ESIA)

MUNSHIGANJ MUNICIPALITY

ASIAN INFRASTRUCTURE INVESTMENT BANK

Waste Concern Consultant

IPE GLOBAL

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) OF MUNSHIGANJ SUBPROJECT

Table of Contents

List of Table:

List of Figures

List of Abbreviation

ADB	Asian Development Bank
AD	Anaerobic Digestion
AIIB	Asian Infrastructure Investment Bank
BOO	Build-Operate-Own
BOT	Build-Operate-Transfer
BMP	Best Management Practice
CBO	Community Based Organization
CDM	Clean Development Mechanism
CRDP	City Region Development Project
CSO	Civil Society Organizations
CTEIP	Coastal Towns Environmental Infrastructure Project
DAE	Department of Agriculture Extension
DIFE	Department of Inspection for Factories and Establishments
DLS	Department of Livestock Services
DED	Detailed Engineering Designs
DoE	Department of Environment
DoF	Department of Fisheries
DPHE	Department of Public Health Engineering
DSM	Design Supervision Management
EA	Environmental Assessment
ECA	Ecological Critical Area
ECA	Environmental Conservation Act
ECC	Environmental Clearance Certificate
ECoP's	Environmental Code of Practices
ECR	Environment Conservation Rules
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMIS	Environmental Management Information System
EMP	Environmental Management Plan
EMU	Environmental Management Unit
ESA	Environmental and Social Assessment
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMPF	Environmental and Social Management Plan Framework
ESMP	Environmental and Social Management Plan
ESR	Environmental Screening Report
ESS	Environmental and Social Standards
FGD	Focus Group Discussion
GAP	Gender Action Plan
GBV	Gender Based Violence
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IDB	Islamic Development Bank
IEE	Initial Environment Examination
LGD	Local Government Division
LGED	Local Government Engineering Department
ISWMIP	Integrated Solid Waste Management Improvement Project
MLGRDC	Ministry of Local Government Rural Development and Co-operatives
MOA	Ministry of Agriculture
MOE	Ministry of Energy

MOEF&CC	Ministry of Environment and Forest & Climate Change
MoPE&MR	Ministry of Power Energy and Mineral Resources
MOF	Ministry of Finance
MOI	Ministry of Information
LMP	Labour Management Procedures
NGOs	Non-Government Organizations
NOC	No Objection Certificate
OHS	Occupational Health and Safety
PA	Protected Area
PAD	Project Appraisal Document
PAU	Project Affected Unit
PMO	Project Management Office
PMU	Project Management Unit
PPE	Personnel Protective Equipment
RP	Resettlement Plan
RPF	Resettlement Policy Framework
SCC	Site Clearance Certificate
SEA	Sexually Exploitation and Abuse
SH	Sexual Harassment
SIA	Social Impact Assessment
STS	Secondary Transfer Station
SWM	Solid Waste Management
TOR	Term of Reference
ULBs	Urban Local Bodies

GLOSSARY

Adverse impact: An impact that is considered undesirable.
Ambient air: Surrounding air.
Aquatic: Growing or living in or near water.
Arsenic: Arsenic is a chemical element with symbol "As" and an atomic number 33. Arsenic occurs in many minerals, usually in conjunction with sulfur and metals, and also as a pure elemental crystal. Arsenic is a metalloid.
Bangla: Bengali language.
Baseline (or Existing) Conditions: The 'baseline' essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e., the 'No-development Option'.
Bazar: Market.
Beel: A "back swamp" or depression. It can be either perennial or seasonal.
Beneficial impacts: Impacts, which are considered to be desirable and useful.
Biological diversity: The variety of life forms, the different plants, animals and micro-organisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity
Biological Oxygen Demand (BOD): The amount of dissolved oxygen, consumed in a biological process, which degrades the organic matter in water.
Consultation: The process of seeking the views of interested or affected stakeholders and engaging them in constructive two-way dialogue.
Ecology: Science, which studies relationships and interaction between organisms and their environment.
Ecological factor: Any part or condition of the environment that influences the life of one or more organisms.
Ecosystem: A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.
Emission: The total amount of solid, liquid or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in grams per cubic meter of gas or by a relative measure, upon discharge from the source.
Endangered species: Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.
Environmental effects: The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.
Environmental enhancement: An international change, which amplifies the anticipated positive impact of the project on an environmental component.
Environmental Impact Assessment (EIA)/Environmental assessment: The systematic, reproducible and interdisciplinary identification, prediction and evaluation, mitigation and management of impacts from a proposed development and its reasonable alternatives, sometimes known as environmental assessment.
Environmental Impact: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic and human receptors.
Environmental Management Plan (EMP): A plan to undertake an array of follow-up activities which provide for the sound environmental management of a project/intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental effects are maximized; and sustainable development is ensured.
Environmental Management: Managing the productive use of natural resources without reducing their productivity and quality.
Erosion: Process in which wind and water removes materials from their original place; for instance, soil washed away from an agricultural field.

Evaluation: The process of looking back at what has been really done or accomplished.
Fauna: A collective term denoting the animals occurring in a particular region or period.
Field Reconnaissance: A field activity that confirms the information gathered through secondary sources. This field study is essentially a rapid appraisal.
Flora: All of the plants found in a given area.
Flood Plain: Areas of relatively low-lying land seasonally inundated by overspill from adjacent rivers, lakes and natural depressions.
Habitat: The natural home or environment for a plant or animal.
Household: A household is defined as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit by having separate cooking arrangements constitute separate households.
Important Environmental Component (IEC): These are environmental components of biophysical or socio-economic importance to one or more interested parties. The use of important environmental components helps to focus the environmental assessment.
Initial Environmental Assessment/ Evaluation: Preliminary analysis undertaken to ascertain whether there are sufficient likely significant adverse impacts to warrant a "full" EIA. In some countries, use of initial assessment forms a meaning of "screening" proposed projects.
Khal: Small Channel, Canal.
Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.
Mauza: A Bangla word for the smallest government administrative area corresponding to a village revenue unit.
Magnitude: The degree of change in an important environmental component that results from a project activity. It refers to the size of the impact s and could be either beneficial or adverse.
Mitigation: An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.
Natural Gas: Flammable gas, consisting largely of methane and other hydrocarbons, occurring naturally underground (often in association with petroleum) and used as fuel.
Negative Impact: Negative Change from the existing situation due to the project.
pH: pH is a measure of how acidic/basic water is. The range goes from 0 - 14, with 7 being neutral. pH of less than 7 indicate acidity, whereas a pH of greater than 7 indicates a base. pH is really a measure of the relative amount of free hydrogen and hydroxyl ions in the water.
Public involvement/ Public consultation: A range of techniques that can be used to inform, consult, or interact with stakeholders affected/to be affected by a proposal.
Reversible impact: An environmental impact that recovers either through natural process or with human assistance (e.g., cutting off fish migration by an embankment might be reversible at a later stage if a proper regulator is built).
Risk analysis: A technique used to determine the likelihood or chance of hazardous events occurring (such as the release of a certain quantity of a toxic gas) and the likely consequences.
Stakeholders: Those who may be potentially affected by a proposal e.g., local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or take an interest in it.
Social Impact Assessment: The component of EIA concerned with changes in the structure and functioning of social orderings. In particular the changes that a development would create in: social relationship; community (population, structure, stability etc.); people's quality and way of life; language; ritual; political/economic processes; attitudes/values.
Socio-economic: The human environment, which includes social and economic components that are not termed biophysical.
Sustainability: Applied to positive impacts only and could be of three different types sustainable, sustainable with mitigation and non-sustainable
Taka: Unit of Bangladeshi currency.
Terrestrial: Living on land.
Thana: Sub-district level of government administration, comprising several unions under a district.
Union: Smallest unit of local self-government comprising several villages.
Upazila: Sub-district name. Upazila was introduced in 1982.

Wildlife: Organism that can survive without any artificial help. The four general types are: mammals, amphibians, reptiles and birds.
Wildlife Habitat: An area maintained as an undisturbed breeding ground for wild fauna. The habitat is protected for the continued well-being of the resident and migratory fauna.
Zila: Bengali word of district.

EXECUTIVE SUMMARY

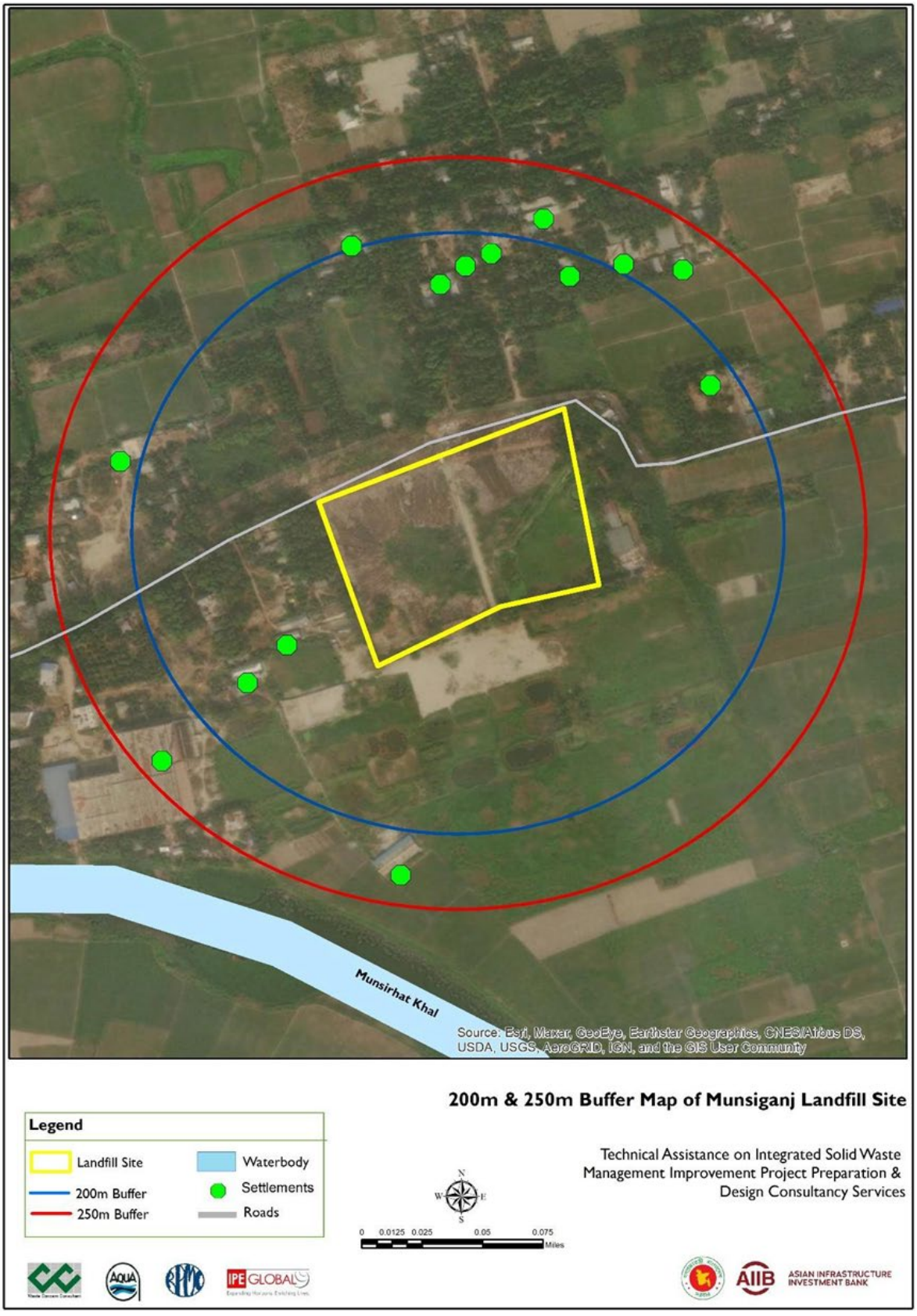
The current Integrated Solid Waste Management Improvement Project (ISWMIP), supported by the AIIB, will improve the SWM system in the selected municipal areas. This will help: (i) improve public health and quality of life by reducing exposure to pollutants and disease vectors associated with solid waste; (ii) strengthen the government's capacity to plan for and implement effective waste management services; and (iii) improve SWM practices in the country, encouraging waste minimization, recycling, and segregation at source. The project is aligned with the Government of Bangladesh (GoB)'s priorities for providing sustainable urban infrastructure. The country is, in particular, facing an immense challenge in its solid waste management. The project would directly contribute to one of the key objectives of the 8th Five Year Plan and the long-term Perspective Plan for 2021-2041, that is, to improve the urban environment and quality of life.

The subproject aims to establish an integrated landfill and resource recovery facility, improve secondary storage of waste by introducing containerized storage system, medical waste treatment facility and improve two existing roads in Munshiganj Pourashava connecting the landfill site. The land for establishing the integrated landfill and resource recovery facility is owned by the Pourashava authority. This land was acquired by the government and handed over to Munshiganj Pourashava. Currently, the land is free from any unauthorized occupancy. One existing road (Road from Munshirhat to Pourashava boundary via dumping station including 36m long RCC bridge) of 1.85 km connected to the proposed landfill area will be improved without any widening. This road is also free from any unauthorized occupancy. The project plans to construct four Secondary Transfer Stations (STSs) in the Pourashava. The proposed STSs shall be established in the sites owned by the Pourashava.

According to AIIB guidelines, the Munshiganj subproject will require a comprehensive ESIA following the ESMPF addressing the Environmental and Social Standards to ensure that the subproject is environmentally sound and sustainable. As part of the AIIB funding guidelines, an Environmental and Social Impact Assessment (ESIA) should be carried out to address the environmental and social issues of the subproject following operational procedures, policies, guidelines, and statements set by the AIIB. According to the Environmental Conservation Rules (ECR), 2023 of the Department of Environment (DoE), Bangladesh, the subproject will fall under the "**Red Category**" and is on the Red list in ECR'23 (Schedule-1, Sl-66 of Red Category: Municipality Landfill Site).

Subproject Categorization			
Sl. No.	**SWM Components**	**Category (ECR'2023)**	**Overall Assessment**
1	Landfill of Municipality	Red	Red category subproject
2	Compost Plant (>5MTs)	Orange	
3	Material Recovery Facilities (MRF)	-	
4	Refuse-Derived Fuel (RDF)	-	
5	Medical Waste Treatment Facility	Orange	

The sub-project is located at the existing landfill site of the Munshiganj Municipality, which is in Ward 9. Geographically it is located between 23.538144°north and 90.547963°east. Below, satellite images and drone images depict the location of the Munshiganj subproject. Location map of landfill site and compliance with environment rules, and location map of the integrated landfill and resource recovery facility, STSs and access road connecting the integrated landfill and resource recovery facility are shown in the maps below.



200m & 250m Buffer Map of Munsiganj Landfill Site

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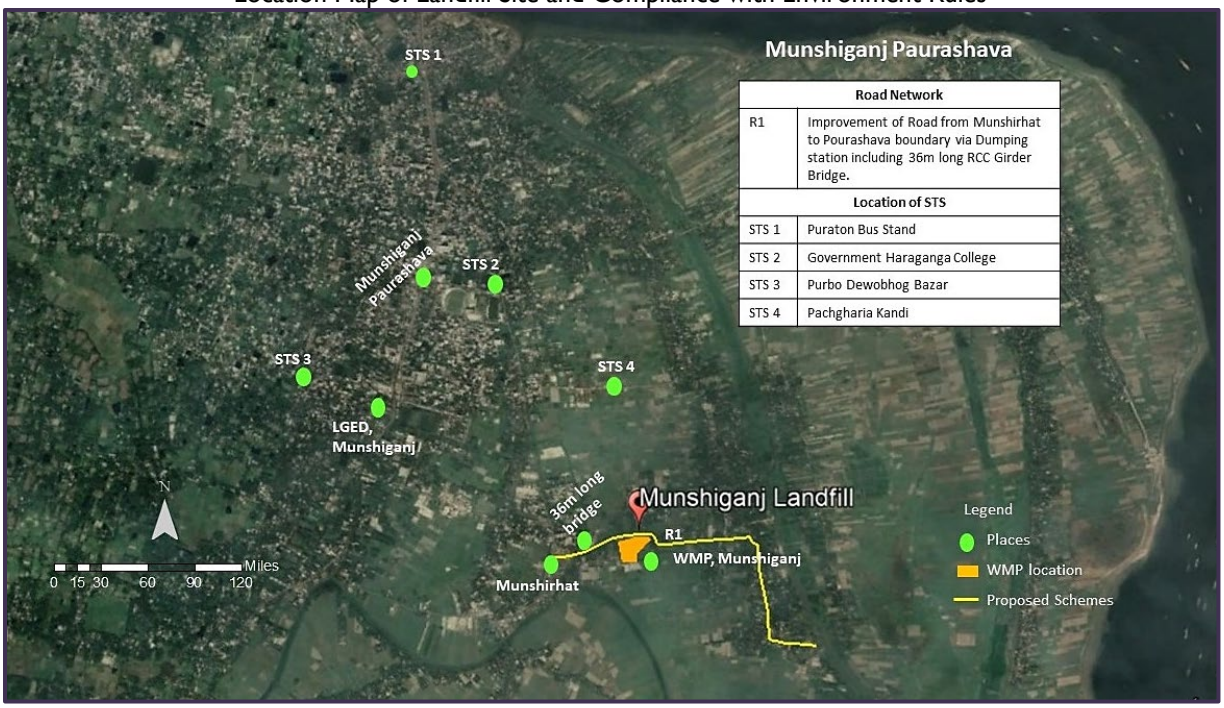
Location Map of Landfill Site and Compliance with Environment Rules



Locations of the landfill site and STSs and alignment of the connecting road for the landfill site

To improve the solid waste management situation of Munshiganj following interventions have been planned:

- Compost Plant
- Material Recovery Facility
- Landfill Cells
- Leachate Treatment Facility and
- Medical Waste Treatment Facility

The contractor and operator will be primarily responsible for preparing the Site-Specific Environmental Management Plan (SEMP) following the risks associated with the subprojects preconstruction, construction & operation stages. During construction, the contractor will be guided by the SEMP. This shall be based on the subproject's ESMP with details on staff, resources, implementation schedules, and monitoring procedures. The table below shows the environmental and social risks associated with the Integrated Solid Waste Management Improvement Project of the Munshiganj Municipality.

Subproject Activities	Environmental and Social Risk
Preconstruction Stage	
1.1 Location impacts of the plant	Nearby communities may be affected due to increased pollution during construction and operation.
1.2 Incorporation of all mitigation measures in the design	The efficiency of the plant operation.
1.3 Natural calamities	There is a threat of inundation due to flooding during monsoon due to excessive rain.
1.4 Sources of materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.
1.5 Permits, clearances, no objection certificate (NOC) etc.	Failure to obtain environmental clearance and NOCs, etc., can result in design revisions and/or stoppage of works.
1.6 Preparation of SEMP	Expect minor impacts during the construction period only and mitigation measures to be addressed.

Subproject Activities	Environmental and Social Risk
1.7 SEMP implementation training	Irreversible impact on the environment, workers, and community
Construction Stage	
2.1 Physical and Cultural Heritage	Construction works will be on the existing landfill site, thus risk for chance finds is very low.
2.2 Excavations	Potential erosion, dust generation, and accident. The impacts are negative but short-term, site-specific within a relatively small area, and reversible by mitigation measures.
2.3 Waste management	Oil, grease, etc., from construction machinery; Hazardous and solid waste from waste construction material and food; The impacts are negative but short-term, site-specific within a relatively small area, and reversible by mitigation measures.
2.4 Water quality (surface and groundwater)	Trenching and excavation, runoff from stockpiled materials, and chemical contamination from fuels and lubricants may result in silt-laden runoff during rainfall, which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area, and reversible by mitigation measures.
2.5 Soil disturbance	The construction activities may cause soil degradation problems in the areas of the plant, access road, etc.
2.6 Air Quality	Air pollution due to construction activities. The impacts are negative but short-term, impacts within a relatively small area, and reversible by mitigation measures.
2.7 Noise Level	Construction activities will be nearby settlements. A temporary increase in noise level may be caused by excavation equipment and the transportation of equipment, materials, and people. The impact is short-term and within a relatively small area, and reversible by mitigation measures.
2.8 Biodiversity	▪ Clearing of existing vegetation may result in the loss of associated ecological habitats and their fauna. ▪ Noise, vibrations, and intrusive activities related to construction works may scare away animals remaining onsite after vegetation clearance.
2.9 Socio-economic status	Manpower may be employed from the local community during the construction and operation stage. Thus, the potential impact is positive and long-term.
2.10 Provision of Worker Facilities	Inconvenience to the communities due to the presence of workers; Solid waste and sanitary discharges from worker camps.
2.11 Occupational Health and Safety	Occupational hazards can arise during work. Potential impacts are negative and long-term but reversible by mitigation measures.
	Health Risk of construction workers due to COVID-19
2.12 Community Health and Safety	Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area, and reversible by mitigation measures.
2.13 Site reinstatement	Damage due to debris, spoils, excess construction materials
Operation Stage	
3.1 Health and Safety Risks of Workers	Risk to the health of workers working in plant operation and maintenance, workers may suffer infectious diseases due to hazardous waste Workers/ operators may have accident risks in operation and maintenance of the landfill and resource recovery facility
3.2 Efficient Working of Integrated Solid waste management activities	Inefficient working of integrated solid waste management activities may cause poor quality of treatment and management of solid waste. It may cause environmental, health, and safety risk to workers and the environment.
3.3 Air Quality	The ambient air quality of the landfill Area.
3.4 Socio-economic aspect	▪ Visual impacts. ▪ Impacts on community health. ▪ Employment.
3.6 Traffic management	▪ Random parking of vehicles and unplanned loading/unloading areas can lead to traffic congestion for compost and recyclable transport

In order to identify households, businesses, and individuals affected due to the implementation of the sub-project have been identified through social surveys, field visits, consultation meetings, and observations. The list of the affected entities with livelihood impact due to the implementation of integrated landfill and resource recovery project along with the improvement of access roads is shown

below:

Social Impact Assessment in the Construction and Operation Phase of Landfill Site							
Sl No.	**Affected Entities**	**Construction Phase**			**Operation and Maintenance Phase**		**Remarks**
		No. Affected	**Compensation**	**Engaged in work**	**Engaged**	**Work field**	
1	Waste Pickers	5	√	√	√	Engage in MRF	Will be absorbed by the municipality
2	Vangari Shop	6	√	√	√	Better Livelihood	Transfer and Reconstruction Grants will be made before the construction phase
3	Affected Households (Titled Households)	9	√	X	X	To be compensated by resettlement	Based on the decision of DOE and the Municipality
4	Affected Households (Non-Titled Households)	3	√	X	X	To be compensated by resettlement	Based on the decision of DOE and the Municipality

Social Impact Assessment in the Construction and Operation Phase of One Connecting Road							
Sl No.	**Affected Entities**	**Construction Phase**			**Operation and Maintenance Phase**		**Remarks**
		No. Affected	**Compensation**	**Engaged in work**	**Engaged**	**Work field**	
1	Small Shops, Mills and Business Enterprise along the connecting road	15	√	X	X	X	Compensation payment for income loss will be made before the construction phase

For the Munshiganj subproject, the Compensation Provision under Livelihood Restoration Program has been estimated at Tk. 22,481,181 (Tk. 17,762,181 for landfill site improvement and Tk. 4,719,000 for connecting road improvement). The Project Director of ISWMIP will allocate the compensation payable, and Pourashava authority will disburse the compensation to the PAPs under the supervision of the social safeguard team of the supervision consultant of the project. A social survey was conducted in December 2022 and a road survey was conducted in June 2023. The quoted numbers regarding the affected categories are currently considered an estimate, and their numbers will be updated six months before the commencement of civil works to reflect the fluidity of the waste-picking ecosystem and the change in the commercial establishments along the connecting roads. No person will be eligible for any Livelihood Restoration Compensation after the update. During the social and road survey, GPS coordinates are taken for the affected entities. This GPS location will be used to verify and update the affected persons during compensation payment for livelihood restoration. The entitlement matrix and the project-affected persons' compensation are detailed in the livelihood restoration plan report of the Munshiganj subproject. In addition to payment of compensation to the affected persons, it is recommended to arrange capacity-building training for the affected persons along with the arrangement of health camps annually. The estimated training and health camp budget is shown in the Livelihood Restoration Plan. In addition to payment of compensation to the affected persons, it is recommended to arrange capacity-building training for the affected persons along with the arrangement of health camps annually. The estimated training and health camp budget is shown in the Livelihood Restoration Plan.

A copy of the ESMP shall be kept onsite during the construction period at all times. The ESMP shall be made binding on the contractor operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance. LGED has fully endorsed the ESMP and is committed to implementing all the mitigation measures. Munshiganj Municipality will also ensure that the work is carried out in an

environmentally acceptable manner and that the monitoring and reporting are completed in a compliant and timely fashion, acceptable to DOE.

The stakeholders are involved in developing the ESIA through discussions onsite, and public consultation, after which views expressed are incorporated into the ESIA. This ESIA will be made available to a wider audience via the Munshiganj Municipality, LGED, and AIIB websites. Free printed copies of the executive summary documents in Bangla and English will be made accessible to the general public. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the ESIA to ensure any public grievances are addressed quickly.

1. INTRODUCTION

1.1 Background

Bangladesh is one of the fastest urbanizing and most densely populated countries in the region, putting great pressure on basic urban services and infrastructure. Solid Waste Management (SWM) has been one of the major urban challenges in the country given its rapid urban growth. Despite the Government's efforts in improving the SWM system, waste collection and disposal capacity is still limited. Less than half of total waste generated is collected, while uncollected waste is often informally burned, buried, or illegally dumped in streets, public spaces, drainage channels, and waterways. This has resulted not only in public health hazards and the contamination of the environment, including air, water, and soil, but also the blocking of major drainage channels and sewerage networks.

The current Integrated Solid Waste Management Improvement Project (ISWMIP) supported by the AIIB, will improve the SWM system in the selected municipal areas. This will help: (i) improve public health and quality of life by reducing exposure to pollutants and disease vectors associated with solid waste; (ii) strengthen the government's capacity to plan for and implement effective waste management services; and (iii) improve SWM practices in the country, encouraging waste minimization, recycling, and segregation at source. The project is aligned to the Government of Bangladesh (GoB)'s priorities for providing sustainable urban infrastructure. The country is, in particular, facing an immense challenge in its solid waste management. The project would directly contribute to one of the key objectives of the 8th Five Year Plan and the long-term Perspective Plan for 2021-2041, that is to improve the urban environment and quality of life.

The GoB has received a Project Preparation Special Fund (PSF) from AIIB to support the preparation of proposed ISWMIP for consideration of USD500 million AIIB financing. The investment shall be undertaken in a phased manner with a likely investment size for Phase I of USD 150 million. The PSF is being implemented by the Local Government Engineering Department (LGED) under the Local Government Division (LGD), the Ministry of Local Government Rural Development and Co-operatives (MLGRDC).

The project will function under the overall guidance of a Steering Committee (SC) which will be chaired by the Secretary, Local Government Division (LGD), the Ministry of Local Government Rural Development and Co-operatives (MLGRDC). The SC will play a significant role in high-level decision making, ensure seamless coordination among the various governmental actors, and accelerate the implementation of the proposed activities under various components. The SC will comprise representatives from various ministries.

The LGED has adopted the ESMPF[1] findings, which lays out the requirements for the environmental and social impact assessment, environmental management plans, best management practices, and social management plans, for the ULBs where sites for ISWM are finalized and for the ULB areas once the ISWM areas are identified. This ESIA report of Munshiganj Municipality has been prepared following the ESMPF policies, guidelines and procedures to be integrated into the design and implementation of component 1, 2, 3 & 4 respectively, under the proposed project.

1.2 ISWMIP Components

The ISWMIP has four components as mentioned below:

- ***Component 1: Waste Collection and Transportation.*** This will help improve and optimize solid waste collection and transport services in selected Urban Local Bodies (ULBs), including collection containers and fleet, mechanical cleaning equipment, and transfer stations etc.
- ***Component 2: Waste Processing and Disposal Systems.*** This will finance prioritized waste processing and disposal infrastructure, including closure of polluted landfill sites, construction

[1] LGED would like to express its deepest appreciation to all those who have provided the support and cooperation in completing the ESMPF report. A special gratitude is being conveyed to the concerned officials of AIIB for their invaluable cooperation and continued sharing of information. Further, it's a matter of gratefulness to put on record the services so kindly extended by Consulting Firms and others involved in the ESMPF study.

and rehabilitation of engineered sanitary landfills (standalone or regional/ clustered), and provision of facilities related to composting, resource recovery and waste-to-energy.

- ***Component 3: Project Management and Supervision Support.*** This will support in the areas of project management, monitoring and evaluation, procurement, financial management, and environmental and social safeguards (including public awareness campaigns and public consultation), and provision of support with respect to supervision and maintenance of infrastructure investments.
- ***Component 4: Policy Support and Capacity Building.*** This will support: (i) improvement of the SWM sector policy and legal framework; (ii) policy and guideline development related to waste minimization and recycling, private sector participation, inclusion of informal workers, and multi-jurisdictional waste management; and (iii) institutional capacity strengthening for relevant central and local agencies in SWM.

1.3 Scope of the ESIA

The detailed scope of the ESIA study is as outlined below:

- Screening of the subproject based on applicable Environmental and Social Management Planning Framework (ESMPF) based on reconnaissance survey and field-based assessment of AIIB's Environmental and Social Standards (ESSs) of the Environmental and Social Framework (ESF);
- Scoping for the ESIA study by identifying the applicable ESSs;
- Development of a regulatory, policy and administrative framework relevant to the subproject;
- Monitoring, analysis and reporting of the environmental and social baseline data of the study area including consultation with local communities and other stakeholders;
- Assessment of the environmental impacts of the subproject in the study area;
- Assessment of social impacts on the local community as well as subproject affected people (if any) and any other stakeholders, which have been identified during the social consultation process;
- Identification of potential risks and hazards including environmental, socio-cultural, public health hazards due to the development of Munshiganj subproject;
- Formulation of an Environment and Social Management Plan and associated/specific mitigation plans for identified impacts and effective risk management especially for the protection of the natural environment of the subproject area; and
- Formulation of Stakeholder Consultation and Grievance Redress Mechanism for the subproject.

1.4 Approach and Methodology of the ESIA Study

1.4.1 Categorization of the Subproject

According to the Environmental Conservation Rules (ECR), 2023 of the Department of Environment (DoE), Bangladesh, the subproject will fall under "**Red Category**" and it on the Red list in ECR'23(Schedule-1, Sl-66: Municipality Land-filling Site). Therefore, it is mandatory to conduct an Environmental Impact Assessment (ESIA) for obtaining an environmental clearance certificate. The EIA approval from the DoE has been obtained. According to AIIB, this subproject will require a comprehensive ESIA following the ESMPF addressing the three Environmental and Social Standards to ensure that the subproject is environmentally sound and sustainable. There is difference in subproject categorization as per AIIB, ESS and GOB rules (ECR-2023).

1. Scoping

Scoping was done for:

- Categorization of the subproject according to ECR '23 and the AIIB ESSs.
- Identifying and procuring institutional information.

- Information collection through discussions/meetings with AIIB, LGED, Munshiganj Municipality etc. to define scope for the impact assessment,
- Planning and implementation of mitigation and monitoring,
- Confirmation of the applicability of the performance standards set forth by the AIIB as requirements of the ESS.
- Confirmation whether Resettlement Action Plan (RAP) or voluntary dispossession or negotiated settlement is required.

2. Statement of Works

The environmental and social screening of Munshiganj subproject was performed and the basis of the screening was –

- Desk review of the relevant documents and available imagery of the subproject site and its surroundings,
- Reconnaissance survey of the site, surrounding areas, approach road and informal discussions with local stakeholders,
- Discussions with AIIB, LGED, Munshiganj Municipality, design consultants of the client and Department of Environment (DoE) to update the regulatory requirements and formats/ methods, etc.

3. Reconnaissance Survey and Data Collection Scheming

- A reconnaissance survey of the site and the surrounding area was conducted in May 2022 to ascertain the extent of the study area and to identify the studies to be conducted to fulfill the requirements of the ESIA.
- Relevant information about the subproject area were gathered through detailed physical survey and measurement of environmental parameters as necessary.
- Additional information was collected from published literature and previous ESIA reports.
- In addition, data and information were also collected from different government and non-government organizations.

4. Baseline Data Collection

An environmental and social baseline survey have been carried out to gather information on the existing physicochemical, biological, and socio-economic environment of areas surrounding the proposed area. These data collection campaign was as follows:

- Identification of the monitoring locations for air, water and noise for sensitive receptors, and at key locations for water intake and outfall, etc.;
- The baseline data collection, monitoring and analysis for environmental parameters was completed during the period from end of December 2022;
- Socio-economic data collection and consultations were carried out in December 2022;
- Secondary data was also collected from different government departments, local bodies and through literature surveys etc.;
- Stakeholder consultation was completed with the intent of collecting baseline information on the environmental and social conditions and sensitivities, developing a better understanding of the potential impacts, informing the public of the proposed subproject and to gain an understanding of the perspectives/concerns of the stakeholders; and
- Environmental and Social Auditing were done in November 2022.

5. Impact Assessment and Mitigation Measures

- Analysis of the baseline results and the incremental impacts of the subproject were assessed in accordance with the Bangladesh national guidelines for air, water and noise emissions; standards stipulated in the Environment Conservation Rules (ECR), 1997 and amendments thereof and with reference to the AIIB's Environmental and Social Standards, AIIB's Safeguard Policies, IFC's Environmental, Health and Safety (EHS) Guidelines, including the General Guidelines;
- The impact assessment involved the prediction and evaluation of impacts from the subproject in different phases, including site preparation, construction and operation phase, decommissioning of subproject and included consideration of mitigation measures towards the same;
- Impact prediction covered residual impacts (impacts remaining after all possible mitigations have been incorporated) and took into account control measures that are part of the subproject design (e.g., acoustic enclosures for major equipment). Additional measures aimed at further avoiding, minimizing and mitigating predicted impacts were proposed where necessary or appropriate;
- Impact assessment also involved risk assessment covering hazard identification, consequence analysis and risk reduction measures and recommendations; and
- Impacts have been further classified as insignificant, minor, moderate or major based on the criteria for rating of impacts.

6. Analysis of Alternatives

Analysis of alternative options was considered to minimize impacts of the subproject while undertaking the ESIA study. The alternative options assessed in the study ranged from technology, transportation methods, subproject site and operations, including the no subproject alternative. Alternatives are considered in terms of their potential environmental impacts, the feasibility of mitigating these impacts alternatives for mitigation measures for high residual impact/risk, if any etc.

7. Management Plans and Grievance Redress Mechanism

- Environmental and Social Management Plan (ESMP) were developed for the mitigation measures suggested and included defined roles and responsibilities for implementation;
- A Grievance Redress Mechanism (GRM) was developed by the consultant to address any complaints and concerns from all stakeholders;
- Based on the risk assessment, risk reduction measures and recommendations for a WMP, CMP, LMP, TMP, BMP were also developed; and
- ESMP also addressed the institutional review, finalization of ESMP and grievances.

8. Information/Data Sources

Key relevant information sources have been summarized in Table 1.1

Table1-1 Key Data Sources

Parameters	Information sources	Remarks
Subproject Background, Technical details on subproject and associated components	▪ Subproject specification documents from Munshiganj Municipality ▪ Subproject Execution milestones, Landfill layout, Solid waste management system	Munshiganj Municipality provided other information required during the course of the study
Study area features and sensitivities	▪ Ground physical survey ▪ Satellite images ▪ National web portal of Bangladesh ▪ Primary data collection	Details of the satellite data used is included in baseline chapter

Parameters	Information sources	Remarks
Legal framework	▪ Department of Environment ▪ IFC and AIIB documents ▪ DOE ESIA Guidelines	In discussion with the DOE and local Govt. departments, AIIB and LGED
Land use /Land cover Details, Meteorology and climatic conditions	▪ Ground Physical Survey ▪ Bangladesh Meteorological Department ▪ Observatory Surface Meteorological Data	Details of the satellite data used is included in Baseline chapter, Pre-subproject land use data are collected from subproject personnel and local people.
Geology, Topography, Hydrology and Drainage	▪ Munshiganj Subproject Location Map, previous EIA reports of the project area ▪ Bangladesh Water Development Board ▪ Web portal of National Encyclopedia of Bangladesh (Banglapedia)	Field Observations
Natural hazards	▪ Web portal of National Encyclopedia of Bangladesh (Banglapedia) ▪ Bangladesh Meteorological Department	Included in consultation with Locals
Environmental baseline as Air quality, water quality, soil and sediment quality	▪ Primary data collection ▪ Applicable Standards from DoE, Bangladesh	Monitoring was completed from December 2022.
Ecological parameters	▪ Primary and Secondary data collection, observations, surveys and local consultations ▪ Websites of birdlife international ▪ IUCN Data base	Data collection was carried out in the month of December 2022. Endangered and critical status were checked from the website: www.iucnredlist.org
Social-economic parameters	▪ Primary data collection surveys, extensive consultations, meetings and discussions held with stakeholders ▪ Bangladesh population Census for 2011 ▪ Fisheries Census data ▪ Land Regulation Policy, Bangladesh ▪ Web portal of National Encyclopedia of Bangladesh (Banglapedia)	Primary socio-economic survey was carried out in month of December 2022. Details provided in baseline environmental and social conditions chapter.

1.5 Structure of the ESIA Report

The ESIA report has been prepared following the ESMPF as well as ECR 1997. The report is divided into ten (10) chapters to cover all key issues comprehensively. The report structure is as follows:

Chapter 1 of this ESIA report describes the background and objectives of the subproject. It also presents an outline of the methodology followed for carrying out ESIA.

Chapter 2 presents an overview of policy, legal and administrative framework relevant to the subproject.

Chapter 3 presents a detail description of the subproject including the major activities to be carried out during both construction and operation phases of the subproject.

Chapter 4 presents baseline information, identification and assessment of the potential environmental, ecological and socio-economic impacts of the proposed subproject, both during construction and operation phases, as well as environmental and social audit of existing industries.

Chapter 5 presents the alternative options for the proposed subproject.

Chapter 6 presents the potential impacts identification and assessment including the mitigation measures for enhancement of positive impact and reduction or elimination of negative impacts.

Chapter 7 presents the information disclosure along with outcome of public consultations and communications carried out as a part of the environmental assessment.

Chapter 8 presents the Environmental and Social Management System (ESMS), including the Environmental and Social Management Plan (EMP) and the Monitoring Plans for both construction and operational phases along with the GAP, OHSMP, GBV, WMP, CMP, LMP, TMP, BMP.

Chapter 9 Grievance Redress Mechanism of the subproject containing the mechanism process, intake channel, registry, referral, resolution & appeals process, GRM monitoring & reporting etc.

Chapter 10 of the ESIA report presents the conclusions of the environmental assessment of the proposed subproject.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

The proposed Integrated Solid Waste Management Improvement Project will be implemented in compliance with applicable national environmental laws and regulations. Bangladesh has a wide range of laws and regulations related to environmental protection, natural resources conservation as well as social issues, which are mostly cross-sectoral and would be applicable to the proposed project. The Asian Infrastructure Improvement Bank (AIIB) also has certain Social and Environmental safeguard policies, which needs to be adhered to for the purpose of the implementation of this project. This section presents an overview of the major national environmental, social and solid waste management laws, policies and regulations that are relevant and may apply to activities supported by the project, institutional arrangement and national and sub-national level, and AIIB safeguard policies.

2.2 National Environmental and Social Laws, Rules, Policies and Guidelines

Table 2-1: List of Applicable National E&S Laws, Rules, Policies and Guidelines

Sl. No.	Policies/Act/Rules	Key provisions and purpose	Applicability to the sub-projects/LGED
1.	Bangladesh Environmental Conservation Act (ECA), 1995	This umbrella act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. According to this act (Section 12), no industrial unit or project shall be established or undertaken without obtaining, in a manner prescribed by the accompanying Rules, an Environmental Clearance Certificate (ECC) from the Director General of DoE.	Yes, sub-projects have to get ECC.
2.	Bangladesh Environmental Conservation Rules (ECR), 2023	The rule 5 classifies industrial units and projects into four categories depending on environmental impact and location for the purpose of issuance of ECC. These categories are: Green, Yellow, Orange and Red. The ECR 2023 describes the procedures for obtaining Environmental Clearance Certificates (ECC) from the Department of Environment for different types of proposed units or projects.	Yes, LGED sub-projects will fall under Red category, hence require ESIA approved by the DoE and have to deposit prescribe fees according to the schedule 7 to obtain ECC.
3.	Bangladesh Environment Court Act, 2010	Bangladesh Environment Court Act, 2010 has been enacted to resolve the disputes and establishing justice over environmental and social damage raised due to any development activities.	According to this act, government can take legal actions if any environmental problem occurs due to ISWMI subproject interventions.
4.	The Protection and Conservation of Fish Act (1950)	This act provides power to the government to: make and apply rules to protect fisheries; prohibit or regulate erection and use of fixed engines; and construction of temporary or permanent weirs, dams, bunds, embankments and other structures.	Yes, as the sub-projects includes waste collection and transportation, waste processing and disposal systems etc. which has potential risk for air and water pollution, habitat alternation, hinder of natural flow/migration.
5.	Protection and Conservation of Fish Rules (1985)	Section 6 states, "No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters.	Yes, during construction and operation of the sub-projects.
6.	Bangladesh Wildlife (Protection and Preservation) Act 2012	The act protects 1,307 species of plants and animals, including 32 species of amphibian, 154 species of reptile, 113 species of mammal, 52 species of fish, 32 species of coral, 137 species of mollusk, 22 species of crustacean, 24 species of insect, six species of rodent, 41 species of plant and 13 species of orchid. Of these, eight amphibian, 58 reptile, 41 bird, and 40 mammal species are listed as endangered in the IUCN Red Data Book (2000, updated in 2015).	Yes, the sub-projects area might have presence of these listed threatened animals.

Sl. No.	Policies/Act/Rules	Key provisions and purpose	Applicability to the sub-projects/LGED
7.	Biodiversity Act, 2017	It provides for the creation of the National Committee and the Biodiversity Management and Surveillance Committees at local levels (i.e. districts, upazilas, municipalities and unions). In general, all these committees are mandated to: assist the Government in implementing the National Biodiversity Strategy and Action Plan (NBSAP) and to visit the biodiversity enriched areas in their respective territories; and, monitor the progress of implementation of the NBSAP.	Yes, all sub-projects need to include these local committees, so that they can monitor project impact on the local biodiversity.
8.	Forest Act 1927 (Amendment 2000)	The act empowers the government to regulate the felling, extraction, and transport of forest produce in the country.	Yes, sub-projects will include felling of trees and social forestry.
9.	Embankment and Drainage Act, 1952	The act consolidates the laws relating to embankments and drainage providing provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion or other damage by water.	Yes, sub-projects will include interventions in the water bodies, construction of bridges, ghats, etc.
10.	Bangladesh Water Act, 2013	As per this act, all forms of water (e.g., surface water, ground water, sea water, rain water and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people. Without prior permission issued by the executive committee, no individuals or organizations will be allowed to extract, distribute, use, develop, protect, and conserve water resources, nor they will be allowed to build any structure that impede the natural flow of rivers and creeks.	Yes, LGED is permitted to implement water projects covering impact area below 1000 hectare (<1000 ha).
11.	Bangladesh Labor Act, 2006	It provides the guidance of employer's extent of responsibility and workmen's extent of right to get compensation in case of injury by accident while working.	Yes, sub-projects require substantial labor from local and external areas.
12.	Bangladesh National Building Code, 2006	The BNBC clearly sets out the constructional responsibilities according to which the relevant authority of a particular construction site shall adopt some precautionary measures to ensure the safety of the workmen. The Code also clarifies the issue of safety of workmen during construction.	Yes, sub-projects will include construction of STS, Landfill Sites, etc.
13.	The Noise Pollution Control Rules, 2006	The Noise Pollution Control Rules have been established in order to manage noise generating activities which have the potential to impact the health and wellbeing of workers and the surrounding communities.	Yes, many activities of sub-projects will be performed under the densely populated areas.
14.	Road Transport Act, 2018	The new Road Transport Act 2018 has finally come into effect at the start of November. After the long-standing Motor Vehicle Ordinance of 1983, the new act introduces a myriad of updated laws and adds new definitions for what constitutes an offence, with most of the fines and punishments receiving major bumps.	Yes, sub-projects will use heavy vehicles, deploy drivers and operators of machineries.
15.	Solid Waste Management Rules 2021	These rules require (i) source segregation of waste into dry and wet waste, (ii) standards for composting, (iii) an-aerobic digestion and waste-to-energy projects, (iv) guidelines for landfilling, and (v) standards for the placement of secondary storage bins, and primary and secondary collection of waste. Promotion of 3Rs, site selection criteria for landfills, recycling plants, and applicable environmental standards are typically articulated by MoEF&CC. For landfill site selection and construction of large-scale organic waste recycling plants, an environmental impact assessment would also be overseen by the environmental agency. MoEF&CC also monitors the local government's performance for compliance of such rules and environmental regulations.	Yes, Subproject will be well guided by the SWM rules.
16.	Rules for Removal of Wrecks and Obstructions in inland	Rules for removal of wrecks and obstructions	Yes, if obstruct natural canals/rivers or any other natural water ways

Sl. No.	Policies/Act/Rules	Key provisions and purpose	Applicability to the sub-projects/LGED
	Navigable Water Ways (1973)		(includes seasonal water bodies).
17.	The Water Supply and Sanitation Act (1996)	Regulates the management and control of water supply and sanitation in urban areas.	Yes, sub-projects will include construction of water supply and sanitation facilities
18.	The Ground Water Management Ordinance (1985)	Describes the management of ground water resources and licensing of tube wells	Yes, construction sites of the sub-projects may require deep tube wells for meeting up water use.
19.	The Antiquities Act (1968)	Describes the preservation of cultural heritage, historic monuments and protected sites	Yes, sub-projects areas may have elements of cultural, historic and protected value.
20.	Acquisition and Requisition of Immovable Property Act, 2017	The principal legal instrument governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property.	Yes, both acquisition and requisition of land, and other properties would require by the sub-projects.

2.3 Environmental and Social Policy of AIIB

The AIIB Environmental and Social Framework (ESF), 2016 (AIIB, 2016) (Amended February 2019 and May 2021) provides an overview of the AIIB concerning (a) environmental and social sustainability; and (b) its role in meeting the challenge of sustainable development in Asia. The complete objectives of development are framed within the ESF in terms of both local impacts, and global challenges, especially in climate change. The ESF provides general specifications, standards and objectives that clients should adhere to during project preparation and implementation. Thus, the ESF attaches importance to country regulatory systems as sources of legally binding procedures and standards.

The Environmental and Social Policy (ESP) in the ESF comprises essential environmental and social requirements for each project and is accompanied by:

(a) Three associated mandatory Environmental and Social Standards (ESSs) setting out requirements applicable to clients on, respectively,

i. ESS-1: Environmental and Social Assessment and Management,

ii. ESS-2: Land Acquisition and Involuntary Resettlement and

iii. ESS-3: Indigenous Peoples;

(b) An Environmental and Social Exclusion List (ESEL); and

(c) A Glossary of certain terms used in the ESP and ESSs.

The three ESSs mentioned in the ESP are, ESS 1: implementation of environmental and social assessment and management, ESS 2: prevent/minimize involuntary resettlement and ESS 3: protection of vulnerable/indigenous people. These standards require clients to implement structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. Together, the ESP and the ESSs comprise an environmental and social management approach designed to:

i. Ensure environmental and social screening and categorization,

ii. Analyze future project environmental and social threats, and impacts;

iii. Identify measures to prevent, reduce, mitigate, cover or make up for project environmental and social impacts;

iv. Provide a process to consult the public on environmental and social risks and impacts of projects and to disclose information.

The AIIB classifies all its projects into four categories.

- The project is categorized as Category A if it is likely to have significant adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented and requires the client to conduct an Environmental and Social Impact Assessment (ESIA) with Environmental and Social Management Plan (ESMP).
- A project is categorized as Category B when: it has a limited potentially adverse environmental and social impacts; the impacts are not unprecedented; few if any of them are irreversible or cumulative; they are site-specific; and can be successfully managed using good practice in an operational setting and requires clients to conduct an initial review of the environmental and social implications of the Project.
- A project is categorized C when it is likely to have minimal or no adverse environmental and social impacts and the client is required to prepare a review of the environmental and social aspects of the Project.
- A project is categorized FI if the financing structure involves the provision of funds to a financial intermediary (FI) for the project, whereby the bank delegates to the FI the decision-making on the use of the bank funds, including the selection, appraisal, approval and monitoring of bank-financed subprojects. The bank requires the FI to develop and apply an appropriate ESMS that is proportional to the environmental and social risks associated with the bank-supported portfolio, is consistent with this ESP, excludes from bank support activities covered in the ESEL and incorporates applicable provisions of the ESSs.

AIIB requires the client to establish, in accordance with the ESP and applicable ESSs, a suitable grievance mechanism to receive and facilitate resolution of the concerns or complaints of people who believe they have been adversely affected by the project's environmental or social impacts, and to inform project-affected people of its availability. People who believe they have been or are likely to be adversely affected by a failure of the Bank to implement the ESP may also submit complaints to the bank's oversight mechanism in accordance with the policies and procedures to be established by the bank for such mechanism.

ESF 2016 (amended in 2019) has also provisions for identify measures to avoid, minimize, or mitigate potentially adverse impacts on and risks to physical, biological, socioeconomic and cultural resources, safety of both workers and affected community and natural resources during the design, construction, operation, and decommissioning of the project.

All AIIB funded investment project financing are required to follow the Environmental and Social Framework (ESF) consisting three (3) Environmental and Social Standards (ESS). These ESSs set out their requirement for the borrowers relating to the identification and assessment of environmental and social risks and impacts associated with any project. The ESSs supports the borrowers in achieving good international practice relating to environmental and social sustainability, assist them in fulfilling their national and international environmental and social obligations, enhance transparency and accountability and ensure sustainable development outcome through ongoing stakeholder engagement.

2.4 Environmental Clearance Process

The ECR, 2023 provides a basic framework for environmental evaluation of proposed projects in all sectors and establishes procedures. Accordingly, the project proponent should first obtain a location clearance and conduct the appropriate study to obtain environmental clearance of the project. Any project constructed in Bangladesh must obtain an Environmental Clearance Certificate (ECC) before its operation.

Similar to Environmental Screening process of the projects, Rule 5 of ECR has classified the projects into following four categories based on the site conditions and the impacts on the environment. The projects are categorized under four categories they are: Green, Yellow, Orange and Red. Various industries/projects falling under each category have been listed in schedule-1 of the ECR. According to the Rules of the ECC to all existing and proposed industrial units and projects, which are falling in the green category without undergoing EIA. However, for category Yellow, Orange and for Red

projects require location clearance certificate and followed by issuing of ECC upon the satisfactory submission of the required documents.

For getting location and environmental clearances, the project proponent of concerned project should apply to the concerned Divisional Officer of DoE by filling Form-3 as per the rules given in the ECR. They should accompany with the following documents:

- Application through prescribed form-3 under ECR 2023
- Prescribed fee under the schedule of ECR 2023
- Report on Feasibility of the industrial unit or project
- Initial Environmental Examination (IEE) Report or EIA as per the Terms of Reference Provided by the DoE
- EMP for the proposed project
- No Objection Certificates (NOC) from the Local Authorities.
- Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution
- Outline of Relocation and rehabilitation plan
- Other necessary information (based on the type of the project)

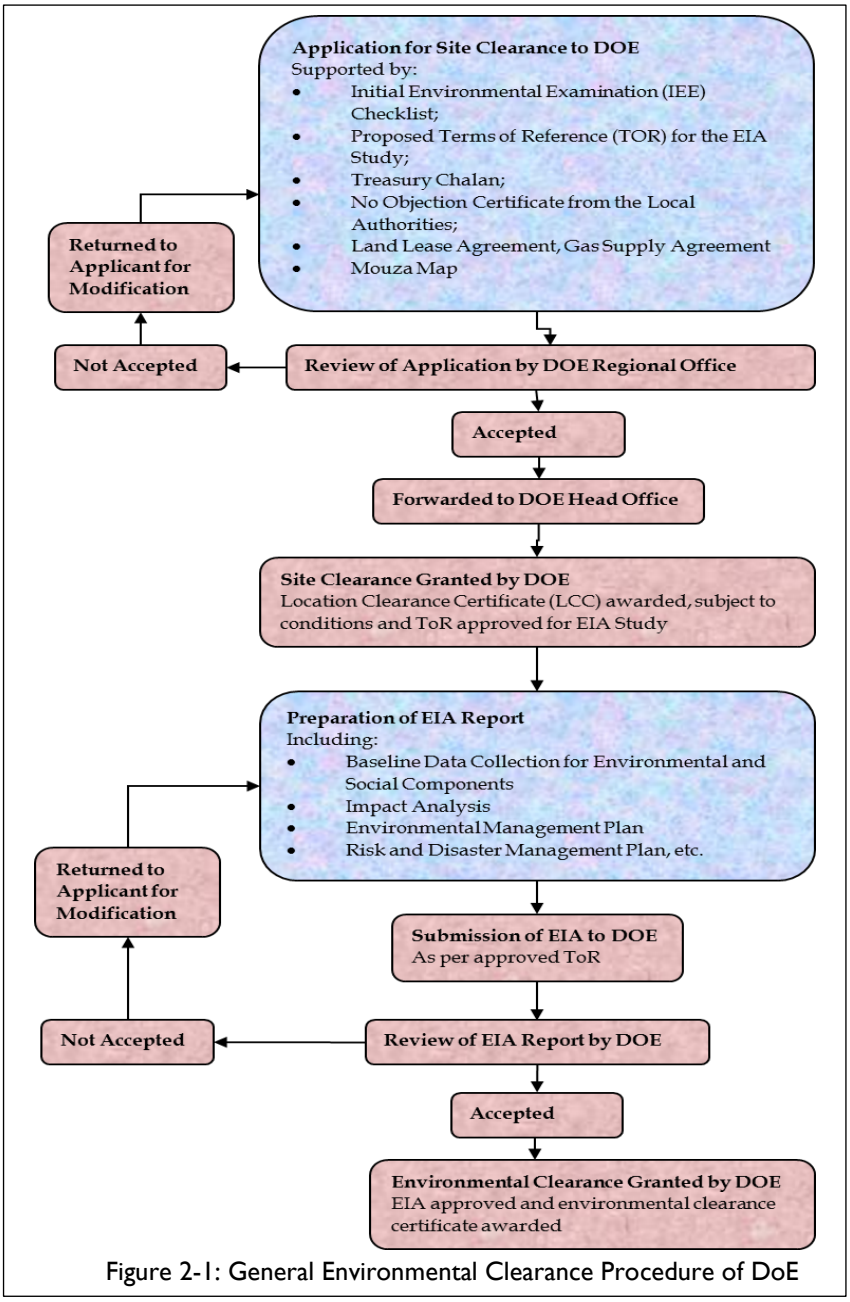


Figure 2-1: General Environmental Clearance Procedure of DoE

The environmental clearance is one-year validity for the projects which come under the Red Category. The environmental clearance process as per the DoE, Ministry of Environment and Forests, Government of Bangladesh is shown in Figure 2-1.

As part of the ECC application, a detailed IEE/ EIA with EMP satisfactory to the DoE must be prepared. The project is considered to have some negative environmental impacts. Therefore, the project requires having an EIA Report along with EMP which has to be accepted by DoE as part of the LCC & ECC Issuance. Under the ECR 2023, DoE has 30 days to respond after reviewing documents from the receipt of the ECC application for a Red category project. Submission of any further materials would be carried out, as per requirement of DoE toward obtaining the LCC and ECC. Steps to be followed for obtaining the ECC for this SWM project are shown in Figure-2.1. Additionally, Detailed Flow Diagram for ECC for Red Category Projects is shown as below Figure-2.2.

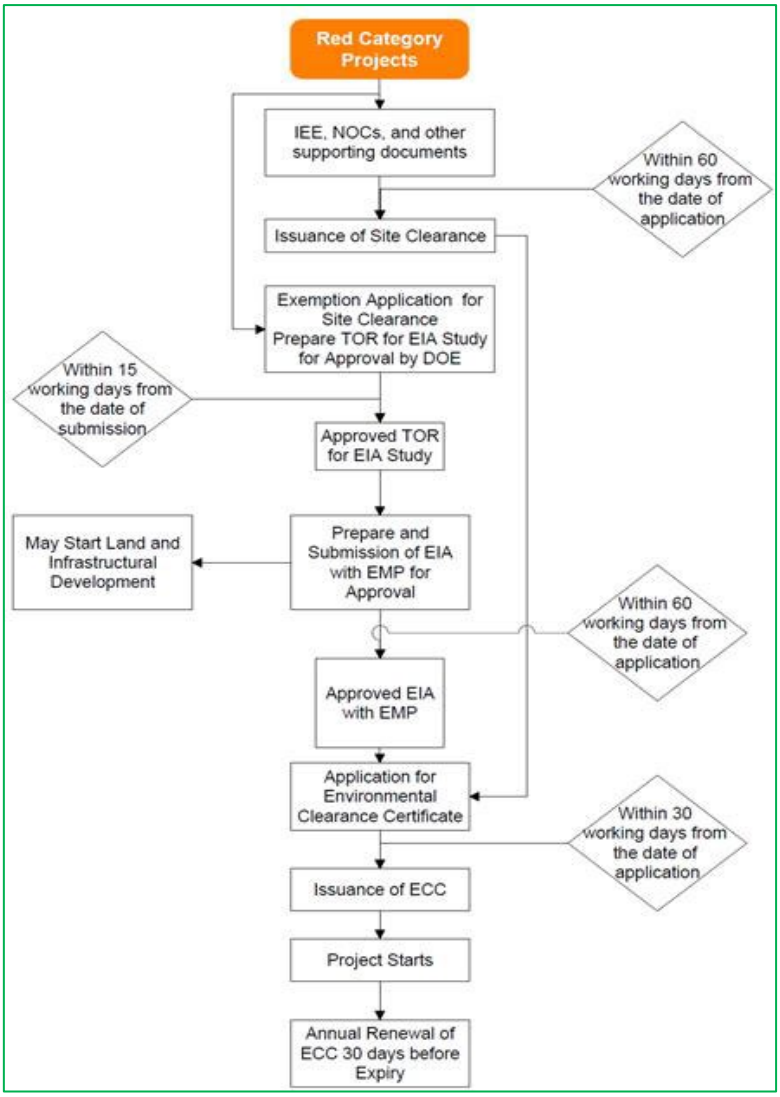


Figure 2-2: Environmental Clearance Procedure for Red Category Subproject

In addition to ECA 1995 and ECR 2023 there are a number of other policies, plans, and strategies, which need to be considered in the project. The detailed description of all these relevant legislations is provided afterward in section 2.2 of this report.

2.5 Munshiganj subproject Category as per ECR 2023

In the first week of March 2023 the ECR 2023 has been gazette and published for the use of the project works Bangladesh. This Munshganj subproject has landfill site; compost plant (>5MTs); Pyrolysis and Material Recovery Facilities (MRF). According to the Environmental Conservation Rules (ECR), 2023 of the Department of Environment (DoE), Bangladesh, the subproject will fall under "Red Category" and it on the Red list in ECR'23 (Schedule-1, Sl-66 of Red Category: Municipality Landfill Site).

Table 2-2: Category of Munshiganj Subproject

Subproject Categorization			
Sl. No.	**SWM Components**	**Category (ECR'2023)**	**Overall Assessment**
1	Landfill of Municipality	Red	Red category subproject
2	Compost Plant (>5MTs)	Orange	
3	Material Recovery Facilities (MRF)	-	
4	Refuse-Derived Fuel (RDF)	-	
5	Medical Waste Treatment Facility	Orange	

2.6 Applicable Environmental Standards and Guidelines

The following quality standard of compost mentioned in the Table 2.1 should be ensured for safe use of compost.

Table 2-3: Physical Properties of Compost

SL No.	Parameters	Standard
1	Color	Dark brown to black
2	Physical condition	Non-granular form
3	Odor	Absence of foul odor
4	Moisture Content	Maximum 20%
5	Inert materials	Maximum 1%

Table 2-4: Chemical Properties of Compost

SL No.	Parameters	Standard
1	pH	6.0 - 8.5
2	Organic Carbon	10 – 25%
3	Nitrogen, N	0.5 – 4.0%
4	Carbon and Nitrogen ratio (C:N)	Maximum 20:1
5	Phosphorus, P	0.5 – 3.0%
6	Potassium, K	0.5 – 3.0%
7	Sulfur, S	0.1 – 0.5%
8	Zinc, Zn	Maximum 0.1%
9	Copper, Cu	Maximum 0.05%
10	Chromium, Cr	Maximum 50 ppm
11	Cadmium, Cd	Maximum 5 ppm
12	Lead, Pb	Maximum 30 ppm
13	Nickel, Ni	Maximum 30 ppm

Note: Final products of compost will not be used in food grain production if the above-mentioned parameters values exceed the standard values but these products can be used in other crops.

Standard Quality of Treated Leachate

Table 2-5: Discharge Standards for processed solid waste

SL. No	Parameters	Unit	Standard (At source) (Maximum limit except pH)	
			Inland Ground Water	Sewerage drain
1	pH	-	6 - 9	6 - 9
2	BOD_5 at 20^0C	mg/l	30	250
3	COD	mg/l	250	-
4	Suspended Solids (SS)		100	600
5	Total Dissolved Solids (TDS inorganic)	mg/l	2100	2100
6	Ammoniacal Nitrogen	mg/l	50	50
7	Total Kjeldahl Nitrogen	mg/l	100	-
8	Arsenic, As	mg/l	0.2	0.2
9	Mercury, Hg	mg/l	0.01	0.01
10	Lead, Pb	mg/l	0.1	1.0
11	Cadmium, Cd	mg/l	2.0	1.0
12	Total Cr	mg/l	2.0	2.0
13	Copper, Cu	mg/l	3.0	3.0
14	Zinc, Zn	mg/l	5.0	15.0
15	Nickel, Ni	mg/l	3.0	3.0
16	Cyanide, CN	mg/l	0.2	2.0
17	Cl^-	mg/l	1000	1000
18	F^-	mg/l	2.0	1.5
19	Phenol (also called carbolic acid) C_6H_5OH	mg/l	1.0	5.0

Emission Standard of Solid Waste Incinerator

Table 2-6 Stack Emission Standard from incineration

SL. No.	Parameters	Average Time	Maximum Presence Limit (mg/Nm^3)
1	Particulate matter	1 hour	30
		24 hours	20
2	Carbon Monoxide	1 hour	100
		24 hours	80
3	Nitrogen Oxide	1 hour	300
		24 hours	250
4	Sulfur Dioxide	1 hour	100
		24 hours	80
5	HCL	1 hour	60
		24 hours	50
6	Mercury	0.5-8 hour	0.05
7	Cadmium and Thallium	0.5-8 hour	0.1
8	Antimony, As, Pb, Cr, Cobalt, Cu, Mn and Nickel	0.5-8 hour	0.5
9	Hydrogen Fluoride	0.5 hour	1.0
10	Dioxin and Furan	6-8 hours	0.1 ng TEQ/Nm^3

Water Quality Monitoring Standard

Table 2-7 Potable Water Standard of landfill Ground Water

SL. No.	Parameters	Unit	Standard (Maximum Presence Limit except pH)
1	Arsenic	mg/l	0.05
2	Cadmium	mg/l	0.003
3	Chromium hexavalent	mg/l	0.05
4	Copper	mg/l	1.5
5	Fluoride	mg/l	1.0
6	Lead	mg/l	0.01
7	Mercury	mg/l	0.001
8	Nitrate as NO_3	mg/l	45.0
9	pH	mg/l	6.5 – 8.5
10	Fe	mg/l	0.3 – 1.0
11	Total Dissolved Solids	mg/l	1000
12	Chloride	mg/l	250
13	Sulfates as SO_4	mg/l	250
14	Color	Hazen unit	15

Source: Schedule-2 (Kh) of ECR 2023

Ambient Air Quality Monitoring Standards

Table 2-8 Ambient Air Quality Standard Baseline information of the Subproject

Air Pollutants	Standard Value	Average time
(1)	(2)	(3)
Carbon Monoxide (CO)	05 milligram/cubic meter	8 hours
	20 milligram/cubic meter	1 hour
Lead (Pb)	0.25 microgram/cubic meter	Yearly
	0.50 microgram/cubic meter	24 hours
Nitrogen Dioxide (NO_2)	40 microgram/cubic meter	Yearly
	80 microgram/cubic meter	24 hours
Particulate Matter $_{10}$ (PM_{10})	50 microgram/cubic meter	Yearly
	150 microgram/cubic meter	24 hours
Particulate Matter $_{2.5}$ ($PM_{2.5}$)	35 microgram/cubic meter	Yearly
	65 microgram/cubic meter	24 hours

Air Pollutants	Standard Value	Average time
(1)	(2)	(3)
Ozone (O_3)	180 microgram/cubic meter	1 hour
	100 microgram/cubic meter	8 hours
Sulfur Dioxide (SO_2)	250 microgram/cubic meter	1 hour
	80 microgram/cubic meter	24 hours
Ammonia (NH_3)	100 microgram/cubic meter	Yearly
	800 microgram/cubic meter	24 hours

Source: Schedule-1 of Air Pollution (Control) Rules 2022

2.7 Conventions, Treaties and Protocols

Table 2-9: International Conventions, Treaties and Protocols

International Environmental Agreement	Signed Year & Place	Details	Relevance with the project
United Nations Framework Convention on Climate Change (UNFCCC)	4-14 June 1992 (Rio de Janeiro, Brazil & New York, United States)	Parties to take precautionary measures to anticipate prevent or minimize the causes of climate change and mitigate its adverse effects.	The project is subject to the impact of climate change. Engineering designs of the subproject consider climate change impacts, such as flooding and temperature rise.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	22 March 1989 (Basel, Switzerland)	The treaty was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs).	In May 2019 to an amendment of the Basel Convention plastic waste is presumed as hazardous material. Recycling of plastic waste is one of the significant provisions of the project.
Convention on Biological Diversity	5 June 1992 (Rio De Janeiro, Brazil)	The Convention has three main goals: the conservation of biological diversity (or biodiversity); the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources.	The project will have a prominence on protection and conservation of biological diversity for the area rich with biological resources. A Biodiversity Management Plan will be prepared and implemented to comply with the provision.

3. DESCRIPTION OF THE SUBPROJECT

3.1 Background

Solid Waste Management (SWM) is the major challenges for the Munshiganj Municipality for its rapid urban growth. Despite the government's efforts in improving the SWM system, waste collection and disposal capacity in Munshiganj Municipality is still limited. Maximum generated wastes are uncollected, while these are often informally burned, buried, or illegally dumped in streets, public spaces, drainage channels, and waterways. This has resulted not only in public health hazards and the contamination of the environment, including air, water, and soil, but also the blocking of major drainage channels and sewerage networks.

The current Integrated Solid Waste Management Improvement Project (ISWMIP) supported by the AIIB, therefore, will improve the SWM system in the Munshiganj municipal areas. This will help: (i) improve public health and quality of life by reducing exposure to pollutants and disease vectors associated with solid waste; (ii) strengthen the government's capacity to plan for and implement effective waste management services; and (iii) improve SWM practices in the country, encouraging waste minimization, recycling, and segregation at source. As part of the AIIB funding guidelines, an Environmental and Social Impact Assessment (ESIA) should be carried out to address the environmental and social issues of the subproject following operational procedures, policies, guidelines, and statements set by the AIIB.

3.2 Key Features of the Subproject

3.2.1 Waste Quantum and Generation rates

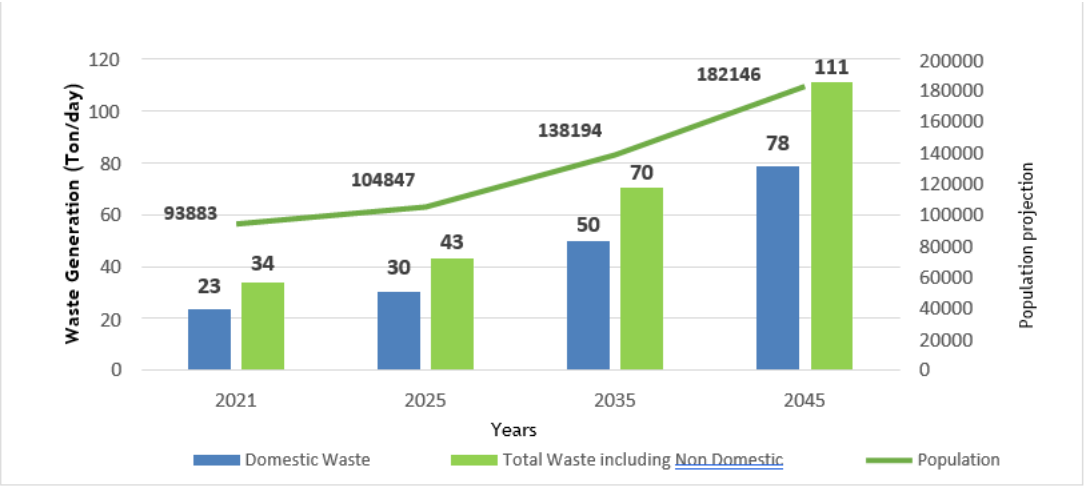
There is no data available regarding the total amount of solid waste generated in the municipality. The data on waste generation has been established from a recent survey conducted by Waste Concern during 2020-2021. The survey provides waste generation rates based on size of population of the cities. The table below provides population size wise domestic waste and total waste generation.

Table 3-1 Population size-wise Waste Generation

Population of ULBs	**Domestic Waste** Kg/cap/day	**Total** (including non-domestic) kg/cap/day
50,000- 100,000	0.25	0.36
100,001-200,000	0.26	0.37
200,001-300,000	0.31	0.44
300,001-500,000	0.32	0.45
500,001-10,00,000	0.36	0.51
>1,000,000	0.43	0.6

Source: Waste Concern, 2022

Based on the survey it was found that for a municipality with a population between 200,000-3,00,000 persons, the solid waste generation rate is estimated at around 0.31 kg/cap/day for domestic waste and 0.44 kg/cap/day for total incl. non-domestic waste. Accordingly, the waste generation has been estimated for the municipality for 2021 and projected till 2045. The waste generation of the municipality projected for the year 2025, 2035 and 2045 is provided in the table.



Source: Estimated by the Consultant
Note: Waste generation rate: 0.36kg/person/day with a 5% increase every 5 years has been considered.

Figure 3-1 Waste Generation Projections for Municipality
Source: Estimated by the Consultant
Note: Waste generation rate: 0.44kg/person/day with 5% increase in every 5 year has been considered.

3.2.2 Physical Composition of Waste

Waste Concern study (2021) has undertaken physical composition analysis of waste by collecting samples from households, markets, and from trucks arriving at landfill sites. The following figure shows the average physical composition of solid waste for Class A municipality; it is representative for Munshiganj which is a Class A municipality.

It is observed that the organic waste comprises of major portion (85%) of the solid waste, followed by plastics. Other cateory of recyclables such as paper, textiles and glass, though not in considerable amount also form a part of the overall waste composition. The large quantity of degradable organic contents indicates the necessity for frequent collection and removal. This also indicates the potential of recycling of organic waste for resource recovery, such as composting and waste to energy projects using biological process

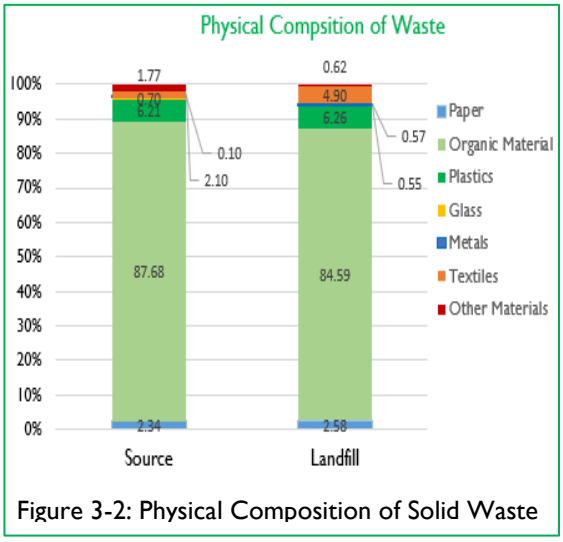


Figure 3-2: Physical Composition of Solid Waste

Source: Waste Concern, 2021

3.2.3 Existing MSW Management System

Primary Collection and Transportation

House-to-house waste collection is not specified in the local government ordinance as a mode of waste collection. However, the Solid Waste Management Rules 2021 has recommended collecting sources of segregated waste from households. The local government ordinance instead stipulates that local government bodies shall establish a waste storage facility (community bins) at convenient locations, where the resident will be responsible for disposing of the waste as their responsibility. However, once the waste is disposed of in the community bins, it is the responsibility of the local government bodies to manage it. Since house-to-house waste collection is an additional service that the citizens prefer, it is advisable that the Municipality should engage the private sector/NGOs/CBOs for the collection of waste from different wards; this should be done by enacting a service charge which should be fixed by the municipality.

It is proposed that the house-to-house waste collection program is expanded throughout the entire town, including residential, commercial buildings, and the three slums, for a service charge. Currently, an estimated 5880 households are covered in the house-to-house waste collection program, whereas the total number of holding in the town is 20,863.

Considering the gaps of the existing waste collection system, the design of the collection system is proposed to cater to the requirements of narrow streets as well. It is recommended to practice source segregation at the household level irrespective of the category of urban areas. To promote waste segregation, the households will be encouraged to use separate bins for collecting organic and inorganic waste. The approach (Figure 3.3) involves only segregating waste at the household level into mainly three categories – Organic Waste (Green Bin), Inorganic Recyclable Waste (Yellow Bin), and Hazardous Waste (Red Bin).

Figure 3-3 Bins for Waste Segregation at HH level- Dry, Wet, and Domestic Hazardous Waste

The existing design of the rickshaw van used for the primary waste collection is not viable since it is open and lacks a cover. During monsoons, it becomes challenging to pull the rickshaw vans. Moreover, the loading and unloading of waste from the rickshaw vans represents a problem. Therefore, instead of an open rickshaw van, it would be an improvement to use a modified van with six to eight containers to collect waste. This type of modified rickshaw van can also be used for the collection of source-separated waste. The improved rickshaw van with containers can directly discharge waste into covered containers and reduce multiple handling of waste. This type of van collects segregated waste easily. Green containers can be used for organic waste, while bags can be used for the collection of recyclables.

Along similar lines, the waste generated from markets and commercial establishments will be collected through these vans or dumped directly into secondary storage facilities /community demountable bins at the market areas. Further, (Figure 3-5) using demountable container carrier vehicles, waste collected will be carried to the secondary transfer station or directly taken to the landfill site.

Current Design of Rickshaw Vans without any containers

Recommended Rickshaw Van with containers and bag for plastic waste

Figure 3-4 Proposed Rickshaw Van For Primary Waste Collection

3.2.4 Waste reduction & Segregation at HH level

The current approach to waste management is particularly focused on post-generator levels in the SWM chain, on areas such as collection, transport and disposal. A significant component of a sustainable waste management practice is the reduction of waste in the first place and the segregation of waste generated at the household level. This is more relevant for significant for low-income areas & informal settlements, where the centralized systems of collection & transport are difficult. These areas are particularly affected by littered waste in the drains, streets and are more vulnerable to epidemics and other negative effects on health & environment. In order to effectively address waste management at HH level, particularly in low-income settlements or slums, the following measures are proposed:

- **Sustained Awareness Campaigns**: A sustained program of IEC/BCC interventions, focused on informal settlements will consistently be carried out. The awareness programs will focus on reduction of waste, and place greater emphasis on recycling and reuse. The programs will also include campaigns for segregation of different types of waste, awareness on services and benefits. (Annexure 2 further elaborates on the IEC/BCC Plans for aspects such as waste segregation, reduction, reuse/recycle at the HH and community level)
- **Involvement of NGO's**: The local NGO's will be involved in informal settlements for collection of waste from households and establishing formal links of these to the waste management chain of the municipality. The NGO's would be provided necessary support, and efforts to build their capacity through training programs. The NGO's/CBOs will also be involved in awareness campaigns in informal settlements.
- **Infrastructure Support**: The municipality will provide waste management services and infrastructure support to the hard-to reach areas/slums areas through interventions such as providing waste management trucks at slum entrances, provision of lorry carts to local NGOs for collection, shared/community bio-bins etc.

A detailed segregation note has been provided as Annexure 1

3.2.5 Proposed Requirements

The summary of proposed requirements for primary collection and transportation is summarized in the Table 3-2 below:

Table 3-2 Summary of Proposed Requirements for Primary Collection and Transportation

Particulars & Assumptions	Unit	Quantity (Designed Year 2025)
Total Waste Collection in Munshiganj	TPD	32 (75% of the generated wastes)
Quantity of Biodegradable Waste	TPD	84
Quantity of Non-bio-degradable waste	TPD	16
Capacity of Rickshaw Van	Kgs	400
No. of trips/day of Rickshaw Vans	Nos.	2
Coverage of Rickshaw Vans at the Household level	%	100%
Collection of Waste to Transfer Station	Days	Daily

Table 3-3: Primary Collection & Transportation Capacity

Primary Collection & Transportation	Capacity	Unit	Total No. (2025)	Total No. (2035)
Proposed Number of Rickshaw Vans	400	kg	40	65
Proposed Number of Drivers	1 driver / vehicle	No.	40	65
Proposed Number of workers for Rickshaw Vans	1 worker / vehicle	No.	40	65
Number of Safety Gears Kit (including gloves, masks, boots, uniform, shovels etc.)	1 kit per worker	No.	40	65

Source: Estimated by Consultant

3.2.6 Secondary Collection and Transportation

Key Proposed Interventions

To improve waste storage for secondary collection, small and medium-sized demountable containers (2-3 m3 to 5 m3 volume) are recommended for the municipality. It has also been recommended to initiate house-to-house waste collection services using rickshaw vans with 6-8 containers and some motorized vans for commercial and market areas. The containers can then directly discharge the segregated waste into the closed demountable containers for secondary waste collection, reducing multiple handling of waste. Depending upon the population of the wards, at least one container should be placed in each ward. The containers should be placed on a raised base of 9 to 12 inches to avoid water infiltration inside the containers in the case of waterlogging during the monsoon. Moreover, the containers should not be placed near the drains. The advantages of using a container system are as follows:

- Reduction in the number of collection points.
- More efficient in terms of transportation.
- Less manpower is required, and hence easy to monitor conservancy inspectors.
- Reduce GHG emissions by reduction of trips.
- Less environmental pollution compared to open concrete bins or open collection points.
- Less loading time for collection of waste and easy to unload.
- Avoid rainwater infiltration inside the storage container and hence less chance of leachate generation.
- Less chance of attracting rodents and flies since the containers are closed.

The Figure 3-5 below shows the containerized proposed community bins

Figure 3-5 Proposed Demountable Containerized Bins

There is only one secondary transfer station in the municipality area, which is not working efficiently. Hence, the secondary transfer station must be restructured for efficient collection and transportation of waste to the landfill site.

3.2.7 Proposed Requirements

The summary of proposed requirements for secondary collection is summarized in the table 3-4 below:

Table 3-4 Proposed Requirement for Improvement in Secondary Collection

Secondary Collection	Capacity	Unit	Total No. (2025)	Total No. (2035)
Proposed Number of Small Demountable Containers	2	m^3	16	21
Proposed number of Improved Secondary Transfer Stations	5	ton	4	9
Proposed Number of workers		No.	11	15
Number of Safety Gears Kit (including gloves, masks, boots, uniform, shovels etc.)	1 kit per worker	No.	11	15

Source: Estimated by Consultant

3.2.8 Waste Transportation

3.2.8.1 Key Proposed Interventions

Regarding total waste transportation, labor productivity, and loading time, demountable trucks with closed containers appear more efficient than open trucks in Bangladeshi conditions. As such, the municipality should move from an empty truck waste collection and transportation system to demountable container trucks. Different types of demountable container trucks can be used depending on the road width. Instead of using flat-bed open trucks, it is recommended to use small and medium-sized demountable container trucks with GPS in the Municipality, which can make between 6-8 trips per day.

The figure 3-6 below shows various options for containerized waste collection trucks that could be utilized in municipality.

Proposed Containerized Waste Collection Trucks: Small Truck for Carrying Containers

Proposed Containerized Waste Collection Trucks: Large Truck for Carrying Containers

Proposed Containerized Waste Collection Trucks: Small Truck for Carrying Containers

Proposed Containerized Waste Collection Trucks: Tractor for Carrying Demountable Container

Figure 3-6 Proposed Containerized Waste Collection and Transportation System
Source: Consultant's Assessment

3.2.8.2 Proposed Requirements

The list of vehicles and the summary of proposed requirements for Secondary Collection and Transportation is summarized in the Table 3-5 below:

Table 3-5 Summary of Proposed Requirements for Secondary Collection and Transportation

Secondary Collection & Transportation	Capacity	Unit	Total No. (2025)	Total No. (2035)
Proposed Number of Containerised Collection Truck	2	m^3	4	6
Proposed Number of Tipper Truck	2	ton	5	7
Proposed Number of Drivers for vehicles	1 driver / vehicle	No.	9	13
Proposed Number of workers for Vehicles	1 worker / vehicle	No.	9	13
Number of Safety Gears Kit (including gloves, masks, boots, uniform, shovels etc.)	3 kits per worker/ year	No.	27	39

3.2.9 Waste Collection Routing

Solid waste collection is a significant section in the process of solid waste management (SWM) and is estimated to consume up to two-thirds of the entire SWM budget. The functional element of the collection includes not only the gathering of solid wastes and recyclable materials but also the transport of these materials, after collection, to the location where the collection vehicle is emptied. Collection

of solid waste in an urban area is difficult and complex because the generation of waste takes place in every house, apartment, commercial and individual facility as well as in the streets, parks, and even vacant areas. Therefore, in any waste collection operation, it is essential to look into; the types of waste collection services/systems, type of equipment to be used, associated labor requirements, and collection routes. Once equipment and labor requirements have been determined, collection routes must be laid out so that both collectors and equipment are used effectively. No universal set of rules can be applied to all situations. Therefore, optimization of solid waste collection routes in urban areas is essential where significant time is spent loading and unloading as well as driving. Optimizing of collection services still depends on the collection team's knowledge of local conditions such as one-way streets and road construction.

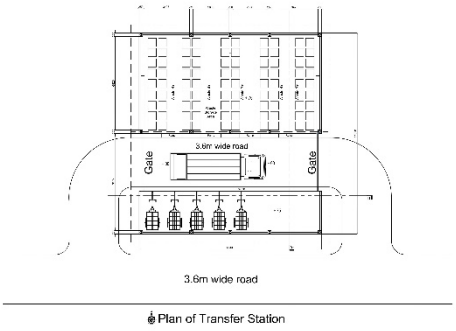
Four STS (Secondary Transfer Station) have been selected tentatively considering the population and waste generation of the wards. Wastes will be stored in the waste collection points after door-to-door collection. Then waste collecting truck will collect the waste from waste collection points to the landfill. Total waste generation is 34 tons in 2021 in the municipality. 4 STS have been proposed for collecting wastes from the 9 wards (Figure 3-7). The following Table 3-6 shows the distribution of the STS in the wards.

Table 3-6: Distribution of secondary transfer station

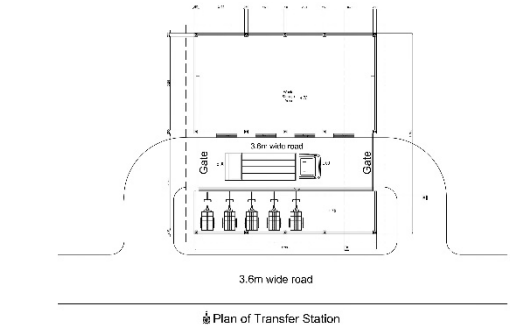
Wards	Pop (2021)	Waste Generation (2021) TPD	Waste Collection Point (STS)	Waste Collection (2021)
7	12163	4	STS 1	8
8	11426	4		
2	14252	5	STS 2	9
3	11446	4		
1	11630	4	STS 3	7
5	8499	3		
4	7952	3	STS 4	8
6	8499	3		
9	6902	2		
Total	**93883**	**34**		**34**

Side view

Side view



Secondary Transfer Station (With Container)



Secondary Transfer Station (Without Container)

Section 1

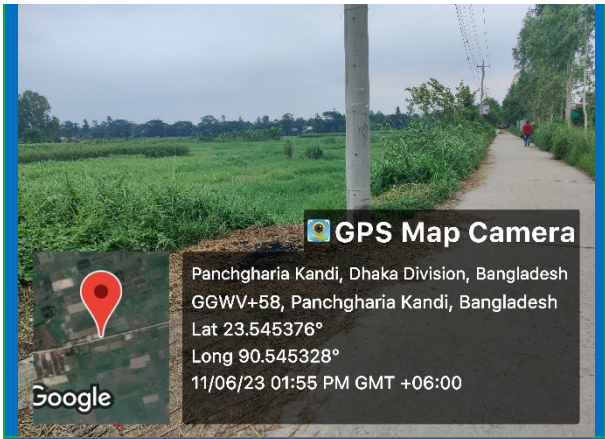
Section 2

Figure 3-7: Proposed Design of Secondary Transfer Station

4 STS have been proposed for Munshiganj Municipality to serve all the 9 wards. The description of the surroundings using 250m buffer around the proposed STS has been illustrated below with appropriate figures.

Table 3-7 : The latitude and longitude of the proposed STS in Munshiganj Municipality

Proposed STS	Latitude (°)	Longitude (°)
STS 1 in Ward 9	23.545371	90.545328
STS 2 in Ward 4	23.54305	90.52978
STS 3 in Ward 2	23.54906	90.538699
STS 4 in Ward 3	23.558532	90.532191



Proposed STS 1 in Ward 9

Proposed STS 2 in Ward 4

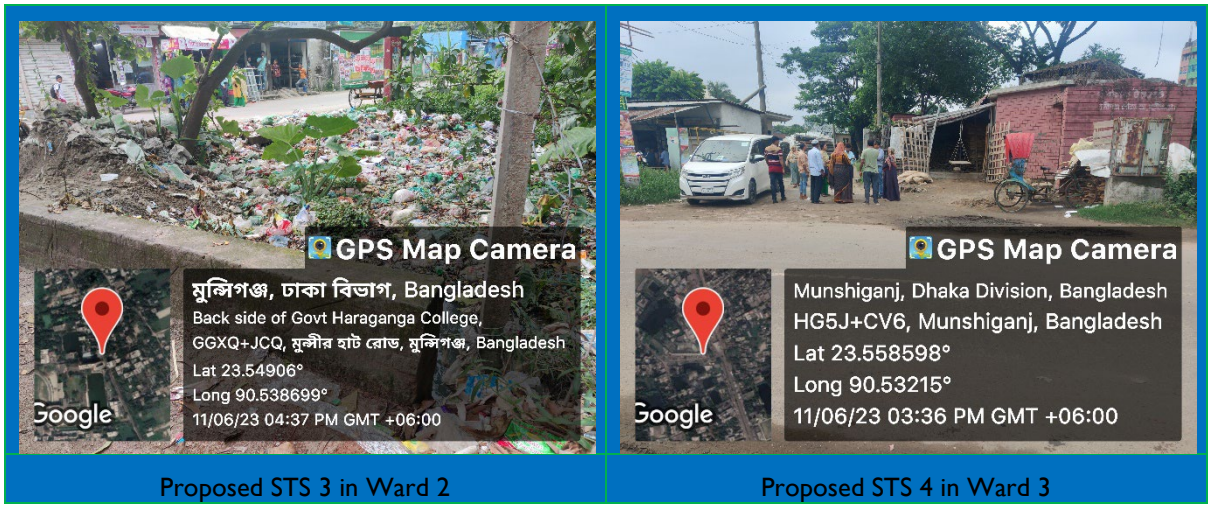


Figure 3-8: Surrounding of Proposed STSs in Munshiganj Municipality

Location map of the integrated landfill and resource recovery facility, STSs and access road connecting the integrated landfill and resource recovery facility in Munshiganj Paurashava are shown in the maps below:

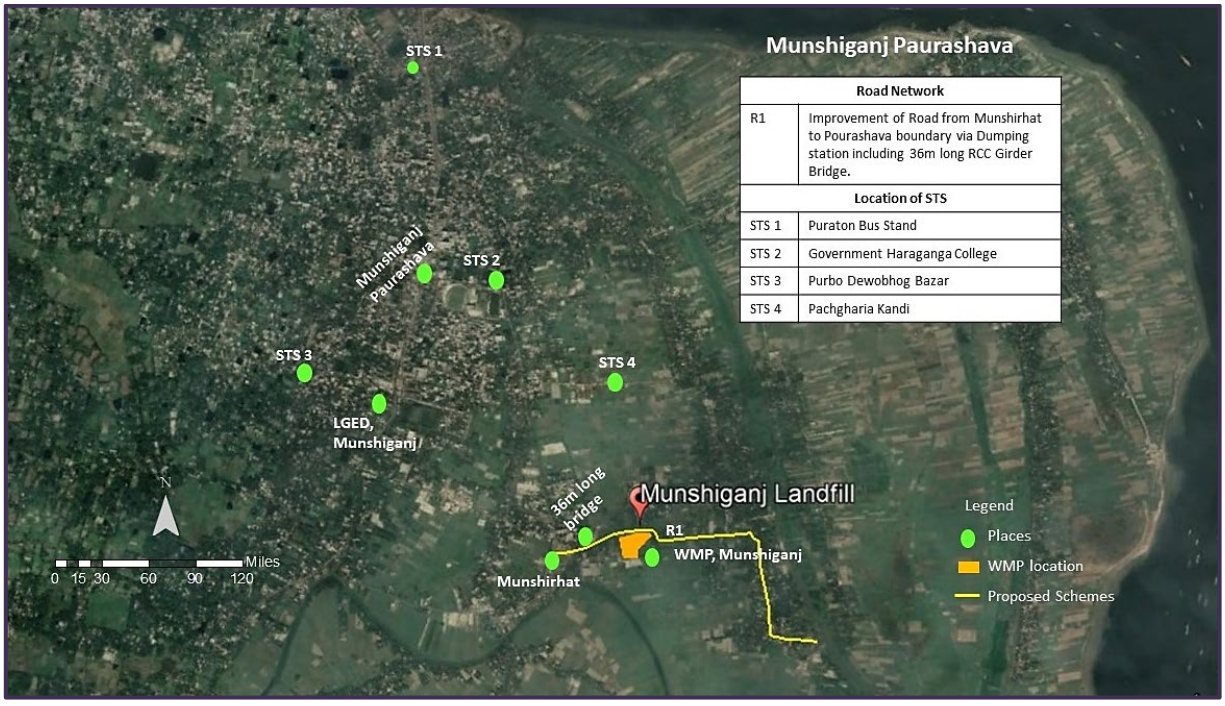


Figure 3-9: Locations of the landfill site and STSs and alignment of the connecting road for the landfill site

3.3 Administrative Location of the Subproject

Munshiganj is a district in central Bangladesh. It is a part of the Dhaka division and borders Dhaka district. It is bound by Dhaka and Narayanganj districts on the north, Madaripur and Shariatpur districts on the south, Comilla and Chandpur districts on the east, Dhaka and Faridpur districts on the west.

Munshiganj town is a Category A municipality in the Dhaka division of central of Bangladesh. Munshiganj Municipality was established in 1972, It is one of the commercial towns and also serves as the headquarters of Munshiganj district. Munshiganj Municipality consists of 9 wards with an area of 10.85 sq. km.

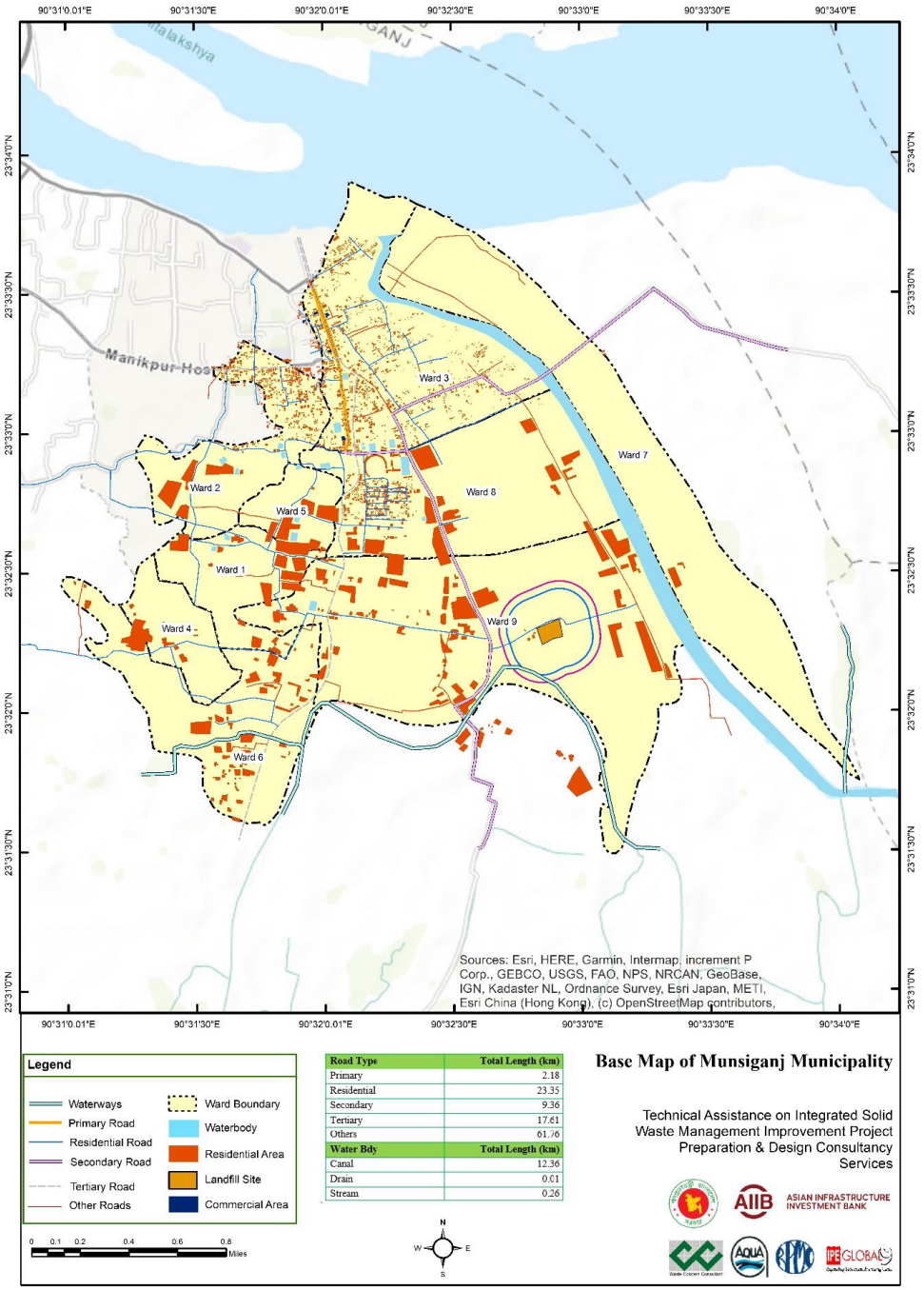


Figure 3-10: Munshiganj Municipality Location Map and Ward Map

3.4 Subproject Components

3.4.1 Project Concept

Most municipality's current waste management system approach is strongly conventional and focuses on end-of-the-pipe solutions, i.e., waste collection, transportation, and final disposal. Placing priorities on reusing, recycling, and reducing waste is missing. It is critical to treat solid waste management as a system (i.e., with the collection, disposal, and resource recovery) and as a priority sector.

Designing and implementing new waste management systems and optimizing existing ones should consider the aspects of resource recovery, environmental soundness, financial sustainability, stakeholder involvement, and institutional capabilities, in addition to the technical and technological appropriateness of systems for managing the waste. The selection of waste management processes

and technologies for Munshiganj Municipality is based on the Decision Matrix Tool for Best Practicable Options (BPO) prepared under this Project. The BPO is a suggestive/indicative strategy that the ULBs of various population sizes may refer to draw city/town-specific Action plans for efficient processing and disposal of waste. It further outlines packages and combinations of technology/approaches to be adopted and maintaining environmental standards. The Table 3-8 below provides an overview of the suggestive technologies primarily based on the town's size and quantum of waste generated by the urban area.

Table 3-8 Ranking of Options for SWM Processing & Disposal Technologies as per ULB Category

ULB category	Option Rank							
	1	2	3	4	5	6	7	8
Category 1 ULB Up to 20TPD (Population. up to 50000)	Box Method with forced Aeration	Vermi-Composting	Bio-methanation	Refuse derived fuel (RDF)	Pyrolysis	Sanitary landfill	Incineration	Integrated system (composting + RDF+MRF+ Controlled landfill)
Category 2 ULB 21TPD- 60 TPD (Population. 50001 – 100000)	Box Method with forced Aeration	Vermi-Composting	Bio-methanation	Sanitary landfill	Refuse derived fuel (RDF) Pyrolysis	Integrated system (composting + RDF+MRF+ Controlled landfill)	Incineration	
Category 3 ULB 61-100 TPD (Population. 100001 – 200000)	Integrated system (Composting + RDF+MRF+ Controlled landfill)	Box Method with forced Aeration	Vermi-Composting	Bio-methanation	Refuse derived fuel (RDF) Pyrolysis	Sanitary landfill	Incineration	
Category 4 ULB 101-500 TPD (Population. 200001 – 700000)	Integrated system (composting + RDF+MRF+ Controlled landfill +FSTP)	Refuse derived fuel (RDF)	Pyrolysis Sanitary landfill	Incineration	Box Method with forced Aeration Vermi-Composting	Bio-methanation		
Category 5 ULB >500 TPD (Population. Above 700001)	Integrated system (composting + RDF+MRF +Controlled landfill +FSTP)	Refuse derived fuel (RDF). Pyrolysis	Pyrolysis	Sanitary landfill	Incineration Box Method with forced Aeration Vermi-Composting	Bio-methanation		

Source: Best Practicable Options (BPO) – as a guiding tool to the ULBs is prepared by the Consultant under the ISWMIP Project. The Decision Matrix tool has been designed based on several key parameters.

Considering that the current population of Munshiganj Municipality is 93,883and it generates about 34 TPD of waste, the development of an Integrated Landfill and Resource Recovery Facility is recommended for Munshiganj Municipality. The integrated System comprising of a combination of technologies/processes, including a composting plant, controlled landfill, and an MRF facility to segregate dry waste into different streams of waste fractions (paper, plastic, packaging paper, bottles, etc.). The dry waste fractions, or recyclables, could be sold to intermediaries who supply bulk material to the recycling industries is proposed. The provision of a Faecal Sludge Treatment Plant (FSTP) to process city faecal sludge has not been included in the proposal as the financing from the current AIIB program will only facilitate waste management improvements in the cities. It is also recommended that the municipality opts for a 'Regional Cluster Approach' as it caters to the neighboring smaller ULBs and would be a feasible approach for them to achieve efficient waste management.

This is also in line with the National Strategy for Water Supply and Sanitation 2014 (updated in 2021), which has recommended that by 2030, 50% of the municipalities in the country should have integrated landfill and resource recovery facilities. These facilities should be based on the 3R Principles.

The land for the transfer stations has been identified and all compliances have meet met. The municipality should take the case for acquiring these lands forward. In regard to landfill, the land is under the possession of municipality and all compliances are met. A buffer analysis has also been conducted for the land.

3.4.2 Site Selection and Assessment

3.4.2.1 Current Status of the New Site for Landfill

There is one official landfill site having an area of 4.67 acres in the municipality which the municipality acquired in 2021. All the collected waste by the municipality (amounting to ~17-20 tons per day) is disposed of in an uncontrolled manner using crude dumping methods. The existing landfill site is the property of Munshiganj Municipality.

There is no buffer zone near the dumping site and no special area for protecting biodiversity were observed. The site is currently used as a waste disposal facility using crude dumping methods.

The acquired land complies with the criteria of the Department of Environment. There are no big settlements within 250m from the landfill except a few scattered houses. There is no highway or airport lies within 3km from the landfill site. However, there is a waterbody (Munsirhat Khal) in 263m from the landfill site. Some livelihoods will be affected, and they need to be restored. 6 vanghari shops are situated a bit far from the landfill but affected by this project. Additionally, 5 waste pickers will be affected as well. ESIA report deals in detail with the social issues. Following Figure 3-11 shows the location of the landfill site.

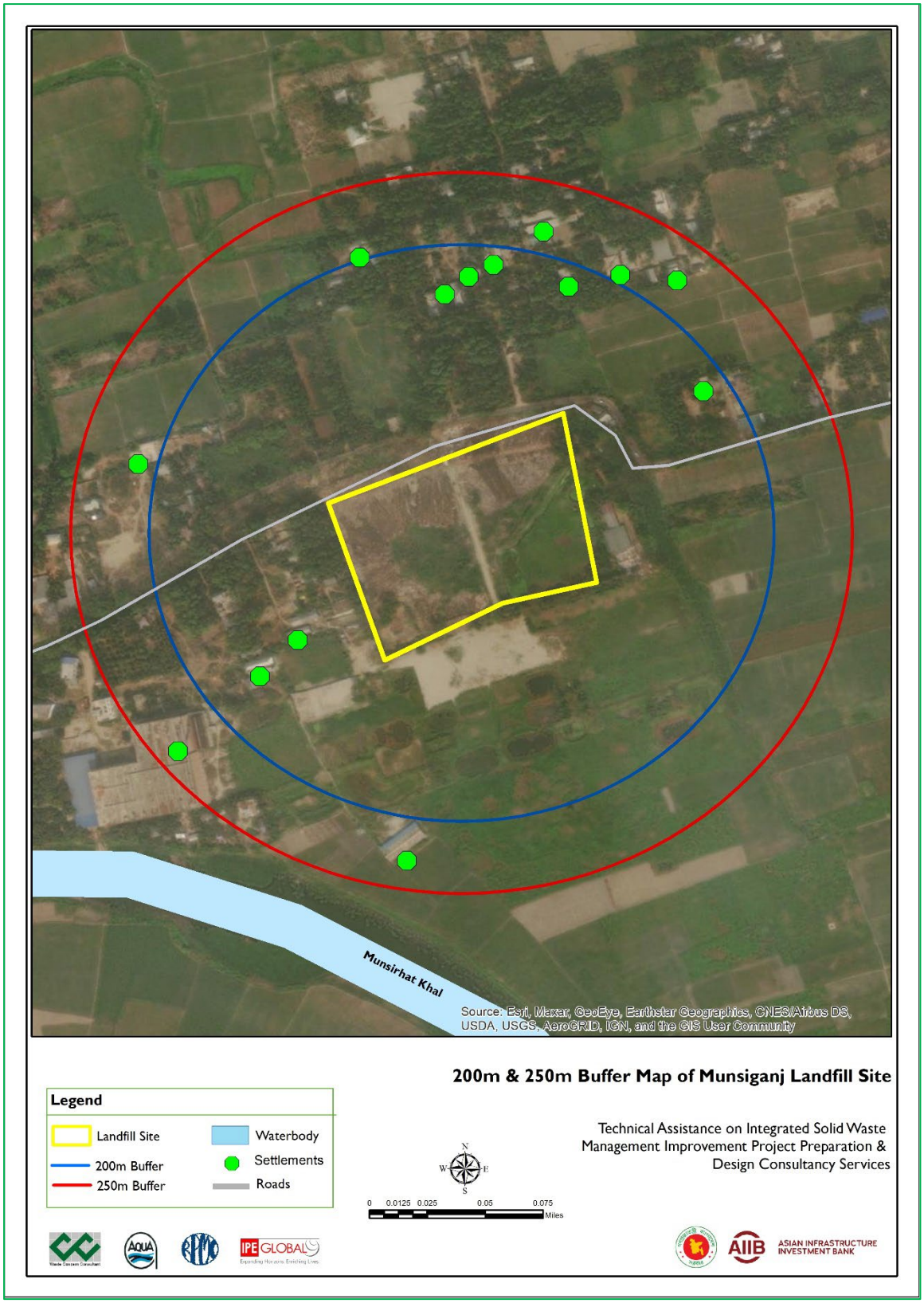


Figure 3-11: Munshiganj City Corporation Landfill Site - Location Map
Source: Consultant's Field Survey

Figure 3-14 Aerial and Drone View of Proposed Site

North side of the dumping area- Road

North side of the dumping area- Road

Figure 3-13: Snapshot- Landfill Site and Surroundings Photographs

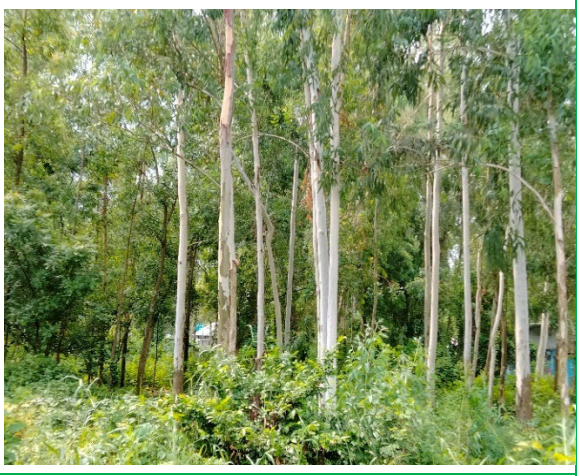
	
South side of the dumping area-Agriculture	South side of the dumping area-Agriculture
	
East side of the dumping area-Trees & house	Westside of the dumping area-Trees & house
	
Low land inside of the Landfill area	Trees adjacent to the Landfill area beside road

Figure 3-15 Surrounding of the landfill area
Source: Consultant's Field Survey

3.4.3 IL&RRF - Overall Planning & Layout Plan

The proposed subproject has been designed to establish an Integrated Landfill and Resource Recovery Facility (IL&RRF) in the existing landfill site of Munshiganj. The facility will comprise of a composting plant, a MRF, leachate treatment facility as well as controlled landfilling of waste at the existing waste disposal site Baradi of Munshiganj Municipality. The subproject will be able to recycle and treat solid

wastes to the tune of 100 tons/day by the year 2045 in an environmentally friendly manner. The subproject will also remove and cap the existing waste disposed of in the landfill site using the open dumping method. The existing waste will be disposed of and caped in a new cell. Apart from composting and waste recycling, the subproject will reduce GHG emission by avoiding landfilling a significant amount of biodegradable and recyclable waste. Allocation of the incoming wastes (50 tons/day in 2025) to the landfill site would be as follows:

The primary objective of the proposed Landfill with Resource Recovery Facility is to provide adequate control measures to prevent (or reduce as far as possible) adverse effects on the environment, in particular, the pollution of surface water, groundwater, soil, and air, as well as the resulting risks to human health arising from landfilling of waste. The fundamental objective of the proposed facility is to enhance sustainability and promote the 3Rs of waste (reduce, reuse, and recycle). The proposed design has considered the diversion and conversion of bulk waste into resources (compost, plastic waste to oil, and inorganic waste recycling).

The project by 2025 shall be able to divert 46% of the generated waste for composting, 40% of inorganic waste shall be recycled in the MRF. In all 50% will be recycled, and 50% will be landfilled in 2035, and this recycling rate shall be increased to 70% by 2045. Using this percentage of waste recycling, the proposed landfill site can be used up to 2045. The total area of the landfill site is 4.67 Figure 3-15 shows the layout plan of the proposed integrated landfill and resource recovery facility. Table 3-9 shows the distribution of space for different facilities.

Table 3-9: Land use Plan of the Proposed Landfill Facility

SL No.	Land Use	Area (sq.m)
1	Capped Cell for old waste	1493.00
2	Cell 1	3412.00
3	Cell 2	2089.00
4	Compost Plant:	1847.00
5	MRF	1607.00
7	Leachate Treatment facility	1067.00
8	Office Building	147.00
9	Generator Room	62.00
10	Motor Room	15.00
11	Switch Room	15.00
12	Mechanical, Electrical, Workshop Room	58.00
13	Vehicle Washing Ramp	42.00
14	Weigh Bridge	32.00
15	Underground Water tank and pump room	9.00
16	Leachate Water Storage Tank	10.00
17	Septic Tank	21.00
18	Biomedical Facility	365.00
19	Hazardous Waste Cell	240.00
20	Deep Burial	378.00
21	Security Room	36.592
22	RCC Road	3340.00
23	HBB Road	380.00
24	Green Area	708.00
25	Plantation	6903.582
Total Area		**24277.174**

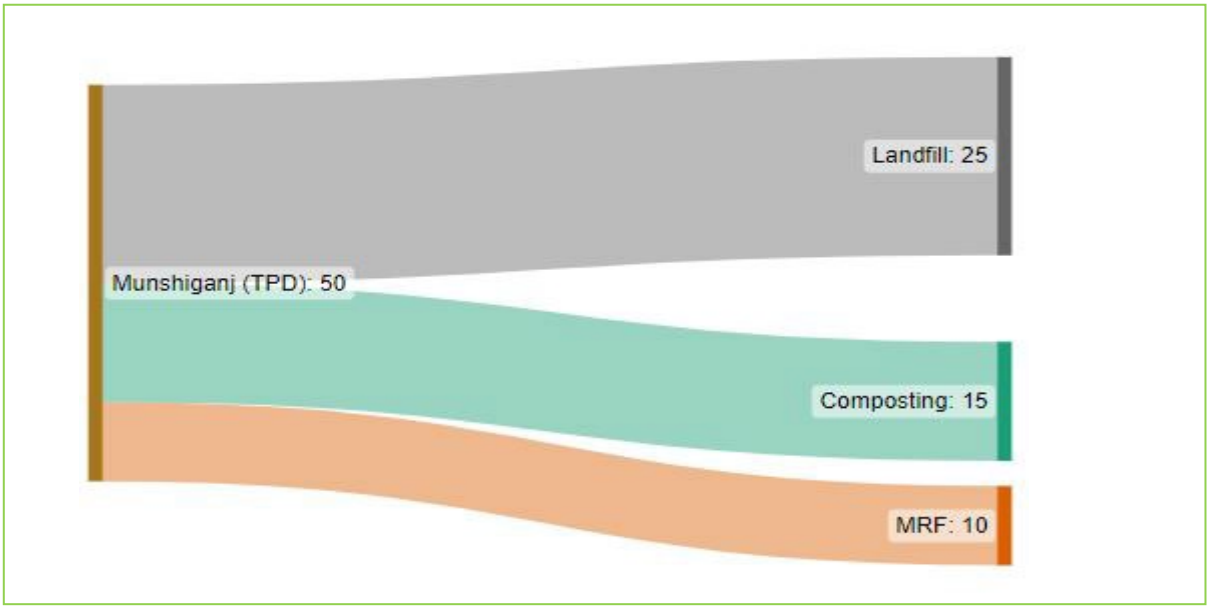


Figure 3-16: Mass Balance of Waste to be Managed in the Proposed Facility

Source: Consultant's Assessment

Legacy Waste: It is estimated that currently, 16,455 tons of solid waste is disposed of in landfill using the open dumping method. A new cell will be made with an HDPE liner at the base of the landfill. The currently disposed waste shall be disposed of in the new cell and capped.

Bio-medical Waste Management Facility: Recently, a local NGO constructed a medical waste management facility on the landfill site. As such, the project proposes no intervention on medical waste management.

The layout Plan of the facility is provided in the figure below:

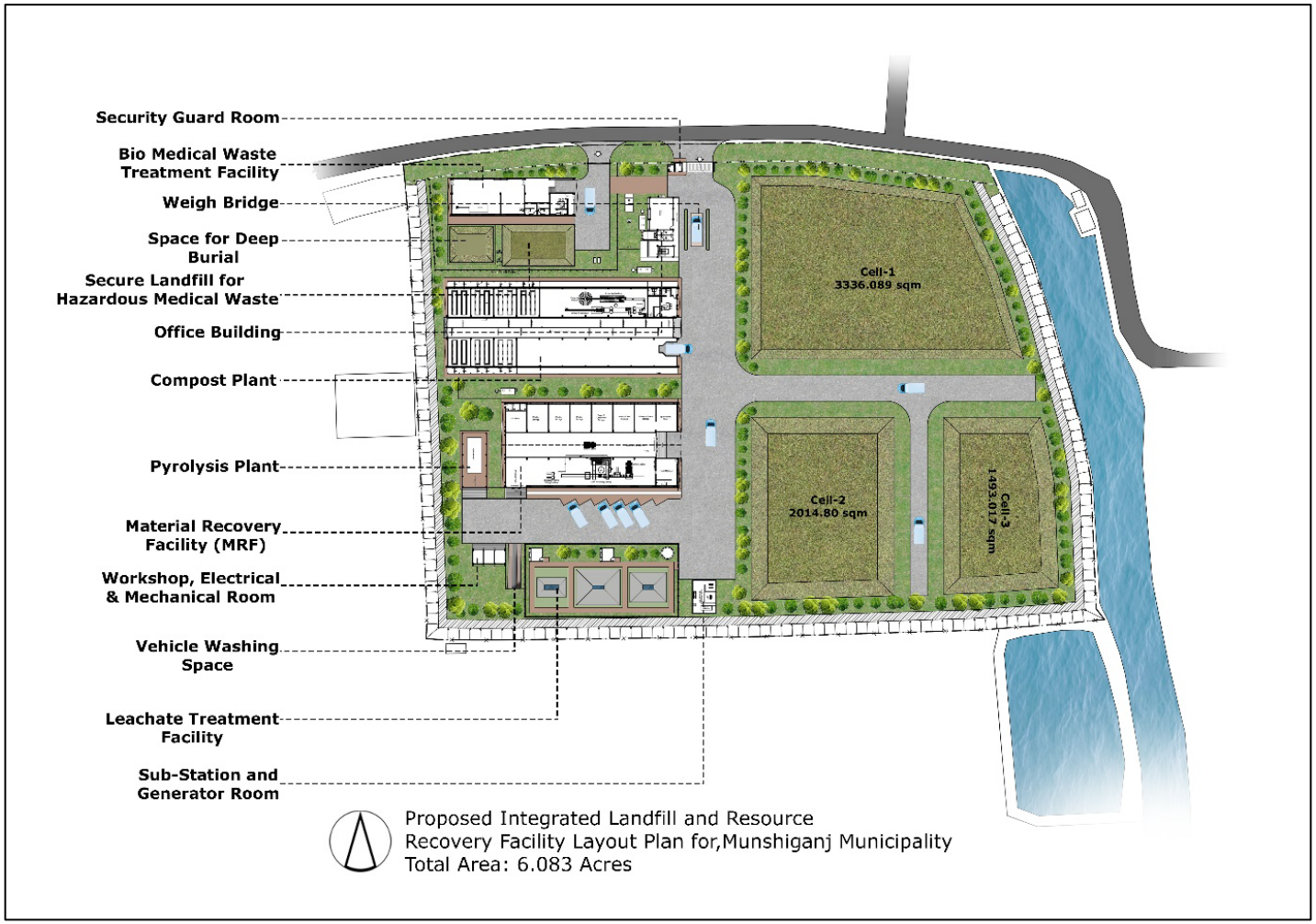


Figure 3-17: Proposed Design Layouts- IL&RRF

3.4.4 Processing and Resource Recovery Facilities

3.4.4.1 Details of Composting Plant

Integrated Landfill & Resource Recovery Facility (IL&RRF)

The proposed IL&RRF site with 4.67 acres of land has several activities introduced to treat waste scientifically. The current waste generation of the municipality is estimated at 34 tons, and it is expected to reach 111 tons per day in 2045. The design of the plant considers the 2045 scenario with 10-15% extra waste considering the extreme events. The proposed facility will have the following facilities: A weighbridge and an office room, three controlled landfill cells (receive 25 tons per day), a composting plant (15 tons per day capacity), an MRF facility (10 tons per day capacity), leachate collection and treatment system, boundary wall, RCC internal road, and an embankment along with a green belt around the site. The landfill cells have an HDPE liner at the base. A leachate treatment facility has been provisioned to treat leachate from the landfill cells and subsequently reuse it. No liquid will be discharged from this facility without ensuring the safe treatment of the wastewater. The IL&RRF has the following facilities to manage the incoming waste:

1. Compost Plant
2. Material Recovery Facility
3. Landfill Cells and
4. Leachate Treatment Facility
5. Medical Waste Treatment Facility

After weighing at the weighbridge, all incoming waste will go to the compost plant, material recovery facility (MRF) and subsequently all rejects will go to landfill cells. Leachate water generated from the landfill cells and compost plant will go to the waste water treatment facility, and treated wastewater will be re-circulated in the landfill cells. No wastewater will be released without proper treatment from the landfill facility. Figure 6-5 shows how incoming waste is converted into a resource using composting technology, material recovery facility, and pyrolysis technology. The figure below shows that waste will be segregated into two significant fractions from the sorting platform. Biodegradables will go for the composting process, which is aerobic (static pile with forced aeration). After the entire composting process, an economic output, 'compost,' is produced. A small portion of `reject' will be generated during the initial sorting from the compost plant, and also during the composting process, these rejects will be disposed of in the landfill cells. Sorted non-biodegradables, mainly plastic, paper and metals will be taken to the MRF adjacent to the compost plant.

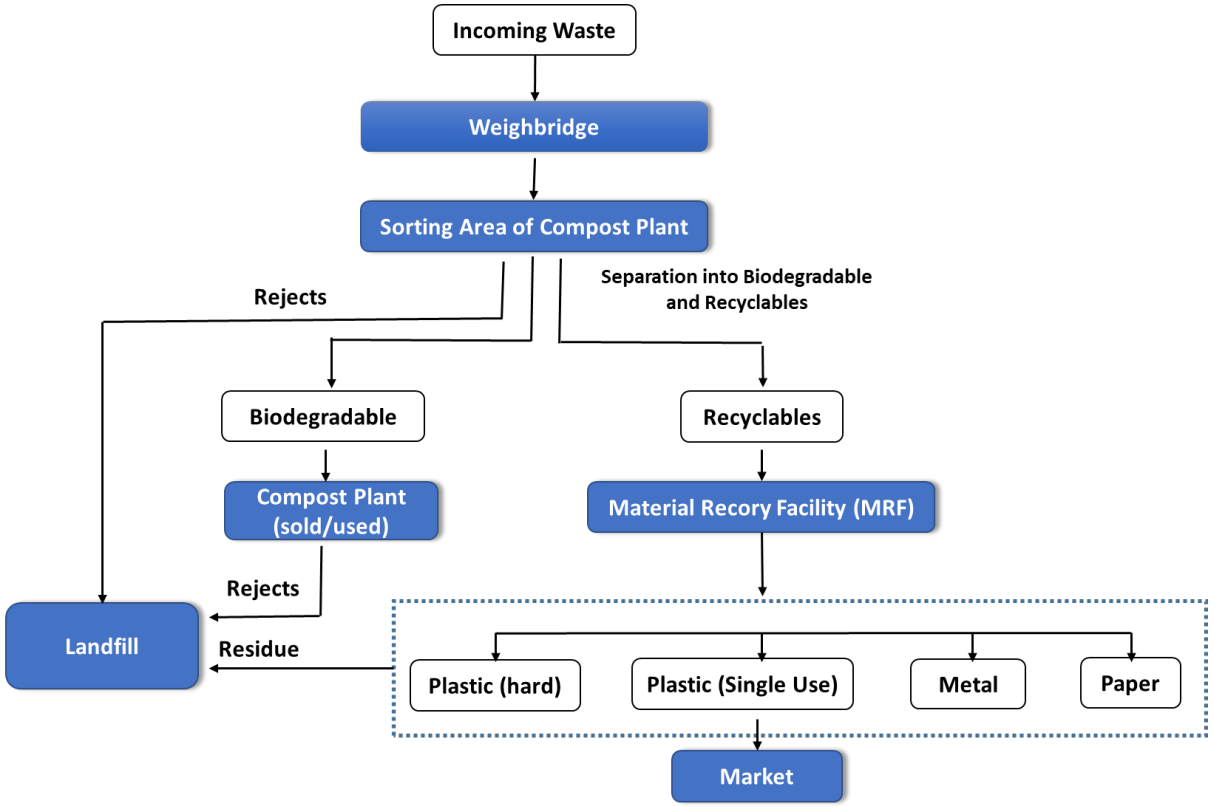


Figure 3-18: Diagram Showing the major activities (i.e., composting, material recovery facility (MRF), Pyrolysis (Plastic to oil).

In the MRF building, mixed recyclables are sorted using a mechanical conveyor belt and sorting machine. These recyclables will be sorted into plastic (hard), plastic (single-use), metals, paper, and other fractions. All the recyclable items will be compacted, baled, and stored for the market.

3.4.4.2 Composting Process

From the weighing bridge, incoming waste is taken to the compost plant. The composting process is based on the static pile with a forced aeration system. The composting process will be carried out under a roof with a leachate collection and reuse system. The process will consist of the following steps (see Figure 3-17):

1. Receiving processing
2. Pre-composting process;
3. Intermediate process (1st screening step);
4. Maturing process; and
5. Final Screening (2nd screening step and storage);

The figure below is shown a step-by-step activity carried out during the composting process. The compost plant is expected to process 15 Tons/day of organic waste as an input.

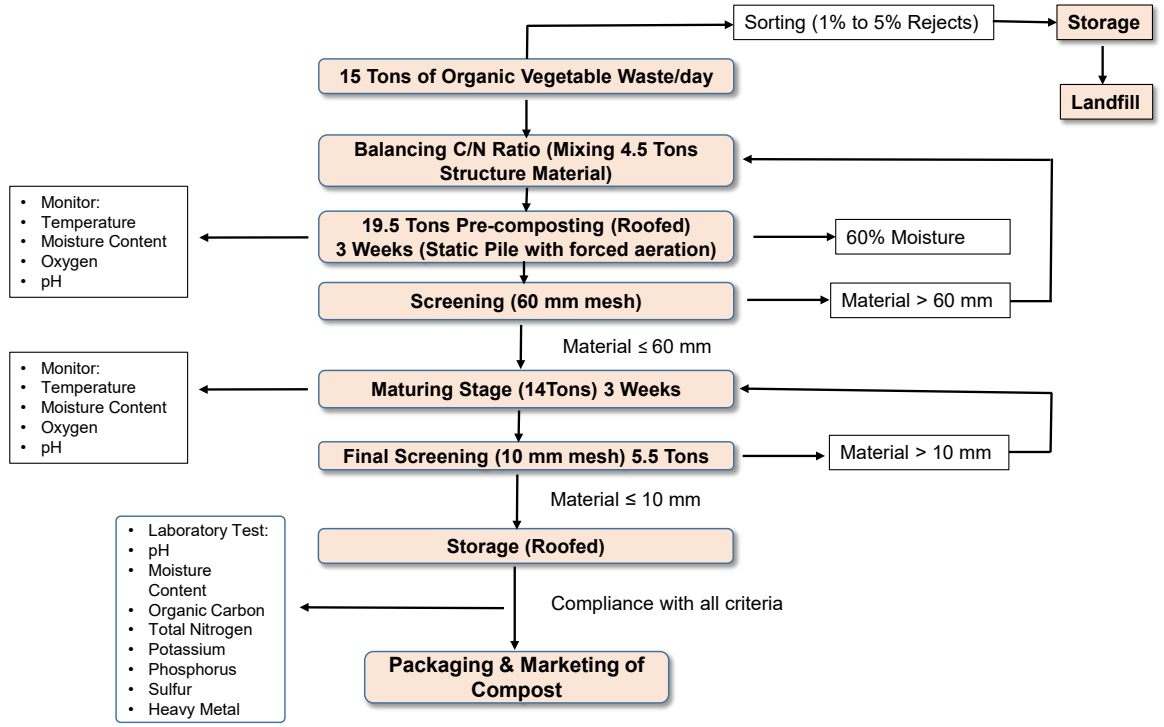
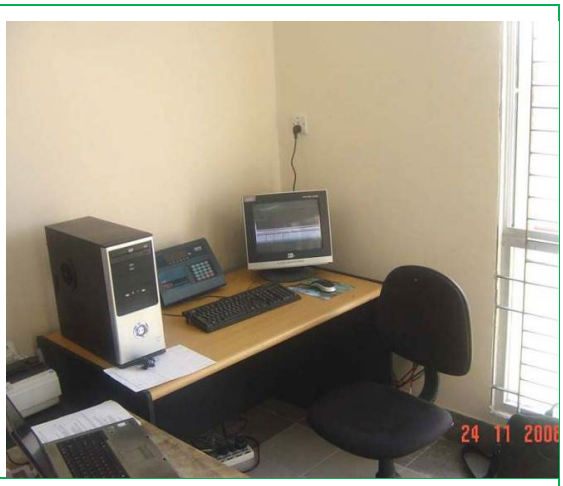


Figure 3-19: Material flow analysis of the composting process

3.4.4.3 Receiving process

After entering the facility, incoming municipal waste first goes to the weighing bridge for record keeping. The process starts by un-loading the partially segregated municipal wastes collected from households and vegetable market areas at the reception area of the compost plant, where the wastes will be inspected. After the inspection, the wastes will be mixed with structure material, from where the mixture will be transported to the pre-composting cells.

Incoming waste taken to the weigh bridge for measurement and record keeping of waste.



Proper record keeping and data base for incoming and outgoing items in the facility.

Figure 3-20: Receiving process

3.4.4.4 Un-loading

Vehicles that collect the waste from the local market and households in Munshiganj will unload the waste at the receiving and sorting area of the compost plant. A compost plant operator staff member

will guide the vehicles to the reception area where the vehicles will unload their wastes for sorting.

	
Incoming waste being unloaded in the receiving and sorting area of the facility	Unloaded waste is kept in the composting cell for processing using a static pile with forced aeration

Figure 3-21: Unloading process

3.4.4.5 Sorting

After the vehicles unload their waste, a staff member will inspect the waste to check for inorganic substances. These substances will be removed manually and stored temporarily in a container. After initial sorting, the waste will be sorted mechanically using a trammel. The organic waste after the sorting will be used for composting, while the recyclable items will be taken to the MRF.

3.4.4.6 Mixing

Depending on the composition of the fresh organic wastes, the amount of structure material will be determined by the compost plant staff. A loader will mix the fresh organic wastes with the structure material. The structure material is a residue from the 1st screening step. After mixing the fresh organic wastes with the structure material, the composition is ready for the next step in the process.

3.4.4.7 Pre-composting process

Pre-composting will be done in "pre-composting cells." These cells are designated areas with enough space for 3-4 days daily amount is dumped, inspected, and mixed. There are 6 cells in total that all have a built-in system for forced aeration, which is regulated by butterfly valves. No turning will be required. The pre-composting process will take about 3 weeks. By monitoring the temperature daily, the compost plant operator will regulate the forced aeration system to reach an optimum pre-composting process. Controlling the forced aeration will ensure that pathogens, viruses and bacteria are neutralized according to certifying specifications before proceeding to the next step.

	
Blowers are introduced for forced aeration of the static pile inside the compost box.	Regular monitoring of temperature, moisture, oxygen, and other parameters is maintained for the proper composting process.

Figure 3-22: Pre composting process

3.4.4.8 Intermediate process

The intermediate process is a 1st screening step. After the 3 weeks of pre-composting, the semi-finished product will be taken out of the cells by a wheel loader. The wheel loader then drives it immediately to a fully automated drum screen. This drum screen will separate the half-fabricate into 2 fractions:

- The fraction 0–60 millimeters that will go to the maturing process;
- The fraction > 60 millimeters that will be used as structure material.

After the screening, both fractions will be processed further in the designated areas.

3.4.4.9 Maturing process

The maturing process is almost the same as the pre-composting process with the forced aeration method. The only differences are:

- The period of the process, which will take about 4-5 weeks;
- Two cells will be used for maturing of waste.
- The material's composition is < 60 millimeters and has no more structure material.

Matured compost is screened for marketing after drying

Matured compost is screened in the fractions 0-10 and 10-60 millimeters

Figure 3-23: Maturing process

3.4.4.10 Final screening

The end-process will be done about 6-7 weeks after the receiving process. The product will be taken out of the windrows and screened again. This time the screening is done in the fractions 0-10 and 10-60 millimeters. The fraction:

- 0-10 millimeters is the end product, which is the compost and will be stored in cells similar to the pre-composting cells. The storage cells, however, don't have any aeration;
- 10-60 millimeters is not ready for marketing or enrichment and will go back to the maturing process, where it will be mixed with screened material from the intermediate process and stay for an additional 4-5 weeks in the maturing area.

After the processes described, we have compost (fraction 0-10 millimeters) ready for marketing or enrichment.

3.4.4.11 Packaging and Marketing

Marketing of compost will be done after laboratory analysis of the product. Analysis of compost will be done as per the Bangladesh Compost Standards. After the quality analysis of the compost product, it will be kept in a storage area for marketing. Compost will be sold in both bulk and

packet. The entire composting process is shown in Figure 3-22. A typical layout plan of the compost plant is shown below.

The marketing of compost from an organic waste recycling facility is vital for the long-term sustainability of the facility. The following section describes key issues linked with marketing of compost.

Compost is a marketable, value-added commodity. Many composting plants have failed to deliver tangible results due to marketing problems. Marketing of compost depends on five key factors:

(i) Quality of the compost and its compliance with standards;
(ii) Packaging and branding of the product;
(iii) Consistent supply of compost during the cropping seasons;
(iv) Distribution and sales mechanism; and
(v) Communication and promotion of the product.

Apart from the aforementioned factors, the following external factors are also vital:

(i) Government issued compost standards and certification;
(ii) Promotion of Integrated Plant Nutrient Systems, demonstration farming, and extension work by the Department of Agriculture; and
(iii) Buy-back at fixed price by municipalities or agriculture departments.

Product quality is the most important factor in ensuring customer satisfaction and continued sales. Compost quality can be classified into visible and invisible criteria, as shown in the Table 3.10.

Table 3-10: Visible and invisible criteria for compost

Visible Criteria Assessed by Customers	**Invisible Criteria Assessed by Lab Analysis**
• Color • Smell • Foreign materials (plastic, glass, wires, nails) • Degree of maturing assessed by color, smell, and moisture content	• Nutrient Content (NPK) • Suitability for plants (pH, salt content) • Heavy metal content • Presence of pathogens

Source: Rouse J., Rothenberger S. and Zurbrügg C. 2008. *Marketing Compost: A Guide for Compost Producers in Low and Middle-Income Countries.*

Clearly, visible criteria are easier to control during production than invisible criteria. In order to convince the customer about invisible criteria, governmental product certification through a registration number and results from a government-approved laboratory are important. Since 2008, Bangladesh's Department of Agriculture Extension provided licenses to companies producing compost, as well as approved compost brands. One key criterion for compost registration in Bangladesh is that the compost producer must have an agreement with government approved laboratory for batch analysis, and the results have to be sent to the Department of Agriculture Extension prior to marketing. Registration and certification of compost by the government have resulted in increased customer demand for government-certified compost. At present there are 71 private sector organizations involved in production and marketing of compost.

It is also important to market the compost in bags as well as prominently display the product's brand name. In Bangladesh, compost is usually sold in 40-kg bags for farmers, and 5-kg bags are sold in the urban area for horticulture. It is always advantageous to sell compost in bags rather than in bulk. Packaging can be used to promote the company's product, display the logo, and provide production information. At present the market price of compost varies between Tk. 15-40 per kg.

A sales and distribution mechanism has a notable impact on compost marketing. There are three options for marketing compost (Figure 3.22):

(i) **Direct distribution**. Producer sells directly to customer. This kind of marketing is sustainable for small-scale community-based compost plants.
(ii) **Semi-direct distribution**. Producer engages sales agent to market the product.
(iii) **Indirect distribution**. Producer engages a bulk buyer, such as a specialized fertilizer company with retail branches.

Since compost is an agricultural product and compost plants are located in urban areas, away from customers located mostly in rural areas, the direct marketing of compost to rural customers is very difficult. It also increases the price of compost due to transportation and storage costs. Experiences in South Asian countries have shown that when large-scale compost plants employ a direct sales approach to market the product, it inevitably fails. Farmers prefer to deal with specialized fertilizer companies with local retail branches that offer them credit instead of having them pay cash. Farmers then pay back the fertilizer companies after harvesting their crop. Box 6.1 highlights the advantages of awareness raising for IPNS,

Engaging fertilizer companies to market the compost through this form of indirect distribution has the following advantages:

(i) Fertilizer companies already have their existing networks and distribution channels up to the village level.
(ii) Fertilizer companies have their own storage facility.
(iii) They have their own transportation facility.
(iv) Compost is sold in the retail shop with chemical fertilizer.
(v) Through their retail shops, fertilizer companies provide credit facility and undertake promotional work.

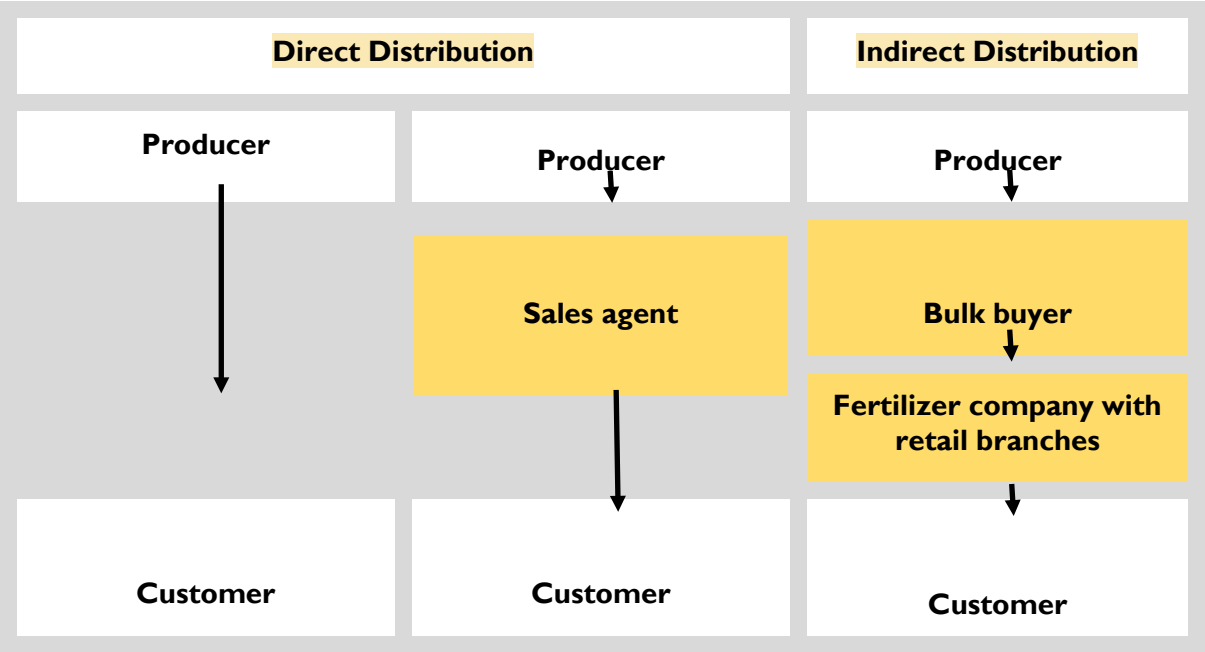


Figure 3-24: Compost Sales and Distribution Models
Source: Rouse J., Rothenberger S. and Zurbrügg C. 2008. *Marketing Compost: A Guide for Compost Producers in Low and Middle-Income Countries.*

Box 1: Integrated Plant Nutrient Systems: The Way Forward for Promoting Compost

The most important aspect in marketing is communicating the right message. Compost is not an alternative to chemical fertilizers. Rather, when compost is used in conjunction with chemical fertilizers, it provides a higher yield (at least 25%–30% in the case of rice and vegetables in Bangladesh). The use of compost also results in 30% reduction in the use of chemical fertilizer. The requirement for irrigation is also reduced by 35%, since compost has high moisture-holding capacity while simultaneously acting as a medium for climate change adaptation by improving the quality of soil and increasing the soil's organic matter content. In Bangladesh, the government is officially promoting the use of both chemical fertilizers and compost as part of their Integrated Plant Nutrient System (IPNS), to improve quality of soil and crop production. A similar approach is followed in Sri Lanka. In India, the Ministry of Agriculture requires fertilizer companies to implement a basket approach or co-marketing of both chemical and compost to farmers. The promotion of IPNS needs a large quantity of quality and certified compost. alone.

Laboratory analysis of compost will be carried out as per the Bangladesh Compost Standards

Compost is bagged and ready for marketing

Figure 3-25: Quality Control and Bagging of Compost

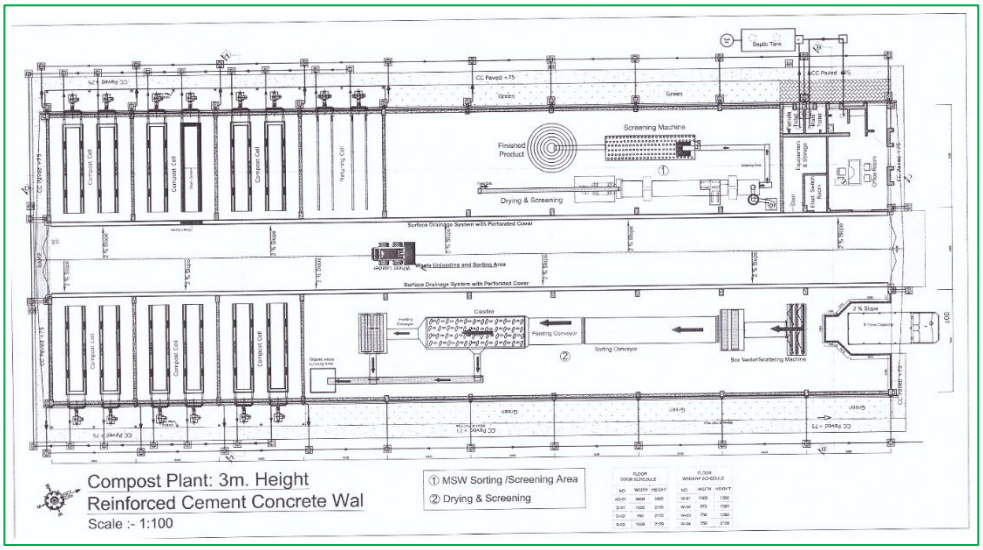


Figure 3-26: Typical layout plan of the compost plant

3.4.5 Material Recovery Facility (MRF):

This is a mechanical-type material recovery facility where a manager's office room with a toilet is provided. Workers (male and female) have separate changing rooms, and toilets are provided in the facility. In the year 2025, 32 tons of municipal waste are expected to arrive at this facility on a daily basis. Out of this total of 100 tons/day of incoming waste, 5 tons/day of recyclables (paper, plastics,

carton storage, metals, and residuals) will be stored in designated compartments of this facility. The unloading and sorting area of incoming waste is kept well-ventilated by introducing exhaust fans and ventilation fans. 15 (fifteen) meter wide column-to-column space provided to allow easy access for incoming trucks in the sorting area. Recyclables with economic value will be sold in the recycling market. Space has been allocated for the baling area, where baling, shredding, and compacting of the inorganic waste will take place. Space for the storage of baled recyclables is also provided in the facility. Enough ventilation and lighting (natural from the transparent fiberglass roof and lights) are provided in the design to keep the area well-lighted for a better working environment. A corrugated GI sheet with 0.7 mm thickness is used as a roofing material. All the single-use plastic amounting 3 tons per day shall be used in the pyrolysis plant to produce diesel.

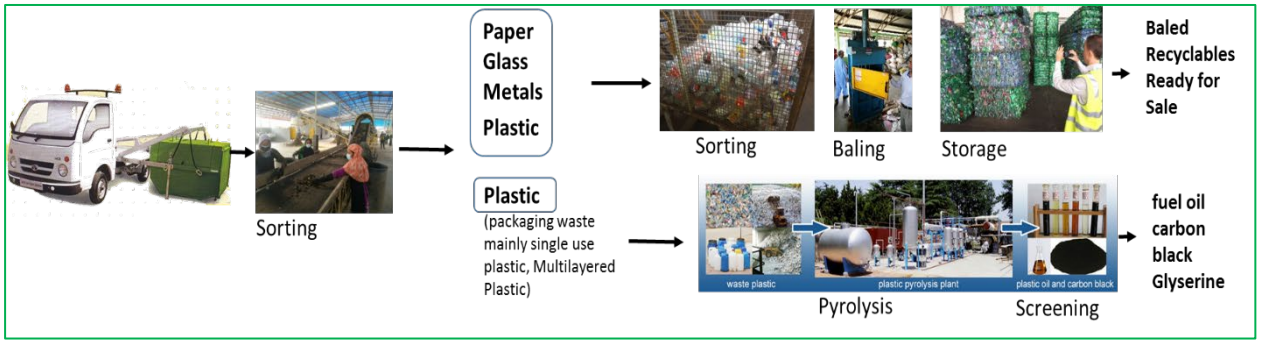


Figure 3-27: Layout Plan of the Typical MRF

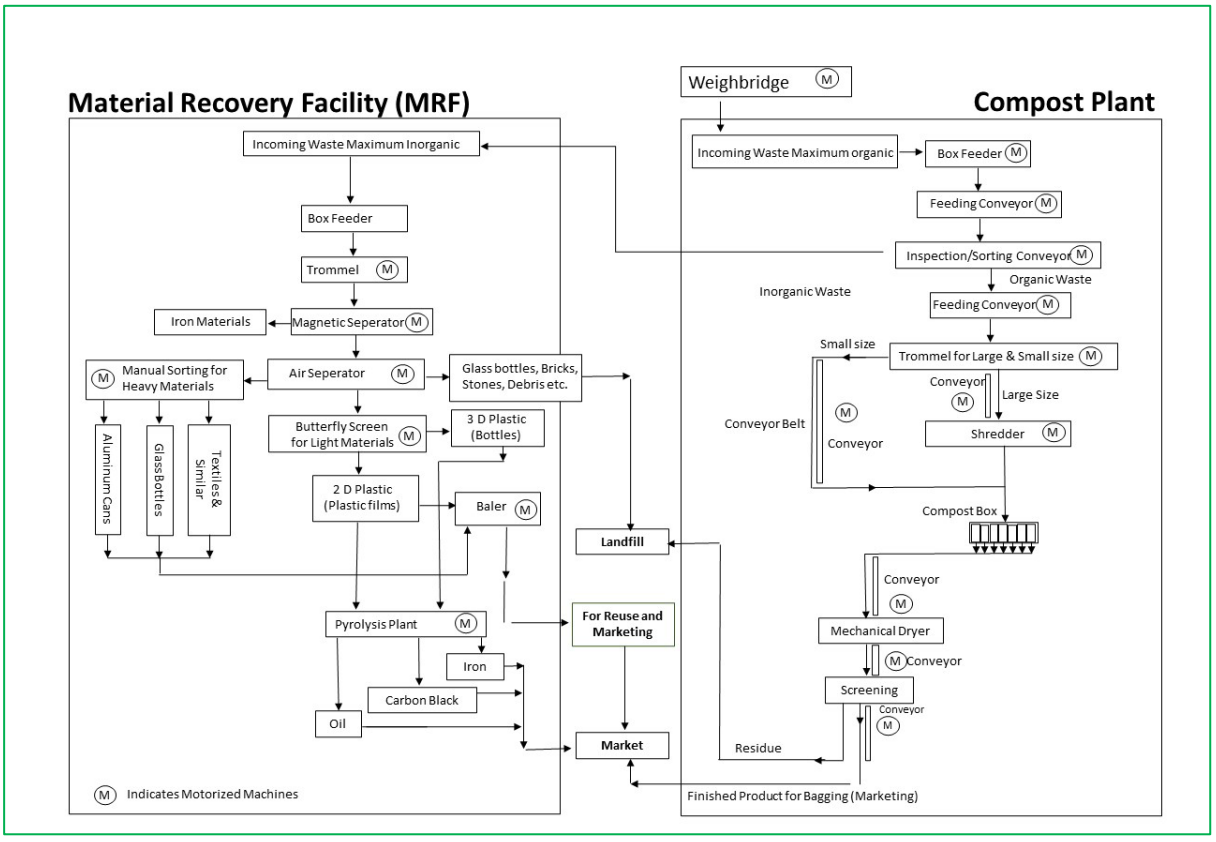


Figure 3-28: Flow diagram of Material Recovery Facilities

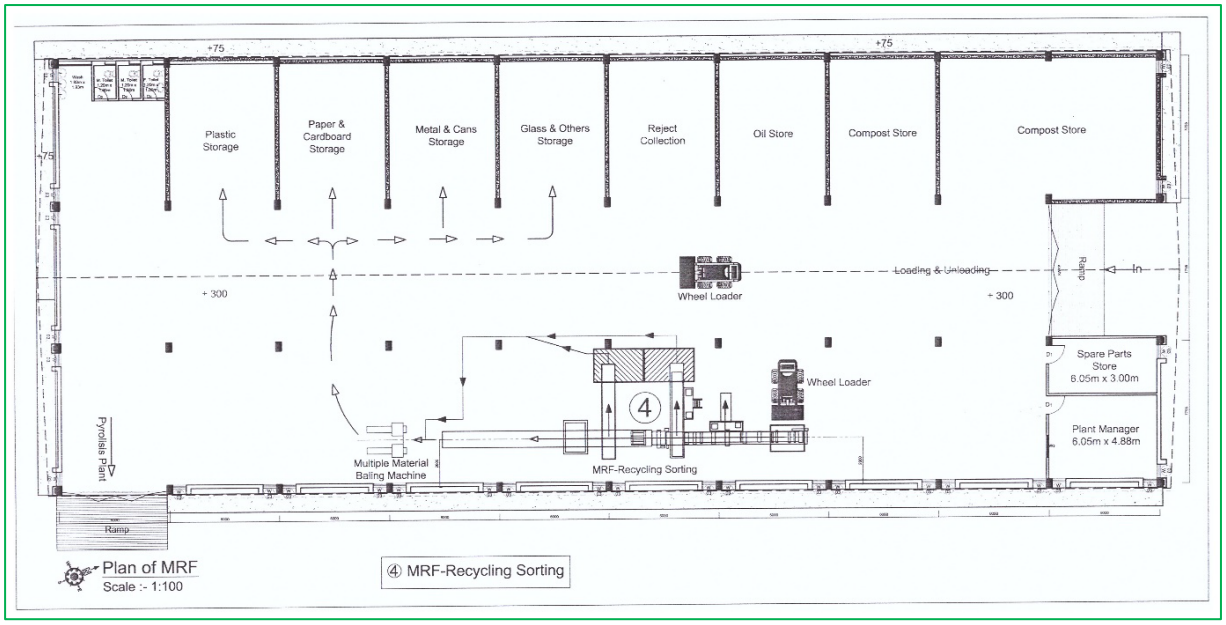


Figure 3-29: Layout Plan of the Typical MRF

Landfill

3.4.6 Design Considerations

As regards the design consideration for the proposed landfill with a resource recovery facility, the consultant has taken into account the following considerations:

Landfill: The landfill will be designed to provide safe waste disposal with minimal effect on the environmental components such as soil, groundwater, surface water, air, and people. The cells will maximize waste disposal quantity within the available space of the selected site. The key design considerations include the following:

Expected waste input: The current and projected amount of waste to be collected and disposed of in the landfill cells must be known. These will determine the size of the cells and the eventual lifespan of the facility that will be constructed in the selected site.

Target landfill life: Disposal facilities are usually planned for a 20-year period, with the individual cells lasting for 5 to 7 years.

Geology: The foundation for the landfill should have sufficient bearing capacity. A geotechnical survey has been conducted on the proposed landfill site. It was found from the geotechnical survey that the soil up to 4.5-meter depth is clayey silt with medium plasticity. The soil is silty sand between 6 to 9 meters in depth and medium dense silty sand between 10 to 19.5 meters. The soil has medium plasticity. The bearing capacity of the soil was found to be less than 1.5 tons per square foot.

Hydrogeology: The proximity of the groundwater to the surface affects the extent of excavation needed to generate the space for the landfill cells. As a rule, the base of the cell should be min. 2 m above the water table.

Hydrology: Surface water draining towards the landfill area could potentially increase leachate and bring about local flooding during major rain events. The design will incorporate peripheral drainage systems, diverting water from the landfill cells.

Availability of cover materials: Landfill cover will be sourced from the excavation to be made for the cells and related facilities.

Ground conditions and prevention of seepage: The ground where the landfill will be developed must be impermeable (rock without cracks or clay of min 1 m thickness to avoid leachate seeping uncontrolled into the ground and thus polluting the groundwater. If these conditions are not met, a liner must be established. SWM Rules 2021 has recommended an HDPE liner of 1.5mm or clay liner of 90 cm thickness with a permeability coefficient of 1x10cm-9/sec.

It is recommended to use a 1.5 mm HDPE liner for the landfills. The liner must have a foundation of stable soil without any large stones. This can be achieved by compacting and leveling local soil and trimming out large rocks and stones (over 25 mm). Then a leveling layer of sand or fine gravel (0-8 mm) of min. 100 mm is added. The liner must be adequately anchored on all sides according to the manufacturer's requirements.

On top of the HDPE liner, there should be a layer of filter fabrics for protection when exposed to sunshine and weather. Usually, a drainage layer should be added on top of the filter fabrics. This may be of min. 300 mm thickness and the material must be without large stones (more than 20 mm) but can be any locally available soil with high permeability (sand, river gravel, etc.). In the drainage layer, slotted collection pipes for leachate collection should be installed at an internal distance of 20-30 m.

Leachate treatment: Leachate quantities must be minimized through strict and planned separation of clean rain surface water and polluted seepage. The treatment has the best effect on concentrated leachate. In general. Leachate has unpredictable properties compared to other waste water types, which calls for specialized design and planning. Leachate is challenging to treat adequately; many plants worldwide have problems achieving satisfactory treatment results.

Several treatment methods are available, from advanced and expensive membrane technologies to simple biological treatment. From practical experience under similar conditions, low-tech biological methods like aeration and subsequent sedimentation are suitable under local conditions.

Recommended treatment option

The treatment plant will be designed for leachate from the initial cell with 5-7 years of operation, and the input will be average rainfall in average max. Month over the last 10 years. This is because the landfill will represent a substantial retention volume, distributing the water volumes from rain over time. Observations from other landfills indicate that the retention will even flow to approx. a month's average. The following design criteria are used for the treatment of leachate:

- The water volume will be equal to the average maximum rainfall per month multiplied by the landfill cell area;
- **Aeration Pond**: The retention time in the Aeration Pond will be 1 day at the maximum flow, and it will be equipped with aerators. The depth of this pond is 2 m;
- **Facultative Pond**: The retention time in the Facultative Pond will be 4-5 days in maximum flow;
- **Polishing Pond**: The retention time in the polishing pond with plants will be 1 day in maximum flow. The depth of this pond 2.5;
- The ponds have a 2 mm HDPE liner at the bottom;

Gas control: The accumulation and migration of landfill gas must be controlled. The most effective manner of managing landfill gas is to collect, treat and utilize it.

Environmental nuisances: Special consideration will be taken to minimize and control nuisances arising from the landfill's construction, operation, closure and aftercare phases. Nuisances that may occur from landfilling include: noise, odors', dust, litter, birds, vermin, and fires. However, the protection measures suggested to control the nuisances arising from the SWM facility (i.e., noise, odors, dust, litter, birds, vermin, and fires, etc.) are as follows:

- Recover, collect, and dispose of municipal solid wastes properly at the designated landfill site;

- Handle the non-biodegradable and biodegradable municipal wastes separately at the SWM facility as quickly as possible;
- Prohibit unwanted littering and unorganized discharge of wastes at the site of the SWM facility;
- Municipal solid waste is either adequately managed in a collection pit or disposed of in a municipal collection system;
- Dispose of municipal solid wastes immediately and avoid stocking for a more extended period to prevent potential nuisance and complaints;
- Haul all wastes using transport equipment such as dump trucks with proper cover (e.g., tarpaulin) to avoid accidental release along the route to the disposal site;
- Utilize haulers that are authorized to handle and transport these kinds of wastes; and
- The unloading and sorting area of incoming waste is kept well-ventilated by the introduction of exhaust fans and ventilation fans.

3.4.7 Landfill Layout

A landfill site will comprise of the area in which the waste will be filled as well as an additional area for support facilities. Within the area to be filled, work may proceed in phases, with only a part of the area under active operation. The following facilities must be located in the layout:

(a) Access roads;
(b) Equipment shelters;
(c) Weighing scales;
(d) Office space;
(e) Compost plant;
(f) Material resource recovery facility;
(g) Medical waste management facility;
(h) Boundary of the landfill areas and areas for stockpiling cover material and liner material;
(i) Drainage facilities;
(k) Leachate treatment facilities; and
(l) Location of monitoring wells.

3.4.7.1 Proposed Design of Landfill & Resource Recovery Facility

Planned Infrastructure Investments to be Developed and the Design Horizon

Site plan with a design period of 20 years; the project components/facilities were planned up to the year 2045. Investment works to be implemented under the project comprise the following:

- Construction of 1 (one) controlled landfill cell out of a total of 2 (three) cells;
- Construction of 1 (one) capped cell for management of existing waste;
- Construction of 1 (one) compost plant;
- Construction of mechanical-type material recovery facility (MRF);
- Installation of medical waste treatment plant;
- Construction of leachate collection, treatment, and reuse system;
- Construction of office, workshop, electrical, and security buildings at the landfill site;
- Construction of the access road to the landfill site to be above flood levels;
- Construction of internal road and rainwater drainage system along with peripheral embankments;
- Construction of fencing and entrance gate:
- Construction of car washing facility;
- Provision of operations & maintenance equipment

The site plan showing the overall design of the proposed Integrated Landfill with Resource Recovery Facilities is shown in Figure 3-28.

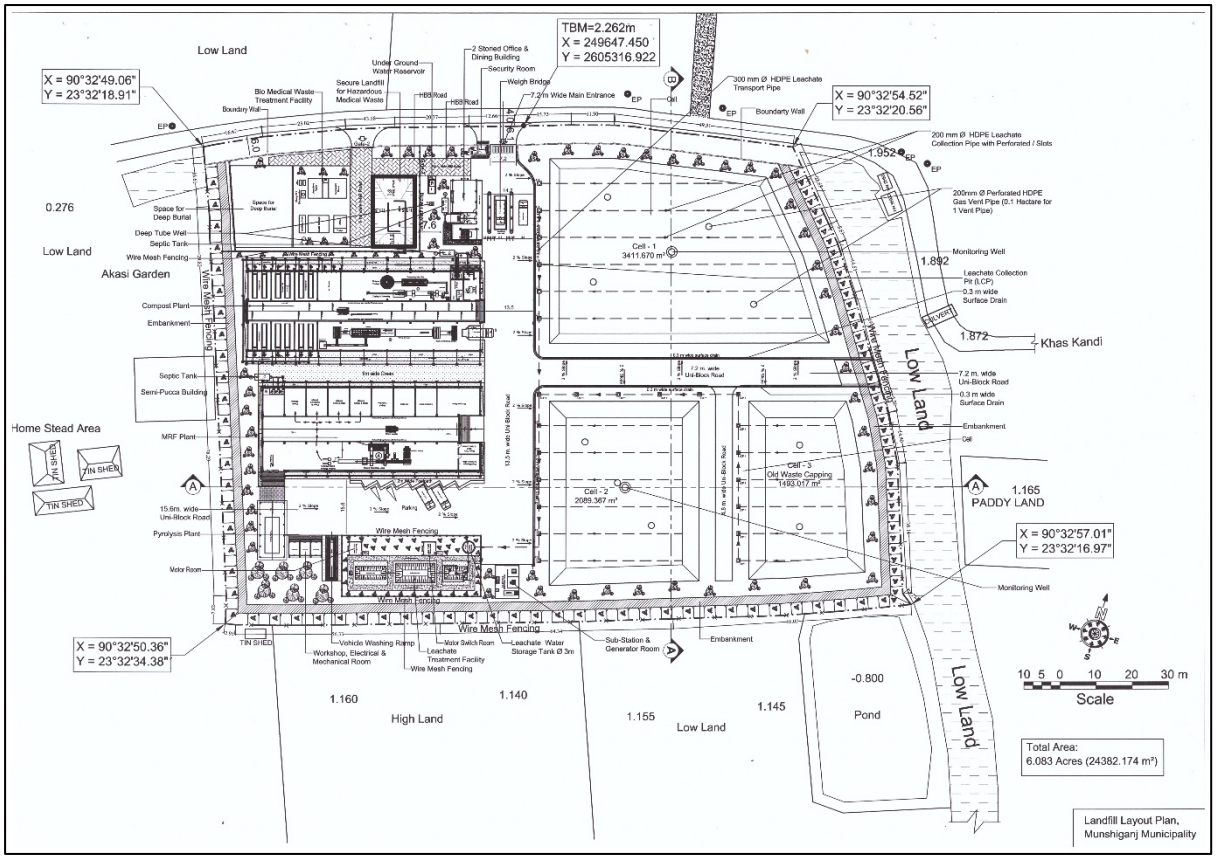


Figure 3-30: Layout plan for the proposed Integrated Landfill with Resource Recovery Facility

3.4.7.2 Incorporating Climate Resilience Measures in the Detailed Design

This project supports climate resilience by introducing the following measures:

- The finished ground level of all the construction is considered to be above the flood level;
- The plinth level of all construction is kept above flood level;
- Embankments around the landfill have been considered;
- All sidewalls and roofs are specially designed to withstand high wind velocity and storm up to 260 km/hr;
- Concrete roads are introduced to avoid waste penetration in the ground and to avoid attracting rodents and other pests to the facility;
- Concrete block roads are used along with landfill cells. Leachate collection and treatment ponds can take additional wastewater in case of extreme events.
- The highest rainfall amount in the last 10 years has been considered in the design of leachate collection and the rainwater discharge system;
- The landfill site shall have HDPE lining and clay layer to avoid percolation of leachate water into the groundwater;
- To save the landfill area, around 18% of the inorganic waste shall be recycled;
- Staff and worker restrooms with bathing and toilet facilities are provided to provide comfort to the workers during extreme weather;
- The landfill site shall have boundary walls;
- Staff and worker restrooms with bathing and toilet facilities are provided to provide comfort to the workers during extreme weather; and
- The landfill site shall have boundary walls, drainage facilities, and a drinking water facility.

Mass Balance of the Incoming Waste

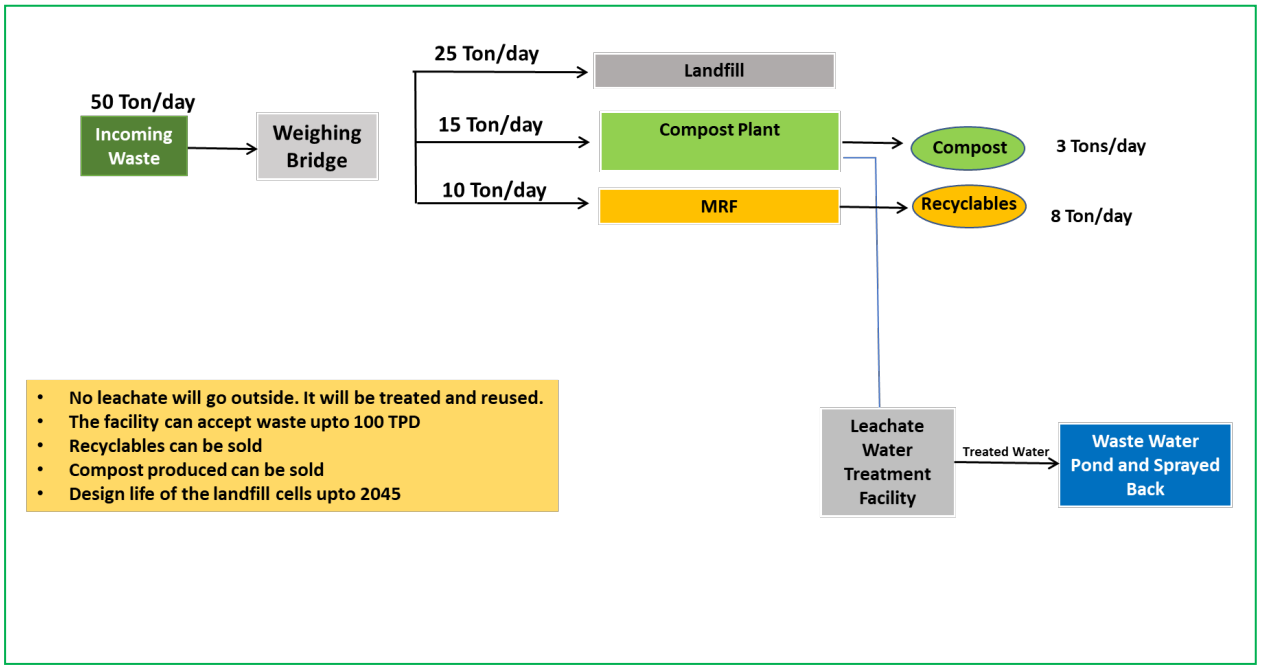


Figure 3-31: Mass Balance of the Proposed Integrated Landfill with Resource Recovery Facility (ILRRF)

The facility will accept 50 tons/day of solid waste per day, out of which 25 tons will go into the controlled landfill, 15 tons will go into the compost plant and 10 tons will go into the MRF. The following section describes the details of each unit of the facility.

3.4.8 Landfill Cell Volumes and Phasing

The proposed landfill project is developed with due consideration of the local site conditions. The design is based on a topographic and geotechnical survey conducted in 2023. With a net average landfill height of 10m, Cell-1 included in the bid will have to cover an area of approximately 0.35 ha, which has been the design basis. For the entire 20-year span, an area of about 0.6 ha is needed, assuming a final landfill height of 12 meters. The controlled landfill will have three (2) cells. Each cell can be used for 5-6 years period. After 10 years, cell number 1 can be reused, and old waste can be used as cover material. Apart from cell numbers 1 to 2, cell number 3 will be used for the capping of old waste already disposed of in the landfill site.

The construction work of these landfill cells has a layer of compacted clay (MDD 95% hydraulic conductivity $1 \times 10 m^{-9}/s$), having a 1.0 m thickness at the base layer from the ground level. On the top of this compacted clay layer, an impermeable HDPE liner (1.5 mm thickness) and a protective layer of non-woven geo-textile (1.5 mm) have been introduced. A 400 mm thick drainage layer with sand and gravel (20 mm size) has been introduced on the top of this layer. Every day, the waste will be placed in the Cell with a 1- meter depth, which will be covered with a daily cover (with 150 cm thickness). A final cover (with a thickness of 300 cm) will be introduced on the top of the pile with cover vegetation with 150 mm topsoil. These cells have a slope of 1:3 ratios with a height of up to 10 meters after full completion. Within this drainage layer, leachate collection and transportation pipes are introduced in 20-meter intervals. These pipes are 200 mm Ø and 350 mm Ø HDPE collection and transport pipes, respectively. These pipes have slots/ perforation (25 mm Ø) to allow leachate to be collected and transported to the proposed leachate treatment facility. These cells will have daily cover, gas vent pipes, and final cover for environmentally friendly operation.

Landfill cells are planned to be constructed in stages. During the initial stage, Cell-1 will be constructed, and the life of this landfill Cell-1 is expected to be 5-6 years. During this initial stage, all the facilities and structures required for the uninterrupted operation of the proposed landfill project will be

completed. These facilities are as follows, main entrance, security. Subsequently, Cell-2 will be constructed in the future for the disposal of waste. All these cells are connected to the leachate water treatment facility using HDPE pipes.

3.4.9 Groundwater Levels and Preventive Measures

As per the geotechnical survey report prepared in 2023, the groundwater table at the landfill site was found to be between 3-3.15 m. In order to prevent any seepage of leachate to the groundwater, a 0.5 m compacted clay (permeability of 1×10^{-9} m/sec) liner has been provided in the detailed design. On top of the clay liner, a 1.5 mm HDPE liner is also provided. A Clay liner, along with a 1.5 mm HDPE liner, will secure protection against seepage of leachate into the groundwater. The HDPE liners will be appropriately anchored at all sides according to the manufacturer's requirements and the design.

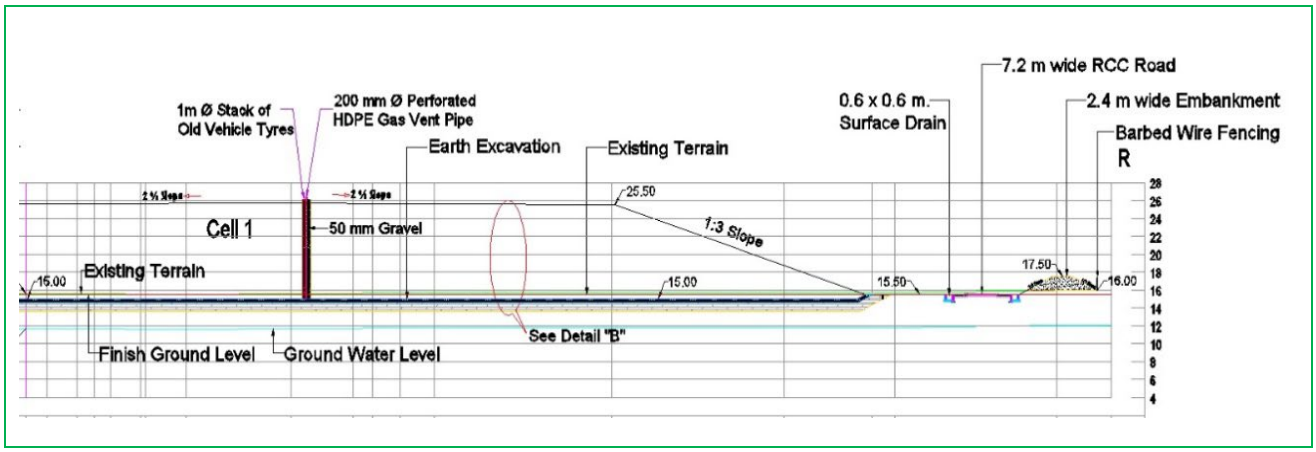


Figure 3-32: Typical section of landfill cell shows the height of the cell, slope, leachate collection system and landfill gas vent pipes etc.

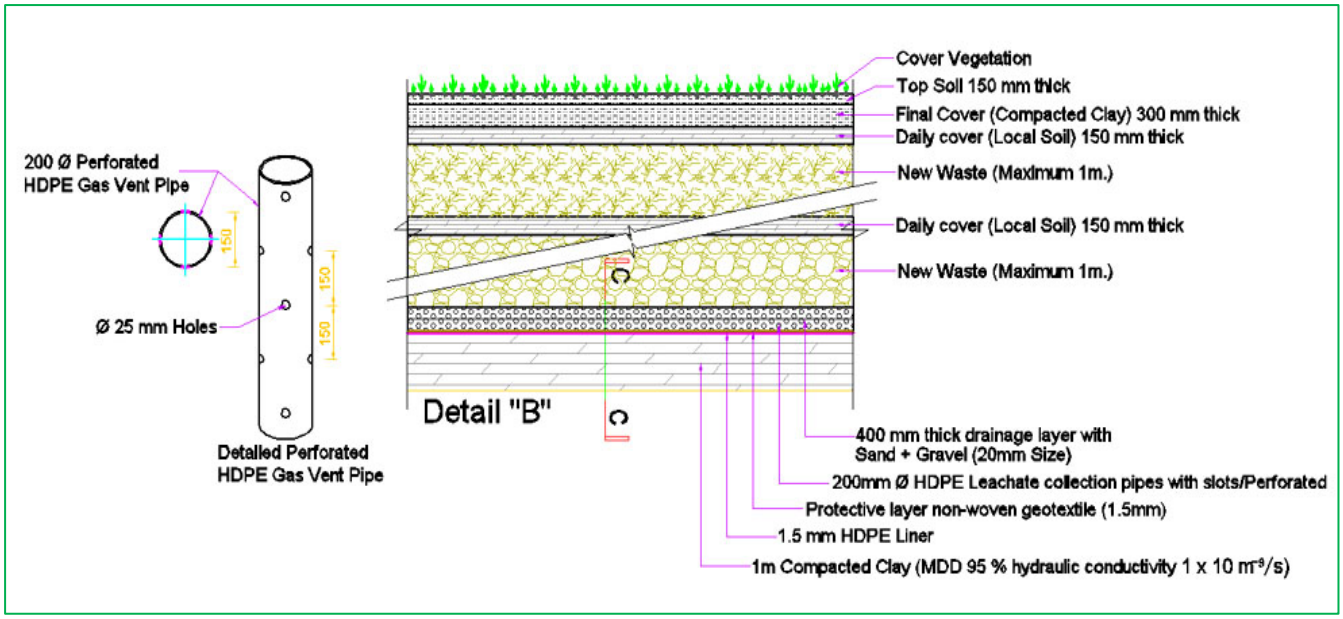


Figure 3-33: Typical cross-section of landfill cell showing leachate water drainage and landfill gas vent pipe system

Figure 3-34: 1.5 mm thick HDPE Liner on top of the Clay Layer shall be used to manage leachate

3.4.10 Leachate Collection, Treatment & Recirculation

In addition to the impermeable bottom layer, a drainage layer has been designed on top of the impermeable layer. This is done to collect leachate and avoid water stagnation in the landfill. The drainage layer has a thickness of 400mm, which consists of sand and gravel (20 mm size). Leachate collection and transport pipes have been installed in the drainage layer to bring the leachate to the treatment plant. A 200 mm dia perforated HDPE pipe has been used for the collection of leachates from the landfill cells. Leachate collection pipes are placed 20 m apart. Leachate transport pipes are also HDPE having 350 mm dia. HDPE pipes and fittings shall conform to the standards as ISO 4427 or EN 12201, SDR 17/PN 10 with PE 100 material. The material for the drainage must be well-graded and must have good drainage properties. The sand/gravel material for the drainage layer shall have a coefficient of permeability of at least 10^{-3} m/s.

To reduce leachate generation, control measures have been considered that will minimize the quantities of precipitation, surface water, and groundwater entering landfilled waste. These control measures include soil cover and an impermeable material placed at the base. Leachate has been considered by the inclusion of a proper drainage system for the collection and in-facility treatment of leachate before recirculation in the cells. Based on the review of the following: relevant studies, the annual rainfall amount of the town, and the topography of the landfill site, a very simple treatment option has been utilized. The option uses ponds that consist of an aeration pond, followed by a facultative pond, and lastly, a wetland pond. A treated leachate water storage pond has been designed for the storage and reuse of the treated leachate. It is expected that between cubic meters/day of leachate will be generated during the period from June to October. The following design criteria are used for the treatment of leachate:

- The water volume will be equal to the average maximum rainfall per month multiplied by the landfill cell area;
- **Aeration Pond**: The retention time in the Aeration Pond will be 1 day at the maximum flow, and it will be equipped with aerators. The depth of this pond is 2 m;
- **Facultative Pond**: The retention time in the Facultative Pond will be 4-5 days in maximum flow. The depth of this pond is 2.5 m;
- **Polishing Pond**: The retention time in the polishing pond with plants will be 1 day in maximum flow. The depth of this pond 0.8;
- The ponds have a 2 mm HDPE liner at the bottom;
- Based on the rainfall data and area of cell, the following parameters have been used:
- Average maximum monthly rainfall: 148 mm
- Evaporation in wet months: 31 mm
- Net volume of rainfall per month: 117 mm
- Area of cell-1: 3412 sq.m
- Average maximum daily rainwater infiltration volume 12.87 cu.m/day say 15 cu.m during peak

Leachate Water Recirculation: Treated leachate water from the waste treatment plant (lined polishing pond) will be conveyed to the treated water pond using a 160 mm dia PVC pipe. From the treated water pond, the treated leachate water will be pumped using a centrifugal pump and pressure uPVC pipe network of 50 mm dia with gate valve and detachable hose pipe attached at the outlet for spraying into cell number 1 during the dry season. Pressure PVC pipe used for leachate water recirculation shall have the following specification: wall thickness of pressure PVC pipe shall be 2.7 mm for 25mm & 3.40 mm for 50mm dia., class E, 15 bar (15.30 kg/cm2, PN16). The pipes shall conform to ASTM/BS/ISO/IS standards. A 350 sq.m treated storage tank has been designed with a 1 m depth, which will be used for the recirculation of treated leachate into the cells.

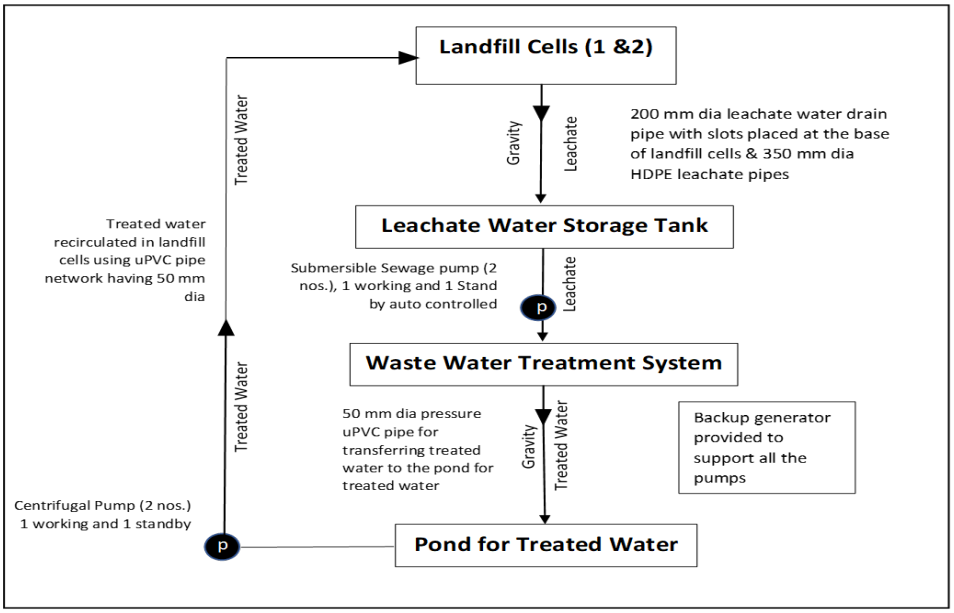


Figure 3-35: Flow diagram Showing How Leachate Water is Treated and Recirculated

3.4.11 Landfill Gas Control

There is no plan to flare or recover the gas. The gas ventilation has been designed as follows: (1) during site preparation, the landfill side slopes are lined with impermeable clay to curtail lateral migration of the gases and then lined with coarse rock or gravel to allow gases to escape to the atmosphere; and (2) rock-filled, wire mesh wrapped, vertical wells of about 1 m diameter are created during landfill (about one well for every 0.1 hectares). 200 mm dia perforated HDPE gas vent pipes are placed between the spacing of 30 meters apart.

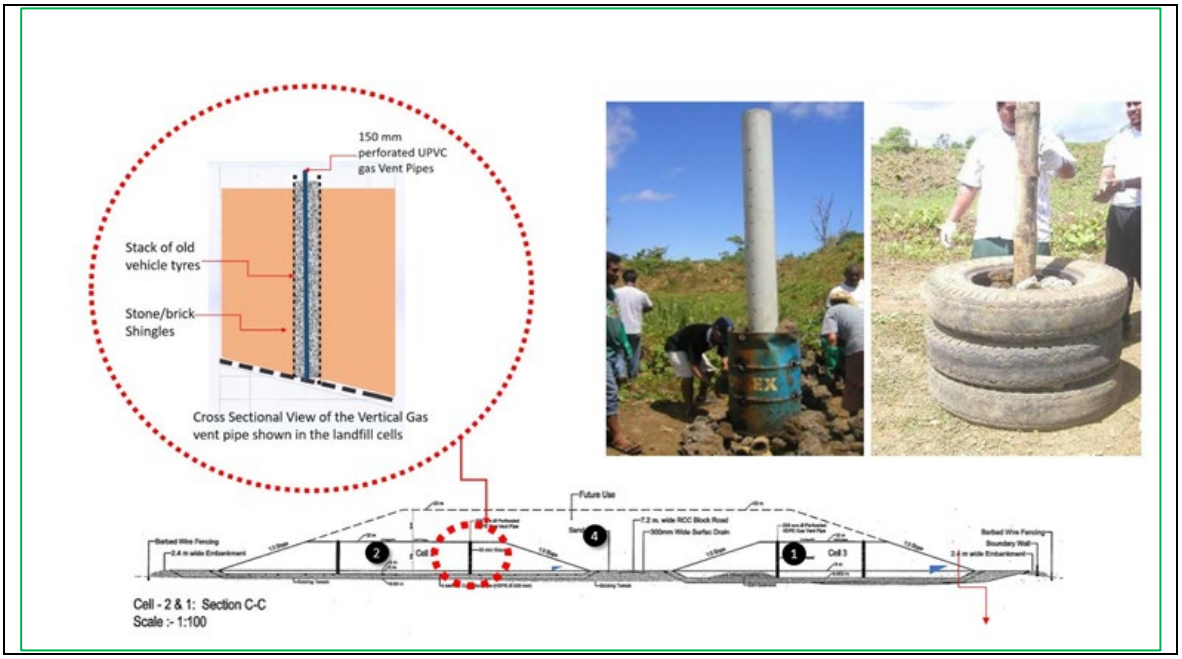


Figure 3-36: Typical Section Showing 200 mm Dia Perforated HDPE Vertical Gas Vent Pipe Introduced for Venting Landfill Gas from the Landfill Cells

3.4.12 Landfill Closure

As each phase is completed and as the final cover level is reached in successive phases, the following interconnectivity will be established:

a. The leachate collection system of each phase will be sequentially connected (if so designed)
b. The surface water drainage system at the cover of each phase will be sequentially connected (if so designed)
c. The temporary surface water drainage system is dismantled at the base of each completed phase.
d. The gas collection system (if provided) of each phase is sequentially connected. Upon completion of all phases, a final check will be made of the proper functioning of all interconnected systems.
e. An access road will be provided on the landfill cover to enable an easy approach for a routine inspection.

3.4.13 Regional Landfill

As mentioned in the sections above, a 'Regional landfill' is recommended for Munshiganj Municipality to cater to the surrounding ULBs. The 'Regional Landfill' will receive and process solid waste from more than one municipality (e.g., 2 or more municipalities). The advantages of adopting a regional approach will be as follows:

- Municipalities to aggregate the waste quantities generated across their respective jurisdictions to take advantage of economies of scale in transportation, processing, and disposal of MSW;
- Reduce the financial and technical burden on each Municipality and help the cities discharge their obligation for MSW management in a cost-effective manner with better technologies;
- Result in more efficient use of land and other scarce natural resources within the region; and
- Enable better management and easier monitoring with an optimal number of MSW management projects.

Various principles have been followed to ensure the selection of the most optimum and feasible cauterization option for the IL&RR facility. This includes an assessment of:

- **Proximity of ULBs:** Towns within 15 km and 20km of Munshiganj Municipality have been considered. This is to ensure that the waste transportation from these ULBs do not have to spend more time to travel to reach the IL&RR facility.
- **Processing:** To operate at its optimum capacity, the processing facilities are only optimal for Regional Landfill sites where the waste to be processed is significant in weight. It is assumed that biodegradables, inerts, and unsegregated recyclables can be processed at these processing stations. Since the rejects from the processing plant is either not suitable for recycling or further processing, it would be disposed into the regional landfill sites, along with the inert waste. Hence, only 30% of total waste, which mostly consists of inerts and processed rejects, are disposed into the regional landfill site.
- **Disposal:** Processed waste consisting of mostly inerts and processed rejects will be dumped in the Regional Landfill Site in compliance with the rules. It is estimated that about 30% of the waste will be disposed of at landfill initially. Based on these principles, one additional ULB (Mirkadim) – can be considered to utilize the Regional Landfill & RR Facility proposed for Munshiganj Municipality. Based on the operational cost of the landfill in Munshiganj Municipality, they can charge USD 7 per ton to dispose of the solid waste from Mirkadim Municipality.

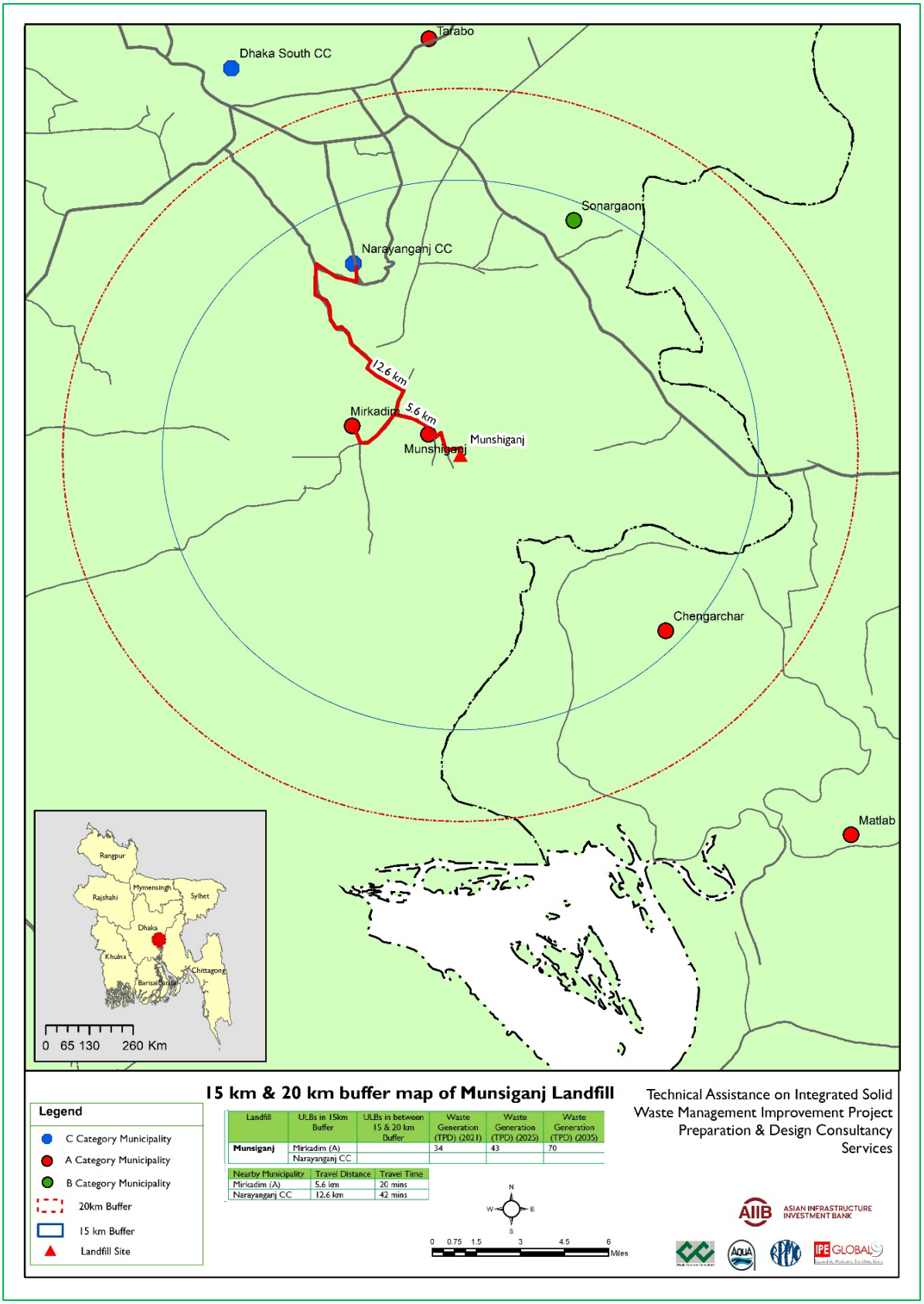


Figure 3-37: Regional Landfill – Conceptual Plan

3.4.14 Improving the Access Roads

The project will improve one existing road (road from Munshirhat to Pourashava boundary via dumping station including 36m long RCC bridge. Total length of the two road is 1.85 km which are connected to the proposed landfill area. The improvement will be limited to resurfacing of the existing track without any widening of the road. No additional land acquisition is required for the road improvement. These roads are also free from any unauthorized occupancy.

3.5 Associated and Existing Facilities

The associated and existing facilities are defined in the AIIB ESP and project ESMPF. The E&S due diligence considered project (i) associated facilities (those which are not funded by the project but whose viability and existence depend exclusively on the project and whose operation and services are essential for successful operation of the project) and; (ii) project existing facilities (those which are already established and operating, and which the project will help upgrade or rehabilitate).

Existing access roads, secondary transfer stations, container bin sites, and other waste treatment facilities linked to the landfill are considered as existing facilities. These facilities are in operation since long time following national and local regulations.

The project does not have any associated facilities.

3.6 Subproject Costing/Budget

The broad estimates for the Capital Expenditure of the sub-project in Munshiganj is given in the table below. The CAPEX has been broadly estimated for four key aspects a) the equipment required for Collection & Transportation- includes the cost of the vehicles for primary and secondary collection and the containers for secondary collection; b) construction of the Integrated Landfill and Resource facility c) cost of the bio-medical waste facility and d) ancillary facilities including access road.

Table 3-11: CAPEX – Munshiganj sub-project

Item	USD
Construction of integrated landfill and resource recovery facility (cell for capping of old waste, new cell for waste disposal, compost plant, MRF, pyrolysis plant, leachate treatment plant, boundary wall, office room, car washing ramp, workshop, guard room, electrical system including transmission, transformer, distribution and deep tubewell with water distribution system	360,0000
Medical Waste Treatment Plant	300,000
Equipment for MRF and Compost Plant	400,000
Weigh bridge (digital)	35,000
Excavator (1)	220,000
Bulldozer (1)	250,000
Front Loader (1)	225,000
Container Carrier Trucks (4)	211,000
Containers (16)	24,000
40 Improved Rickshaw vans (with bins) for primary collection of waste	60,000
Aerators (6)	12,000
Pumps (10)	30,000
Total	5,367,000

Operation and Maintenance Expenses

The O&M expenses are key costs required in operationalization and management of the SWM value chain including waste collection, transportation and treatment facility in the Municipality. The table below provides an overview of the various categories of O&M costs

Table 3-12 Components included under Operating Costs

Item	USD
Operational Cost of Door to Door Waste Collection	144,000
Operational Cost of Secondary Collection of Waste	38,378
Operational Cost of Integrated Landfill and Resource Recovery Facility	137,585
Total	319,963

3.7 Subproject Schedule

Substantial time is required for spanning the continuum of subproject preparation, approval, survey, design & estimate, Contract award and Contract execution. Efforts needs to be made to meticulously follow the work schedule for timely implementation of work. Normally the construction work season in Bangladesh runs from October through May (eight months). Construction works are sometimes impeded for the following reasons.

- Early floods in April/May,
- Late floods in September/October,
- Natural calamities (cyclone/tornado, excessive floods) occur in April/May and October/November.

Normally, the best construction period is only for 6 months a year (October to March). The construction period is sometimes squeezed to 4 months due to natural calamities. Based on time constraint or exigency, construction work may even need to be carried out in the monsoon. Besides, whenever possible, simultaneousness of activities can be ascertained and cashed in on and consequently, quantum of work can be maximized through efficient planning and adoption of best available practice. Summing up, over a 13-month period, major works are advisable to take place between March 2023 and March 2024. A tentative time-schedule for implementation (only as an indication) is shown in Table-3.13.

Table 3-13: Proposed Implementation Schedule for the Munshiganj Sub-project

Month	2022		2023												2024												2025											
	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Pre-feasibility Report																																						
Feasibility Report																																						
Preparation of the bid documents																																						
Tendering of the sub-project and the work order																																						
Execution of the physical work																																						
Final inspection and certification																																						

4. DESCRIPTION OF BASELINE ENVIRONMENT

4.1 Introduction

This section discusses the existing conditions within the subproject study area, covering both the natural and social environments. The analysis was completed through a combination of secondary data sources, extensive on-ground reconnaissance, and baseline studies. The assessment is divided into three broad categories: physical environment, biological environment, and socio-economic environment. The baseline conditions in respect of meteorology, water resources, land resources, agriculture, livestock, fisheries, ecological resources and socio-economic condition in the study area were established by collecting data from secondary and primary sources.

4.1.1 Primary Data Collection

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 transecting walk, field GPS measurement, photographic records, need basis environmental survey, and observations.

4.1.2 Secondary Data Collection

Secondary data were collected during the above site visits and were analyzed based upon which interpretations were made to assess the physical, biological, and socio-economic features of the project area. The relevant information is presented in the subsequence paragraphs. Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject site. The literature survey broadly covered the following:

- Subproject details, reports, maps, and other documents available with the WCC, IPE Global, RPMC, and AQUA Consultants, Upazila Agriculture and Fisheries Department, LGED, and Munshiganj Paurashava information available at websites;
- Relevant acts and extraordinary gazettes, and guidelines issued by Government of Bangladesh agencies;
- Literature review on land use, soil, geology, hydrology, climate, socioeconomic profiles, and environmental planning documents collected from Government of Bangladesh agencies and websites; and
- Web search for literature.

4.2 Topography

Topography of Munshiganj is mainly low-lying area and surrounded by Dhaleshwari river on the north and west, by Ichamati River on the south and by Meghna River on the east. The topography of the municipality is marked with Medium Highland and Lowland with a gentle slope of about 1-2 % in the south east direction towards River Meghna. The elevation of the study area ranges from 2 m to 5 m amsl.

4.3 Land Use and Land Cover of the Study Area

The subproject area contains a mixed type of land use and land cover (Figure 4-1). In most parts of the surrounding area is covered by human settlement. A significant portion of areas are occupied by agricultural land and bare land. Two major rivers namely Dhaleshwari and Meghna are located within 3km buffer zone of the subproject area.

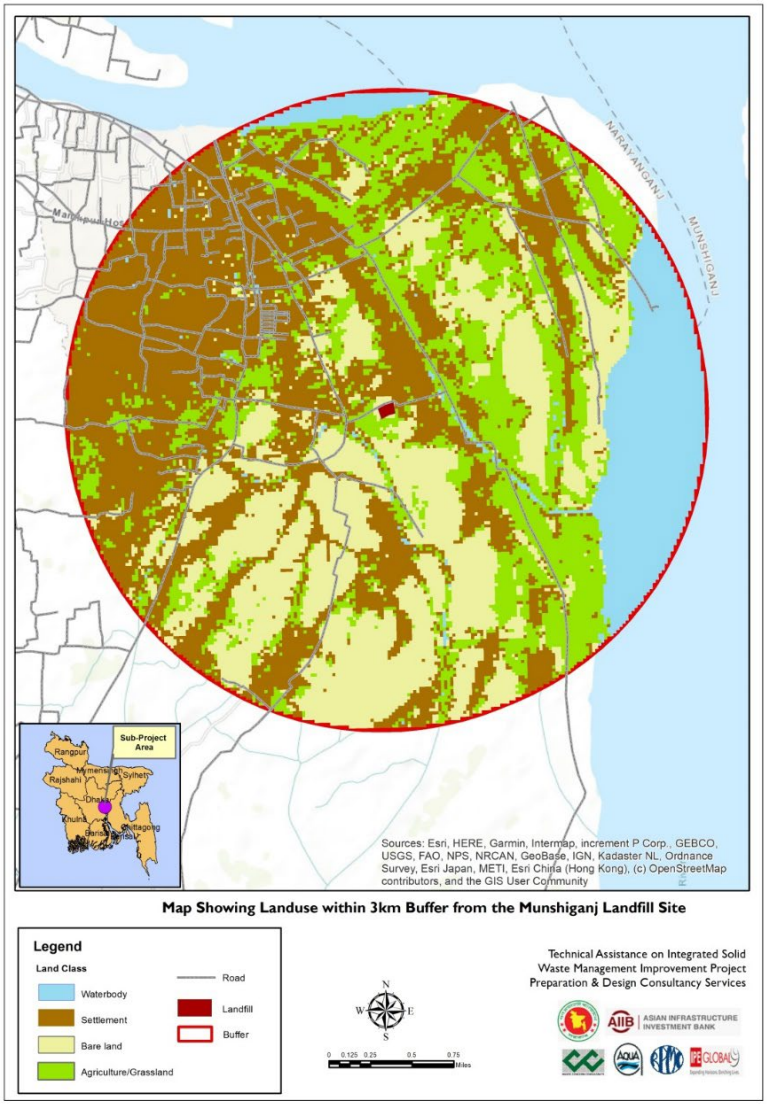


Figure 4-1: Land use land cover map of the subproject area in Munshiganj Municipality

4.4 Geology

Most of the present land surface of the study area is covered by the Holocene flood plains deposited by the Ganga-Brahmaputra-Meghna River system. In the land above tidal inundation, these deposits are composed primarily of silt and sand of appreciable thickness extending to depth of more than hundred meters. In the lower delta, they are principally silt, clay and peat. These sediments contain high water content and are generally loosely compacted and usually grey in color. The recent alluvium deposits are of varying characteristics classified from piedmont deposits near the foot of the mountains to inter-stream alluvium including deposits in the interior, merging with swamp and deltaic deposits approaching the southern shoreline. Stratified deposits of sand, silt and clay constitute the subsurface formations of the study area. The aquifer system of the Holocene sediments is leaky type from which the contamination spread vertically from one place to another.

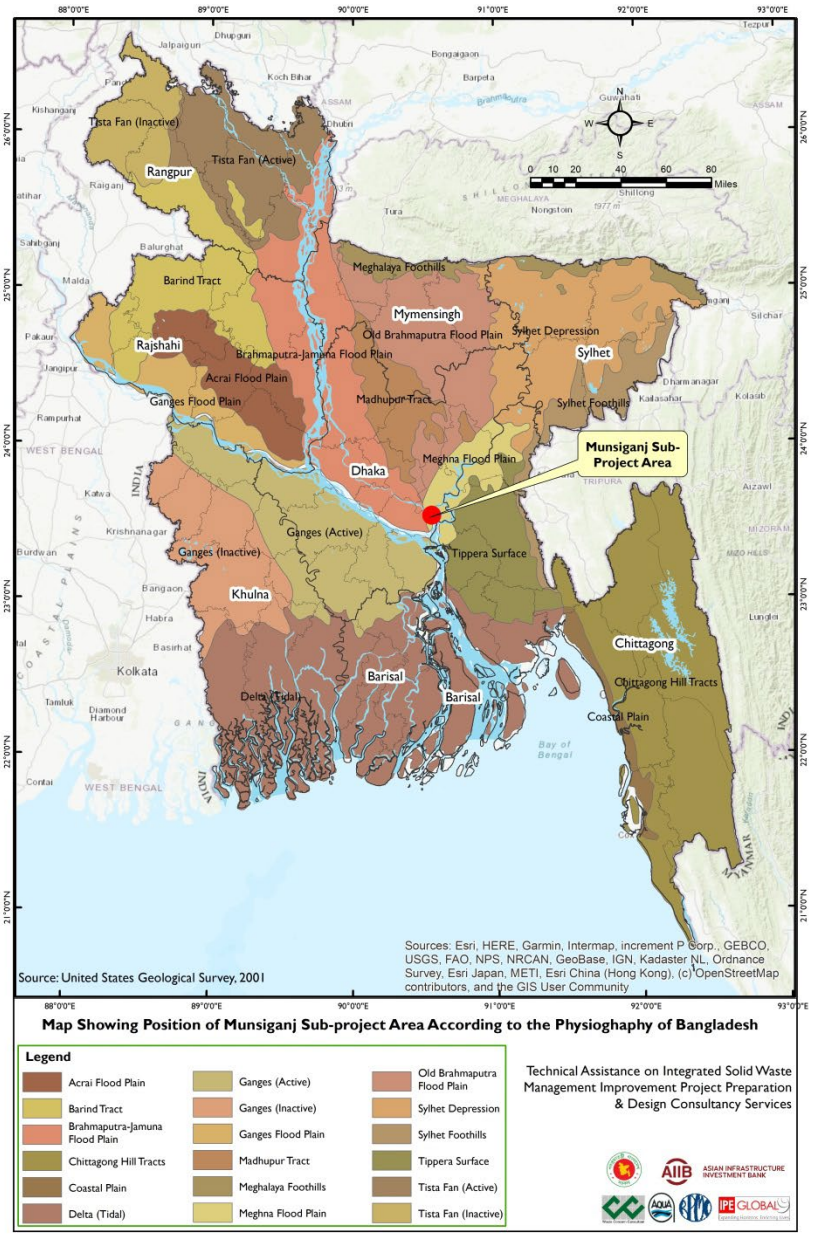


Figure 4-2: Geological Location of Munshiganj Subproject Area in Bangladesh

4.5 Water Resources

The main rivers in and around the municipality of the project site are Dhaleshwari, and Meghna. Munshiganj (Town) stands on south side of the Dhaleshwari River and west side of Meghna River. The drainage system is connected to the river Dhaleshwari, Dhaleshwari branch and Ganakpara khal. Water is moderate in containing organic matter and pollution. The river is important for people daily use, irrigation and carrying raw materials to the industries. Ground water is the source of water for potable water in the project. Average groundwater depth in Munshiganj Municipality is 21 m. Water samples of surface water and groundwater has been collected from the nearby of landfill site for laboratory analysis. The results of water sample analysis are shown in the Table 4-1.

Table 4-1: Results of water sample analysis of different parameters

Water Quality Parameters	Unit	Surface Water (Pond)	Surface Water (Drain)	Groundwater (Deep Tube well)	Bangladesh Standard for Drinking Water (ECR'97)	WHO Guideline for Drinking Water, 2004
Faecal Coliforms	CFU /100mL	8000	9900	0	0	0
pH		7.87	7.15	7.21	6.5-8.5	6.5-8.5
Total dissolved solids (TDS)	mg/L	39.1 .0	511.0	445.0	1000	<1000
Total Alkalinity as $CaC0_3$	mg/L	175.0	235.0	200.0	-	-
Biochemical Oxygen Demand (BOD, 20°C)	mg/L	5.1	17.0	<2.0	0.2	-
Nitrate (NO_3)	mg/L	10.24	1.04	5.66	10	<45
Iron	mg/L	<0.1	3.11	<0.1	0.3-1.0	<0.3
Sulphate	mg/L	41. 12	2.38	3.91	400	<400
Total Suspended Solids (TSS)	mg/L	< 10.0	22.0	<10.0	10	-
Arsenic	ppb	2.65	1.19	<1.0		10

4.6 Natural Hazards

Although the Munshiganj Municipality is located within the vicinity of Dhaleshwari, and Meghna Rivers, the municipality belongs to low flood zone (Figure 4-3). The seasonal flooding occasionally occurs, predominantly by accumulated rainwater which is unable to drain into rivers when they are running at high levels.

River erosion is another major environmental hazard in Munshiganj. Erosion by the Dhaleshwari River sometimes takes serious turn. In addition, there are some regular disastrous events such as nor'westers, hail storm, heavy rain, thunder storm which cause damages to lives and property frequently.

As per Bangladesh National Building Code, 2020 (BNBC, 2020) Munshiganj belongs to low-risk zone in terms of earthquake vulnerability with seismic coefficient, Z = 0.2 (Figure 4-4).

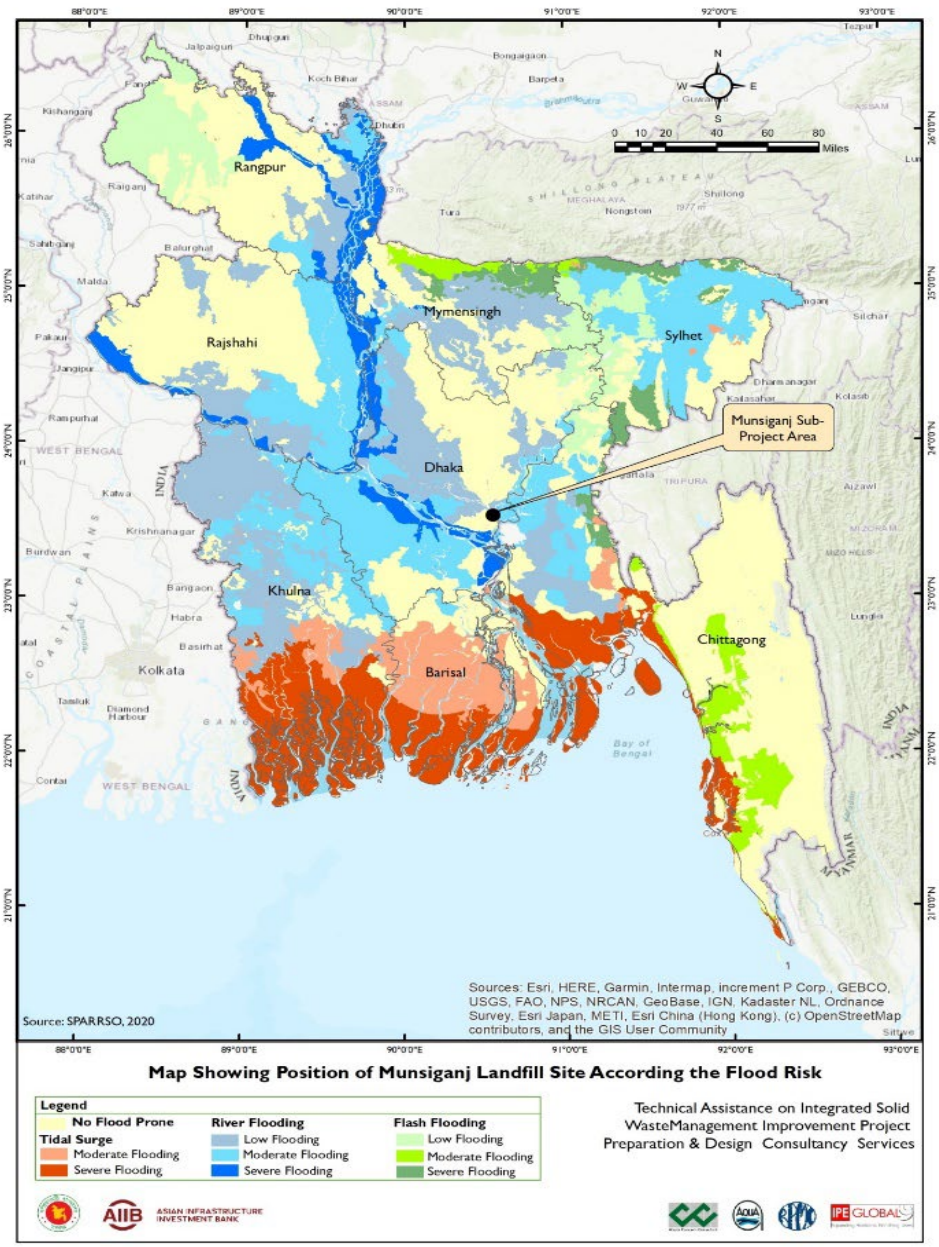


Figure 4-3: Location of Munshiganj subproject area in flood zone of Bangladesh

Figure 4-4: Location of Munshiganj in seismic zone of Bangladesh

4.7 Climate

The climate of this region is tropical accompanied with monsoons and characterized by a change of four seasons. Pre-monsoon season commence from March and continues till the last week of May. The south-west monsoon lasts approximately from June to September, delineating the main rainy season. The transition period from October to November forms the post monsoon season. Dry or winter season starts from in early December which remains till end of February. The study area experiences high air temperature throughout the year with insignificant daily air temperature variations.

4.7.1 Temperature

The climate is tropical with extremes of temperature in summer and winter. April is the hottest month of the year with an average highest temperature of 38.3°C, whereas January is the coolest month with average minimum temperature 15.4°C. It is observed that temperature gradually increase from January to April, and follows a constant pattern from April to September. The temperature tends to start

decreasing from October till January. Figure 4-5 shows the monthly average highest and lowest temperature in Munshiganj.

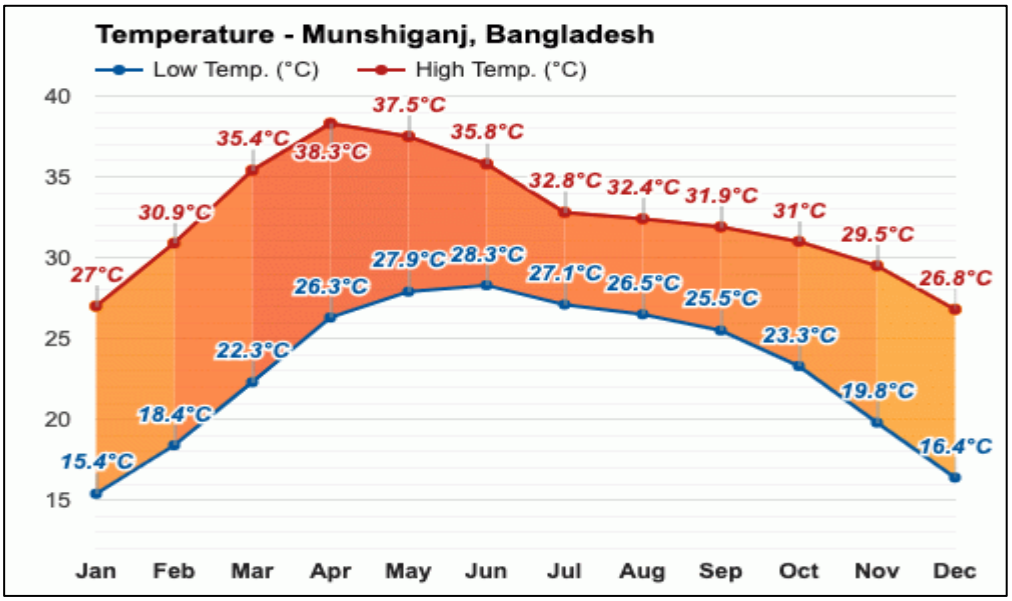


Figure 4-5: Average monthly highest and lowest temperature in Munshiganj
Source: www.weather-atlas.com

4.7.2 Rainfall

The annual rainfall is about 694 mm and approximately 70% of it occurs during the monsoon. Average monthly rainfall during monsoon period is 471 mm. The rainfall follows the general climate pattern with the highest rainfall in the summer month of June to September and minimum rainfall in the cooler and drier months of November to March. Figure 4-6 shows average monthly rainfall in Munshiganj.

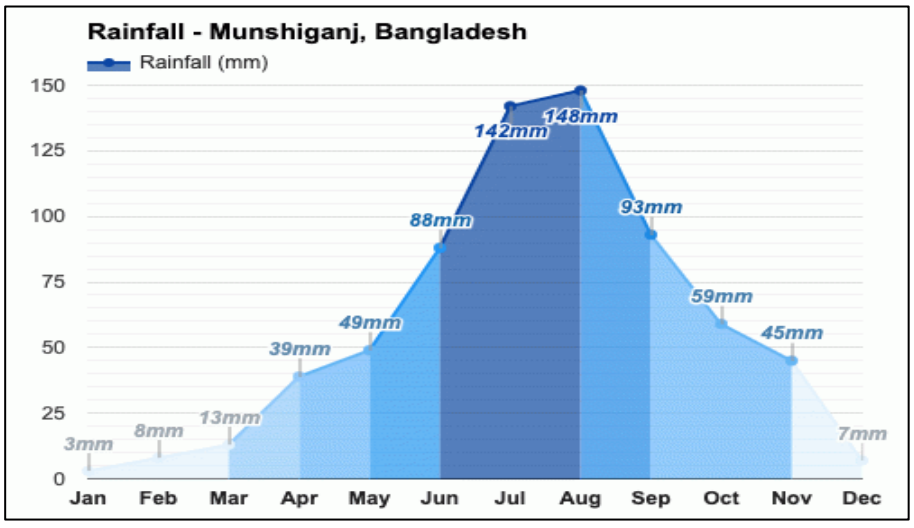


Figure 4-6: Average monthly rainfall in Munshiganj
Source: www.weather-atlas.com

4.7.3 Humidity

Humidity in Munshiganj fluctuates all around the year. Humidity is correlated with rainfall. Hence, it increases during monsoon season. August and September are the most humid season of the year with an average humidity of 82%, whereas it drops down in January with 46%. Figure 4-7 shows average monthly humidity in Munshiganj.

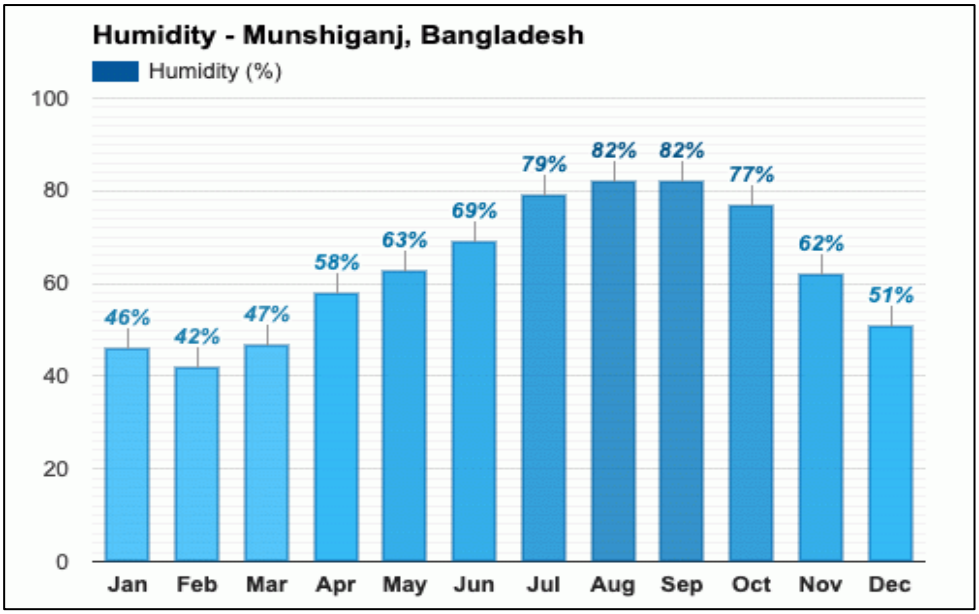
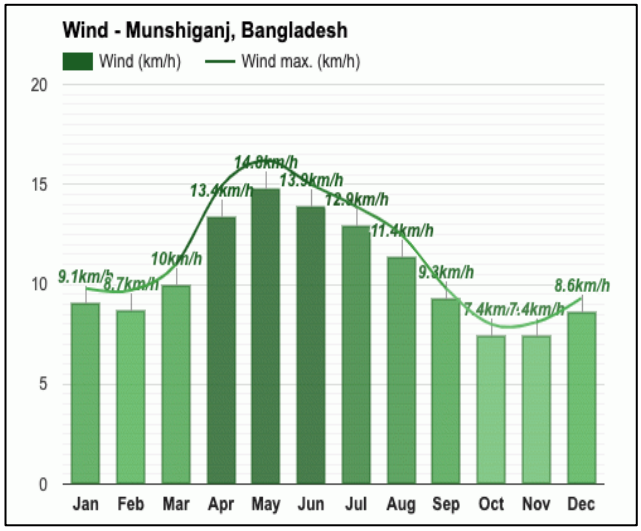


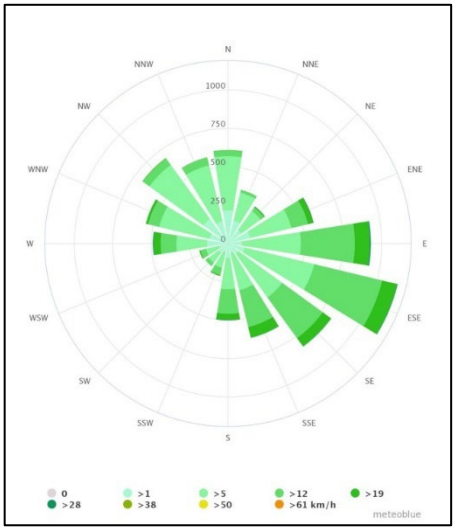
Figure 4-7: Average monthly humidity in Munshiganj
Source: www.weather-atlas.com

4.7.4 Wind Flow

The wind speed also varies al around the year. The windiest month (with the highest average wind speed) is May (14.8km/h). The calmest months (with the lowest average wind speed) are October and November (7.4km/h). The wind flow mostly prevail towards east, south-east, and east-southeast directions. Figure 4-8 shows average monthly wind speed and wind rose diagram in Munshiganj.



Source: www.weather-atlas.com



Source: www.meteoblue.com

Figure 4-8: Average monthly wind speed and wind rose diagram in Munshiganj

4.8 Ambient Air Quality

Air quality in the project site has been monitored on 11 December 2023 from 11am to 7pm both inside and outside of the dumpsite periphery (Figure 4.9).

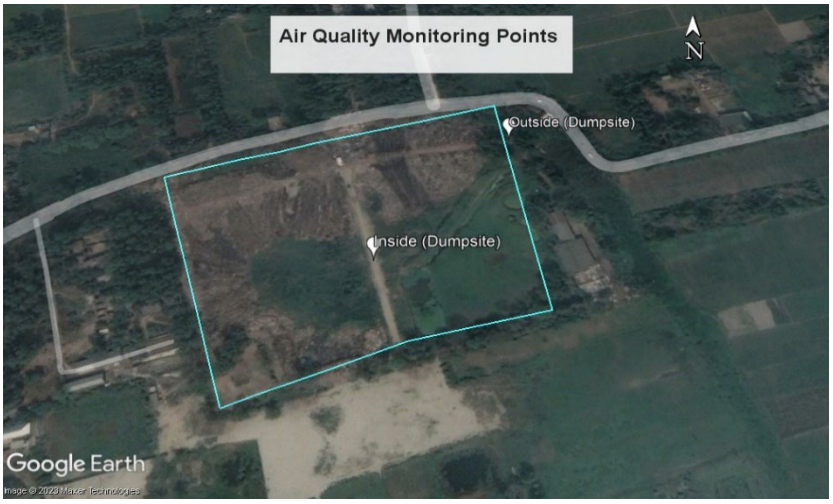
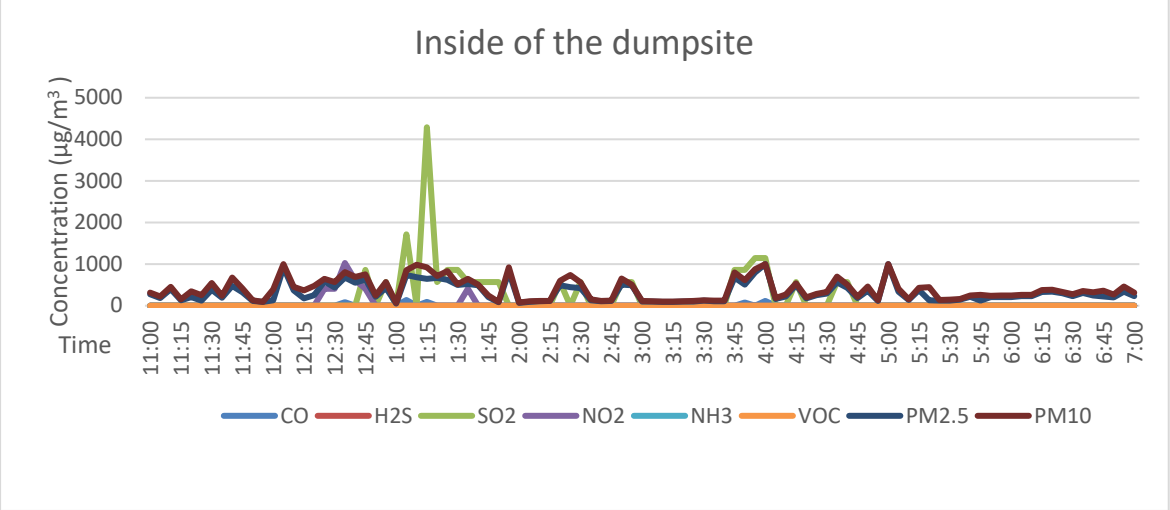


Figure 4-9: Ambient air quality monitoring points in Munshiganj sub-project area

The results of air quality monitoring for 8 hours continuous period have been shown in the figure 4-10. It has been found that average $PM_{2.5}$ and PM_{10} value inside of the dumpsite was 320 µg/m³ and 393 µg/m³ respectively and maximum value was recorded 1000 µg/m³ for both pollutants. The concentrations of suspended particulate matter (SPM) were highest between 1:00 and 2:00 PM. Other gaseous parameters such as CO, SO_2 and NO_2 were recorded occasionally during the 8 hours monitoring period. The maximum concentration of SO_2 was 4290 µg/m³ detected during 1:15 pm. Nitrogen Oxide was mostly detected from 12:00 to 1:00 PM with a maximum concentration of 1027 µg/m³. Carbon monoxide (CO) was very rarely detected with maximum concentration of 137µg/m³.



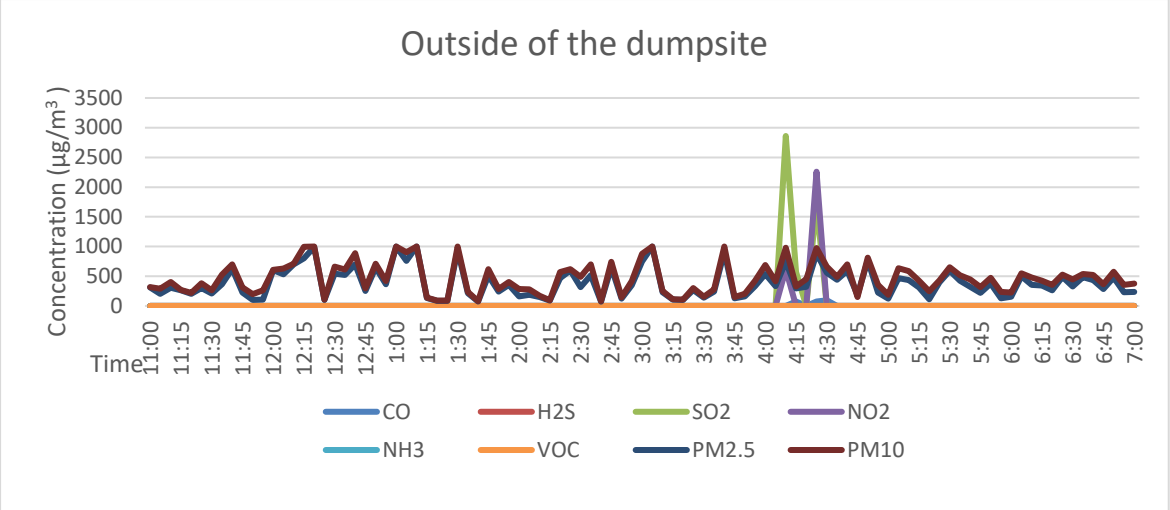


Figure 4-10: Ambient air quality status of dumpsite during 8-hrs monitoring period

In the outside of dumpsite premise the presence of $PM_{2.5}$ and PM_{10} were highest during 12:00 to 1:00 PM with average concentration 595 and 668 µg/m³ respectively. However, the average concentration for both the parameters were 389 and 463µg/m³ for the 8 hours monitoring period. Like inside premises CO, SO_2 and NO_2 were detected rarely in outside of the dumpsite with maximum concentration of 95, 2860, and 2259 µg/m³ respectively. There was no trace of VOC and NH_3.

4.9 Acoustic Environment

According to the Environmental Conservation Rules, 1997 (ECR, 1997) the subproject area can be considered as a mixed area. Due to continuous movement of vehicles especially the auto-rickshaws, the dumpsite site is comparatively noisy. In order to evaluate the acoustic environment in the subproject area, sound level had been monitored from four corner points of the dumping ground during daytime and nighttime (Figure 4-11).

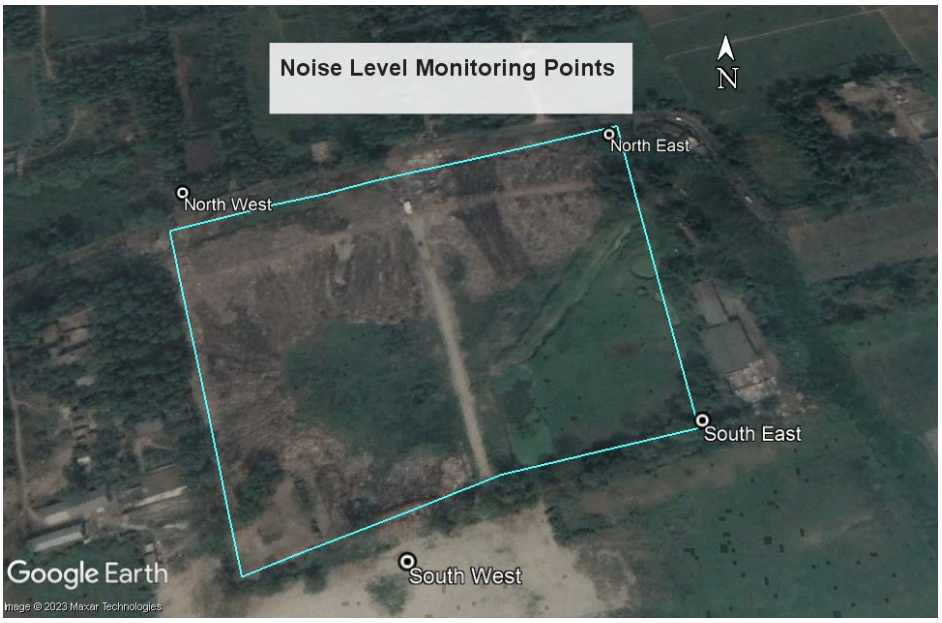


Figure 4-11: Noise level monitoring points in Munshiganj sub-project area

The average sound level of four points in Munshiganj Municipality subproject area and Department of Environment (DoE) standard according to ECR, 1997 have been presented in Table 4-2. From the table, it is apparent that the sound level in the subproject area is beyond the permissible level both in daytime and nighttime.

Table 4-2: The recorded sound level at subproject area and DoE standard

Period	Sound level at subproject area (dB)	ECR, 1997 standard of mixed area (dB)
Daytime (6a.m. to 9 p.m.)	66.3	60
Nighttime (9p.m. to 6 a.m.)	53.9	50

4.10 Agro-Ecological Resources

Munshiganj is famous for its potato cultivation, which is the prime crop of the region. Apart from the potato there are varieties of vegetables and food crops are cultivated across the region which is listed in Table 4-3. Irrigation water in the area is usually sourced by low lift pump.

Table 4-3: Agricultural Crops of Munshiganj Sadar Upazila

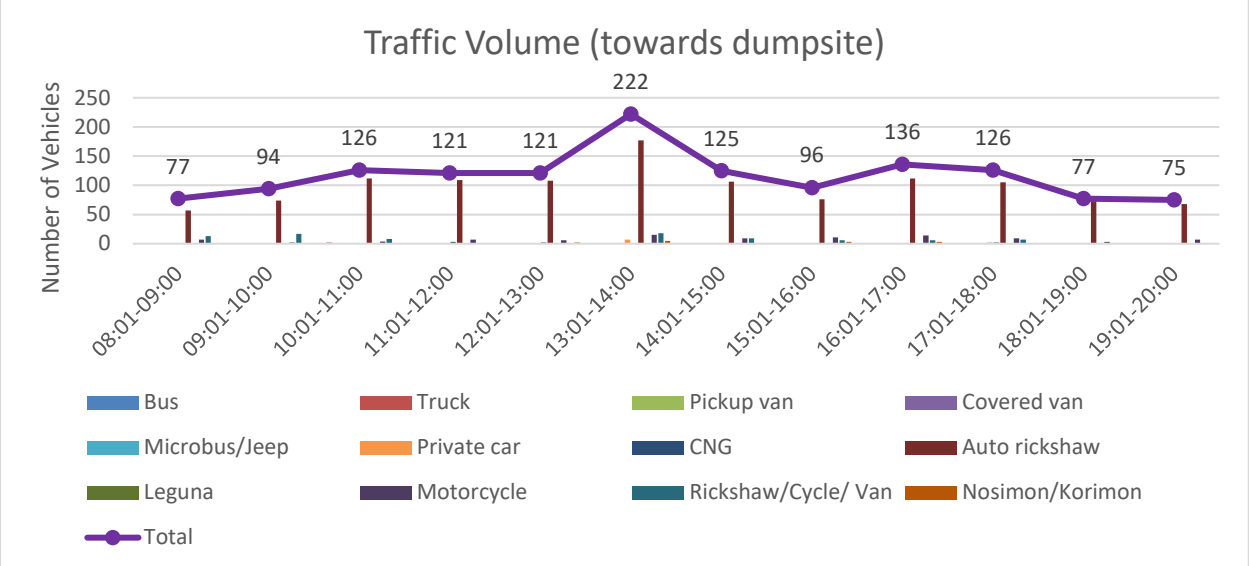
Cropping seasons	Crops
Kharif-I	Bona amon, aush, jute, kaun, sesame, coriander
Kharif-2	Ropa amon, maize, vegetables (organic red spinach, stem spinach, radish, gourd, bitter gourd, teasel gourd)
Robi	Pototao, boro rice, wheat, maize, mustard, nut, grass pea, winter vegetables, onion, chili, sunflower

4.11 Transportation System

4.11.1 Roadway

Although being very proximate to the capital city of Dhaka, the transportation network of Munshiganj city is not so developed with other parts of the country. There is no intercity bus terminal or railway station in Munshiganj. Auto-rickshaw is the major mode of private transport for the residents to travel here and there within the city. People who tend to travel other districts usually visit Narayanganj by these auto-rickshaws and then take bus or other mode of transport.

The waterway connection of the city is comparatively improved from old ages due to its geographical location. There is a Launch terminal in the city, located in Hatlaxmiganj in the municipality of ward-3. The launches in the terminal mostly travel to Dhaka and Narayanganj in order to carry passengers. The launches travel between Dhaka and southern districts also take halt in the terminal.



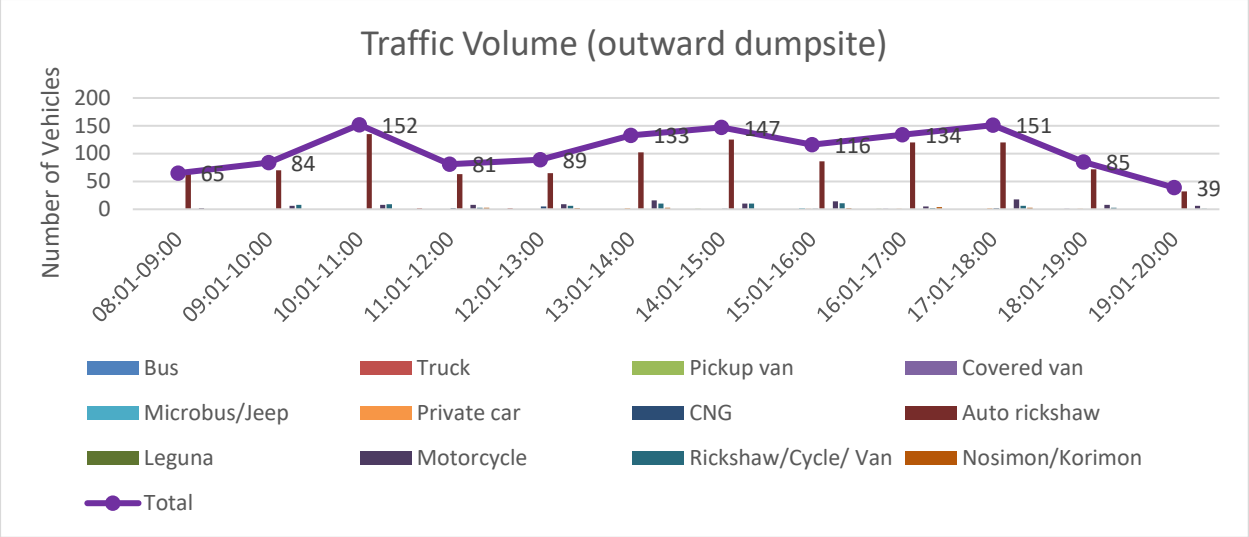


Figure 4-12: Traffic volume around the Munshiganj dumpsite area

A traffic survey has been carried out on 11 January 2023 around the dumpsite from morning 8:00 to evening 20:00 for a total 12-hrs duration (Figure 4.12). In total 2672 numbers of vehicles were recorded among which 1396 vehicles were moving towards the dumpsite and 1276 were outward moving. Auto-rickshaw is the predominant means of transportation which comprised of around 83% of all vehicles. Altogether 2230 auto-rickshaws were counted during the survey. The traffic volume almost shows a similar trend for both the directions. During the morning the traffic volume is comparatively low and it gradually increase as the day goes on. During the afternoon especially between 13:00 and 15:00 the traffic in the area reaches its peak and gradually the volume drops down after 17:00. Apart from the auto-rickshaw considerable numbers of cycle, motor cycle, nosimon, korimon, and private car were observed. Heavy vehicles like truck and pick up were rarely seen.

4.12 Fisheries Resources

The fish habitats are primarily classified under two broad categories, capture fishery and culture fishery. Rivers, internal canals, and beels are considered as capture fish habitats. According to the information of Upazila Fisheries Office total fish production in Munshiganj Sadar upazila was 3399.22 MT in the economic year 2021-22. Among them the total capture fish production was 1766.72 MT. Fish captured from the rivers was 1032.50 MT. Upper Meghna is the major river of capture fish production. Around 906 MT fish has been captured from the river. Hilsha is the dominant fish species in the region. The national fish of the country shares around 74% of total river fish production in the Upazila.

Picture: Key Informant Interview (KII) in Upazila Fisheries Office

Picture: Market survey in local fish market

Figure 4-13: Fisheries Discussion and Market Photos

There are two types of culture fish habitats found in the region: ponds and seasonal water bodies such as paddy field, borrow pit. The total culture fish production in the upazlia was 1632.50 MT in 2021-22. Among them 1627.65 MT fish cultivation was carried out in total 1396 ponds. In the Munshiganj Municipality there are 196 ponds located where fish cultivation takes place. Identification of various fish species found in the Project AOI based on Key Informant Interview (KII) with upazila Fisheries Officials and market survey. The list of available fish species in the region is shown in the table 4.6.

4.13 ECOLOGICAL RESOURCES

There is no protected area close to the subproject area. The nearest Ecological Critical Area (ECA) is Buriganga river which is 13.36 km away from the sub-project area (Figure 4-14). The vegetation covers of the area mainly consists of homestead plantation and roadside vegetation. Lots of birds are found to see in the landfill area in searching of food. The faunal diversity is typical wildlife usually found to see in other city area of the country.

Picture: Vegetation coverage around the dumpsite

Picture: A bird in the dumpsite

Figure 4-14: Vegetation in Picture of the subproejct Area

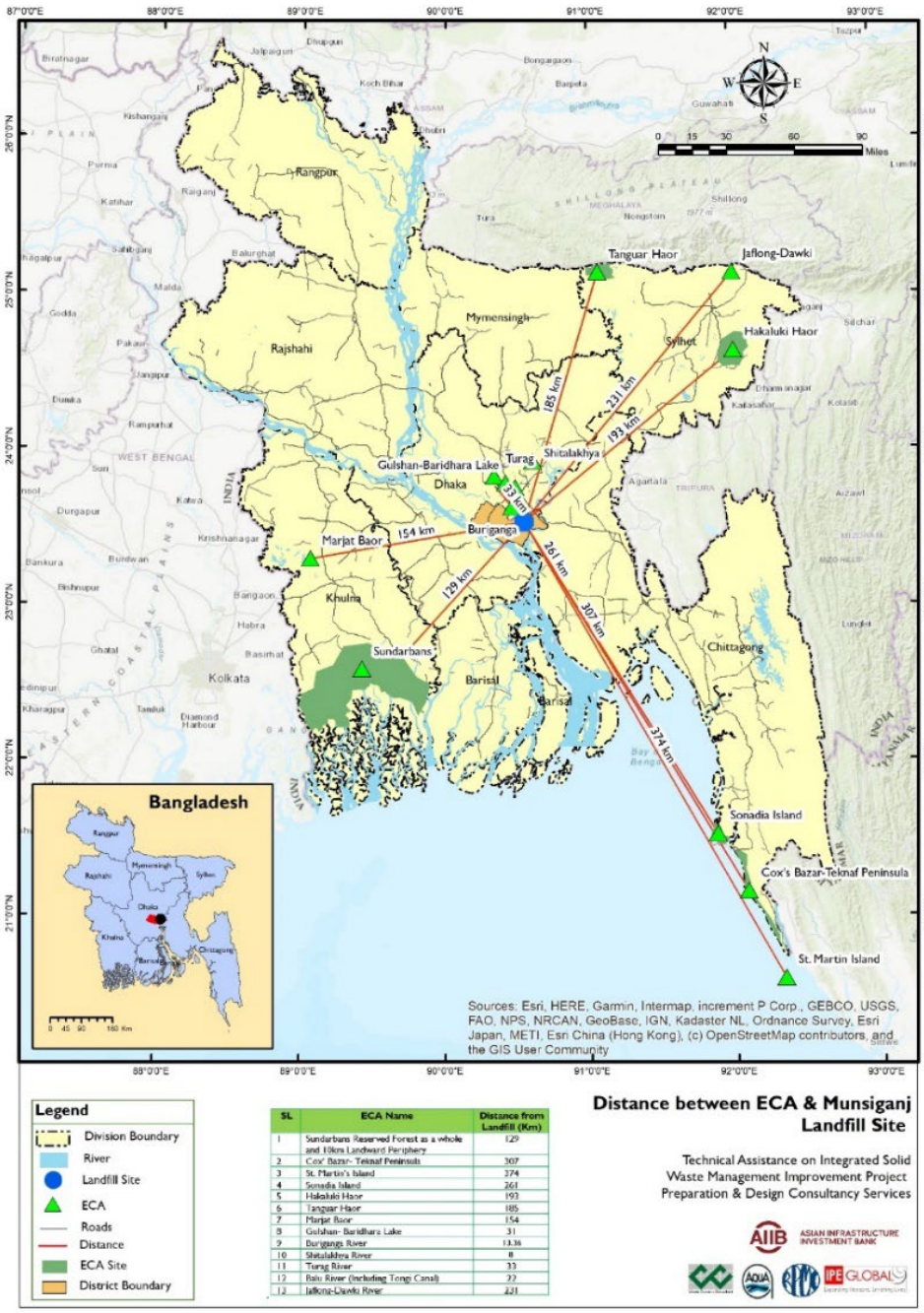


Figure 4-15: Location Map of distances from subproject area to ECAs

4.13.1 Flora

Aquatic floral species grow in rivers, canals, ditches, seasonal wetland and low-lying agricultural lands in submerged, free-floating, or rooted floating states. Aquatic plants, living or growing in water, often form distinct aquatic communities. Table 4-4 shows the complete list of identified aquatic floral species in the study area.

Table 4-4: Identified aquatic flora in the study area

Name			Habit
Scientific	Family	Native	
Alternanthera philoxeroides	Amaranthaceae	Helencha	Herb

Name			Habit
Scientific	Family	Native	
Colocasia esculenta	Araceae	Katchu	Herb
Aponogeton natans	Aponogetonaceae	Ghenchu	Herb
Ipomoea aquatica	Convolvulaceae	Kalmi	Herb
Ipomoea fistulosa	Convolvulaceae	Dholkalmi	Herb
Enhydra fluctuans	Compositae	Helencha	Herb
Ceratophyllum dumersum	Ceratophytaceae	Jhanjhi	Herb
Hygroryza aristata	Gramineae	Phutki janglidhan	Herb
Hydrilla verticillata	Hydrocharitaceae	Janjhi, Kurcli	Herb
Vallisneria spiralis	Hydrocharitaceae	Patajhangi	Herb

Some terrestrial flora has been observed in areas surrounding the proposed project site; however, there are very few floras present within the project site. Some of these grow naturally, while most have been ported. Generally, terrestrial flora makes a complex ecosystem; with which wildlife develop direct relationship through their ecological niche.

Table 4-5: Identified terrestrial flora in the study area

Name			Habit
Scientific	Family	Native	
Mangifera indica	Anacardiaceae	Am	Tree
Alternanthera sesilis	Amaranthaceae	Haicha	Herb
Mikania cordata	Compositae	Assamlata	Herb
Blumea lacera	Compositae	Sheyalmutra	Herb
Carica papaya	Caricaceae	Pape	Shrub
Ipomoea fistulosa	Convolvulaceae	Dholkalmi	Herb
Coccinia indica	Cucurbitaceae	Telakucha	Herb
Ricinus communis	Euphorbiaceae	Reri, venna	Shrub
Phyllanthus reticulates	Euphorbiaceae	Chitki	Shrub
Centolla asiatica	Hydrocotyleace	Than kuni	Herb
Coccos nucifera	Palmae	Narikel	Tree
Areca catechu	Plamae	Supari	Tree
Borassus fiabellifer	Palmae	Tal	Tree
Phoenix sylvestris	Palmae	Khejur	Tree
Artocarpus heterophyllus	Moraceae	Kathal	Tree
Ficus glomoreta	Moraceae	Jagadumur	Shrub
Ficus hispida	Moraceae	Kakdumur	Shrub
Chrysopogon aciculate	Gramineae	Chore Kanta	Herb
Axonopus compresus	Gramineae	Turfgrass	Herb
Molocanna bambusoides	Gramineae	Muli bansh	Shrub

Name			Habit
Scientific	Family	Native	
Cynodon dactylon	Gramineae	Durbaghas	Herb
Saccharum spontaneum	Graminace	Kash	Herb
Albizia procera	Leguminosae	Koroi	Tree
Acacia auriculiformis	Leguminosae	Akashmoni	Tree
Dalbergia sissoo	Leguminosae	Sisu	Tree
Samanea saman	Leguminosae	Rendi	Tree
Delomix regia	Leguminosae	Krishnachura	Tree
Erythrina variegate	Leguminosae	Mandar	Tree
Acacia mangium	Leguminosae	Mangium	Tree
Azadirachta indica	Meliaceae	Neem	Tree
Swietenia mahagoni	Meliaceae	Mehagini	Tree
Musa spp	Musaceae	Kala	Herb
Mimosa invisa	Mimosoidae	Lazzaboti	Herb
Polygonum hydropiper	Polygonaceae	Bishkatali	Herb
Anthocephalus chinensis	Rubiaceae	Kadam	Tree
Zizyphus mauritiana	Rhamnaceae	Boroi, Kul	Tree
Lindernia procumbens	Scrophulariaceae	Bakpuspa	Herb
Datura metol	Solanaceae	Dhutra	Herb
Clerodendrum viscosum	Verbinaceae	Vat	Herb
Tectona grandis	Verbenaeae	Teak	Tree

4.13.2 Fauna

The faunal species recorded from the project site is listed in Table 4-6 including their status according to IUCN red listed category 2015.

Table 4-6: List of faunal diversity in the study area and their IUCN Red List category Status

Family	English Name	Scientific Name	IUCN Red List Category 2015 Status
Amphibians	Common Toad	*Bufo melanostictus*	LC
	Bull frog	*Hoplobatrachus tigerinus*	LC
	Cricket frog	*Limnonectes limnocharis*	LC
	Maculated Tree frog	*Polypedates maculatus*	LC
Birds	Brahminy Kite	*Haliastur indus*	LC
	Common Kingfisher	*Alcedo atthis*	LC
	Asian Palm Swift	*Cypsiurus balasiensis*	LC
	Indian Pond heron	*Ardeola grayii*	LC
	Cattle Egret	*Bubulcus ibis*	LC
	Little Egret	*Egretta garzetta*	LC
	Indian Cuckoo	*Cuculus micropterus*	LC
	Spotted Dove	*Streptopelia chinensis*	LC
	Rock Pigeon	*Columba livia*	LC
	Roseringed Parakeet	*Psittacula krameri*	LC
	Black-rumped Flamback	*Dinopium benghalense*	LC
	House crow	*Corvus splendens*	LC
	Black Drongo	*Dicrurus macrocercus*	LC

Family	English Name	Scientific Name	IUCN Red List Category 2015 Status
	Bronze-winged Jacana	*Metopidius indicus*	LC
	Lineated Barbet	*Megalaima lineata*	LC
	White-browed Wagtail	*Motacilla alba*	LC
	Oriental Magpie Robin	*Copsychus saularis*	LC
	White-throated Fantail	*Rhipidura albicollis*	LC
	Purple Sunbird	*Nectarinia asiatica*	LC
	Black-headed Oriole	*Oriolus xanthornus*	LC
	Red-vented Bulbul	*Pycnonotus cafer*	LC
	House Sparrow	*Passer domisticus*	LC
	Baya Weaver	*Ploceus philippinus*	LC
	Paddy field Pipit	*Anthus rufulus*	LC
	Brown Fish Owl	*Ketupa zeylonensis*	LC
	Common Sandpiper	*Actitis hypoleucos*	LC
	Common Tailorbird	*Orthotomus sutorius*	LC
	Asian Pied Starling	*Sturnus contra*	LC
	Common Myna	*Acridotheres tristis*	LC
Fish	Hilsha	*Tenualosa ilisha*	LC
	Rohu	*Labeo rohita*	LC
	Catla	*Catla catla*	LC
	Snakehead murrel	*Channa striata*	LC
	Climbing gourami	*Anabas cobojius*	DD
	Spotted Snakehead	*Channa punctatus*	LC
	Giant Snakehead	*Channa marulius*	EN
	Yellowtail catfish	*Pangasius pangasius*	EN
	Wallago	*Wallago attu*	VU
	Stinging Catfish	*Heteropneustes fossilis*	LC
	Orange-fin labeo	*Labeo calbasu*	LC
	Bata	*Labeo bata*	LC
	Boggut labeo	*Labeo boggut*	VU
	Long-whiskered Catfish	Aorichthys aor	VU
	Mrigal	*Cirrhinus mrigala*	NT
	Walking Catfish	*Clarius batrachus*	LC
	Olive barb	*Puntius sarana*	NT
	Indian Catfish	*Callichrus pabda*	EN
	Gangetic mystus	*Mystus cavasius*	NT
	Bronze featherback	*Notopterus notopterus*	VU
	Clown Knifefish	*Chitala chitala*	EN
	Mola Carplet	*Amblypharyngodon microlepis*	LC
Mammals	Ganges River Dolphin	*Platanista gangetica*	VU
Reptiles	Common Garden Lizard	*Calotes versicolor*	LC
	Rat Snake	*Coluber mucosus*	LC
	Common Wolf Snake	*Lycodon aulicus*	LC
	Common Krait	*Bungarus caeruleus*	LC
	Common House Lizard	*Hemidactylus flaviviridis*	LC
	Common House Lizard	*Hemidactylus brooki*	LC
	Common Skink	*Eutropis carinata*	LC
	Yellow Monitor Lizard	*Varanus salvator*	VU

Status Code: RE-Regionally Extinct, CR-Critically Endangered, EN-Endangered, VU-Vulnerable, NT-Near Threatened, LC-Least Concern, DD-Data Deficient, NE-Not Evaluated

4.14 SOCIAL BASELINE OF SUB PROJECT AREA

Munshiganj is a Category A municipality in the Dhaka division of southwestern Bangladesh. It is one of the important commercial towns in the country and also serves as the headquarters of Munshiganj district. Munshiganj Municipality consists of 09 wards with an area of 10.85 sq. km. This section will

present the socio-economic profile of the affected persons. This will include brief description of gender profile, religion, education, income, occupation and affected land area in subproject intervention. The SES (Socio Economic Survey) was conducted ESIA report for Munshiganj Pourashava. However, based on the report, LGED will prepare a Livelihood/Resettlement Plan where updated socio-economic information's will be provided. The Table 4-7 below shows that 60 people were interviewed during SES who are dependent with waste handling for their livelihood purpose and this chapter is prepared based on their information's collected from primary data.

Table 4-7: Number of interviewees during SES

Types of Interviewees	**Number**	**Percent**
Landfill Tokai	4	6.7
Town Area Tokai	10	16.7
Ferriwala	5	8.3
Van Driver	23	38.3
Landfill Vangari Shop	8	13.3
Town Area Vangari Shop	5	8.3
Whole Seller	5	8.3
Total	**60**	**100.0**

Landfill Tokai (Male)

Town Tokai (Female)

Landfill Vangari

Town Vangari Shop

Figure 4-16: Photos of the Survey

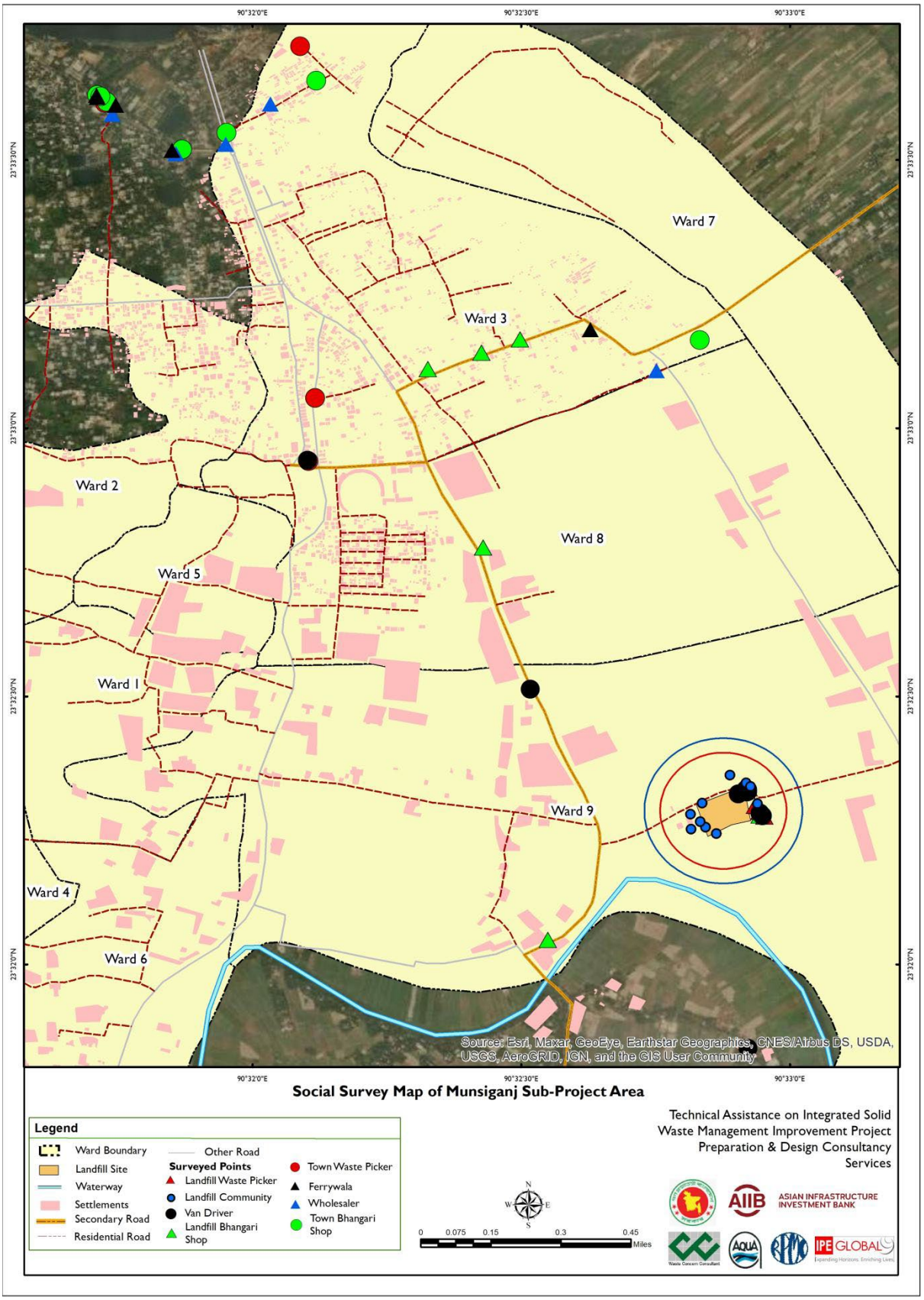


Figure 4-17: Social survey map of Munshiganj sub-project area

4.14.1 General Socio-Economic Profile

Almost all respondents are male except some female Tokai in landfill (75%) and in the town (40%). The following table shows the gender distribution of the respondents.

Table 4-8: Occupation Wise Gender Distribution

Gender	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
Male	25.0	60.0	100	100	100	100	100
Female	75.0	40.0	0	0	0	0	0

The following table shows that a hundred percent of landfill tokais are illiterate. Primary education is noticeable in the whole seller, van driver, and Ferriwala. More than half of the landfill whole sell shop owners are primary education holders. Moreover, 20% of the wholesalers are graduates & 20% of town area vangari shop owners are Master's degree holders. The following table shows the education level of the surveyed people.

Table 4-9: Education level of the responders

Education level	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
Illiterate	100	80.0	60.0	47.8	75.0	20.0	20.0
Primary	0	20.0	40.0	43.5	25.0	40.0	60.0
JSC	0	0	0	8.7	0	0	0
SSC	0	0	0	0	0	0	0
HSC	0	0	0	0	0	20.0	0
Graduate	0	0	0	0	0	0	20.0
Masters	0	0	0	0	0	20.0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Except for these surveyed people, some of their family members are also involved in waste management related work. Table 4-10 shows the scenario of other family members' involvement in waste management-related works.

Table 4-10: Involvement of any other persons of the family in waste recycling work

Response	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
Yes	0	0	0	0	25.0	20.0	40.0
No	100	100	100	100	75.0	80.0	60.0

4.14.2 Status of the Waste Management Related Occupation

60% of landfill vangari shop owners of the respondents choose these works considering the high-income source. Whereas a noticeable wholesaler, landfill tokai, Ferriwala, and town area tokai prefer these jobs as other jobs are unavailable. The following table shows the scenario of the reasons to choose these occupations.

Table 4-11: Reasons of choosing these occupation

Reason	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
High income source	0	0	0	25.0	60.0	0	0
Familiar Work	50.0	10.0	40.0	50.0	0	75.0	33.33
Other work is not available	50.0	90.0	60.0	25.0	40.0	25.0	66.67
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Most of the tokai, Ferriwala are doing their works for recent years, whereas 20% town area vangari shop,12.5% landfill vangari shop and 20% Ferriwala have been doing their job for more than 20 years time. Table 4.12 shows distribution of the duration of their engagement with these works.

Table 4-12: Duration of the engagement with these works

Years	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
1 - 5	25.0	20.0	20.0	73.8	37.5	20.0	40.0
6-10	75.0	70.0	20.0	0	12.5	40.0	20.0
11-15	0	0	0	8.7	0	20.0	20.0
16-20	0	10.0	40.0	17.5	37.5	0	20.0
More than 20	0	0	20.0	0	12.5	20.0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Following table shows the working days for the respondents in a week. Collected information show that the landfill Tokai (100%) expend every day in a week for their livelihood purpose whereas 80% town area tokai are engaged every day in a week for their livelihood. 20% Town area vangari shop are engaged 7 days in a week for this purpose. Most of the respondents work 7 days in a week few of them work 6 days in a week. All the van drivers work for the whole week. Table 4-13 shows the scenario.

Table 4-13: Days of work in a week

Days	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
3	0	0	20.0	0	0	20.0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	20.0	20.0	0	25.0	60.0	50.0
7	100	80.0	60.0	100	75.0	20.0	50.0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Following table shows the daily working time of the respondents in the SES. The landfill Tokai (100%) vandriver (100%) and 60%, town area tokai are usually engaged 10-12 hours for their livelihood purpose.

Table 4-14: Duration of work in a day

Hours	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
3-6	0	40.0	60.0	0	12.5	50.0	0
7-9	0	0	0	0	25.0	25.0	25.0
10-12	100	60.0	40.0	100	62.5	25.0	75.0
13-15	0	0	0	0	0	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Monthly income and expenditure of maximum respondents are in 5000-15000 BDT range. Income & Expenditure are usually high of the wholesalers, brokers and landfill vangari shop owners. Following tables show the monthly income and expenditure of the respondents.

Table 4-15: Monthly income of the respondents

Income Range	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
5000-10000	100	20.0	60.0	26.1	25.0	20.0	20.0
10001-15000	0	70.0	20.0	73.9	37.5	20.0	0
15001-20000	0	0	20.0	0	12.5	60.0	0
20001-35000	0	10.0	0	0	25.0	0	0
35001-50000	0	0	0	0	0	0	80.0
More than 50000	0	0	0	0	0	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 4-16: Monthly expenditure of the respondents

Expenditure Range	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
5000-10000	100	20.0	60.0	26.1	25.0	20.0	20.0
10001-15000	0	70.0	20.0	73.9	37.5	20.0	0
15001-20000	0	0	20.0	0	37.5	60.0	0
20001-35000	0	10.0	0	0	0	0	80.0
35001-50000	0	0	0	0	0	0	0
More than 50000	0	0	0	0	0	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

4.14.3 Socio Economic Profile of Affected People

12 hhs will be affected for implementation of the subproject. The residents living near the landfill area within 250m radius from the landfill of Munshiganj Municipality will suffer from construction hazards. The income level of the HHS is shown below.

Table 4-17: Monthly income from the affected community household

Sl. No	Monthly Income (BDT) from the affected profession	No of Affected HH	Percentage
1	5,000-10,000	4	33.33
2	10,001 – 20,000	5	41.66
3	20,001 – 30000	3	25
4	30,001 and above	0	0
	Total	12	100

Affected household

Affected household

Affected landfill waste picker

Affected bhangari shop

Figure 4-18: Photos of the affected person

Table 4-18: Demographic Details of Affected Population

Sl. No	Total Number of Affected Persons	Male	Female	Total
1	Landfill site Tokai	2	3	5
2	Landfill site Vangari shop	6	0	6
3	Landfill site van driver	17	0	17
4	Community person	11	1	12
	Total	36	4	40

Table 4-19: Monthly Income of the Affected Tokai, Vangari Shop and Van Driver

SL NO	Income Range	Landfill Tokai (%)	Van Driver (%)	Landfill Vangari Shop (%)
1	5000-10000	100	26.1	25.0
2	10001-15000	0	73.9	37.5
3	15001-20000	0	0	12.5
4	20001-35000	0	0	25.0
5	35001-50000	0	0	0
6	More than 50000	0	0	0
7	**Total**	**100**	**100**	**100**

Table 4-20: Monthly Expenditure of the affected Respondents

SL No	Expenditure Range	Landfill Tokai (%)	Van Driver (%)	Landfill Vangari Shop (%)
1	5000-10000	100	26.1	25.0
2	10001-15000	0	73.9	37.5
3	15001-20000	0	0	37.5
4	20001-35000	0	0	0
5	35001-50000	0	0	0
6	More than 50000	0	0	0
7	**Total**	**100**	**100**	**100**

The survey along both sides of the connecting road reveals that the average monthly income of the owners of small shops, mills and business enterprises is Taka 41,233 where the lowest income is Taka 15,000 and the highest income is Taka 135,000. Detail status is shown in **Table 4-21**.

Table 4-21: Monthly Income of the Affected Small Shop, Mill & Business Enterprise Owners along Connecting Roads

Income Range (BDT)	No. of the Owners	Percentage of the Owners
Up to 5000	0	0
5000-10000	0	0
10001-15000	3	20.00
15001-20000	1	6.66
20001-35000	4	26.67
35001-50000	3	20.00
More than 50000	4	26.67
Total	**15**	**100.00**

Altogether 11 employees/staff work in 6 shops out of the 15. Their average monthly income is Taka 15,191 where the lowest income is Taka 9,000 and the highest income is Taka 22,500. Detail status is shown in **Table 4-22**.

Table 4-22: Average Monthly Income of Small Shop, Restaurant & Business Enterprise Employees/Staff along the Connecting Road

Income Range (BDT)	No. of the Employee/Staff	Percentage of the Employee/Staff
Up to 5000	0	0
5000-10000	5	45.46
10001-15000	0	0
15001-20000	3	27.27
20001-35000	3	27.27
35001-50000	0	0
More than 50000	0	0
Total	**11**	**100.00**

The table below shows the details about the types of businesses located along both sides of the connecting roads proposed for improvement under the subproject.

Table 4-23: Types of businesses located along the connecting roads

Sl. No.	Type of Business	No. of Shops	% of Shops
1	Grocery Shop/Oil Shop/Confectionary	7	47
2	Mobile Instrument/Sound System	2	13
3	Rice Shop	1	7
4	Chicken Meat Shop	1	7
5	Fertilizer & Dealership of Corn Shop	2	13
6	Small Restaurant	2	13
Total		**15**	**100**

Shops along the connecting road

Restaurant along the connecting road

Figure 4-19: Photos of the affected entities along the connecting roads

4.14.4 Religion of the potential affected Population

Table represents that most of the project affected people are following Muslim religion (88%). Rest of the people are following Hindu religion. No other religious people have been found as the project affected people.

Table 4-24: Religion Distribution of the Potential Affected Population

SL No.	Religion	Male	Female
1.	Muslim	**22**	**1**
2.	Hindu	**2**	**-**
3.	Others	**-**	**-**

4.14.5 Risks of Diseases Associated with the Current Occupation

Among the respondent's awareness of health problem from the recycling of plastic and waste is high of town area vangari shop (100%) whereas awareness of whole sellers (100%) are not aware about the issue. Landfill Tokai (100%) are also not awarded about waste handling related diseases.

Table 4-25: Awareness about the health problem from the recycling of plastic and other waste

	Landfill Tokai (%)	Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
Yes	0	77.8	500	17.4	12.5	100	0
No	100	22.2	50.0	82.6	87.5	0	100

100% town area vangari shop owner, landfill Tokai (100%), Town area Tokai (100%) are used to soap using before taking food and after work. 60% Ferriwala are not used to soap using before taking food and after work.

Table 4-26: Soap using response about hand wash after working and before taking food

	Landfill Tokai (%)		Town Area Tokai (%)	Ferriwala (%)	Van Driver (%)	Landfill Vangari Shop (%)	Town Area Vangari Shop (%)	Wholesaler (%)
Yes	100		100	40.0	77.8	87.5	100	40.0
No	0		0	60.0	22.2	12.5	0	60.0

Awareness being considered as a prime preventive measure; the survey included a check of respondents about waste handling related diseases in particular. The table indicate that 69.23%, are suffering from problem in taking breath which is the highest and pain (neck, backbone, hand, waist etc. 19.05% is the lowest sufferings. Skin disease is also a prime health hazard which showing the table.

Table 4-27: Types of health hazard they faced while doing their work

Faced Health Hazard	Yes (%)	No (%)
Problem in taking breath	69.23	30.77
Have skin disease	52.50	47.50
Irritation in eyes	20.0	80.0
Get injured	34.04	65.96
Infection in any body part	26.32	73.68
Pain (Neck, backbone, hand, waist etc.)	19.05	80.95

4.14.6 Health Condition of the Landfill Waste Pickers (Tokai)

This section presents the health condition of the landfill tokai based on the social survey findings. As mentioned earlier, the total number of landfill tokais is five. The survey findings reveal that the tokais suffered from different types of diseases during the last one year. About 20% of them suffered from fever and 80% from typhoid and paratyphoid. **Table 4-28** shows the types of diseases affecting landfill waste pickers.

Table 4-28: Types of diseases suffered by the waste pickers in the last one year

Sl. No.	Types of Diseases	% of the Waste Pickers
1	Fever	20
2	Typhoid, paratyphoid	80

Source: Social Survey, December 2022

Apart from the diseases mentioned in **Table 4-28**, the waste pickers are exposed to occupational hazards, as shown in **Table 4-29**.

Table 4-29: Types of health hazards faced by the waste pickers

Sl. No.	Types of Health Hazards	% of the Waste Pickers
1	Have skin disease	40
2	Problem in taking breath	40
3	Pain (Neck, backbone, hand, waist etc.)	20
4	Infection in any body part	60
5	Others	60

Source: Social Survey, December 2022

Due to health issues, waste pickers cannot work on average for two days a month. Based on their average monthly income of BDT 8,000, it has been calculated that they will lose an average income of BDT 571 for this two-day sickness. Moreover, in addition to their income loss for two days, they

spend BDT 200 on average for their medical treatment purpose. Thus, their total average loss per month due to income loss plus expenditure for medical treatment is BDT 771. The maximum loss is BDT 914, 9.14% of their full monthly income of BDT 10,000, and 11.43% of their monthly average income of BDT 8,000, respectively.

Under the project, a skill enhancement program for waste pickers shall be organized involving NGOs. It will help them to minimize occupational health hazards from their current occupation. The project plans to hire waste pickers to work in the MRF to be constructed under the project.

4.14.7 COVID-19 Situation in the Project Influence Area

With the outbreak/spread of COVID-19, people have been mandated by national or local law to exercise social distancing, and specifically to avoid public gatherings to prevent and reduce the risk of the virus transmission. Various restrictive measures have been adopted including some imposing strict restrictions, when necessary, on public gatherings, meetings and people's movement, and others advising against public group events. At the same time, the general public has become increasingly aware and concerned about the risks of transmission, particularly through social interactions at large gatherings.

WHO has issued technical guidance in dealing with COVID-19, including: (i) Risk Communication and Community Engagement (RCCE) Action Plan Guidance Preparedness and Response; (ii) Risk Communication and Community engagement (RCCE) readiness and response; (iii) COVID-19 risk communication package for healthcare facilities; (iv) Getting your workplace ready for COVID-19; and (v) A guide to preventing and addressing social stigma associated with COVID-19. All these documents are available on the WHO website through the following link: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance.

4.15 LIVELIHOOD RESTORATION OF THE SUBPROJECT AFFECTED ENTITIES

Based on the socioeconomic condition of the affected peoples of this subproject detailed out in Section 4.14, a separate livelihood restoration plan has been developed by the consultant. The Livelihood Restoration dealt with the income generating assistance to the affected persons includes both short and medium-term strategies required to be taken. Short-term income restoration strategies are for immediate assistance during relocation and include the following:

- Compensation for land, structures, and all other affected/ lost assets is paid in full before a construction activity begins;
- PAPs losing entire structures are entitled to shifting and reconstruction allowance (cash) for moving to the alternative premise for re-establishing house/business;
- Shifting allowance for households based on the actual cost of moving/unloading
- Sixty days" advance notice to harvest standing seasonal crops, if harvest is not possible, compensation for a share of standing crops at market rates;
- Business owners/tenants including farmers earning a livelihood from crops and experiencing loss of income are entitled to a one-time lump sum grant of one-month income based on the nature and type of losses assessed on a case-to-case basis or on minimum wage rates, whichever is more;
- For vulnerable groups, additional subsistence allowance equal to their average three months income Tk. 15,000 per vulnerable household for restoring or enhancing their livelihood. Vulnerable households will be prioritized in any project employment.

For the Munshiganj subproject, the Compensation Provision under Livelihood Restoration Program has been estimated at Tk. 22,481,181 (Tk. 17,762,181 for landfill site improvement and Tk. 4,719,000 for connecting road improvement). The Project Director of ISWMIP will allocate the compensation payable, and Pourashava authority will disburse the compensation to the PAPs under the supervision of the social safeguard team of the supervision consultant of the project. A social survey was

conducted in December 2022 and a road survey was conducted in June 2023. The quoted numbers regarding the affected categories are currently considered an estimate, and their numbers will be updated six months before the commencement of civil works to reflect the fluidity of the waste-picking ecosystem and the change in the commercial establishments along the connecting roads. No person will be eligible for any Livelihood Restoration Compensation after the update. During the social and road survey, GPS coordinates are taken for the affected entities. This GPS location will be used to verify and update the affected persons during compensation payment for livelihood restoration. The entitlement matrix and the Project affected persons compensation are detailed out in the livelihood restoration plan report of Munshiganj subproject. The social impact assessment is briefly listed in the matrix below which comprises construction, operation & maintenance phases of the subproject.

Table 4-30: Social Impact Assessment of the Landfill Site

Social Impact Assessment in Construction and Operation Phase of Landfill Site							
Sl No.	**Affected Entities**	**Construction Phase**			**Operation and Maintenance Phase**		**Remarks**
		No. Affected	**Compensation**	**Engaged in work**	**Engaged**	**Work field**	
1	Waste Pickers	5	√	√	√	Engage in MRF	Will be absorbed by the municipality
2	Vangari Shop	6	√	√	√	Better Livelihood	Transfer and Reconstruction Grants will be made before the construction phase
3	Affected Households (Titled Households)	9	√	X	X	To be compensated by resettlement	Based on the decision of DOE and Municipality
4	Affected Households (Non-Titled Households)	3	√	X	X	To be compensated by resettlement	Based on the decision of DOE and Municipality

Social Impact Assessment in the Construction and Operation Phase of One Connecting Road							
Sl No.	**Affected Entities**	**Construction Phase**			**Operation and Maintenance Phase**		**Remarks**
		No. Affected	**Compensation**	**Engaged in work**	**Engaged**	**Work field**	
1	Small Shops, Mills and Business Enterprise along the connecting road	15	√	X	X	X	Compensation payment for income loss will be made before the construction phase

In addition to payment of compensation to the affected persons, it is recommended to arrange capacity-building training for the affected persons along with the arrangement of health camps annually. The estimated training and health camp budget is shown in the Livelihood Restoration Plan.

5. ALTERNATIVE ANALYSIS

5.1 General

The alternatives analysis for this subproject was conducted early in the subproject inception to examine feasible alternatives; alternative site locations, designs; or alternative ways of dealing with environmental and social impacts. The alternatives considered are discussed below in some detail.

5.2 Location of the Munshiganj Subproject

Due to land scarcity in the town, seeking an alternative site for establishing the new landfill is quite difficult. Also, land acquisition is now most difficult part of the Munshiganj Municipality considering the subproject nature and land availability.

Like any other project, the subproject site was selected based on economic, technical, social, environmental, and regulatory issues. These criteria have been assessed qualitatively, as landfill area is comparatively small. The criteria used are given in the Table-5.1.

Table 5-1: Criteria used in the selection of subproject site

Sl	Criteria	Justification for the Selected Site
1.	Availability of the land	In the Munshiganj Municipality, land scarcity is very common and availability of suitable land for the subproject siting is a major concern. In the selected site land is still available at relatively better condition. The existing landfill site is the property of Munshiganj Municipality hence no land use conflict is expected. The existing landfill site will be utilized to construct the Integrated Landfill and Resource Recovery Facility. There are no social conflicts with land acquisition.
2.	Regulatory Environment	The site is complying with the SWM Rules of 2021. However, there are few vangari shops and houses within 250m from the landfill site.
3.	Availability of basic infrastructure	All basic infrastructure i.e., roads, power connection, fuel supply etc. are available in the area.
4.	Water availability	Municipal water supply is available.
5.	Wastewater disposal	Wastewater will be generated from the plant operation shall be collected, treated and reused.
6.	Environmental, Ecological and social Impacts	This subproject will have very low environmental, ecological, and social Impact as analyzed in this report; so that it will be acceptable to the local population.
7.	Availability of labor	The locality has a pool of labor which can be employed at subproject construction works. On some highly skill labor and professional must be brought in from the Munshiganj Municipality area.
8.	Availability of by product disposal	The project will produce compost, diesel and recyclable items that will sold.

A total of 4 categories of attributes have been chosen for evaluation of the site. The details of the parameters and the rationale for selection of the site have been provided in Table-5.2. The selected attributes are as follows:

(i) Site accessibility;
(ii) Distance from nearby receptors;
(iii) Environmental sensitivity; and
(iv) Socio-economics;

Table 5-2: Rationale for Site Selection

Sl. No.	Attribute	Parameter	Rationale for Site Selection	Justification for proposed Site selection
1	Accessibility	Road	The site should be accessible for transport of waste from the source of generation till the selected plant site.	The present location is accessible from the waste collection area.
2		Distance from the collection area	The distance of the selected site should not be more than 5km from main roads. Also, the access roads should not be passing from densely populated residential areas.	The site is well situated at well-established road which is less populated.
3	Distance from nearby receptors	Use of site by nearby residents	The present usage pattern of the site should be evaluated in order to determine whether the site is in use at present for agriculture/ settlements.	The site is currently used as waste disposal site.
4		Land use/ zoning	The existing land cover depicts the economic importance of the site. The site shall be more suitable for setting up of the waste management plant if there is less economic importance of the site.	There is less economic importance of the land as it is not used for agriculture and residential purpose. The site is already in use for waste disposal.
5		Public acceptability	The acceptance of the people in the nearby residential areas plays a very important role in setting of the project.	The acceptance of local councilor (14 &16 no. wards) has been obtained for selection of the site.
6	Environmental sensitivity	Environmentally critical area	The selected site should not fall into environmentally critical area.	The proposed site does not fall in ECA.
7	Socioeconomics	Health	There should not be any chronic health diseases in the adjoining areas due to prevailing air quality.	There are no prevalent chronic diseases in the area.
8		Odor	The technology selection for the waste management plant should be such that there shall not be any air pollution issues in 2 km radius.	The site is currently used as open dump site. The sub project will improve the local environmental situation with the activities to meet the standards prescribed in SWM Rules 21.

The proposed site has therefore been chosen for setting up of the proposed integrated landfill and resource recovery plant because of its accessibility and the location in less populated area.

5.3 Technology Choice

Munshiganj sub-project has proposed the following interventions:

- Modified van to cover all the households (including slums);
- Improved rickshaw van with bins and secondary storage containers for direct loading;

- Improved rickshaw van with bins and covered secondary storage point/transfer station/tractor-trailers with direct loading facility;
- Improved demountable container truck;
- Integrated controlled landfill with resource recovery facility (landfill, composting facility, pyrolysis plant, and leachate treatment ponds);
- Proper equipment with standard of service for removal of street sweepings and drain cleaning.
- All kind of technology shall be supportive to the Solid Waste Management Rules 2021.

5.4 No Project Scenario

A 'no project' scenario would lead to magnification of the problems related to waste collection and management, soil quality, water quality, odor and air quality and drainage congestion related issues. It will also lead to development of unhygienic conditions in the Munshiganj Municipality due to poor the waste treatment and management system, from the households and the other solid waste sources. Therefore, it will pose threat to environment and health of the residents of the municipality. Hence, this alternative is undesirable as the development will be unplanned and will lack the basic infrastructure facilities leading to pollution and contamination.

6. POTENTIAL IMPACT IDENTIFICATION AND ASSESSMENT

6.1 Introduction

This section will identify and assess the potential effects that such a project will have on its immediate surroundings upon implementation. The aim is to take account of all of the likely but important environmental/project impacts and interactions, making sure those indirect and cumulative effects, which may be potentially significant, are not inadvertently omitted.

6.2 Methodology

The significance of potential impacts was assessed using the risk assessment methodology that considers impact magnitude and sensitivity of receptors, described below.

Impact Magnitude- The potential impacts of the subproject have been categorized as major, moderate, minor and negligible based on consideration of the parameters such as: i) duration of the impact; ii) spatial extent of the impact; iii) reversibility; iv) likelihood; and v) legal standards and established professional criteria. These magnitude categories are defined in Table-6.1.

Table 6-1: Parameters for determining magnitude

Parameter	Major	Medium/Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 35 years)	Medium Term Lifespan of the project (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of the potential impact	Widespread far beyond project boundaries	Beyond immediate Project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impacts	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal standards and established professional criteria	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Occurs under typical operating or construction conditions (Certain)	Occurs under worst case (negative impact) or best case (positive impact) operating conditions (Likely)	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to occur

Sensitivity of Receptor- The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. Criteria for determining receptor sensitivity of the subproject's potential impacts are outlined in Table-6.2.

Table 6-2: Criteria for determining sensitivity

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

Assigning Significance- Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in Table-6.3.

Table 6-3: Significance of impact criteria

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

6.3 Impacts of the Existing Baseline Condition

6.3.1 Air pollution

Open burning is commonly practiced in the dumpsite of Munshiganj Municipality in order to reduce waste volume. The fires generally burn very slowly, lasting over substantial periods of time and allowing the quantity and concentration of pollutants to buildup. Open burning of wastes releases toxic pollutants in the air which creates greater public health hazard. In addition, indiscriminate burning in dumpsite can exacerbate soil pollution, water pollution and loss of agricultural production.

6.3.2 Water pollution

There is a small canal flowing beside the dumpsite. Leachate water is released from the dumpsite through a pipeline connected to the canal. Apart from leachate discharge, the canal water is contaminated by solid waste disposal from the dumpsite. In addition, industrial chemicals are discharged into the canal which further deteriorates the water quality. Laboratory analysis of the canal water shows high concentration of BOD_5 (110 mg/L). High BOD is harmful to ecosystems as fish and other aquatic life may suffocate in oxygen-depleted waters.

6.3.3 Odor

Odor pollution is a serious nuisance to the local community of resides in the vicinity of dumpsite. In spite of the low population density in the area, passengers and pedestrians passing the dumpsite experience the stinky air.

6.3.4 Biological environment

Many local and migratory birds and other animals use the dumpsite of the Munshiganj Municipality as a feeding ground. Consumption of food from garbage can have both physical and toxicological implications on those animals. When birds feed on the site they are already drifting away from their natural diet. By eating landfill waste, they inevitably ingest plastic, aluminum, drywall and other common materials, many of which can be deadly. Cattles have been seen to consume food from the dumpsite, which may result entrance of plastic into the food chain of human being.

6.4 Screening out Areas of No Significant Impact

From the preliminary design and results of the rapid environmental assessment, it is clear that implementation of this subproject will not have major negative impacts because activities will be localized/site-specific and short in duration. Moreover, subproject construction will be conducted within a relatively small area with a short-time frame. Because of these, some aspects of the environment that are not expected to be significantly affected by the construction process have been screened out and will not be mentioned further in assessing the impacts of the construction process (table-6.4).

Table 6-4: Fields in which the subproject is not expected to have significant impacts

Field	Rationale
Topography, geology and landforms	Required amount of materials will not cause alteration of topography and landforms.
Land use	There are no major changes in any areas to be affected by the subproject.
Tourism	Tourists mostly drive by the villages located as these are located on the highway.

6.5 Summary of Impacts

In addition to the impact identified in above for the technology's vision, design and planning, subproject's other potential impacts on the key environmental parameters have been assessed and their significance determined using the methodology described above. A summary of the potential impacts of the subproject on the key environmental parameters and significance of these impacts are presented in Table-6.5.

Table 6-5: Summary of the potential impacts other than identified in Table-6.1

Potential Impacts	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Environmental Impacts During Pre-Construction Phase								
Location impacts of the plant	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Natural calamities	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Sources of materials	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Testing of water quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Permits, clearances, NOC etc.	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
EMP implementation training	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Environmental Impacts During Construction Phase								
Physical and cultural heritage	Short term	Local	Yes	Occasional	Minor	Low	Negligible	Negligible
Excavations	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Waste management	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Water quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Air quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Noise level	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Biodiversity	Short term	Local	Yes	Likely	Minor	Mild	Moderate	Negligible
Socio-economic status	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Livelihood Impacts	Short Term	Local	Yes	Certain	Medium	Mild	High	Negligible
Provision of worker facilities	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Worker's health and safety	Long Term	Local	Yes	Certain	Major	Severe	High	Negligible
Community health and safety	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Site Reinstatement	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Environmental Impacts During O&M Phase								
Health and safety risk of workers at plant	Long Term	Local	Yes	Certain	Major	Severe	High	Negligible
Efficient working of plant	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Water quality	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Biodiversity	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Air emission and odor	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

Potential Impacts	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Reuse and disposal of compost	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Traffic management	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Socio-economic aspect	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

6.5.1 Anticipated Impacts of Pre-Construction Phase

Planning principles and design considerations will be incorporated in the site planning process whenever possible. The potential adverse impacts that are associated with planning and design are listed in Table-6.6.

Table 6-6: Anticipated impacts of pre-construction phase

Field	Impacts
Location impacts of subproject	Nearby community may be affected due to increased pollution during construction and operation.
Design of the subproject	Impacts to the livelihood of the Project affected people (Reference of Livelihood Restoration Plan)
Natural calamities	Subproject location is major flood prone and heavy storm area.
Sources of materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.
Permits, clearances, no objection certificate (NOC) etc.	Failure to obtain necessary permits and NOCs, etc. can result in design revisions and/or stoppage of works.
ESMP implementation training	Irreversible impact to the environment, workers, and community.

6.5.2 Anticipated Impacts of Construction Phase

The impacts during construction shall include generic construction related impacts associated with construction activities. In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements. These are not expected to be significant, and can be addressed through adoption of good engineering and construction practices and construction methods. The potential adverse impacts that are associated with construction activities are listed in Table-6.7.

Table 6-7: Anticipated impacts of construction phase

Field	Impacts
Physical and Cultural Heritage	Construction works will be on existing Landfill Site, thus risk for chance finds is very low.
Excavations	Potential erosion, dust generation, and accident. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Waste management	• Oil, grease etc. from construction machinery; • Hazardous and solid waste from waste construction material and food;
Water quality (surface and groundwater)	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Soil disturbance	The construction activities may cause soil degradation problems in the areas of plant etc.
Air Quality	Air pollution due to construction activities. The impacts are negative but short-term, impacts within a relatively small area and reversible by mitigation measures.
Noise Level	Construction activities will be nearby settlements. Temporary increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials and people. The impact is short-term and within a relatively small area and reversible by mitigation measures.
Biodiversity	• Clearing of existing vegetation may result in loss of associated ecological habitats and their fauna. • Noise, vibrations, and intrusive activities related to construction works may scare away animals remaining onsite after vegetation clearance.

Field	Impacts
Socio-economic status	• Manpower may be employed from local community during the construction and operation stage. Thus, potential impact is positive and long-term.
Provision of Worker Facilities	• Inconvenience to the communities due to presence of workers; • Solid waste and sanitary discharges from worker camps.
Occupational Health and Safety	Occupational hazards which can arise during work. Potential impacts are negative and long-term but reversible by mitigation measures.
	Health risk of construction workers due to COVID-19
Community health and safety	Construction works will impede the access of some residents in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Site reinstatement	Damage due to debris, spoils, excess construction materials

6.5.7 Anticipated Impacts of Operation Phase

Munshiganj Municipality shall be responsible for operation and maintenance of the subproject. In order to make the environmentally sustainable some mitigation measures are proposed to be integrated in the subproject design so that adverse impact will be minimize while on the other hand beneficial impact will be enhanced. Success of the proposed mitigation measures in the subproject's design needs to be monitored during operational stage as mentioned earlier. However still there are certain environmental risks from the operation of the subproject, most notably are handling of solid waste compost plant, MRF, pyrolysis plant, leachate treatment plant etc. which can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the plant, and to implement rapid and effective repairs where necessary. However, there is also an occupational health risk to workers engaged in plant maintenance activities. The potential impacts that are associated with the operational activities are listed down in Table-6.8.

Table 6-8: Anticipated impacts of operation phase

Field	Impacts
Health and safety risk of workers	Risk of health of workers working in plant operation and maintenance, workers may suffer infectious diseases due to feedstock handling. Workers/plant operators may have accident risk of operation and maintenance of Incinerator Plant.
Efficient working of the plats and MRF	Inefficient working of plant may cause poor quality of treatment and resulting under treatment of solid waste may cause environment, health and safety risk to workers and environment.
Air emission	• Ambient Air quality of the subproject
Traffic management	• Random parking of vehicles and unplanned loading / unloading areas can lead to traffic congestion for distilled water transport
Socio-economic aspect	• Visual impacts. • Impacts on community health. • Employment.

6.6 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact assessment examined the interaction between the subproject's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The project's potential cumulative effects were considered with respect to valued components in environmental and socioeconomic categories, in four areas:

- Of any potential residual project effects that may occur incrementally overtime;
- Consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
- Potential overlapping impacts that may occur due to other developments, even if not

directly related to the proposed subproject; and

- Future developments that are reasonably foreseeable and sufficiently certain to proceed

The project has identified the valued components as water quality, air quality, acoustic environment, socioeconomic and socio-community components, and human health and safety. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject are the areas where the facilities (transfer stations, composting plant, associated medical waste management facilities, faecal sludge management facilities and controlled landfill) is located. The temporal boundary can be considered as the whole Munshiganj Municipality area.

The infrastructures will be (i) designed to the current best practice standard and in line with the current LGED guidelines for a10-year design period;(ii) built that the floods do not damage them; and (iii) drains of the facilities are to be kept free from wastes and siltation.

Water quality. Due to nature of the subproject, there is risk of contaminating ground water and nearby bodies of water during O&M phase. However, the infrastructures have been designed ensuring impermeability of surfaces by having concrete surfaces for the transfer stations and composting plant while HDPE/clay liners for the controlled landfill. Drains within the facilities will also ensure wastewater generated during operations will be treated and diverted away from any channel leading to agricultural lands, water bodies, and water sources/tube wells. Short-term negative impacts are possible but can be mitigated through design and implementation of ESMP. Potential residual effects is considered to be negligible.

Air quality. Emissions of common air contaminants and fugitive dust may be elevated in proximity to active work sites during construction and O&M phases; these impacts will be short-term and localized to the immediate vicinity of controlled landfill site. Greenhouse gas (GHG)emissions may increase as a result of the subproject activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, land filling of residual wastes). Given the subproject's relatively minor contribution to common air contaminants and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

Acoustic environment. Noise levels during construction and O&M activities in immediate proximity of work sites are expected to increase. The duration of exposure will be relatively brief and imperceptible. The exposure represents a temporary, localized, adverse residual effect of low significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction and O&M activities. The overall significance rating of potential residual effects is considered to be negligible.

Socioeconomic and socio-community. Concerns on existing provisions for pedestrians, other forms of transport, and over-all impact on livability particularly nearby the transfer stations and composting plant will occur spatially during construction and O&M activities. Traffic movement will be improved once the construction activities are completed. Since the subproject involves small-scale facilities, it will not conflict with existing or planned land use. O&M manuals for the facilities, comprehensive capacity building, and community involvement to be provided under ISWMIP will ensure efficient operation of the facilities and acceptability by the stakeholders. However, following improvement in infrastructures and services, added residential developments, commercial, and business facilities and increased densities are expected to develop and enhance Munshiganj Municipality area. This can be considered a long-term cumulative benefit of the subproject.

Given the scale of the project it is likely that a number of local people will obtain at least temporary socio-economic benefits, by gaining employment in the construction workforce, and thus raising their levels of income. In addition, a significant number of employments will be generated associated with the O&M of the facilities to be developed under the subprojects. These benefits can bring wider social gains if they are directed at vulnerable groups.

Community and workers health and safety. No adverse residual effects to human health will occur as a result of construction or O&M activities, and mitigation measures are in place to ensure public and worker safety, and will be closely monitored. While exposure to elevated noise levels,

fugitive dust and common air pollutants will occur in proximity to worksites, due to their short-term and localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

Upon completion of the subproject, the socio-community will be the major beneficiaries of this subproject. With the improved solid waste management facilities, additional vehicles and workers PPE, they will be provided with reliable and climate-resilient municipal services. In addition to improved environmental conditions, the subproject will reduce occurrence of diseases and people would spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health. These are considered a long- term cumulative benefit.

Therefore, the project will benefit the public by contributing to the long-term improvement of municipal services and community livability in Munshiganj Municipality area.

7. INFORMATION DISCLOSURE, STAKEHOLDER ENGAGEMENT

7.1 Introduction

The objectives of the information disclosure, consultation and stakeholder engagement process for this sub project is to disclose, inform, consult, engage, collaborate and empower the communities and other local stakeholders from the planning to implementation at the Munshiganj Pourashava. Consultation and participation are undertaken to achieve specific objectives at subproject identification, planning, design, implementation and evaluation stages. Disclosure, consultation and participation (DCP) of the affected persons and beneficiaries in project planning and implementation are keys to success of any project. The DCP creates opportunities for them to voice their opinions and concerns and offers opportunities to participate in the project design, planning and implementation processes. The Safeguard Policy of AIIB emphasizes upon ensuring formulation and execution of development projects in compliance with environmental and social safeguards, which requires the executing agency to conduct meaningful consultation with displaced persons, their host communities, and civil society organizations. Consultation process encompasses timely disclosure of relevant and adequate information to the project stakeholders and thereby promotes transparency, sustainability and opportunities for amicable conflicts management reducing the risks of project implementation delays.

7.2 Objective of Stakeholder Engagement

The objectives of engaging stakeholders during the ESIA process as well as throughout the subproject includes:

- **Ensuring Understanding:** An open, inclusive and transparent process of engagement and communication will be undertaken by the IPDC (Inclusive Participation, Discloser, and Consultation) to ensure that stakeholders are well informed about the proposed development. Information will be disclosed as early and as comprehensively as possible.
- **Involving Stakeholders in the Assessment:** Stakeholders were included in the scoping of issues, the assessment of impacts, and management/mitigation measures defined in the draft ESIA report. They also played an important role in providing local knowledge and information for the social baseline and informing the social impact assessment.
- **Building Relationships:** Through supporting open dialogue, engagement will help to establish and maintain a productive relationship between the IPDC team and stakeholders. This supported not only an effective ESIA, but also will strengthen the future relationships between the IPDC and stakeholders.
- **Managing Expectations:** It is important to ensure that the proposed project does not create, or allow, unrealistic expectations to develop among stakeholders about potential Project benefits. The engagement process will serve as a mechanism for understanding and managing stakeholder and community expectations, by disseminating accurate information in an easily understandable manner.
- **Ensuring Compliance:** The process is designed to ensure compliance with both local regulatory requirements and international best practice.

7.3 Approach and Methodology of Stakeholder Engagement

Stakeholder engagement activities will provide stakeholder groups with relevant information and opportunities to voice their views on issues that matter to them/affect them. The mechanism of information dissemination should be simple and be accessible to all. Two of the important means that have been followed until now include briefing material and organization of community consultation sessions. The briefing material (all to be prepared in local language) can be in the form of

(a) Brochures (including project information, details of entitlements including compensation and assistance to be given to the PAPs; grievance mechanism) that can be kept in the offices of local self-government and project office;

(b) Posters to be displayed at prominent locations and

(c) Leaflets that can be distributed in the project areas.

Consultation meetings should also be organized at regular intervals by the project to acquaint the communities, target group beneficiaries and affected persons of the following:

- Timeline and progress of the project by components.
- Information on beneficiary participation.
- Information of involuntary displacement, compensation and entitlements.
- Information of participation of small ethnic communities.
- Timeline for acquisition of land using voluntary donation, direct purchase and any other voluntary approach.

Also, opinion and consensus of the community needs to be sought for livelihood transformation, relocation of any community assets and involuntary resettlement management. Information disclosure procedures are mandated to provide citizen eccentric information as well as all documentation necessary for addressing any queries. Disclosure of information will enhance governance and accountability specifically with respect to strengthening of monitoring indicators to help the AIIB monitor compliance with the agreements and assess impact on outcomes. However, it is to be noted that only digital, internet, social media etc. will be followed where face to face interaction can be conducted by following the COVID-19 protocols until COVID -19 situation improves. Other on-line based platforms can also be used, such as web-conferencing, webinar presentations, web-based meetings, Internet surveys/polls etc. especially due to COVID-19 related restrictions.

The stakeholder engagement activities that Munshiganj Pourashava authority will undertake for their project. The activity types and their frequency are adapted to the three main project stages: project preparation (including design, procurement of contractors and supplies), construction, and operation and maintenance. The methods used would vary according to the target audience and would include:

- Public/community meetings, separate meetings for women and vulnerable
- Face-to-face meetings
- Focus Group Discussions/Key Informant Interviews
- Workshop with the Experts
- Surveys, polls etc.
- Interviewing stakeholders and relevant organizations
- Mass/social media communication (as needed)
- Disclosure of written information: brochures, posters, fliers, Munshiganj Pourashav and LGED website

7.4 Stakeholder Engagement Plan

The consultation should continue throughout the project cycle to achieve highest scale of effectiveness of resettlement implementation. Several additional rounds of consultations with affected persons will be required during RP implementation. The next round of consultations will be required prior to start of compensation payment and assistance. For the benefit of the community in general and affected persons in particular, the RP should be made available at LGED local offices and at local union and upazila parishads/pourashova. For continued consultations, the following steps are envisaged:

- Key features of the ESIA particularly the environmental and social awareness and institutional arrangements for grievance redress should be summarized in a leaflet and distributed among the DPs and their communities along the project corridor.
- LGED will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders to encourage the participation of the APs in ESIA implementation.
- Attempts should be made to ensure that vulnerable groups understand the process and take their specific needs are taken into account.
- Final safeguard documents will be placed in LGED and AIIB websites before implementation

of the project, whose reference link has to be shown in the summarized leaflet.

Stakeholder engagement plan is listed below in Table -7.1.

Table 7-1 Stakeholder Engagement Plan of the Munshiganj Municipality subproject

Stakeholders	Category of stakeholder	Brief profile	Overall influence on Subproject	Basis of Influence Rating
Subproject Management				
Munshiganj Municipality Subproject	Primary	Munshiganj Municipality is the primary Subproject proponent own a controlling stake of 100% in the Subproject	Highest	▪Are the primary Subproject proponents ▪Responsible for operation of this Subproject ▪Primary financial beneficiaries ▪Responsible for all the Subproject related risks and impact liabilities
Community				
Local Community	Primary	Primarily includes adjacent community to the Munshiganj Municipality subproject area especially wards#14&16	Medium	▪No major restrictions around the Subproject site especially with respect to grazing land ▪Subproject bring development to the area ▪Increase in employment opportunities and preference in job ▪Minimize impact
Regulatory/Administrative Authorities & Agencies				
Local Government Engineering Department (LGED)	Primary	LGED is the primary government executing authority for the construction of all ISWMIP subprojects	High	▪Are the primary subproject executing authority ▪Responsible for construction of this Subproject ▪Responsible for all the subproject related risks and impact liabilities of construction stage
Dept. of Environment, Bangladesh	Primary	The Department of Environment is the primary government regulatory authority for environmental protection in Bangladesh.	High	▪Responsible for monitoring subproject's environmental compliance throughout the subproject lifecycle
Other Regulatory & Permitting Authorities	Primary	DAE, DoF	High	▪Agencies required for obtaining permits and licenses for operation of the subproject ▪Primary involvement during operation phases
Political Administration				
Upazilla (sub District Level) Political Administration	Secondary	Elected representative of people at sub-district level for a fixed tenure	Medium	▪Key linkage between the community and the subproject proponent
Ward Councilor/	Secondary	Elected representative at union level i.e.	Medium	▪Plays important role in providing public opinion and sentiment on the subproject

Stakeholders	Category of stakeholder	Brief profile	Overall influence on Subproject	Basis of Influence Rating
leaders & local representatives		village level for a fixed tenure		▪Empowered to provide consent and authorization for establishment of subproject on behalf of the community

Detail of FGDs, KIIs and Stakeholder Consultation meeting are listed in table-7.2.

Table 7-2: FGDs, KIIs and stakeholder consultation meeting details of Munshiganj subproject

Sl. No.	Meeting Type	Group Identity	Discussed Issue	Meeting Venue	Meeting Date	No. of Participants
1	Individual discussion with the affected people	Affected people of the community	Loss of land, structures and livelihoods (Inside the buffer zone)	Spot discussion inside the buffer zone.	6th December,2022	12
2	Individual discussion	Affected whole seller and Broker	Loss of income	Spot discussion inside the town area	15th December2022 and 17th December 2022	6
3	FGD-1	Female group (Enlisted Street sweeper of the Munshiganj Pourashava)	Development of livelihood	Sweeper Colony	7th December 2022	24
4	FGD-2	Male group Enlisted sweeper of the Munshiganj Pourashava	Development of livelihood	Sweeper Colony	7th December 2022	13
5	Individual Interview	Income loser group (Bhangari shop located beside the landfill)	Loss of income	Jugia Palpara,Tremohoni road, Patorgade mor,Khustia	14th15th December2022 and 17th December 2022	8
6	Individual interview	Income loser group (Bhangari shop located inside the town)	Loss of income	Boro Station Road,Court para,Mozompur Rail gate,Uttar mell para, Munshiganj.	14th December2022 and 17th December 2022	11
7	Individual Interview	Income loser group (Waste picker inside the landfill)	Loss of income	Vagar,Landfill area,Munshiganj	14th December2022 and 17th December 2022	8
8	Individual discussion	Income loser group (Waste picker inside the town)	Loss of income	Upazilla mor,Zilla school mor, Gorur hat boro bazar, Mozompur Rail gate, Pach raster mor Munshiganj.	14th December2022 and 17th December 2022	12
9	Individual interview	Income looser Ferriwala group	Loss of income	Mozompur rail gate,Boro station road, Zilla school, Munshiganj,	14th December2022 and 17th December	9

Sl. No.	Meeting Type	Group Identity	Discussed Issue	Meeting Venue	Meeting Date	No. of Participants
				Chorhasmor, Hospital mor, front of post office, Munshiganj.	2022	
10	Individual interview	Affected Van Driver	Loss of income	Nisanmor,Housing d block, Jailkhana mor,courtpara,Vagar landfill area, PTI road,Munshiganj	14th December2022 and 17th December 2022	8
11	Individual interview	Affected Whole seller	Loss of income	Chowrasmor, Amlapara, Char amlapara, Malipara, Munshiganj	14th December2022 and 17th December 2022	4
12	Individual interview	Affected Broker	Loss of income	Court para, Munshiganj	14th December2022 and 17th December 2022	2
13	Stakeholder Consultation meeting	Various stakeholder	Benefited and affected persons	Munshiganj Pourashava Auditorium	8th December 2022	44

Two (2) Focus Group Discussions (FGDs) were conducted with 32 sweepers from Paurashava sweeper colony. Among them, 15 was female and 17 was male. All of them are from the Harizon community (Subtitle- Balmiki). Additionally Focus Group Discussions (FGDs) for four (4) Secondary Transfer Stations (STSs) were conducted at four different selected locations of Munshiganj Municipality on 11 June 2023. The participants were from different groups like businessmen, NGOs, housewives, teachers, and service holders. Apart from the participants above, Municipality officials and the members of the consultant team were present. Figure 71. Show the photographs of the meetings. Detailed documentation including attendance sheets are provided in the Livelihood Restoration Plan.

Photographs of Focus group discussions and Consultation Meeting of Stakeholders

Figure 7-1: Focus Group Discussion

Figure 7-2 Consultation Meetings of Stakeholders

7.5 Public Consultation Meetings

In the FGDs and Stakeholder Consultation meeting, maximum efforts have been given to get feedback from the participants on their views on the nature of environmental (physical, ecological and social) impacts. Subsequently, their suggestions about the ways to mitigate the adverse impacts and enhance beneficial impacts for the proposed Munshiganj Municipality ISWMI Subproject were also recorded. People who participated in the public consultations were found to be enthusiastic in sharing their views. The participants expressed their opinions and concerns regarding the different issues including the socioeconomic condition of people in their localities, possible impact of the proposed Munshiganj Municipality subproject on the existing local environment and in their lives and livelihood. They also suggested mitigation measures to address the adverse impacts. The major findings of the stakeholder consultations, FGD & KIIs for the Munshiganj subproject are summarized below:

(i) General opinion regarding the proposed ISWMI Subproject

- ✓ Most of the participants know the ISWMI subproject at their locality before interaction with the field ESIA team, which indicates that proper information has been disseminated to them, though the upcoming interventions are unknown to them.
- ✓ Most participants displayed their supportive attitude for ISWMIP with some concerns such as
    - Waste to Gas generation and raw materials of road construction;
    - Noticed the positive and negative sides of the subproject from their perspective. For example, people's life and livelihood have changed, new employment opportunities have come up, air, noise and water pollution potential have increased, etc.

- ✓ Local Representatives believes that more participation could be possible in various ways such as
    - Administrative / institutional support as and when necessary,
    - Worker safety during road crossing,
- ✓ Ward councilor opined that public awareness should be increased to educate the households about the waste segregation at source as well as appropriate disposal of the wastes at the allocated Waste bins or secondary transfer stations.

(iii) Expectation of People

- ✓ Ensure local recruitment as per skill & non-skill qualifications.
- ✓ Ensure pollution (air, noise, water, solid waste) free safe environment in and around the subproject area.

7.6 Public Disclosure

Distribution of the disclosure materials will be through making them available online under the COVID-19 situation. Upon improvement of the situation, distributions of the disclosure materials will be through making them available at venues and locations frequented by the community and places to which public have unhindered access in the usual manner. Free printed copies of the executive summary of the ES documents in Bangla and English will be made accessible for the general public at the following locations:

- LGED Headquarters, Agargaon, Dhaka
- Affected District Administration office
- Munshiganj Pourashava Office
- Local NGO offices;
- Other designated public locations to ensure wide dissemination of the materials.
- Newspapers, posters, radio, television.
- Information centers and exhibitions or other visual displays.
- Brochures, leaflets, posters, nontechnical summary documents and reports.
- Official correspondence, meetings

The final ESIA should be made available at accessible places stated above, and the executive summary should be translated into local language (Bengali) and posted in the LGED and AIIB websites. The final ESIA document will be shared with AIIB for clearance and disclosure according to its procedure. As a part of the disclosure, all versions (Bengali and English) should be made available at the subproject office in addition to LGED's website.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

The primary objective of the environmental and social management plan (ESMP) is to record environmental and social impacts resulting from the sub-project activities and to ensure implementation of the identified "mitigation measures", in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operational phases of the sub-projects.

8.2 Mitigation Measures For E&S Impacts

8.2.1 During Preconstruction

Based on the possible impacts during pre-construction phase, mitigation measures have been suggested for the proposed subproject. A set of mitigation measures against possible environmental and social impacts due to an improvement project at its pre-construction phase is proposed in the following Table 8.1.

Table 8-1: Proposed mitigation/enhancement measures during pre-construction phase of construction, rehabilitation and maintenance of infrastructure project under LGED.

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
Commercial Structures	▪ Loss of commercial structures; ▪ Dust pollution; ▪ Loss of income and livelihoods.	▪ Avoid the housing and commercial structure during the finalization of the alignment and location of the bridge; ▪ Proper compensation should be given before starting the removal or dismantling works; ▪ Create job opportunities for the PAPs. ▪ Water spraying on the bear surface or dust pollution source;	Contractor	LGED
Loss of vegetation/ tree	▪ Accident risk during removal of trees/vegetation's in the project sites; ▪ Birds and others species can migrate from the trees/vegetations; ▪ Impacts on the local climatic condition.	▪ Prior to start construction, all vegetation should be removed from the proposed construction sites with the consultation of the local relevant authorities; ▪ Avoid disturbance and careful during construction vehicle and equipment movement; ▪ Proper H&S measures (use of appropriate PPE such as hand gloves, safety shoes and helmet) for the workers should be taken during removal of trees, bushes & crops; ▪ To mitigate the ecological impact, tree plantation plan can be considered in the design & accordingly tree plantation will be done in an appropriate location to be determined by the LGED after consultation with the concerned authority; ▪ Proper H&S measures (use of appropriate PPE such as hand gloves, safety shoes and helmet) for	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
		the workers should be taken during removal of trees, bushes & crops; ▪ To mitigate the ecological impact, tree plantation plan can be considered in the design & accordingly tree plantation will be done in an appropriate location to be determined by the LGED after consultation with the concerned authority; ▪ The engineer shall approve such felling; only when the proponent secures receive a "clearance" for such felling from the LGED, as applicable; ▪ Tree felling, if unavoidable, shall be done only after compensatory plantation of at least two saplings for every tree cut is done; ▪ During the tree removal from the proposed construction sites diameter at best height (DBH) of the trees is 6 inches, only such trees should be considered by the contractor for compensation and plantation; ▪ Tree plantation at the suitable locations after completion of the construction activities.		
Removal of Utilities	▪ Vulnerable for workers health and safety; ▪ During movement of heavy construction machineries equipment's can damage the utility services if not previously removed; ▪ Due to carelessness or incautiousness death from sudden electric shocks may occur.	▪ Prior to start construction, the utility services (electrical cables, telephone line, water supply pipeline, gas supply pipeline and internet line) if applicable should be shifted with the consultation of the relevant organizations; ▪ Inform the local community before starting removal or demolishing work; ▪ Carefully remove the utilities that are connected to any structures; ▪ Proper health and safety measures for the workers should be taken during shifting of these lines to avoid any incidents.	Contractor	LGED
Dismantling	▪ Dust pollution in the construction site; ▪ Health hazard for the workers and community during dismantling works; ▪ Noise level increase;	▪ Notify the adjacent community before starting the demolishing work; ▪ During the removal or demolition of existing structures if required will be fully removed by the contractor; ▪ Spraying of water in the dry land or from where there is a possibility to generate dust;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
	▪ Vibration effects on the structures on the surrounding of the project area; ▪ Surface water contamination, blockage of navigation and drainage, impacts on aquatic animal; ▪ A detail of the dismantling plan is also given in the Annex-C.	▪ Banned fishing, swimming, boat movement activities in the construction sites, if applicable; ▪ Proper H&S measures for the workers such as using of appropriate PPE (helmet, Earplug, musk, safety shoes, hand gloves etc.) should be taken to avoid any accidents; ▪ Construct noise barrier around the dismantling site; ▪ Stop the engine when it is not required; ▪ Monitor noise level as per DoE guidelines; ▪ Impact wise mitigation measures are given.		
Setting up labour camps	▪ Land encroachment; ▪ Solid and liquid waste from the labour camp	▪ Labour camp should be constructed at a distance from the water bodies; ▪ Avoid productive land and away from the settlement during the selection of land for the setup of labour camp; ▪ No solid and liquid waste discharge into the water bodies; ▪ Instruct workers to maintain clean environment in the camps.	Contractor	LGED

8.2.2 During Construction

Possible environmental impacts during construction phase from the project construction, rehabilitation and maintenance activities have been identified. For mitigating the possible environmental impacts during construction phase mitigation measures are given in the following table 8.2.

Table 8-2: Proposed mitigation/enhancement measures during Construction phase of project construction, rehabilitation and maintenance program under LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
Air Pollution	▪ Construction vehicular traffic: Air quality can be affected by vehicle exhaust emissions and combustion of fuels ▪ Construction equipment: Air quality can be adversely affected by emissions from construction machineries and combustion of fuels; ▪ Construction activities: Dust	▪ Fit vehicles with appropriate exhaust systems and emission control devices; ▪ Maintain vehicles and construction equipment in good working condition including regular servicing; ▪ Operate the vehicles in a fuel-efficient manner; ▪ Impose speed limits at 30 km/hour on vehicle movement at the worksite to reduce dust emissions;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	generation from earth excavation, earth & sand stockpiles during dry period.	▪ Control the movement of construction traffic in the access road; ▪ Focus special attention on containing the emissions from generators; ▪ Construction equipment causing excess pollution (e.g. visible smoke) will be banned from construction sites immediately prior to usage; ▪ Water spray to the dry earth/material stockpiles, access roads and bare soils as and when required to minimize the potential for environmental nuisance due to dust; ▪ Increase the watering frequency during periods of high risk (e.g. high winds); ▪ Stored materials such as: excavated earth, dredged soil, gravel and sand shall be covered and confined to avoid their wind drifted; ▪ Restore disturbed areas as soon as possible by vegetation; ▪ Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations; ▪ The Air quality monitoring should be carried out by the contractor following the National Air Quality Standard ▪ (Schedule-I Standards for Ambient Air Quality, Air Pollution (Control) Rules 2022.		
Noise Pollution	▪ Construction vehicular traffic: Vibration and	▪ Strict measures for noise pollution control need to be undertaken	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	Noise quality will be deteriorated due to vehicular traffic. ▪ Construction equipment: Noise and vibration will have an impact on adjacent surrounding residents. ▪ Construction activity: Noise will have an impact on adjacent residents.	during construction activities; ▪ Create noise barrier and consider the minimum noise levels at sensitive receptor sites (e.g. dense residential area, schools, mosques, health centers etc.); ▪ Stone breaking machine should be confined within a temporary shed so that noise pollution could be kept minimum; ▪ Protection devices (ear plugs or ear muffs) shall be provided to the workers operating in the vicinity of high noise generating machines during construction; ▪ Construction equipment and vehicles shall be fitted with silencers and maintained properly; ▪ Instruction to the drivers to avoid unnecessary horn; ▪ The Noise level monitoring should be carried out by the contractor following the National Noise Quality Standard (Noise Pollution (control) rules 2006). ▪ Vibration monitoring should be carried out by the contractor.		
Ground Water Pollution	▪ Contamination of groundwater due to Pollution lack of septic tanks or mobile toilets; ▪ Accidental spillage of hazardous liquid from the construction camps.	▪ The contractor will make arrangement for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected; ▪ Handling and storage of the potential contaminants has to be organized under strict condition to avoid water pollution during construction; ▪ Handling of hazardous liquid should be done	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		carefully by the designated experienced person; ▪ Handling and storage of the potential contaminants should be done by the experienced workers. Proper monitoring should be done by the experienced person; ▪ The Ground water quality monitoring should be carried out by the contractor following the National Water Quality Standard (Schedule-2 (kh): Standards for Potable Water, ECR, 2023).		
Surface Water Pollution	▪ Construction & general wastes from the construction sites; ▪ Oil spill from the construction vehicles and construction camp can have effect on fishes and aquatic wildlife (such as snakes, frogs etc.)	▪ Contractor should prepare Waste Management Plan and follow it properly during the construction period; ▪ Any wastes should not be throwing into the river/khal/canal other than dump into the designated waste dumping area; ▪ Store the oil and petroleum product in a separate location cover by a concrete structure; ▪ Handling of hazardous liquid should be done carefully by the designated experienced person; ▪ Monitor the surface water by testing in designated laboratory should be done by the contractor following the Quality Standard (Schedule-2 (ka (I)): Standards for Inland Surface Water, ECR, 2023).		
Land/ Soil Pollution	▪ Decrease the production capacity of agricultural land;	▪ Avoid the productive land, agricultural land, archaeological sites, protected area, forest	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	▪ Land or soil erosion from water or wind; ▪ Sediment pollution and increase the turbidity; ▪ Reduction the microorganism.	area, natural habitat etc.; ▪ Land/soil quality should be ensured by the contractor to fill the abutment area and approach road; ▪ Soil from fallow land should be used in earthwork in approach road; ▪ Re-vegetation the exposed area as early as possible to reduce the soil erosion; ▪ Create barrier for reducing the sedimentation into the water bodies; ▪ The Land or soil quality test should be carried out by the contractor.		
Waste (Solid, Liquid and Hazardous) Pollution Organic waste: remaining foods, leafs, papers, straw, fruit cover etc. Inorganic waste: Polythene, Glasses, Synthetic paper, plastic etc. Hazardous waste: Paint, fuel, chemicals, oil, petroleum products, bitumen etc.	▪ Improper storage and handling of construction & general liquid waste such as fuels, lubricants, chemicals and hazardous liquid onsite, and potential spills from these liquid materials may harm the environment and health of construction workers. ▪ Improper storage and handling of construction & general solid wastes.	▪ The contractor will minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes); ▪ Any wastes should not be throwing into the river/khal/canal other than dump in to the designated waste dumping area; ▪ Handling of hazardous liquid should be done carefully by the designated experienced person; ▪ Organic waste should be managed by composting method. A concrete chamber with 3 rooms is needed to be provided. In one room organic waste should be dumped and another room inorganic waste will be dumped. When the room will be filled then covered by earth. Then dump to the third room. After 6- month organic waste will be	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		converted into fertilizer and will be used by the farmers; ▪ Inorganic waste should be given to the authorized vendor for free of cost for recycling; ▪ Accidental spillage of hazardous waste should be managed by spreading wood powder on the surface of the oil and this powder mixed with oil must store in a designated concrete room; ▪ Provide appropriate PPE to the construction personnel for handle construction materials; ▪ Make sure all containers, drums and tanks that are used for storage are in good condition; ▪ Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution; ▪ Waste water monitoring should be carried out by the contractor, following the national standard (Schedule-10: Standard for waste from Industrial units or Projects waste).		
Hydrological Regime	▪ Drainage congestion and flood at the site.	▪ A detailed hydrological and morphological study of the site (in case of landfill and waste to energy plant) should be conducted; ▪ Proper design and construction accordingly to accommodate flood level; ▪ Wastes should not be disposed near any water body. All waste depending on its	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		characteristics, should be disposed of in a controlled manner.		
Drainage Congestion	▪ Construction of diversion road on the river/ Khal/canal create drainage congestion; ▪ Stockpiling of construction materials in the river/khal/canal also create drainage congestion.	▪ Immediately remove all the construction debris from the construction site as well as from the water bodies in a planned way; ▪ Duration of stockpiling should be minimized as much as possible; ▪ Avoid the encroachment of the water bodies; ▪ Protect water bodies from sediment loads by silt screen or bubble curtains or another barrier; ▪ Construction activity should be recommended during the dry season; ▪ Construction workers shall be instructed to protect water resources;	Contractor	LGED
Erosion and Siltation	▪ Bank erosion at the project site will loss of lands; ▪ Vulnerable for the structures; ▪ Increase turbidity and impact on aquatic life; ▪ Loss of productive land, structures, resources.	▪ Introduce bank protection activities; ▪ Use of geo-bag, stone and concrete to construct the protection wall; ▪ Plantation more vegetation to reduce surface soil erosion and enhancement of the soil compactness and stability.	Contractor	LGED
Road Traffic and Accidents	▪ Increased traffic use of narrow access road by construction vehicle will affect the movement of normal road traffics and the safety of the road users specially the students	▪ Proper Traffic Management Plan (TMP) should be prepared by the contractor during starting of construction & follow it strictly; ▪ In this TMP, the road safety measures such as speed breakers, warning signs/lights, road safety signs, flagman etc. should be included to ensure uninterrupted traffic;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		▪ Movement specially at nearby the educational (Schools, colleges, Madrasha etc.), community infrastructure (mosques, graveyards, Prayer Ground etc.) and health complex; ▪ In addition, BRTA traffic rules and regulations should be strictly followed; ▪ Divert traffic to follow alternative routes to avoid traffic jams; ▪ Avoid talking with mobile during driving.		
Quarries and Borrow Pits	▪ Increased noise level caused by blasting, movement of construction vehicles; ▪ Increased noise level will be impacted on the local community; ▪ Air pollution due to diesel fumes and dust generation resulting from the presence of construction machinery and site cleaning activities.	▪ Create noise barrier around the construction site; ▪ Stop unnecessary engine operation in the construction site; ▪ Maintain vehicles and construction equipment in good working condition including regular servicing; ▪ Control the movement of construction traffic in the access road; ▪ Construction equipment causing excess pollution (e.g. visible smoke) will be banned from construction sites immediately prior to usage; ▪ Water spray to the dry earth/material stockpiles, access roads and bare soils as and when required to minimize the potential for environmental nuisance due to dust; ▪ Stored materials such as: excavated earth, dredged soil, gravel and sand shall be covered and confined to avoid their wind drifted; ▪ Restore disturbed areas as soon as possible by vegetation.	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
Landscape and Aesthetics	▪ Excavation of borrow pits, stock piling of construction materials, placing of construction equipment and parking of construction vehicles; ▪ Presence of construction camps, equipment and their activities; ▪ Movement of construction vehicles on the existing road network and temporary haul roads;	▪ Parking of construction vehicles and stockpiling of construction materials/excavated earth should be done in systematic way to avoid the damaging of aesthetics of the site; ▪ Duration of stockpiling should be minimized as much as possible; ▪ Vegetation plantation after complete of the construction work; ▪ Completely remove the construction on camp facilities, equipment's and their activities; ▪ Limit the speed of the vehicles and cover the vehicles during the movement or transportation of materials on the existing road network and temporary haul road; ▪ Plantation of trees at the construction site after completion of the construction activities immediately.	Contractor	LGED
Occupational Health and Safety	▪ Campsites for construction workers and safety are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	▪ Construction workers camp shall be located at least 500 m away from the nearest habitation; ▪ Consider the location of construction camps away from communities in order to avoid social conflicts; ▪ Create awareness among the camp users on health and safety requirements to be maintained and code of conduct.	Contractor	LGED
	▪ Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate	▪ Adequate housing for all workers should be provided avoiding over crowing; ▪ Safe and reliable water supply; ▪ Hygienic sanitary facilities and sewerage system.	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	substandard living standards and health hazards			
	▪ Management of wastes is crucial to minimize impacts on the environment.	▪ Ensure proper collection and disposal of solid wastes within the construction camps; ▪ Insist waste separation by source; organic wastes in one container and inorganic wastes in another container at sources; ▪ Dispose organic wastes in a designated safe place on daily basis; ▪ The organic wastes should be always covered with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, etc. are not attracted; ▪ Locate the garbage pit/waste disposal site minimum 500m away from the resident area so that people are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places.	Contractor	LGED
	▪ There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices.	▪ Provide adequate health care and sanitation facilities within the construction sites;	Contractor	LGED
	▪ There will be an increased risk of work crews spreading sexually transmitted infections and HIV/ AIDS.	▪ Train all construction workers in basic sanitation and health care issues and safety matters and on the specific hazards of their work; ▪ Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information,	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		education and communication for all workers on regular basis; ▪ Regular mosquito repellant spraying during monsoon periods.		
	▪ Health risk of construction workers due to COVID-19	▪ Prepare the health and safety guidance for COVID-19 at work sites and get approval from MWMU; ▪ Strictly follow and implement the H&S guidance for COVID-19 at worksite; ▪ Everyone entering the worksite must wear a mask, gloves and hard shoes. ▪ 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; ▪ Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing. ▪ Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home). ▪ Encourage frequent hand washing and social distancing at campsite. ▪ Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer. ▪ Train workers on how to properly put on, use/wear, and take off protective clothing and equipment. Make these trainings mandatory at worksites and provide 10-15 minutes of a workday for such	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		'training and encouragement' activities.		
	▪ Construction work may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths.	▪ Provide the workers a safe and healthy work environment; ▪ Provide appropriate PPE for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields and ear protection; ▪ Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones; ▪ Appoint an environment, health and safety manager to look after the health and safety of the workers; ▪ Inform the local authorities responsible for health, religious and security before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters.	Contractor	LGED
	▪ Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victim.	▪ Provide health care facilities and first aid facilities are readily available; ▪ Document and report occupational accidents, diseases, and incidents and actions taken; ▪ Identify potential hazards to workers, particularly those that may be life threatening and provide necessary preventive and protective measures; ▪ Provide awareness to the construction drivers to strictly follow the driving rules;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		▪ Provide adequate lighting in the construction area and along the roads in the construction site.		
Community Health and Safety	▪ Accidents on the approach road and construction site; ▪ Noise and dust pollution; ▪ Communicable diseases can spread among the local community.	▪ Prior to start the construction activities contractor will be informed the local community; ▪ Instruct the drivers and limit the speed of the vehicles; ▪ Regular health checkup of the workers and awareness training about the communicable diseases; ▪ Proper lighting at the project site during the night time; ▪ Avoid unnecessary noise pollution; ▪ Spraying water in the dry surface to reduce the dust pollution ▪ Provide proper access control to the project site and unauthorized entry to the project site will be controlled.	Contractor	LGED
Impacts on Archaeological/ Historical/ Social/ Cultural/ Religious Sites	▪ Air and dust pollution; ▪ Noise level may create uncomforted; ▪ Vibration can affect social/ cultural/ religious sites.	▪ Create temporary barrier around the project site; ▪ Regular spraying of water in the construction site and approach road to reduce the dust emission; ▪ Control the speed limit about 30 km/hour in the construction site and approach road; ▪ Construction activities should be continued during day time only; ▪ Carefully handling of construction machineries and equipment's near the sensitive receptors near the project site.	Contractor	LGED
Housing and Commercial Structures	▪ Air and dust pollution;	▪ Spraying water on the dry surface to reduce dust pollution;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	▪ Noise level may create uncomforted; ▪ Loss of income and employment; ▪ Mental stress; ▪ Resettlement or removal due to realignment of approach road; ▪ Vibration can affect on structures.	▪ Create noise barrier around the construction sites; ▪ Limit the speed of vehicles in the construction site; ▪ Prior notice to the local inhabitants for resettlement issues if required; ▪ Compensation should be given to the PAPs in-time according to RP; ▪ Realignment of approach road if required; ▪ Job opportunities for the PAPS and priority should be given; ▪ Plantation of trees in an appropriate location will be determined by the LGED after consultation with the concern authority (Forest Department).		
Flora and Fauna	▪ Dust will be generated during earthwork and deposited on the leaves of nearby trees; this will abduct the growth of trees. ▪ Construction activities will increase sediment loading of streams and changes in turbidity will impact adversely upon fishes and aquatic animals. ▪ Diversion at bridge site will act as barriers to the migration of fishes and aquatic animals. ▪ Noise generation from the construction vehicles and equipment's can create disturbance for	▪ Proper construction management plan should be introduce in the Contractor LGED construction sites; ▪ Regular water spraying in the dry area from where there is a possibility to dust pollution; ▪ Proper management plan for the waste management in the construction sites; ▪ Construction work should be preferred during dry season; ▪ No disturbance for aquatic animal and keep provision for the fish movement; ▪ Diversion road should be removed properly as soon as possible; ▪ Construction activities should be continued during day time only; ▪ Create noise barrier and avoid unnecessary machineries and equipment's operation;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
	the birds and wildlife;	▪ Vegetation plantation after compilation of the construction work; ▪ Construction workers shall be instructed to protect natural resources, flora and fauna, including wild animals and aquatic life, hunting and unauthorized fishing are prohibited; ▪ Natural river/khal/canal will be reinstated after completion of construction works; ▪ Fingerling (fish) can be released to the river/khal/canal near the bridge site to boost up the fish resources.		
Disturbance to Wildlife Movement	▪ Noise from construction machineries and vehicles, movement of workers likely to be disturb the movement of wildlife; ▪ Permanent migration may occur from the area; ▪ Increase of mortality due to collision with vehicles;	▪ Instruct workers and contractors to avoid harassment and Contractor LGED disturbance of wildlife; ▪ Schedule activities to avoid disturbance of wildlife during critical periods of the day (e.g., night) or year (e.g., periods of breeding, nesting); ▪ Turn off all unnecessary lighting at night; ▪ Maintain noise-reduction devices (e.g., mufflers) in good working order on vehicles and construction equipment; ▪ Temporary fencing around the construction site during construction period; ▪ Educate workers regarding the occurrence of important resources in the area and the importance of their protection, including the appropriate regulatory requirements;	Contractor	LGED

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigate Measures	Responsibility	
			Implementation	Supervision
		▪ Regular monitoring of the death and disturbance of wildlife in the construction site.		
Fisheries and other Aquatic Animals	▪ Increase turbidity and siltation can spawning beds for fish; ▪ Noise from pile driving activities, aquatic animals including fishes will be affected; ▪ Turbid water can reduce the infiltration of sunlight into deep water.	▪ Construction activities is preferred during the dry season; ▪ Careful handling of construction waste in the construction site; ▪ Introduction of land/soil erosion and dust control practices in the construction site; ▪ Provide adequate space for movement and safe passage of fishes and other aquatic animals; ▪ Schedule activities to avoid disturbance of fish and aquatic anima during critical periods of the day (e.g., night) or year (e.g., periods of breeding); ▪ Turn off all unnecessary lighting at night to avoid attracting and disturbance of fishes; ▪ Maintain noise-reduction devices (e.g., mufflers) in good working order on vehicles and construction equipment; ▪ Regular monitoring the fish death and disturbance of fish and aquatic animals in the construction site; ▪ Fingerling (fish) can be released to the river/khal near the bridge site to boost up the fish resources	Contractor	LGED

8.2.3 During Operation

Based on the possible environmental impacts identified, a list of mitigation measures has been suggested for operation phase in Table 8.3 in order to reduce the negative effects.

Table 8-3: Proposed mitigation/enhancement measures during operation phase of the project construction, rehabilitation and maintenance program under Munshiganj Municipality.

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
Air Pollution	▪ Dust emission from the increasing number of vehicles in the site area; ▪ Vehicular emission from burning fuels. ▪ GHG emission from the landfill sites ▪ Moving wastes, by-and end-products (such as composts, and reyclables) may create dusts during dry season.	▪ Establish the speed breaker to limit the speed of the vehicle near the site; ▪ Increase number of plantations by adding new species of trees on the appropriate locations after consultation with the concern authority. ▪ Use bin covers and/or tarpaulins during transport of wastes, by-, and end products (compost) ▪ Use tarpaulin to cover soils, sand and other loose material that will be used in the controlled landfill. ▪ Green belt will be developed around the facilities to act as a barrier for dust pollution. ▪ Minimum amount of organic waste will be sent to controlled landfill so that landfill gas formation is minimum. ▪ Use the gas vent pipe for the extraction of GHG emission; ▪ In the design of the pyrolysis plant it must ensure the exhaust treatment.	Municipality	Municipality
Surface Water Pollution	▪ Remaining construction materials may be washed by the rainfall into the water sources and lead to sedimentation and increase turbidity; ▪ Hazardous materials spilled by accidents; ▪ Soil erosion during rainy season can contaminate nearby surface water. ▪ Unmanaged leachate can contaminate the surface water ▪ Run-off from stockpiled wastes and end-products of composting which may	▪ Remaining construction materials will be completely removed from the proposed project site after completing of the construction activities; ▪ Cover the bare surface by plantation of trees/vegetation to reduce the surface soil erosion; ▪ Speed control measures close to the site to reduce the occurrence of accidents; ▪ Bank protection work can be done at the site; ▪ Avoid rainy season for continuing any development activities. ▪ Take all precautions to prevent entering of run-off into streams, water courses, or irrigation system. Install temporary silt traps or sedimentation basins along the channels leading to the water bodies. ▪ Remove all wastes, by-,and end-products immediately. ▪ Monitor discharge of leachate including review of ECC conditions. Parameters to be monitored include suspended solids, dissolved solids (inorganic), pH, ammoniac nitrogen (as N), total nitrogen (as N), biochemical and chemical oxygen demand, arsenic mercury, lead, cadmium, total chromium, copper, zinc, nickel, cyanide, chloride, fluoride, phonemic compounds and othersasperECR,1997. ▪ Monitor compost quality. Visual inspection to ensure that glass, plastic and other	Municipality	Municipality

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
	cause siltation and reduction in the quality of adjacent bodies of water.	physical inerts and fragments are absent in compost and it has no offensive smell. Also testing of compost to meet standards for arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, pH and other parameters as prescribed by the relevant National policy of the Government.		
Acoustic environment	▪ Increase in noise level due to presence of workers and movement of vehicles.	▪ Plan activities in consultation with the LGED so that activities with the greatest potential to generate noise are conducted during periods of the day which will resulting least disturbance.	Municipality	Municipality
Health and safety risk of workers	▪ Risk of health of workers working in plant operation and maintenance, workers may suffer infectious diseases due to feedstock handling. ▪ Workers/plant operators may have accident risk of operation and maintenance of Incinerator Plant.	▪ 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. ▪ Maintaining good housekeeping in waste processing and storage areas. ▪ Fire extinguisher and firefighting facilities should be established during operation	Municipality	Municipality
Efficient working of the landfill and resource recovery facility	▪ Inefficient working of plant may cause poor quality of treatment and resulting under treatment of solid waste may cause environment, health and safety risk to workers and environment.	▪ Procedure for each step of operation shall be documented and all workers/operators shall be trained on the proper operation of each component of the plant. ▪ Although impact is likely to be minimal due to new and well-designed efficient system, it must be ensured that the facility is operating properly at all times.	Municipality	Municipality
Efficient working of Sanitary Landfill & Resource	▪ Inefficient working of the Sanitary Landfill & resource recovery	▪ Procedure for each step of operation shall be documented and all workers/operators shall be trained on the proper operation of each component of the facility.	Municipality	Municipality

Issues/ Activities	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility	
			Implementation	Supervision
Recovery Facility	facility may cause environment, health and safety risk to workers and environment.			
Traffic management	▪ Random parking of vehicles and unplanned loading / unloading of wastes in the subproject areas can lead to traffic congestion	▪ A well-defined schedule and route will be followed by the waste carrying trucks; ▪ Proper signage will put up near the proposed facility giving route directions; ▪ Vehicles will be parked inside the facility premises in the designated slots; ▪ Entry and exit routes from the premises will be clearly marked; ▪ Adequate lighting and reflective boards will be put up for night time safety; ▪ A proper traffic management plan will be implemented to mitigate adverse impacts; ▪ All routes will be planned to cause minimal disturbance to local community; ▪ The vehicles will be allowed to move in the site only through dedicated entry and exit points within the site; ▪ Dedicated parking area will be provided in the facility for parking of vehicles; ▪ The speed limit of vehicles will be restricted to 20 km/hr.	Municipality	Municipality
Community health and safety	▪ Possible accumulation of waste causing health problems for community. Pests and vermin.	▪ Wet/biodegradable wastes will be emptied directly from the bins to primary collection vehicles daily and dry/non-biodegradable wastes once in a week. The number and type of bins and vehicles to be procured under the project is sufficient to ensure no accumulation of wastes in the community. ▪ Wastes will be collected regularly to prevent pests and vermin.	Municipality	Municipality
Socio-economic aspect	▪ Visual impacts. ▪ Impacts on community health. ▪ Employment.	▪ Good Solid Waste handling practices will be implemented which will greatly reduce foul smell and reduce impact from odors; ▪ Vehicles moving through community roads will be covered and the operations will be restricted to day time; ▪ Maximum efforts will be made to provide job opportunities to local residents during construction and operation phase. ▪ Awareness campaigns should be organized emphasizing the need of sorting at source, waste collection and participatory role of Citizens in Solid waste management in the Municipality/City Corporation Area.	Municipality	Municipality

8.3 Environmental and Social Unit of Munshiganj Municipality

For Munshiganj sub-project to be implemented by LGED, a Project Management Unit (PMU) headed by the Project Director (PD) of this project will be formed who will oversee the project activities. An "Environmental and Social Management Unit (ESU)" within the PMU will oversee the environmental

and social management issues associated with the Munshiganj subproject. The ESU should be manned by personnel competent in undertaking environmental and social screening and monitoring and will report directly to the PD. The ESU with support from relevant Munshiganj Municipality/local communities (if necessary) will carry out "Environmental/Social Screening" and "Analysis of Alternatives" of sub-projects, following the guidelines contained in the Environmental and Social Management Framework (ESMF). For second batch of the project, the project consultants (environmental and social specialists) will carry out these screening activities.

The ESU, as required, will carry out further environmental and social assessment of the sub-projects. The PMU of LGED will be responsible for implementation of EMP and preparation of quarterly reports, with support from "Environmental and Social Unit" (see Figure-8.1).

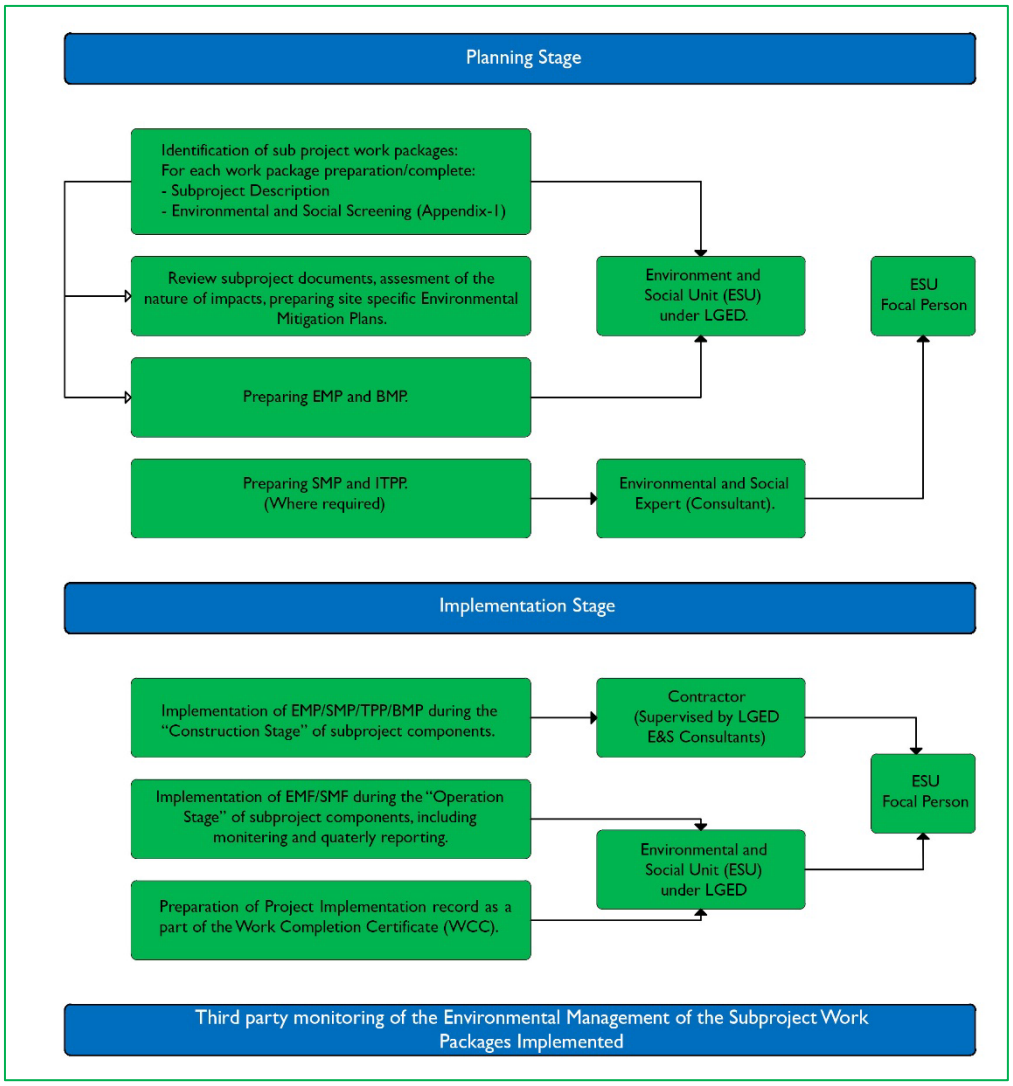


Figure 8-1: Institutional arrangement of ISWMP

Capacity Building. Given a new ESU will be set up for the project with staff lack familiarity with E&S requirements especially international good practice those working on the project will need trainings on environmental and social safeguards in general and the specifics of management and monitoring requirements for the project. The contractors' staff would also need some training and awareness raising to ensure they fully understand the ESMP requirements. Thus, a training program will be implemented. Training modules will be developed by PMU with support from consultants and same will be agreed with AIIB. The training modules will be delivered by the supervision consultant and will be a part of the project cost that includes institutional strengthening, capacity building and training for safeguards.

8.4 Environmental & Social Management Plan (ESMP)

8.4.1 Scope of the ESMP

The primary objective of the environmental and social management plan (ESMP) is to record environmental and social impacts resulting from the sub-project activities and to ensure implementation of the identified mitigation measures, in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operational phases of the sub-projects.

The ESMP have developed to lay out: (a) the measures to be taken during preconstruction, construction and operation phases of a sub-project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed.

The environmental management program should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as a sub-project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. For all sub-projects to be implemented under the ISWMIP, the ESMP should be a part of the contract document.

The major components of the ESMP include:

- Mitigation and enhancement measures
- Monitoring plan
- Estimation of Cost of ESMP
- Institutional arrangement for implementation of ESMP

8.4.2 Work Plan & Schedule

The contractor and operator will be primarily responsible for preparing the Site-Specific Environmental Management Plan (SEMP). During construction, contractor will be guided by the SEMP. This shall be based on the subproject's ESMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed SEMP will be the basis for monitoring by ESU and supervision consultant. Inclusion in construction contract documents the provisions requiring the contractor to submit a SEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The SEMP will allow ESU, construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the SEMP, ESU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

Table 8-4 Environmental Management and Monitoring Plan for the Integrated Solid Waste Management Improvement project of Munshiganj Municipality

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
1. Pre-Construction Phase							
1.1 Location impacts of the plant	Nearby community may be affected due to increased pollution during construction and operation.	The site should be selected in such a way that nearby community may have no or minimum impact such as dust, noise and access limit at construction phase and air emission and odor during operation phase due to proposed works.	Final design drawings	Prior to award of contract	Consultant	ESU	No additional cost required
1.2 Incorporation of all mitigation measures in the design	Efficiency of the plant operation.	▪ It must be ensured that contractor's design of the plant includes all proposed mitigation measured in Chapter 8 of this ESIA report.	Final design drawings	Before start of construction	Consultant	ESU	No additional cost required
1.3 Natural calamities	Plant location is in the tidal flood zone, thus, there is a threat of inundation due to tidal flood during monsoon.	▪ Highest flood level has been considered in the design. ▪ Planning of landfill at a suitable elevation above high flood level (utilizing accurate topographic survey).	Final design drawings	Prior to award of contract	Consultant	ESU	No additional cost required
1.4 Sources of materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	▪ Prioritize a site which already permitted by the authority. ▪ If other sites are necessary, it is contractor's responsibility to verify the suitability of all material sources and to obtain the approval of ESU and consultants. ▪ If additional quarries will be required after construction is started, construction contractor will obtain a written approval from ESU.	▪ Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary	During construction phase, as necessary in discussion with ESU, and Consultant.	Contractor	Consultant and ESU	No additional cost required

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
1.5 Permits, clearances, no objection certificate (NOC) etc.	Failure to obtain necessary permits and NOCs, etc. can result in design revisions and/or stoppage of works.	▪ Obtain NOC from Ward#14&16 member Munshiganj Municipality prior to start of civil works. ▪ Acknowledge in writing and provide report on compliance all obtained permits, clearance, NOCs, etc. ▪ Include in detailed design drawings and documents all conditions and provisions if necessary.	Incorporated in final design and communicated to contractors.	Prior to award of contract	Consultant	ESU	No additional cost required
1.6 Preparation of SEMP	Expecting minor impacts, during construction period only and mitigation measures are addressed.	▪ Contractor will prepare site specific environmental management plan which should be reviewed and approved by the employer at least 10 days before commencement of construction. ▪ Relevant information disclosed.	SEMP prepared, approved and disclosed	Upon completion of layout plan by contractor	**Contractor**	Consultant and ESU	No additional cost required
1.7 SEMP implementation training	Irreversible impact to the environment, workers, and community	Project manager and all key workers of contractors will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labor laws, applicable environmental laws, etc.	(i) Proof of completion (ii) Posting of EMP at worksites	Before start of construction	Consultant	ESU	Cost of the training to contractor is responsibility of ESU
2. During Construction Phase							
2.1 Physical and Cultural Heritage	Construction works will be on existing Landfill Site, thus risk for chance finds is very low.	▪ Stop work immediately to allow further investigation; ▪ Prevent workers or any other persons from removing and damaging of archaeological remains.	Records of chance finds	Visual inspection by ESU on regular basis	**Contractor**	Consultant and ESU	Included in civil works contract
2.2 Excavations	Potential erosion, dust generation, and accident. The impacts are negative but short-term, site-specific	▪ The excavated earth shall always be dumped on the designated areas to be reused as needed. ▪ In the event that excavations are to be kept open overnight, lights, high visibility	Contractor's safety and security program; Location of stockpiles; Number of complaints from stakeholders;	Inspection by ESU on a regular basis;	**Contractor**	Consultant and ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
	within a relatively small area and reversible by mitigation measures.	warning signs, and barricades shall be provided.					
2.3 Waste management	Oil, grease etc. from construction machinery; Hazardous and solid waste from waste construction material and food; The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	▪ Wastes must be placed in the designated bins which must be regularly emptied. These shall remain within demarcated areas and shall be designed to prevent wastes from being blown out by wind. ▪ Recycling is to be encouraged by providing separate receptacles for different types of wastes and making sure that staff is aware of their uses. ▪ All waste must be removed from the site and transported to a disposal site.	Complaints from community; Regular inspection of waste management activity.	As work progresses	**Contractor**	Consultant and ESU	Included in civil works contract
2.4 Water quality (surface and groundwater)	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	▪ Every effort shall be made to ensure that any chemicals or hazardous substances do not contaminate the soil or water on-site. ▪ Care must be taken to ensure that runoff from vehicle or plant washing does not enter the surface/ground water. ▪ Site staff shall not be permitted to use any stream, river, other open water body, or natural water source adjacent to or within the designated site for them for disposing wastes. ▪ All concrete mixing must take place on a designated, impermeable surface. ▪ All substances required for vehicle maintenance and repair must be stored	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) No visible degradation to nearby drainages, *khals* or water bodies due to construction activities	Visual water quality inspection during construction	Contractor	Consultant and ESU	Included in Civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		in sealed containers until they can be disposed of from the site. ▪ Hazardous substance/ materials are to be transported in sealed containers or bags. ▪ Monitor water quality according to the environmental management plan.					
2.5 Soil disturbance	The construction activities may cause soil degradation problems in the areas of the plant, access road etc.	▪ Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecast, and actions to be taken during or after rainstorms shall be developed by the Contractor. ▪ Slope protection measures through turfing; ▪ The earthwork sites where exposed land surface is vulnerable to runoff shall be consolidated and/or covered. ▪ The material stockpile sites shall be far away from surface water bodies and areas prone to surface run-off. Loose materials shall be bagged and covered. ▪ Channels, earth bunds, netting, tarpaulin and or sand bag 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.	Complaints from community; Vegetation cover; No visible degradation to nearby drainages, *khals* or water bodies due to soil erosion.	As work progresses	**Contractor**	Consultant and ESU	Included in civil works contract
2.6 Air Quality	Air pollution due to construction activities. The impacts are negative but short-	▪ Water spraying for dust control; ▪ Construction materials with potential for significant dust generation shall be covered;	Location of stockpiles; Number of complaints from stakeholders;	Visual air quality inspection during construction	**Contractor**	Consultant and ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
	term, impacts within a relatively small area and reversible by mitigation measures.	▪ No smoke belchers equipment; and ▪ Limiting speed of construction vehicles in access roads and work sites to maximum of 20 kph.					
2.7 Noise Level	Construction activities will be nearby settlements. Temporary increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials and people. The impact is short-term and within a relatively small area and reversible by mitigation measures.	▪ Consultation with affected people; not to operate noisy equipment during night time (22:00 – 06:00); ▪ Sound suppression for equipment; ▪ Ear protection for workers. ▪ Conduct noise quality monitoring as per EMP.	Number of complaints from stakeholders; Use of silencers in noise-producing equipment and sound barriers; Noise Quality, Equivalent Sound Pressure Level	Inspection by ESU and supervision consultants on monthly basis;	**Contractor**	Consultant and ESU	Included in civil works contract
2.8 Biodiversity	▪ Clearing of existing vegetation may result in loss of associated ecological habitats and their fauna. ▪ Noise, vibrations, and intrusive activities related to construction works may scare away animals remaining onsite after vegetation clearance.	▪ Plantation will be done at the ratio of 1 (cut): 2 (new planting) for each tree felling (if any). ▪ No trees, shrubs, or groundcover will be removed or vegetation stripped without the prior permission of the environmental specialist; ▪ While clearing vegetation it must be ensured that no wildlife injure and/or die. ▪ Harming and/or killing of any types of wildlife by the workers of the project must be prohibited.	ESU to report in writing the number of trees cut and planted twice; Number of complaints from stakeholders on disturbance of vegetation, poaching, fishing, etc.	Visual inspection by ESU and supervision consultants on monthly basis	**Contractor**	Consultant and ESU	Included in civil works contract
2.9 Socio-economic status	Manpower may be employed from local community during the construction and	▪ Employ at least 50% of labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that	(i) Employment records; (ii) Records of compliance to	Visual inspection by ESU and supervision	**Contractor**	Consultant and ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
	operation stage. Thus potential impact is positive and long-term.	sometimes occur when workers are imported. ▪ Secure construction materials from local market.	Bangladesh Labor Law and other applicable standards.	consultants on monthly basis			
2.10 Provision of Worker Facilities	Inconvenience to the communities due to presence of workers; Solid waste and sanitary discharges from worker camps.	▪ Provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted; ▪ Provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soak away, or holding tank with removal by vacuum truck. ▪ Solid waste should be collected at waste bins and disposed of properly offsite.	Site-specific H&S Plan; Records of supply of uncontaminated water; Record of H&S orientation trainings; Condition of sanitation facilities for workers	Visual inspection by ESU and supervision consultants on monthly basis	**Contractor**	Consultant and ESU	Included in civil works contract
2.11 Occupational health and safety	Occupational hazards which can arise during work. Potential impacts are negative and long-term but reversible by mitigation measures.	▪ Comply with requirements of Government of Bangladesh Labor Law and all applicable laws and standards on workers H&S. ▪ Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental safeguard specialist will help further capacity building. ▪ Ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; ▪ Arrange for readily available first aid unit including an adequate supply of	▪ Equipped first-aid stations ▪ Number of accidents ▪ Records of supply of uncontaminated water. ▪ Condition of eating areas of workers ▪ Record of H&S orientation trainings ▪ Use of PPE; ▪ % of moving equipment outfitted with audible back-up alarms	Visual inspection on regular basis	**Contractor**	Consultant and ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		sterilized dressing materials and appliances. ▪ Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; ▪ Ensure moving equipment is outfitted with audible back-up alarms; ▪ Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.	▪ Permanent sign boards for hazardous areas ▪ Signage for storage and disposal areas ▪ Condition of sanitation facilities for workers				
	Health risk of construction workers due to COVID-19	▪ Prepare the health and safety guidance for COVID-19 at work sites and get approval from MWMU; ▪ Strictly follow and implement the H&S guidance for COVID-19 at worksite; ▪ Everyone entering the worksite must wear a mask, gloves and hard shoes. ▪ 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; ▪ Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing. ▪ Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home).	▪ Record of COVID-19 protocol; ▪ Record of medical check-up; ▪ Awareness meeting records.	Visual inspection on monthly basis	**Contractor**	Consultant, ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		▪ Encourage frequent hand washing and social distancing at campsite. ▪ Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer. ▪ Train workers on how to properly put on, use/wear, and take off protective clothing and equipment. Make these trainings mandatory at worksites and provide 10-15 minutes of a workday for such 'training and encouragement' activities.					
2.12 Community health and safety	Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	▪ Adequate lighting, temporary fence, reflectorized barriers and signage at active work sites; ▪ Contractor's activities and movement of staff will be restricted to designated construction areas. ▪ Contractor's preparedness in emergency response; ▪ Project Affected Persons need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action as per environment management specialist's instruction.	▪ On-site record book ▪ Complaints from stakeholders ▪ GRM records	Visual inspection on monthly basis	**Contractor**	Consultant and ESU	Included in civil works contract

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		▪ Adequate dissemination of the GRM and Contractor's observance/implementation of the GRM.					
2.13 Site reinstatement	Damage due to debris, spoils, excess construction materials	▪ Remove all spoils wreckage, rubbish, or temporary structures which are no longer required; ▪ Request ESU to report in writing that worksite has been vacated and restored to pre-project conditions before acceptance of work.	ESU report in writing that (i) worksite is restored to original conditions; (ii) worker shed has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.	Prior to turn-over of completed works	**Contractor**	Consultant and ESU	Included in civil works contract
3. Operation Phase							
3.1 Health and safety risk of workers	Risk of health of workers working in plant operation and maintenance, workers may suffer infectious diseases due to hazardous waste Workers operators may have accident risk of operation and maintenance of the subproject activities.	▪ 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.	▪ Regular inspection and testing of all safety features and hazard control measures and personal protective features; ▪ Ensure proper training of newly deployed worker. ▪ Record of regular health check-up for the epidemic disease and illness of related workers.	Regular monitoring weekly at the plant.	ESU	Munshiganj Municipality	Included in O&M cost

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		▪ First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility. ▪ Maintaining good housekeeping in waste processing and storage areas. ▪ Fire extinguisher and firefighting facilities should be established during operation					
3.2 Efficient working of Integrated Solid waste management activities	Inefficient working of integrated Solid waste management activities may cause poor quality of treatment and management of solid waste and may cause environment, health and safety risk to workers and environment.	▪ Procedure for each step of operation shall be documented and all workers/operators shall be trained on the proper operation of each component of the Integrated Solid waste management activities. ▪ Although impact is likely to be minimal due to new and well-designed efficient system, it must be ensured that the facility is operating properly at all times.	▪ Check the Integrated Solid waste management activities regularly. ▪ Record of regular inspection of Integrated Solid waste management activities. ▪ Proper training to the operator.	Regular monitoring daily at plant.	ESU	Munshiganj Municipality	Included in O&M cost
3.3 Water Quality	Run-off from stockpiled wastes and end-products of composting which may cause siltation and reduction in the quality of adjacent bodies of water.	▪ Take all precautions to prevent entering of run-off in to streams, watercourses, or irrigation system. Install temporary silt traps or sedimentation basins along the channels leading to the waterbodies. ▪ Remove all wastes, by and end-products immediately. ▪ Monitor discharge of leachate including review of ECC conditions. Parameters to be monitored include suspended solids, dissolved solids (inorganic), pH, ammoniac nitrogen (as N), total nitrogen (as N), biochemical and	▪ Check the Run off from Stock Piled wastes and end product of composting ▪ Test the leachate, compost quality ▪ Tests at the minimum includes measurement of temperature, pressure, contact time, spore tests, and	▪ Regular monitoring daily at plant. ▪ Daily inspection of leachate by operation and monthly inspection for first 3 years of operation. Leachate Quality monitoring to be done twice a year	ESU	Munshiganj Municipality	Included in O&M cost

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		chemical oxygen demand, arsenic, mercury, lead, cadmium, total chromium, copper, zinc, nickel, cyanide, chloride, fluoride, phenolic compounds and others asper Solid Waste Management Rules 2021. ▪ Monitor compost quality. Visual inspection to ensure that glass, plastic and other physical inerts and fragments are absent in compost and it has no offensive smell. Also testing of compost to meet standards for arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, pH and other parameters as prescribed by the relevant National policy of the Government. ▪ Monitor treated wastes quality as per Medical Wastes Rules and conditions of the ECC.	other routine tests (visual).	for first three years of operation			
3.4 Acoustic environment	Increase in noise level due to presence of workers and movement of vehicles. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	▪ Plan activities in consultation with Munshiganj Municipality so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance.	▪ Noise level will be monitored	▪ Monthly inspection at the Landfill Area	ESU	Munshiganj Municipality	Included in O&M cost
3.5 Air Quality	Ambient Air quality of the landfill Area.	▪ Ambient Air quality will be monitored once by direct measurement from different locations of landfill area.	▪ Ambient Air quality will be monitored once by direct measurement of sensitive air pollution parameters like	Monthly inspection at the Landfill Area	ESU	Munshiganj Municipality	Included in O&M cost

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
			particulate matters (PM10, PM2.5), and SOx, NOx, CO, CH4, VOC.				
3.6 Socio-economic aspect	▪ Visual impacts. ▪ Impacts on community health. ▪ Employment.	▪ Good waste handling practices will be implemented which will greatly reduce foul smell and reduce impact from odor; ▪ Vehicles moving through community roads will be covered and the operations will be restricted to day time; ▪ Maximum efforts will be made to provide job opportunities to locals. ▪ Awareness campaigns should be organized emphasizing the need of sorting at source, waste collection and participatory role of Citizens of the Munshiganj Municipality.	▪ Regular inspection at plant site. ▪ Proper training to the driver. ▪ Record of awareness campaign.	Weekly monitoring.	ESU	Munshiganj Municipality	Included in O&M cost
3.7 Traffic management	▪ Random parking of vehicles and unplanned loading / unloading areas can lead to traffic congestion for distilled water transport	▪ A well-defined schedule and route will be followed by the waste carrying trucks; ▪ Proper signage will put up near the proposed facility giving route directions; ▪ Vehicles will be parked inside the facility premises in the designated slots; ▪ Entry and exit routes from the premises will be clearly marked; ▪ Adequate lighting and reflective boards will be put up for night time safety; ▪ A proper traffic management plan will be implemented to mitigate adverse impacts;	▪ Check the vehicle pool. ▪ Record of regular inspection. ▪ Proper training to the driver. ▪ Record of accidents/incidents.	Regular monitoring weekly at vehicle pool.	ESU	Munshiganj Municipality	Included in O&M cost

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Responsibility		Cost and Source of Funds
					Implementation	Supervision	
		▪ All routes will be planned to cause minimal disturbance to local community; ▪ The vehicles will be allowed to move in the site only through dedicated entry and exit points within the site; ▪ Dedicated parking area will be provided in the facility for parking of vehicles; ▪ The speed limit of vehicles will be restricted to 20 km/hr;					

8.5 Environmental Costs

The contractor's cost for site establishment, preliminary activities, construction, defect liability activities, and environmental mitigation measures related to ESMP implementation before construction and construction are to be incorporated into the contractual agreements and engineer's costs, which will be binding on him for implementation. The survey will be conducted by the contractor.

The operation phase mitigation measures are again of good operating practices, which will be the responsibility of the implementing agency (Munshiganj Municipality). The activities identified in the ESMP mainly include site inspections and informal discussions with workers and local community, and this will be the responsibility of ESU with the assistance of consultant, costs of which are part of project management.

Most of the costs associated with environmental mitigation and enhancement measures are included in the EMP budget. In consideration to the environmental impacts and their mitigation measures for this subproject, some items need to be incorporated in the Bill of Quantity of this subproject. A substantial part of environmental costs shall be covered under civil works contract. However, exact figures of environmental costs under civil works contract are not included in this EIA. Costs of these items will be dealt elsewhere in the respective subproject component document. The environmental costs presented in Table-8.5 are tentative provisions and suggested to be incorporated in the bill of quantities of bid documents. These figures are estimated based on experience of undertaking similar works under different LGED projects and the assumption of an average of $10,000 per annum as cost of implementing ESMP mitigation measures. For the details of environmental costs under civil works contract, individual contract package bid document may be consulted. It is assumed that the environmental cost under civil works contract for each contract package will be more or less same.

Table 8-5: Tentative EMP Budget for BOQ

(The following items need to be incorporated in the Bill of Quantity of this subproject)
Cost Estimates for Environmental Management

Sl. No.	Description of Items	Unit	Quantity	Unit Rate (Tk)	Item Total (Tk)	Costs covered by
1	Environmental Monitoring (i) Air Quality, (ii) Noise level, (iii) Water quality, (iv) Sediment at work site to the entire satisfaction of engineer-in-charge.	LS			6,00,000.00	Cost included in the BoQ as Provisional sum item (non-competitive item)
2	Dust suppression measures (excluding watering for compaction) to the entire satisfaction of the engineer-in-charge.	LS			1,50,000.00	
3	Rehabilitation of ancillary sites including stockpile sites, brick crushing sites, borrow areas, workforce camp, to the entire satisfaction of the engineer-in-charge.	LS			1,00,000.00	
4	Proper disposal of camp site wastes to the entire satisfaction of the engineer-in-charge.	LS			1,00,000.00	
5	Maintain First aid box at camp site to the entire satisfaction of the Engineer-in-charge.	LS			20,000.00	
6	Miscellaneous	LS			30,000.00	
Sub-Total:					**10,00,000.00**	

Sl. No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)	Costs covered by
7	Prevention of spillage, leakages of polluting materials to the entire satisfaction of the engineer-in-charge.					Contractor
8	Providing and maintaining adequate potable water supply facilities (Shallow Tube well) at camp site and work site to the entire satisfaction of engineer-in-charge.	Nos	4			Contractor
9	Providing and maintaining adequate sanitation facilities (both for male and female) at camp site and work site to the entire satisfaction of engineer-in-charge.	Nos	4			Contractor
10	**Traffic Management** Maintaining traffic management at worksite from time of commencement of construction activities to time of completion activities, including ensuring that the road is safe for users (this includes providing necessary barricades, warning signs/lights, guide signs, flagmen, maintaining diversion roads by cutting, filling, constructing, etc. or by any other means) in accordance with the full satisfaction of the Engineering-in-charge.					Contractor
11	**Installation of signboards/billboards** Precautionary signboards/billboards/ danger signals in appropriate places to notify people about the project	sqm	10.80			Item included in the BOQ
12	**Working labor shed:** Construction of Labor shed with C.I sheet Roofing, fencing and brick soling					Contractor
13	floor as per approved plan and to the entire satisfaction of the engineer-in-charge. **Personal Protection Equipment for Workers** Providing and maintaining appropriate (safe design, fit and comfort) personal protection equipment (PPE) to ensure the highest possible protection for employees in establishing and maintaining a safe and healthful working environment at workplace.					Contractor

Sl. No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)	Costs covered by
14	**Removal of equipment/ surplus materials/ rubbish/temporary structures/fully reinstate** On completion of the Contract, Contractor shall remove the equipment, surplus materials, slope erosion, canal sedimentation, rubbish and temporary structures of all types and shall leave sites in clean condition to the entire satisfaction of the engineer-in-charge and local people					Contractor
15	**Occupational Health and Safety** To ensure safety of health and hazards for construction workers including -Adequate housing for all workers -Safe and reliable water supply; -Hygienic sanitary facilities and sewerage system					Contractor
16	**Community Health and Safety** To ensure safety of health and hazards on local resources and infrastructures of nearby communities					Contractor
17	**COVID-19 Health and Safety** Washable cloth face mask, disposable hand gloves, wash basin & water container, soap, alcohol-based sanitizer, pump spray, disinfectant, tissue papers, garbage bin, plastic bag, contactless temperature reader etc.					Contractor
19	Training on Environmental Management Plan, Health& Safety and COVID-19 related threat for the contractor's workforce					Consultants

The cost for Environmental Quality Tests of Various Components –Water (surface and underground), Ambient air and Noise level, and Soil quality is given in Table-8.6 below.

Table 8-6: Indicative Costs for Environmental Quality Tests (Part of EMP Budget in BOQ)

Sl. No.	Environmental Parameters	Analytical Parameter	Unit cost (BDT)	Frequency (times) /Sampling Location	Total cost (BDT)
1	Ambient Air Quality	Suspended Particulate Matter (SPM), Particulate Matter (PM 2.5), Particulate Matter (PM 10), Oxides of Sulphur (Sox), Oxides of Nitrogen (NOx), Carbon Monoxide (CO),	40,000	6 times / (Once at two locations during pre-construction and semi-annually at two locations during construction phase)	40,000x6=2,40,000
2	Noise Quality	Noise Level (dB) in selected busy areas at and	10,000	12 times / (Once at two	10,000x12=1,20,000

Sl. No.	Environmental Parameters	Analytical Parameter	Unit cost (BDT)	Frequency (times) /Sampling Location	Total cost (BDT)
		around the subproject road/*bridge/khal site* (under Normal Condition and with Traffic)		locations for day and night time during pre-construction and semi-annually at two locations for day and night time during construction phase)	
3	Groundwater Quality	pH, Total suspended solids (TSS), Total dissolved solids (TDS), Dissolved oxygen (DO), Arsenic (As), Iron (Fe), Chloride (Cl), Electrical Conductivity (EC), nitrate-N (NO_3-N)	20,000	6 times / (Once at two locations during pre-construction and semi-annually at two locations during construction phase)	20,000x6=1,20,000
4	Surface Water Quality	pH, Total suspended solids (TSS), Total dissolved solids (TDS), Turbidity, Dissolved oxygen (DO), Biological oxygen demand (BOD_{5days}), Chemical oxygen demand (COD), Arsenic (As), Iron (Fe), Chloride (Cl), Electrical Conductivity (EC), nitrate-N (NO_3-N, fecal and total coli-form	20,000	6 times / (Once at two locations during pre-construction and semi-annually at two locations during construction phase)	20,000x6=1,20,000
5	Total Cost:				**6,00,000.00**

8.6 Monitoring and Reporting

ESU will monitor and measure the progress of ESMP implementation. The monitoring activities will correspond with the project's risks and impacts, and will be identified in the ESIA for the subproject. In addition to recording information on the work and deviation of work components from original scope ESU, and consultant will undertake site inspections and document review to verify compliance with the ESMP and progress toward the final outcome.

Contractor will submit monthly monitoring and implementation reports to ESU, who will take follow-up actions, if necessary. ESU will submit quarterly monitoring reports to DoE. Subproject budgets will reflect the costs of monitoring and reporting requirements.

ESU will carry out the following monitoring actions to supervise project implementation:

(i) conduct periodic site visits for projects with adverse environmental or social impacts;
(ii) conduct supervision with detailed review for subproject with significant adverse social or environmental impacts;

(iii) prepare the periodic monitoring reports for DoE to ensure that adverse impacts and risks are mitigated;
(iv) work with PMU to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
(v) prepare the subproject completion report for the AIIB-ISSWMIP team that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

External E&S Monitoring. Considering the sensitivity of the project (E&S Category A), LGED will recruit an independent consultant/consulting firm (ToR to be agreed with AIIB) under the Project. This independent consultant/consulting firm will undertake independent monitoring of E&S implementation and will submit periodic (semi-annual) reports to AIIB and PMU on independent monitoring of E&S aspects.

8.7 Gender and Social Inclusion Action Plan

Table 8-7: Different Levels of Gender and Social Inclusion Action Plan

Objective	Actions	Responsibility	Timeline
Policy Level Actions			
Gender Assessment	Rapid gender assessment including situation of GBV/SEA/SH in the sector to refine the gender and social inclusion action plan. The assessment will review existing policies, strategies and provision on gender inclusion. It will also carry out stakeholder consultation to prioritize project activities. It will further contribute to the Gender Action Plan.	ESU, GBV/Gender specialist(s)	Before start of implementation of the project/sub-projects in the field.
Policy dialogues	Policy dialogues with diverse government agencies to i) promote women in the technical sector that tend to be 'male-dominated' with more and better jobs, ii) placing women in decision making positions in the LGED Central Training Unit(CTU) iii) increasing female trainers as well as administration staff. Policy dialogues with non-government stakeholders such as NGO's to better determine how women's rights and interests can be protected and promoted in the professional field.	ESU, GBV/Gender specialist(s)	Within one year
Promote gender inclusion through capacity building, consultations and research	Based on outcomes from policy dialogues, capacity building for ESU to integrate gender inclusion into their policies and procedures. Capacity building will enhance gender inclusiveness in the following areas: ▪ HR policies; ▪ Trainee selection process; ▪ Trainings and methods; ▪ Communication on social norms. Create opportunities in male-dominated sectors:	ESU with support from AIIB	Procedures to be finalized before training. Implementation throughout the project.

Objective	Actions	Responsibility	Timeline
	▪ Support capacity building in male-dominated sectors by encouraging female hires in firms and jobs typically saturated by males through awareness raising campaigns and vocational partnerships. Consultations and roundtable in sectors where women are overrepresented in order to improve working conditions (safety, equal salaries, working hours etc.) and professional growth opportunities. Targeted capacity building packages on gender inclusion for associated institutions such as job placement providers, apprenticeship providers, NGOs etc.		
Program level actions			
Employment	▪ Reduce the existing discriminations of male-female ratio in all works under project; ▪ Engage women in construction and maintenance; and ▪ Create opportunities to implement 'equal-wage' for 'equal work' in case of male and female labors.	ESU	Implementation throughout the project.
Working-environment	▪ Keep provision of women friendly facilities (separate shades, toilets, day-care center) for the female laborers engaged in infrastructure construction; ▪ Ensure women friendly facilities (e.g. waiting room, toilets, day-care center etc.) in other work places; and ▪ Maintain discipline/social safety/sexual harassment prevention.	ESU	Implementation throughout the project.
Training	▪ Organize orientation program on gender issues for project staff and other officers; ▪ Assist in preparation of gender related appropriate training and refreshers training program & manual and arrange training coordinating with ESU; ▪ Collect sex disaggregated data of the participants of community consultations and other project activities; ▪ Conduct orientation and awareness raising sessions a road safety and gender-based violence (Including sexual exploitation and human trafficking) and STI prevention; and ▪ Orient contractors and LGED staff focus on core standards.	ESU, GBV/Gender specialist(s)	Implementation throughout the project.
Empowerment	▪ Identify the areas of women empowerment at all levels of project/sub-projects implementation;	ESU, GBV/Gender specialist(s)	Implementation throughout the project.

Objective	Actions	Responsibility	Timeline
	▪ Involve women at equal ratio in social development plan preparation, implementation and monitoring; ▪ Add supportive facilities for women laborers in tender documents; and ▪ Give directions by the project regarding inclusion of women in various committees of City Corporation/Municipal;		
Ensure/Improve women's participation in project activities	▪ Regular engagement with stakeholder working closely with female and vulnerable communities; ▪ Ensure effective implementation of social safeguards and GAP under the project; ▪ Devise and implement strategies such as affirmative action to enhance opportunities for female staffs of diploma and formal short courses for training and capacity building; ▪ Technical assistance to ensure selection process is designed to encourage application from female candidate through positive discrimination in selection criteria. Attention paid to selection processes in sectors that are 'male-dominated'; and ▪ Develop a 'women in work' platform linked with project's digital platform to connect female graduates and trainees with employment opportunities, and disadvantaged women with wider economic opportunities through job or enterprise support.	ESU	Within one year Within the second year

8.8 Occupation Health and Safety Management Plan

8.8.1 Objective

It is the goal of the Munshiganj subproject to provide the safest jobsite possible for all employees, subcontractors and the general public. Due to the close proximity of the jobsite to occupied areas and planned changes in the means of egress of occupants, special precautions must be taken to ensure the safety of everyone in the area. The following sections describe the plan set forth to ensure the success of this objective.

8.8.2 Emergency Procedures

Subproject management team is fully committed and led by example, ensuring that they have adequate processes to achieve their construction and operational safety and environmental goals and objectives. For any accidental injury or physical loss of fingers, hand, leg, eye etc. Incidental deaths caused due to accident at site are fully covered complying with safety regulations of Bangladesh. The subproject aims to protect the environment in recognition of global trends towards reducing emissions.

In case of an emergency on site, the following procedures are instituted of each site:

1) The whole site has been given the official instruction with the contact no. to communicate the concern in case of emergency.

2) Method of communication should be determined at each site such as telephone, walkie-talkie, transportation etc.
3) Emergency telephone numbers are posted:
    a. Police
    b. Fire
    c. Medical Response Team
4) Post near communication station the address of the site.
5) Post names of first aid responders on site.
6) Designate person to direct emergency crews to site of emergency.
7) Instruction to each employee if known harmful plants, reptiles, animals, or insects, are present regarding all of the following:
    a) The potential hazards
    b) How to avoid injury
    c) Applicable first aid procedures to be used in the event of injury

8.8.3 General Safety Regulations

Subproject Safety Rules and Protective Equipment for all individuals

(Must be read and signed by all individuals on the job site provide to all contractors)

ALL THE SAFETY RULES MUST BE OBEYED. FAILURE TO DO S0 WILL RESULT IN STRICT DISCIPLINARY ACTION BEING TAKEN.

1) Eye protection will be worn when there are potentials of hazards from flying objects or particles, chemicals, arcing, glare, or dust. Protective footwear shall be worn to protect from falling objects, chemicals, or stepping on sharp objects. Athletic or canvas-type shoes shall not be worn.
2) Protective gloves shall be worn when required to protect against a hazard.
3) Keep your mind on your work at all times. No horseplay on the job. Injury or removal from the job site or both can be the result.
4) Precautions are necessary to prevent sunburn and to protect against burns from hot materials.
5) The use of illegal drugs or alcohol or being under the influence of the same on the project shall cause for termination. Inform your supervisor if toking strong prescription drugs that warn against driving or using machinery.
6) Do not distract the attention of fellow workers. Do not engage in any act which would endanger another employee.
7) Sanitation facilities have been or will be provided for use of all.
8) Never work aloft if you are afraid to do so, if you are subject to dizzy spells, or if you are apt to be nervous or sick.
9) Never move on injured person unless it is absolutely necessary. Further injury may result. Keep the injured as comfortable as possible and utilize job site first-aid equipment until on ambulance arrives.
10) Know where firefighting equipment is located and be trained on how to use it.
11) Lift correctly - with legs, not the bock. If the load is too heavy 6ET HELP. Stay fit. Control your weight. Do stretching exercises. Approximately twenty percent of all construction related injuries result from lifting materials.
12) Do not use power tools and equipment until you have been properly instructed in the safe work methods and become authorized to use them.

13) Be sure that all guards are in place. Do not remove, displace, damage; or destroy any safety device or safeguard furnished or provided for use on the job, nor interfere with the use thereof.
14) Do not enter on area which has been barricaded.
15) Never oil, lubricate, or fuel equipment while it is running or in motion.
16) Before servicing, repairing, or adjusting any powered tool or piece of equipment, disconnect it, lock out the source of power, and tag it out.
17) Excavated or other material shall not be stored nearer thon two feet from the edge of the excavation. Excavations less than 5 ft may also require cave in protection in some instances.
18) Use only extension cords of the three-prong type. Use ground fault circuit interrupters of all times and when using tools in wet atmosphere (e.g., outdoors) or with any temporary power supply. Check the electrical grounding system doily.
19) Workers at site should walk only through the designated walkway.
20) Know what emergency procedures have been established for your job site. (Location of emergency phone, first aid kit, stretcher location, fire extinguisher locations, evacuation plan, etc.)
21) Never enter a manhole, well, shaft, tunnel or other confined space which could possibly have a nonreplicable atmosphere because of lack of oxygen or presence of toxic or flammable gas, or has a possibility of engulfment by solids or liquids.
22) If you must work around power shovels, trucks, and dozers, make sure operators can always see you. Barricades are required for cranes.
23) A good job is a clean job, and a clean job is the start of a safe job. So, keep your working area free from rubbish and debris.
24) Do not use a compressor to blow dust or dirt from your clothes, hair, or hands.
25) Trenches over five feet deep must be shored or sloped as required. Keep out of trenches or cuts that have not been properly shored or sloped. Excavated or other material shall not be stored nearer thon two feet from the edge of the excavation. Excavations less than 5 ft may also require cave in protection in some instances.
26) Use the "four and one" rule when using a ladder. One foot of base for every four feet of height.
27) Portable ladders in use shall be equipped with safety feet unless ladder is tied, blocked or otherwise secured. Step ladders shall not be used as a straight ladder.
28) Ladders must extend three feet above landing on roof for proper use.
29) Detective ladders must be properly tagged and removed from service.
30) Keep ladder bases free of debris, hoses, wires, materials, etc.
31) Scaffold planks shall be properly lapped or otherwise secured to prevent shifting.
32) If any port of your body should come in contact with on acid or caustic substance, rush to the nearest water available and flush the affected port. Secure medical aid immediately.
33) The use of harnesses with safety lines when working from unprotected high places is mandatory. Always keep your line as tight as possible.
34) Never throw anything "overboard." Someone passing below may be seriously injured.
35) Know what emergency procedures have been established for your job site. (Location of emergency phone, first aid kit, stretcher location, fire extinguisher locations, evacuation plan, etc.)

8.8.4 Safety Procedures

Munshiganj subproject plans to achieve worker safety and health by through adhering to the following set forth procedures:

- Using a qualified safety person.
- Assign a Person who is on site during all work for ensuring their safety
- Making regular job site safety inspections.
- Enforcing the use of safety equipment.
- Following safety procedures and rules.
- Providing on-going safety training.

- Enforcing safety rules and using appropriate discipline.
- Conducting and submitting o weekly site inspection report. Weekly site inspection report is to be completed by designated competent person.

8.8.5 Special Consideration on Pedestrian Safety

To ensure that pedestrian traffic does not become exposed to construction hazards, fence will be erected to eliminate access and pedestrian traffic (on project location). There are major demolition as well as open excavations which pose hazards to pedestrians. Signs will be erected of the nearest crosswalks stating the sidewalks are closed ahead and pedestrian crossing should occur of designated points. Barricades will be erected to ensure that occupants do not unintentionally enter the construction area posing a great risk to their health. Barricades will also be erected to ensure those employees ore not exposed to o fall and/or construction hazards posed by the removal of the glass above the hazards as well as the new paths of egress.

8.8.6 Job Site Inspections

The competent person or other designated person will tour each job site daily and observe potential safety/health hazards, including the potential hazards of confined spaces and develop a plan for safeguarding this company's workers which may include, but not limited to, the following:

1. Conducting a daily review of the area of work to observe any present or future safety hazards. Any safety hazard, or potential hazard, will be recorded and corrected by the competent person. Once the hazard has been corrected the competent person is to notify the concern immediately.
2. Guarding against the hazard as set forth by concern with safety manual and regulations.
3. Providing personal protective equipment and enforcing its use
4. Training workers in safe work practices. This can be achieved through weekly toolbox talks, but not limited, conducted by the competent person. The toolbox talks are to be turned on a weekly basis and will be kept on file at job site office.
5. Coordinating protection of workers through other contractors.
6. Assigning a competent person to train and inspect hazards visually on the job site.
7. Conduct weekly site inspection reports. These reports ore to be turned into off ice.

A record of all safety inspections and correctional steps listed above will be kept as office record.

8.8.7 Mission

Subproject will make safety as the highest priority and train the employees to ensure they have the tools necessary to keep them safe. In conclusion, the guidelines set forth in this plan will ensure the highest level of safety to all parties involved. The safety plan will be monitored for effectiveness by us. If changes need to be mode to this safety to ensure the highest level of safety, such changes will be submitted as soon as those measures ore put in place.

The purpose of this plan is to assure that employees are protected from unintended machine motion or unintended release of energy which could cause injury.

(i) Management Responsibilities

a) Each supervisor shall train new employees and periodically instruct all of their employees regarding provisions and requirements of this lockout procedure.

b) Each supervisor shall effectively enforce compliance of this lockout procedure including the use of corrective disciplinary action where necessary.

c) Each supervisor shall assure that the safety procedures ore provided to their employees.

d) Prior to setting up, adjusting, repairing, servicing, installing, or performing maintenance work on equipment, machinery, tools, or processes, the supervisor shall determine and instruct the

employees of the steps to be taken to assure they are not exposed to injury due to unintended machine motion or release of energy.

(ii) Responsibility of site supervisor

a) Check the Construction Safety Plan and associated Work Method Statements are completed as stated above.

b) Take action to correct the situation if you identify that the above has not been complied with.

c) If a circumstance outside your control is preventing you from ensuring the above, report the issue to the concern of higher authority.

(iii) Employees Responsibility

a) Employees shall comply with the safety procedure.

b) Employees shall consult with their supervisor or other appropriate knowledgeable management personnel whenever there are any questions regarding their protection.

c) Employees shall obtain and care for the equipment required to comply with the construction.

d) In case of sickness or injury, no matter how slight, report of once to your supervisor. In no case should an employee treat his or her own or someone else's injuries or attempt to remove foreign particles from someone else's eye.

8.8.8 Some Important Matters

Safety equipment

Your supervisor will see that, you receive the protective clothing and equipment required for your job. Use them as instructed and take care of them. You will be charged for loss or destruction of these articles only when it occurs through negligence.

Safety shoes

The organization will designate which jobs and work areas require safety shoes. Under no circumstances will on employee be permitted to work in sandals or open-toe shoes. A reliable safety shoe vendor will visit the entity periodically. Notices will be posted prior to the visits.

Safety glasses

The wearing of safety glosses by all shop employees and volunteers is mandatory. Strict adherence to this policy can significantly reduce the risk of eye injuries.

Seat belts

All paid and volunteer staff must use seat belts and shoulder restraints (if available) whenever they operate o vehicle on organization business. The driver is responsible for seeing that all passengers in front and rear seats are buckled up.

Good housekeeping

Work location should be kept clean and orderly. Keep machines and other objects (boxes, shopping carts, etc.) out of the center of aisles. Cleon up spills, drips, and leaks immediately to ovoid slips and falls. Place trash in the proper receptacles. Stock shelves carefully so merchandise will not fall over upon contact.

Safety Regulation

The health, safety and welfare of Munshiganj Municipality SWM employees and of all others involved by our operations ore highly important. The management team is fully committed and led by example, ensuring that they have adequate processes to achieve the operational safety and environmental goals and objectives.

The subproject ESU team aims to protect the environment. In recognition of global trends towards reducing emissions, the points are:

1. Protecting people.
2. Pursuing a goal of an injury, incident free culture, founded on leadership and behavioral change processes
3. Protecting the environment by being a responsible and responsive employer.
4. Implementing effective health and safety management systems.
5. Developing and adopting best available HS&E practices.
6. Engaging with our people and customers in driving continual performance improvement.
7. Implementing effective environmental management systems.
8. Proactively supporting the maintenance of 3rd Party accreditations.
9. Continually improving overall HS&E performance.
10. Proper management of hazardous materials of site.

Safety rules and guidelines:

To ensure safety, Munshiganj Municipality SWM team have to observe and obey the rules and guidelines appropriate to the jobs:

1. A Medical Officer has been employed for monitoring as well as serving the whole working for their injuring.
2. An MBBS doctor will be contracted for this project stationed close to the workplace who will be our appointed doctor for all the employees working at site.
3. In case of sickness or injury, no matter how slight, report of once to your supervisor. In no case should an employee treat his or her own or someone else's injuries or attempt to remove foreign particles from someone else's eye.
4. In case of injury resulting in possible fracture to legs, bock, or neck, or any accident resulting in on unconscious condition, or a severe head injury, the employee is not to be moved until medical attention has been given by authorized personnel.
5. Do not wear loose clothing or jewelry around machinery. It may cotch on moving equipment and cause a serious injury.
6. Never distract the attention of another person, as you might cause him or her to be injured. If necessary, to get the attention of another person, wait until it can be done safely.
7. Where required, you must wear protective equipment, such as goggles, safety glosses, masks, gloves, hair nets, etc. appropriate to the task.
8. Safety equipment such as restraints, pull backs, and two-hand devices are designed for your protection. Be sure such equipment is adjusted for you.
9. Pile materials, skids, bins, boxes, or other equipment so as not to block aisles, exits, firefighting equipment, electric lighting at power panel, valves, etc. Fire Doors and Aisles Must be Kept Clear!
10. Keep your work area clean.
11. Use compressed air only for the job for which it is intended. Do not clean your clothes with it, and do not fool around with it.
12. Observe "No Smoking" regulations.
13. Shut down your machine before cleaning, repairing, or leaving it.

14. Tow motors and lift trucks will be operated only by authorized personnel. Walk-type lift trucks will not be ridden and no one but the operator is permitted to ride the tow motors.
15. Do not exceed a speed that is safe for existing conditions.
16. Running and horseplay ore strictly forbidden.
17. Do not block access to fire extinguishers.
18. Do not tamper with electric controls or switches.
19. Do not operate machines or equipment until you have been properly instructed and authorized to do so by your supervisor.
20. Do not engage in such other practices as may be inconsistent with ordinary and reasonable common-sense safety rules.
21. Report any unsafe condition or acts to your supervisor.
22. Help to prevent accidents.
23. Use designated passages when moving from one place to another; never take hazardous shortcuts (i.e., between moving equipment or across roadways).
24. Lift properly-use your leg muscles, not your bock muscles. For heavier loads, ask for assistance.
25. Do not adjust, clean, or oil moving machinery.
26. Keep machine guards in their intended places.
27. Do not throw objects.
28. Clean up spilled liquid, oil, or grease immediately.
29. Wear hard-sole shoes and appropriate clothing (i.e., shorts or mini dresses are not permitted).
30. Place trash and paper in proper containers and not in cans provided for cigarette butts

8.9 Gender Based Violence (GBV) Prevention Plan

8.9.1 Introduction

Gender-based violence is a general term used to capture any type of violence that is rooted in exploiting unequal power relationships between genders. This can include gender norms and role expectations specific to a society as well as situational power imbalances and inequities. Gender-based violence can impact anyone, and can include intimate partner and family violence, elder abuse, sexual violence, stalking and human trafficking.

8.9.2 Country and Sector contexts

Women have been working in the solid waste management process for a long time. Which starts from clean houses, shopping malls, roads, bazaars, cities to rural areas. So, excluding them is almost impractical in the solid waste management process. Women have been working in the sector for a long time which is directly or indirectly enriching the economy of the country. Horizon women's from the lower caste Hindu community work as sweepers in municipalities. Due to their tireless work, we urban dwellers live in a clean, pollution and odor free city. Yet we do not value them socially. Their children do not get jobs even after studying. This discrimination runs almost in the society and the country. They should to be associated with gender mainstreaming. Which will play a role in the development of the project and the country's economy.

8.9.2.1 Female Labor Force Participation in Bangladesh

Bangladesh's female labor force participation (FLFP) has risen substantially yet, FLFP and quality of jobs for females are still lagging. There have been remarkable improvements in FLFP made in Bangladesh in

recent decades, raising the FLFP rate from 26 percent in 2002 to 35.6 percent in 2016, benefiting from the expansion of garment manufacturing industries. Yet, by comparison, male labor force participation is much higher at over 80 percent. Moreover, the improvement in FLFP rates has hit a plateau, remaining at 36 percent in 2017. This gender disparity can be attributed to structural barriers including women's domestic burden, sex segregation in educational subject and occupation, employer discrimination, restricted mobility, limited access to trainings, lack of female friendly facilities, sexual harassment at work, limited childcare provisions. Social norms that influence and limit women's choices as well as a lack of a supportive policy environment also stunts FLFP. Moreover, female employment tends to be more concentrated in low-paid and low-productivity occupations, which are more vulnerable to technology innovation and automation in the production process. Increasing women's labor force participation and improving the quality of female employment will require more significant support for women's access to employment opportunities and high-quality skills development programs.

8.9.2.2 Gender Based Violence in Bangladesh

Violence against women (VAW) is one type of GBV which is very prevalent in Bangladesh and is often rooted in gender inequalities and harmful gender norms. VAW in Bangladesh is still very high. Report on Violence against Women (VAW) Survey 2015 jointly conducted by the Bangladesh Bureau of Statistics (BBS) and UNFPA found that 73% of married women in Bangladesh have experienced forms of violence from their husband, 55% reported forms of violence in the past 12 months, and 50% reported physical violence in their lifetime. More than 10 million Bangladeshi women experience physical or sexual violence every year. The numbers may be higher but societal stressors often prevent victims of rape and domestic abuse to step forward. Cybercrimes have added a new element to VAW. The Counter Terrorism Unit of Bangladesh Police reported a rapid rise in cases filed with their Cyber Crime Unit, (845 in 2018 up from 566 in 2017) of which 70% of the victims were women and children. The worst manifestation or existing forms of GBV is child marriage, also known as early marriage. Child marriage and the dowry system puts girls at particular risk of sexual, physical and psychological violence throughout their lives. Bangladesh has one of the highest early marriage rates in the world at 59 percent in 2018 (UNFPA, 2019). Early marriage nearly always results in school drop-outs or from to pursuing higher education and early childbirth, and is often used as a way for trafficking young girls. This is hazardous from a health perspective and is a hindrance to academic and economic development.

8.9.2.3 Status of Gender Based Violence (GBV) in subproject

Munshiganj Municipality covers an area of 42.79 square kilometers. 247066 people live in the municipality. Gender based violence is very less here as people living now are educated, religious and aware. After discussing with the women sweepers of Munshiganj Municipality and different levels of people in different parts of the city, consultant came to know that gender-based violence is very less here. Municipality dwellers are also law abiding.

However, during the construction work in the landfill area, there is a possibility of sexual harassment of women workers and women of the host area due to the arrival of new workers from neighboring areas or outside areas. At that time the contractor should conduct the awareness building activities and make orientation of the new workers about the laws of Bangladesh regarding sexual harassment and its remedies.

8.9.2.4 Legal and Institutional Environment for Gender Equality and GBV prevention in Bangladesh

Existence of laws and regulations as well as mechanisms helps to address SEA/SH risks. Bangladesh has the following mechanisms for SEA/SH/GBV/VAC mitigation, prevention and response.

- The National Women's Development Policy (NWDP), 2011 seeks to reduce violence; eliminate discrimination; increase access to education, health and employment; and address the special needs of older women, women with disabilities and women from indigenous and marginalized communities;

- In early 2017, the Parliament of Bangladesh reviewed the Child Marriage Restraint Act 2016 to permit under-18 girls to be married under "special circumstances". This has raised serious concerns among women's groups and legal NGOs working in the country;
- The Multi-Sectorial Program on Violence against Women (MSPVAW) is being implemented jointly by the Government of Bangladesh and Government of Denmark under the Ministry of Women and Children Affairs. The project is being carried out in collaboration with the Ministry of Law, Justice and Parliamentary Affairs, Ministry of Information, Ministry of Social Welfare, Ministry of Home Affairs, Ministry of Health and Family Welfare, Ministry of Education, Ministry of Religious Affairs, Ministry of Youth and Sports and Ministry of Local Government, Rural Development and Cooperative. One of the significant components of the program is the OCC in the Medical College Hospitals (MCHs). The OCCs provides health care, police assistance, DNA test, social services, legal assistance, psychological counseling and shelter service etc. A training module for combating VAW was developed for OCC staffs, teacher, students, health assistant, family planning officers and other professions. Another intervention set up by the MSPVAW is the National Helpline Center for violence against women, a 24-hour helpline that can be accessed from land lines and mobile numbers;
- A High Court decision declared in 2009 that the sexual harassment of girls and women is illegal, and issued a set of guidelines defining sexual delinquency to prevent any kind of physical, mental or sexual harassment of women, girls and children at their workplaces, educational institutions and other public places including roads across the country;
- Bangladesh's laws do address the use of corporal punishment in school settings; and in 2010 the Ministry of Education released an Education Circular that forbids corporal punishment in class rooms and schools. This same ban does not, however, extend to alternative care institutions, penitentiary settings or as punishment for specific criminal offenses;
- Bangladesh legislated an 'ICT Act' in 2006 to combat cybercrime and online harassments. However, the provisions of this Act are quite insufficient to undertake legal measures appropriately as it does not address gender-based violence online in a clear and effective manner. The country has also formed a 'Cybercrime Tribunal' that addresses cyber violence;
- Other than NWDP, the government has enacted a number of stringent laws and policies to protect men and especially women from gender based violence (GBV) including sexual exploitation and abuse/sexual harassment (SEA/SH): The Criminal Procedure Code, 1889; The Penal Code 1860; The Evidence Act 1972; Child Marriage Restraint Act 1929; Citizenship Act 1951 (Amended 2009); Muslim Family Laws Ordinance 1961; Dowry Prohibition Act 1980; Immigration Ordinance 1982; Immigration Ordinance 1982; Family Court Ordinance 1985; Women and Children Repression Prevention Act 2000 (2003); Women and Children Repression Prevention Act 2000 (2003); Women and Children Repression Prevention Act 2000 (2003); Women and Children Repression Prevention Act 2000 (2003); Women and Children Repression Prevention Act 2000 (2003); Acid Crime Prevention Act,2002;Acid Control Act 2002;The Bangladesh Labor Act 2006;Domestic Violence (Prevention & Protection) Act 2010;Human Trafficking Deterrence and Suppression Act, 2012;The Pornography Control Act, 2012; The Hindu Marriage Registration Act 2012. Multi-Sectorial Program on Violence against Women is being implemented jointly by the Government of Bangladesh and Government of Denmark under the Ministry of Women and Children Affairs. One of the significant components of the program is the OCC (One Stop Crisis Centre) in the Medical College Hospitals (MCHs). The OCCs provide health care, police assistance, DNA test, social services, legal assistance, psychological counseling and shelter service etc.

8.9.3 Potential SEA/SH Risks Assessment in the subproject Areas

Considering the cluster type of project, the project is expected to have minor labor influx. Munshiganj landfill area will construct around 15.12 acre. It is expected that total labor including the skilled and unskilled will not be more than 150(approx.). The number of labor is estimated maximum 50 and among the 50% will be unskilled labor. However, based on the social assessment, few GBV risk are identified as below:

- Labor/workers have lack of knowledge on national laws and policies, and actions in case of GBV issues;
- Contractors have lack of experience in management of GBV issues;
- There are significantly more male labor than female labor in the construction sector;
- Job opportunities of local women and girls are generally limited. However, with civil work in the neighborhood, they may avail job opportunities in the project area and as a result be victims of SEA and workplace SH;
- Higher wages for workers in the local community can lead to an increase in transactional sex including incidents of sex between laborers and minors;
- Civil work projects can cause shifts in power dynamics between community members and within households. Male jealousy, a key driver of GBV, can be triggered by labor influx on a project when workers are believed to be interacting with community women, or community women are getting better wages than their male members of the family. This may lead to abusive behavior within the homes of those affected by the project; and
- A male worker is sexually abused by his male boss or senior worker.

8.9.4. Gender Based Violence (GBV) Prevention Plan

The GBV Prevention Plan takes a comprehensive approach to include both prevention and mitigation measures as the existing policies and measures on mitigation are limited to address GBV. The proposed project involves construction work in the project implemented areas which may have the potential GBV risks, etc. sexual exploitation and abuse, workplace sexual harassment, and non-sexual exploitation and abuse. Therefore, the purpose of this action plan is to identify the issues, stakeholders, possible service providers and assess their capacity that aid in accessing grievance redressal. The action plan will focus on some corresponding mitigation measures sensitizing the communities and other stakeholders, strengthening the institutional capacities to mitigate project related potential risk of GBV in the project affected population. A survivor-centric approach will be followed - all through, victim/survivors' care and providing access to different referral mechanisms are considered key aspects of this plan. The approach aims to create a supportive environment in which each survivor's rights are respected and in which the person is treated with dignity and respect. The project will include a general Code of Conduct (CoC) as well as a Labor Code of Conduct (sample given in Annex I), covering the GBV/SEA/SH related risks for the contractors, sub-contractors, and laborers who will be employed under the project.

GBV Prevention Plan

Table 8-8: GBV Prevention Plan of the Munshiganj Subproject

Action	Activities	Indicator	Responsibility	Risk Management
Awareness raising campaign on SEA/SH in project and trainings.	Prepare relevant communication materials on GBV/SEA/SH and dissemination of these materials. Conduct 4 awareness raising workshop in the project areas: ▪ Develop content and conduct targeted training and orientation session: ▪ Training/orientation sessions to sensitize on importance of addressing GBV/SEA/SH risks on the project and the mechanisms that will be implemented; ▪ Training/orientation session to sensitize other stakeholders on the importance of addressing GBV/SEA/SH risks including cyber bullying; and ▪ The training will be targeted at stakeholders identified in SEP.	Communication material related to GBV/SEA/SH disseminated Awareness raising campaign on GBV/ SEA/SH conducted among all stakeholders Number of project actors trained and oriented on GBV/SEA/SH.	ESU, GBV/Gender specialist(s).	Monitor the activities and provide additional guidance as necessary.
Capacity building for labors, contractors, sub-contractors and stakeholders on anti GBV/harassment policies.	Basic ethics and CoC; Contractors, consultants, labor, sub-contractors and community people's rights and responsibilities, positive discipline. ▪ Prepare Code of Conduct (CoC); ▪ Measures for dealing with GBV, complaints and reporting mechanisms, services for survivors, referral mechanisms and redress procedures; and ▪ Topics to be covered under the trainings can be determined through consultations on training needs.	▪ CoC is prepared; and ▪ All contractors, labor and relevant stakeholders are aware of the CoC.	ESU, GBV/Gender specialist(s).	Monitor the activities and provide additional guidance as necessary.
Sensitize the LGED and ESU to the importance of addressing GBV on the project, and the mechanisms that will be Implemented.	Develop deep-dive trainings to build capacity of LGED on safeguarding mechanisms including CoC, GRM, GBV response protocols on and reporting and procedures to handle cases.	Deep-dive trainings conducted.	ESU, GBV/Gender specialist(s).	Monitor the activities and provide additional guidance as necessary.
Organize stakeholder consultations with project actors and	Consultations carried out with different stakeholders and local communities. Share the GBV risk of the project with the relevant stakeholders. Visibly display signs around the project site (if applicable)	Project actors and community members sensitized.	Contractor and ESU,	Monitor the implementation of

Action	Activities	Indicator	Responsibility	Risk Management
community members to inform them properly about the potential GBV risks and project activities to address GBV related issues.	that signal to workers and the community that the project site is an area where GBV is prohibited.		GBV/Gender specialist(s).	Stakeholder Engagement Plan.
Functionalize effective GBV GRM.	As the SEP explicitly entails addressing GBV/SEA/SH, ensure beneficiaries, community members and labor are informed of GBV grievance mechanisms. Train personnel to operate GRM i.e., proper documentation for complaint registration and management; and confidential reporting with safe and ethical documenting of GBV cases. Communicate with local service provider to provide referral and support services to survivors as per Grievance Mechanism guidance on SEA/SH.	Availability of an effective GRM with multiple channels to initiate a complaint / parallel GBV.	ESU, GBV/ Gender specialist(s).	Ongoing monitoring and reporting on GRM to verify it is working as intended.
Clearly define the GBV requirements and expectations in the bidding documents for contractor.	Formulate and adopt GBV informed bidding document. Inform the contractors and provide orientation Include GBV costs in the bill of quantities.	GBV requirement and expectation are adapted in bid document.	ESU-LGED and GBV/Gender specialist(s).	Review by AIIB.
Codes of Conduct (CoC) signed and understood by all those engaged in the project directly receiving project financing.	CoC finalized and agreed on. (See Annex I for sample of code of conduct) Sensitize project related staff about CoC requirements and obligations. Ensure requirements in CoCs are clearly understood by those signing. Have CoCs signed by all those with a physical presence at the project site. Disseminate CoCs (including visual illustrations) and discuss with employees and surrounding communities.	Project-related staff trained and oriented on CoC; Project-related staff who signed CoCs.	ESU-LGED and GBV/Gender specialist(s).	Review implementation during supervision missions.
Codes of Conduct (CoC) for all laborers signed and understood.	CoC finalized and agreed on. (See Annex I for sample of code of conduct) Sensitize project related workers about CoC requirements and obligations. Ensure requirements in CoCs are clearly understood by those signing. Have CoCs signed by all those with a physical presence at the project site. Disseminate CoCs (including visual illustrations) and discuss with employees and surrounding communities.	Project-related staff trained and oriented on CoC; Project-related staff who signed CoCs.	Contractor and ESU, GBV/ Gender specialist(s).	Review implementation during supervision missions.

Action	Activities	Indicator	Responsibility	Risk Management
Accountability and response framework for SEA/SH allegations related to CoC in place.	Have separate, safe and easily accessible facilities for women and men working on the site. Include security measures such as ensuring adequate security personnel. Locker rooms and/or latrines should be located in separate areas, well-lit and include the ability to be locked from the inside. Visibly display signs around the project site (if applicable) that signal to workers and the community that the project site is an area where GBV is prohibited.	Documentation of measures taken to reduce GBV risks.	Contractor and ESU, GBV/ Gender specialist(s)	Ongoing reporting
Undertake regular M&E of progress on GBV activities.	Conduct M&E field visits. Review quarterly the action plan and progress against indicators listed Provide quarterly report.	Successful implementation of agreed GBV Action Plan (Y/N). Quarterly report.	Contractor and ESU, GBV/ Gender specialist(s).	Ongoing reporting.
Improve safety of project related civil works for labor to reduce GBV risks during construction works.	▪ Improve lighting around project area; and ▪ Follow up refurbishment construction activities (Safely demarcated (appropriate signage, lighting)	Clearly demarcated and well-light spaces.	ESU and contractors.	Monitor the activities and provide additional guidance as necessary.

8.9.4.1 Grievance Mechanism

A 4 level GRM will be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints, and grievances. Level-1 GRM is the most significant and AIIB's perspective effectivefunctioning of the field level GRC is most significant. The GRM aims to provide a time bound and transparent mechanism to voice out and resolve social and environmental concerns linked to the project.

The ARIPA 2017 allows objections by the landowners to acquisitions at the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to address grievances and complaints that individual landowners may bring up in the later stages of the process. Since the act doesnot recognize them, there is no mechanism to hear and redress grievances of people who do not have legal titles to the acquired lands. As experienced in past projects, complaints and grievances may range from disputes over ownership and inheritance of the acquired lands to affected persons and assets missed by censuses, the valuation of affected assets, compensation entitlements, complains against noise, pollution, accident, GBV and other social and environmental issues.

In view of this, LGED will establish a procedure to deal with and resolve any queries as well as address complaints and grievances about any irregularities in the application of the guidelines adopted in this RAP for assessment and mitigation of social and environmental impacts through grievance redress mechanism(GRM). LGED is also planning to hire a consultant to set up a cloud based multi-channeled ways to accept feedback on the draft E&S instruments. The system will be also linked with the GRM.

The GRM will deal with complaints and grievances related to both social/resettlement and environmental issues in this Project. Grievance redress committees (GRC) will be formed to receive and resolve complaints as well as grievances from aggrieved persons from the local stakeholders including the project-affected persons. LGED will provide sufficient on boarding and training for the members of the GRCs to ensure their ability to resolve grievances in an effective and efficient manner. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrievedpersons from having to resort to expensive, time-consuming legal actions. The procedure will, however, not pre-empt a person's right to go to the courts of law. There will be four-tier grievance redress mechanism; 1st at field level (Ward), 2nd ULB level, 3rd Project management level and final one is for ministry level.

At present, aggrieved persons in Munshiganj Municipality can submit their complaints either by name or anonymously on the below mentioned mobile and email numbers:

Call center, Munshiganj Municipality

Phone: 071-71674

Mobile: 01733-729696

E-Mail: callcentremp@gmail.co

8.10 Waste Management Plan (WMP)

8.10.1 Introduction

Waste is inevitable because it is generated by daily human activities through discarded materials from domestic chores, agriculture, business, industry, natural and semisynthetic disasters, medical services, etc. consistent with the Bangladesh Environment Conservation Act, 1995, waste is, "any solid, liquid, gaseous, radioactive substance, the discharge, disposal, and discard of which can cause injurious changes to the environment". Management of waste is comprised of the gathering, carrying, treating or disposal of discarded materials and substances (Unnisa & Rav, 2012).

A waste management plan is a vital roadmap for businesses across all sectors. By following a well-prepared waste management plan, businesses can cut costs and reduce their environmental impact by diverting waste from landfill. Construction and demolition businesses benefit from a plan the most.

8.10.2 Objectives

- To assess the activities involved for the proposed and determine the type, nature and estimated volumes of solid waste to be generated by the subproject activities.
- To identify any potential environmental impacts from the generation of waste in the industries and industrial zone.
- To recommend appropriate solid waste handling and disposal measures/routings in accordance with the current legislative and administrative requirements
- To reduce the generation of wastes in the first place and to re-purpose and or reuse the materials for a longer time
- Recycle the solid wastes. Wastes are resources if they are properly recycled to produce other resources like water, energy, and or other materials
- To achieve higher monetary success but not at the expense of the environment. As natural resources are used for business growth, utmost care for nature is ought to be taken.
- To improve the quality-of-life people like you and me will be able to live in a much safer environment.

8.10.3 Waste Management Plan (WMP)

A WMP initially identifies key project information such as responsible figures; clients and principle contractor, and project specifics such as cost and location. Information about waste includes:

- A description of the waste types predicted to be produced over the project, such as hazardous or controlled waste.
- An estimate of the volume of waste produced over the project.
- Description of measuring methods, i.e. X number of skips, X tonnes of waste.
- The waste management method for each waste type, from how the waste will be responsibly stored to whether waste will be reused, recycled, recovered or disposed of.
- Records of waste quantities, management and collections.

A WMP should also outline how responsible people will ensure waste is handled in effective ways and in accordance with their duty of care.

8.10.4 Waste Management Plans Required by Law

The Solid Waste Management Rules 2021 were published in Bangladesh on December 23, 2021, under the Bangladesh Environmental Protection Act, 1995 of Department of Environment (DoE). The Rules define the responsibilities of businesses involved in solid waste management and impose collection, recycling and disposal obligations according to Extended Producer Responsibility (EPR) on manufacturers of non-biodegradable products such as glass, plastic, and bottles. The Regulations also include provisions for the treatment of solid waste such as composting and energy recovery. The

Munshiganj subproject should abide by the regulation when all the Integrated Solid Waste Management Improvement activities start constructing/operating.

The main provisions of the Solid Waste Management Rules 2021 are as follows.

- When recovering resources from waste, the principles of management that consider the waste hierarchy, such as the 3Rs, segregation, and reduction, must be followed at all stages from waste generation to the final disposal.
- Responsibilities of waste generators, consumers, and users:
    - Dispose of the waste following the regulations of authorities including local government.
    - Dispose of waste separately.
    - Do not dump, store, or burn waste outdoors.
- Responsibilities of manufacturers (*not defined) and importers of products
- Collect non-biodegradable products such as glass, plastic, polyethene, multi-layered packaging, bottles, and cans from consumers and recycle or dispose of them if appropriate.
- Determine work plans and implementation procedures for recycling and disposal.
- Ensure that EPR is properly implemented.
- Submit an annual report to the Department of Environment (DOE) on the amount of plastic recycled.
- Raise public awareness of proper waste management.
- In the case of recovery from waste, taking into account the waste hierarchy, the steps of waste management should be followed in order of rejection, waste reduction, reuse, recycling, recovery, purification, and residue management.

Any violation of the above provisions shall be subject to imprisonment for not more than two years or a fine not exceeding 200,000 BDT, or both. The Regulations also include provisions for the treatment of solid waste such as composting and energy recovery.

8.10.5 Waste Management Plan Benefits

There are many advantages to having a waste management plan, especially for construction/operational subproject. Here are some of the top benefits:

Environmental consideration

When the subproject proponent and contractors know what waste will be created and how much, they can plan recycling and reuse services accordingly, ensuring waste that can be better processed, is. This is far preferable to landfill in which greenhouse gases are created, contributing to climate change.

Effectiveness

By assessing waste volume and type prior to and continually throughout a subproject, changes can be made to orders and processes to ensure the amount of waste created is reduced. Not only will materials be used more effectively, but also less time is spent on excess materials.

Save Money

Disposing of waste at landfill can be costly, especially large amounts, so alternative management methods of recycling, reusing and recovery can save money. Additionally, by using materials more effectively and reducing the amount of waste, money is saved.

Reduce Fly-Tipping

If an effective WMP isn't in place, construction businesses or contractors may become complacent or try to cut corners in regard to waste management. Fly tipping, although a serious offence with possible fines and even prison sentences, is common for construction waste. This can have negative environmental impacts and should be avoided with proper waste management by licensed providers.

Figure 8-2: Types of Color-Coded Waste Bins

8.10.7 Proposed Solid Waste Management (SWM)

Collecting, treating, and disposing of solid material that has served its purpose or is no longer useful is discarded. SWM is also an essential service for maintaining the quality of life in Munshiganj Subproject and for ensuring better standards of health and sanitation. If properly collected from the source, SWM would reduce the number of downstream problems related to transportation and disposal of the same.

Solid waste (SW) generated in the subproject can be broadly categorized as non-hazardous waste and hazardous waste. Munshiganj subproject will keep space for solid waste disposal and will segregate waste based on type and subproject components.

- **Construction wastes:** Plastic and paper waste, chemical & oil empty drums and cartons, glass, machine scrap, wood pieces, metal and electrical waste.
- **Domestic wastes:** kitchen and wood waste, plastic, paper, floor sweepings, etc. Road sweeping & sanitary waste: human waste, etc. Garden & agriculture waste: leaves, branches, plants etc. Roads/building construction waste: earth, asphalt, concrete, brick, plaster, wood, glass, stones etc.
- **E-Waste:** Computer systems, peripheral equipment, mobile phone sets, TVs, audio sets and also household appliances biomedical waste.

WMP of Munshiganj subproject contains the following

- A Transfer, Storage, and Disposal Facility (TSDF) of appropriate size will be constructed within the Subproject construction area. Adequate containers will be placed in different

places in each of the subproject sites for segregation and then transported to the TSDF area. It is noteworthy that only the bio-degradable wastes can be treated in the Solid Waste treatment facility.

- The entire SWM is planned to be collected and treated in the composting plant within subproject and the rejects shall be disposed to the subproject's landfill site i.e., Landfill Site of Munshiganj Municipality. A suitable area has been earmarked to handle the solid waste. All these activities are to be carried out in the TSDF area.
- Proper labelling of waste and segregation of waste needs upgrading.
- Separating store hazardous waste for disposal in hazardous waste landfills or handed over to the DoE licensed contractor for appropriate processing and disposal.
- Ensuring that waste which can be processed for recovery of material and energy does not become co-mixed with undesirable elements.
- Upgrade waste management procedures' development and proper training for the workers concerning health & safety and environmental issues (First aid, health safety, chemical handling and storage of dangerous substances) in the subproject works.
- Ensure 3R Principal and regulatory compliance.
- Waste minimization efforts based on the monitoring and analysis of segregated waste. Recycle/ reuse options after waste minimization efforts may be explored.

Table 8-9: Potentially significant Environmental Impacts during the Operational Phase and their mitigation measures

Activity/ concerned issues	Potentially significant Impacts	Proposed Mitigation Measures	Responsible Authorities	Monitoring
Disposal of waste	Improper disposal of industrial waste and raw materials may cause various hazards to the environment including **a.** exposure to biodegradable materials can produce untoward odor & bad smell that can pollute natural air, facilitate the spreading of diseases **b.** contamination of water (surface water, groundwater) **c**. waterlogging **d.** increased breeding of mosquito	**Proper disposal of waste:** The designated site should be at least 1 km away from the locality and the river bank, avoiding the area with natural vegetation. Prior permission is needed from the respective authority before selecting the site ▪ segregation of the wastes prior to disposal ▪ should be dumped in different designated landfill/pits at the dumping site after segregation of different construction materials/solid wastes ▪ all kinds of dumped waste products should be covered ▪ Proper drainage facilities should be ensured to prevent waterlogging ▪ Proper disposal of wastes and drainage of water and ensuring the cleanliness of surrounding environment water storage pool for prevention of mosquito breeding	Munshiganj Municipality	DoE

8.11 CONTRACTOR MANAGEMENT PLAN (CMP)

8.11.1 Introduction

This CMP is intended to outline the relationship between Munshiganj subproject and the contractors, and to describe how the overall contract will be managed (i.e., describe the contractor management processes that will be implemented by the subproject).

In further detail, the purpose of the CMP is to:

- Summarize the contractors' and subcontractors' engagement and management processes, procedures and systems used;
- Define roles and responsibilities for the beneficiary and the contractors and its subcontractors, as well as the relationship and cooperation between all parties, with regards to all subproject activities;
- Outline the applicable subproject standards relevant to the contractors and its subcontractors;
- Set out the processes to ensure the implementation, by the contractors and its subcontractors, of all requirements, project commitments, conditions, methods (work statement for the construction phases), and procedures applicable to them, intended to assure the execution of the Project;
- Define training requirements;
- Establish a Grievance Mechanism about other Construction Environmental and Social Management Plans (CESMPs);
- Define monitoring and reporting procedures, including Key Performance Indicators (KPIs), to monitor the performance of the contractors and its subcontractors; and
- Define intervention procedures, i. e. the way LGED will liaise with the contractors to sort out any issues, namely related with non-compliance and/or environmental and social performance.
- Contractors' environmental, social, cultural heritage management of contractors.

Any subsequent changes to the contractor engagement processes may result in changes to this CMP. Further details of the subproject itself are provided in Chapter 3 whilst information on the subproject roles and responsibilities are described in Section 3.5.

8.11.2 Links to Munshiganj Subproject's HSE Management System

The contractors will be required to align their own HSE-MS with the subproject's one, and to develop their own detailed contractor's Environmental and Social Management Plan (CESMP), including detailed topic and/or activity-specific CESMPs, based on the ESMPF and reminder Management Plans provided by LGED. This will be done through "Work statement documents", which will be agreed with all Contractor, for each site, where will define the special conditions.

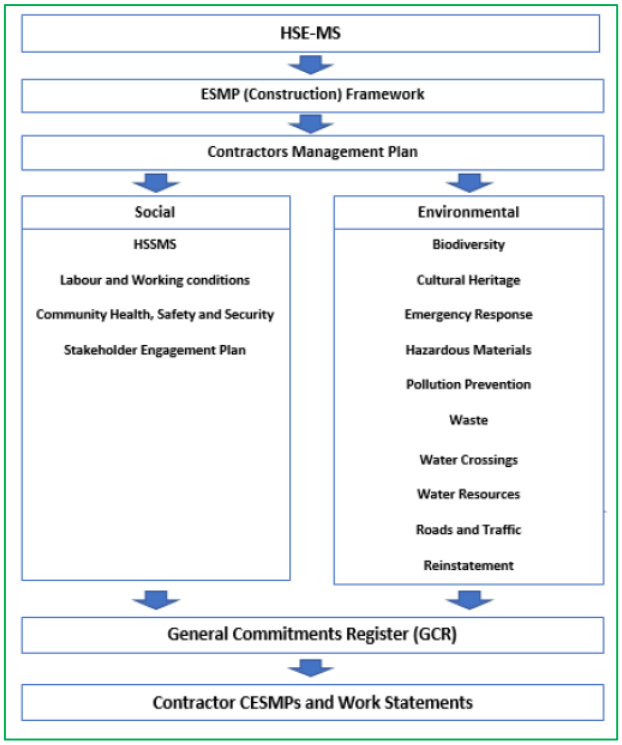


Figure 8-3: Linkage between subproject HSE-MS

8.11.3 Policies and Standards

All contractors and its subcontractors are subject to the conditions and obligation set out in the national legislative framework, AIIB regulations, the Environmental and Social Safeguards (ESS), and country's norms and procedures.

8.11.4 Application to the project contractors

Successful projects that involve contractors all exhibit similar characteristics. They all have clear and unambiguous contracts established that include a statement of work. The efforts of all contractors integrated into a cohesive project plan with all contractors understanding where their efforts fit into the overall picture. The formal and informal interfaces between the beneficiary and the contractors are documented. Before starting specific work, the contractors are granted authorization to proceed. This authorization is received, in writing, via a work authorization form. A formal team building process is established and implemented. These practices all contribute to reducing the risk of misunderstandings or isolationism. Each contractor will have a legally binding, written contract that defines the following items. The legal names of the parties involved in the contract will be specified.

The scope of the contracted work (contained in an attached Statement of Work), will be described on terms of:

- Responsibilities and authority limits of each party to the contract;
- A clear definition of the deliverables and minimum content to be provided by the contractor;
- A clear definition of the services to be provided by the Contractor;
- Any and all constraints imposed on the Contractor by LGED., such as schedule constraints; budget constraints, specific tools to be used; and
- A clear statement of requirements for quality of deliverables and services including the requirement to allow independent quality inspections of materials and processes.

Appropriate terms and conditions, which will be impose on both LGED and the contractor, will be identified. The acceptance process will be clearly identified.

Each CESMP outlines tasks to be undertaken by both LGED and its contractors. The contractors themselves will be required to develop their own detailed management plans/action plans, which will reflect the commitments in this CMP and which demonstrate how they will meet these commitments.

The beneficiary will nominate the obligation of contractor to draws the plan and indicate models for CESMPs on "Work statement document" which will be closed with all contractor for each site, where will define the special conditions and procedures.

8.11.5 Document Management

The LGED will provide the Contractors Management Plan with attributes for all parts, requirements for Contractors and also a Work Statement for construction phases, including models for standard documents. Contractors enter into a business partnership with Munshiganj Municipality after bidding procedures, and will provide in legal time the integrated solution for execution phases, including the economic, environmental and social approach. Contractors will present the information for all subcontractors and the procedures for verification and validation services.

8.11.6 Contractors Engagement and Management

The CMP Plan will highlight all responsibilities, requirements and work statements that are expected of the contractors and how they will be delivered to the beneficiary. The parties will establish contacts points to monitor actions and to correct any non-conformances. All the proposed solutions will be reported to Project Management Unit, management of change structure. This structure is responsible for decisions, under Project manager- management services approval, for drawing procedures able to be applied on all sites or on specific sites, and for updating the CESMP documents.

The approach to managing the subproject will be based on the following guiding principles:

PMU will establish on the bidding documents the conditions and obligation for contractors;

- A Statement of Work will be drawn by the team, jointly with each Contractor taking responsibility for the services outlined in its areas of responsibility;
- Effective channels of communications will be clearly defined and established within the Statement of Work document;
- Each contractor/subcontractor will have its responsibilities and authority limits clearly defined in the Statement of Work;
- Each contractor will have its deliverables and execution time identified in the Statement of Work;
- Each contractor will have the services it is responsible for providing clearly identified and described in the Statement of Work;
- All constraints imposed on the Contractor will be clearly identify in the Statement of Work, including schedule and budget constraints;
- All environmental, social, health and safety and cultural heritage constraints imposed on the contractor will be clearly identify in the Statement of Work;
- Each contractor will have requirements for quality clearly identified within the Statement of Work, including the requirement to allow independent quality inspections of materials and work processes;
- All products and services provided by the subcontractor (partners of Contractor) will be subject to the acceptance of PMU;
- Each subcontract will contain appropriate terms and conditions;
- Adequate facilities will be provided to meet the needs of the Contractors, and the Contractors will support subcontractors in processing invoices and payments, subject to the invoices being delivered to LGED in an acceptable format. To this end, PMU will establish format requirements for invoices in list of Standard Documents;
- The contractors will be directly responsible for their part of the contract in relation with the subproject, even for the subcontracted parts;
- The contractors will be obliged to contract only with solvable and reliable subcontractors, and only with the written approval issued by PMU, and
- ESU is responsible, for project management, for control and monitoring activities regarding constructors' actions and has overall responsibility for environmental, social, health and safety, and cultural heritage aspects of the project

8.11.7 Roles and Responsibilities

Delivery of the project commitments referenced in this CMP is the responsibility of both LGED and its Contractors. The specific responsibilities for implementation of the specific actions identified in the individual CESMPs are clearly distinguished between LGED and relevant Contractors in the Appendices to the CEMPs.

Table 8-10: Mapping of functional elements-between LGED and contractors/subcontractors

Functional Element	LGED	Contractors	Subcontractors
Project Management	X		
HSSE management	X	X	
Management of change	X	X	
Technical monitoring	X	X	
Quality assurance	X	X	
Human resources ((HR) and training	X	X	X
Economic	X	X	X
Legal	X	X	
Information technology	X	X	
Communication and Public relations	X	X	
Audit	X	X	

8.11.7 Contractors' Roles and Responsibilities

Contractor's predominant responsibility will be to ensure that all their work and staff activity is compliant with the legal provision for environment, social, safety, health and the permits provided by Munshiganj Municipality. Their responsibilities include the management of specific activities and for the surveillance of all activities on the site.

The contractors will prepare work plans in compliance with the Project's requirements.

CESMPs to be produced by the appointed contractor-

- Waste Management Plan (Include Hazardous Management Plan)
- Road and Traffic Management Plan
- HSSMS
- Pollution Prevention Management Plan
- Labour and Working Conditions Management Plan
- Emergency Response Management Plan
- Community Health and Safety Management Plan
- Reinstatement Management Plan

The contractors will be responsible for the health and safety plan and measures, regarding their own employees and sites conditions, as well workers' accommodation, under a risk analyze procedure, in accordance with legal provisions, advised by Municipality.

Contractors shall nominate the following employees:

- representative for site coordination;
- representatives for HSSE responsibilities;
- representatives for technical execution, budget, project phases;
- first aid competent person;
- representative for waste management;
- team for guarding the site; and
- team responsible for intervention on accidental pollution events

Other details about contractors obligations related standard documents, which have to be drawn, will be nominate on bidding documentation.

Organizational design/human resources. Contractors are also responsible for developing organizational and human resource elements of the solution recommended by the subproject.

8.11.8 Methods for Successful Contractor Management

Management Practices

Successful projects that involve contractors all exhibit similar characteristics. They all have clear and unambiguous contracts established that include a Statement of Work.

The efforts of all Contractors are integrated into a cohesive project plan with all Contractors understanding where their efforts fit into the overall picture.

The formal and informal interfaces between the beneficiary and the contractors will be documented.

Before starting specific work, the contractors will receive an "authorization to proceed". This authorization will be provided in writing, via a Work Authorization form. Authorization will be dependent on the completion of all necessary pre-construction surveys, the approval by LGED of contractor CESMPs, all associated method statements relevant to the respective section and any further works LGED deem necessary prior to construction. Auditing requirements will be detailed and addressed in the plans listed in the Framework Management Plan.

A formal team building process is established and implemented.

These practices all contribute to reducing the risk of misunderstandings or isolationism.

Environmental and Social and Health and Safety Reporting

Each week, the contractors will prepare and deliver to the ESU weekly progress reports on environmental, social and health and safety performance. The report is to be delivery by noon on Fridays. The report will identify:

- performance against KPIs
- incidents within the period and investigation findings
- planned activities
- a textual description of progress,
- a list of internal milestones attained,
- a brief description of any problems encountered

8.12 LABOR MANAGEMENT PLAN (LMP)

Labor Management Plan ensures appropriate worker management procedures and enhances the development benefits of a project by treating workers in the sub project fairly and providing safe and healthy working conditions for subproject sustainability. Accordingly, the purpose of this Labor Management Procedure (LMP) is to facilitate the planning and implementation of the subproject by identifying the main labor requirements and the associated risks and determining the resources necessary to address the subproject-related labor issues. The LMP sets out general guidance relevant to different forms of labor but also issues and concerns that relate to COVID-19 considerations.

8.12.1 Overview of labor use on the Project

As per ESS2, project workers can be classified into the following four groups: direct workers, contracted workers, primary supply workers, and community laborers. For this subproject, direct workers and contracted workers are the most applicable, as at this stage, significant community labor is not envisioned for the project. The following are the key categories of workers that would be engaged under the project, including groups of workers that are specifically at risk in the COVID-19 context and thus require special attention.

8.12.1.1 Project construction related activities:

All of the activities involved in construction work together to create solid waste management projects, office buildings and impressive structures. Not every activity is used in every project, but it is certain that several different activities are used in order to build a safe, efficient, and functional structure for its users. Different types of construction Activities which will be used in the proposed Solid Waste Management sub project.

Marking & Grading

Marking is one of the first construction activities, which involves marking the area of the plot for reference. This helps the workers to always be able to orient themselves in terms of their workspace.

Grading helps to ensure that solid waste management projects, buildings are even, last long, and maintain maximum support. There may be particular circumstances when something is being constructed that would require a slight incline or decline to the base surface. In this case, it would be very important that the incline is exactly the correct angle. It is a matter of safety and plays a major role in construction management. Grading uses big machines to help ensure the space is level, or that it is at the appropriate angle that it is supposed to be.

Excavation

This is a fairly broad term – there are several different types of construction activities in excavation. In general, the term involves moving earth or rocks out of a certain area to prepare it for construction. This includes basement excavation, which digs the earth out to prepare for a basement to be built. It also includes muck, rock, and topsoil excavation, all of which include removing the substance from the workspace.

Concreting

The process of pouring concrete is another major activity in construction. It is often used for the base of Solid Waste Management projects, buildings, for roads and many other applications. One of the reasons it has become so popular in the construction industry is that concrete is easy to make in large quantities, and it changes states, so that it is easy to work with and manipulate.

Carpentry

One of the first activities that comes to many people's minds when construction is mentioned is carpentry. This is the general cutting and installation of materials that will be used for the construction of a structure. Carpentry used to be a word that described individuals working with wood specifically, but now carpentry means working with several different materials.

Brick masonry

Bricks have been used in Solid Waste Management project construction for decades, and are still used often today as a highly efficient material. Brick masons lay the bricks, ensuring that they are laid in a way that is structurally sound. For example, laying each brick one on top of the other allows for cracks to go all along the entire wall. If the bricks are offset, as you will often see, it makes severe cracking of the mortar less likely.

Plumbing

In solid waste management project structures that require plumbing, there are specific plumbing activities that must occur to ensure they will function properly. This includes putting in piping and fixtures for both incoming potable water and outgoing waste.

Welding

The activity of attaching two metals together using heat is welding, a crucial action in Solid Waste Management project construction used to bind metals, especially for structural purposes. There are different types of welding which can be used for different types of metals and different conditions. All welding is extremely skilled and can be difficult to master. It is also dangerous, so it is important that construction companies have strict safety guidelines.

Electrical

Individuals working as electricians on a solid waste management project construction product are responsible for ensuring that the structure will ultimately have full access to electricity from the transformer provided by the electrical company, which is located close to the building. There are several steps that go into the installation of electricity in a build, including temporary electrical needs, a rough installation, and finally the real installation which will be used.

Roof laying

Roofing is an important construction activity for ensuring the protection of a Solid Waste Management projects structure from the elements, and can help provide stability for the structure. There are different methods used for roofing. Shingles are common for residential roofs, but there are also metal, polycarbonate, and steel roofs, as well as many others which are used for different purposes.

Glazing

This activity is basically anything to do with glass windows and doors in a construction project. The term is used broadly to reference the installation of pretty much any glass involved in the construction of a particular structure.

Finishing

Finishing in Solid Waste Management project construction means putting on the final touches of a structure in order to prepare it to be used. This includes but is not limited to activities like glazing, flooring, painting and plastering. It is most often about final aesthetic touches, and slightly less about safety and function, although all finishing activities are a crucial part of a final construction product

8.12.1.2 Potential labors to be used in the project

The construction works for the Solid Waste Management project will require a number of employees for its various works though details of the specific labor needs will be clearer during works. It is estimated that, position will be recruited in the project for its various works and these to include:

1. Civil engineers,
2. Works Supervisors,
3. Human Resource Managers;
    - Clerks of works
    - Laborers;
    - Security
    - Laboratory staff

Other staff shall include

1) Drivers
2) Masons
3) Carpenters
4) Operators
5) Technicians
6) Admin staff
7) Foremen
8) Mechanics
9) Welders
10) Casual Laborers
11) Cleaners
12) Kitchen
13) Skilled Labors
14) Unskilled labour

Depending on the availability of the human resources in the surrounding area, majority of the employment opportunities, where possible, will be provided to the people in the nearby villages.

Details of specific job opportunities will be released and information provided on application procedures.

Unskilled labor force - the Contractor will be instructed to place emphasis the labor force within the project area to minimize on the labor force immigration into the project area.

Skilled labor – the contractor/consultant will be advised to follow a recruitment procedure that places emphasis on Munshiganj district of Bangladesh. Foreign workers will only be allowed where there is a skills deficiency on the national market. The contractor/consultant will have to demonstrate this deficiency. The contract recommendations on labor force will also be employed where necessary.

Refugee workers – will be employed on condition that they possess the appropriate BAN/UN approval or clearance to work.

The other positions will be competed for fairly. However, during the recruitment process, females will be encouraged to apply, and will be given be special preference (e.g. a special mark will be added to female applicants).

8.12.1.3 Objective of LMP

During the construction period, contractors will follow this LMP to prepare a simplified Labor Management Plan and Code of Conduct. Considering the facts, Labor and Working Conditions and Bangladesh Labor Act, 2006 (amendment in 2018) has set following specific objectives.

To promote health and safety at work-

(a) To promote the fair treatment, nondiscrimination and equal opportunity of project workers;

(b) To protect sub project workers, including vulnerable workers such as women, persons with disables, children and migrant workers, contracted workers, and primary supply workers, as appropriate;

(c) To prevent the use of all forms of forced labor and child labors;

(d) To support the principals of freedom of association and collective bargaining of project workers in a manner consistent with national law; and

(e) To provide project workers with accessible means to raise workplace concerns.

8.12.2 Assessment of the Potential Labor Risk

The main labour risks associated with the sub project are assessed to be related to the potentially hazardous work environment, the associated risk of accidents and labour influx. Based on current conditions it is assessed that the risk of a child or forced labour is negligible, and already managed through national legislation.

Potential labor risks:

- Safety issues while at work like injuries/accidents/ fatalities leading to even death, while at work;
- Short terms effects due to exposure to dust and noise levels, while at work
- Long term effects on life due to exposure to chemical /hazardous wastes
- Inadequate accommodation facilities at work force camps, including inadequate sanitation and health facilities
- Non-payment of wages by employer
- Non-payment of benefits (compensation, bonus, maternity benefits etc.) by employer
- Discrimination in employment (e.g., abrupt termination of the employment, working conditions, wages or benefits etc.)

- Engagement of child labor
- Sexual harassment at work
- Forced labor trafficking
- Security of women work force
- Inadequate facilities for pregnant women and lactating mothers
- Inadequate facilities for the children of the workforce at workforce camp sites
- Possibility of gender-based violence as the road shall traverse through sensitive locations such as hospitals, schools, etc. that are near to habitations.
- Health risks of labor relating to HIV/AIDS and other sexually transmitted diseases
- Unclear terms and conditions of employment
- Discrimination and denial of equal opportunity in hiring and promotions/incentives/training opportunities
- Denial for workers' rights to form workers organizations, etc.
- Absence of a grievance mechanism for labor to seek redress of their grievances/issues

8.12.2.1 Labor Influx

Though project will create substantial number of jobs, it is expected that labor influx will not be significantas the construction will be over the period of a years. Most of the unskilled labors will be hired locally. As, all the construction will be conducted in the urban areas, it is expected that skilled and unskilled labors will be hired locally. The contractor will be responsible for the accommodation of the stay in labor and ensuring labor travel from off site. Some accommodation on site, water supply and sanitation services, etc. will be provided by the contractor. The labor site plan and facilities will be a part of the LMP. A standalone Labor Management Plan will be prepared by contractors for each project site.

However, this labor influx may raise many complex issues, particularly regarding potential transmission risks for COVID-19 both within the worksite and for nearby communities. These risks are not only from workers that are mobilized from abroad or returning from abroad, but also workers moving from other regions, where it is likely that migrant workers are expected to work on the project. Adverse Social Impactsdue to labor influx can be identified as follows:

- Risk of social conflict between labors and community people
- Increased risk of illicit behaviour and crime
- Influx of additional population and burden on public services
- Increased risk of communicable disease and burden on local health services
- Gender Based violence, child labor and school dropout
- Local inflation of price and increased pressure on accommodation and rent
- Increased of traffic and related accident

Contractors will need to maintain labor relations with surrounding communities through a code of conduct. The code of conduct commits all persons employed by the contractor, including sub-contractors and suppliers, to acceptable standards of behavior. The code of conduct must include punishments for non-compliance, including non-compliance with specific policies related to gender-based violence, sexual exploitation and sexual harassment (e.g., termination). The code of conduct should be written in plain language and signed by each worker to indicate that they have:

- Received a copy of the code of conduct as part of their contract;
- Had the code of conduct explained to them as part of induction process;

- Acknowledged that adherence to this code of conduct is a mandatory condition of employment; and
- Understood that violations of the code of conduct can result in serious consequences, up to and including dismissal, or referral to legal authorities.

8.12.2.2 Gender Based Violence

Issues of gender-based violence will be addressed through mandatory training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members and fellow workers, specifically women. The workers should also be informed about national laws that make sexual harassment and gender-based violence a punishable offence. The contractor with support from LGED should develop a system to capture gender-based violence, sexual exploitation and workplace sexual harassment related complaints/issues.

8.10.2.3 Occupational Health and Safety

The contractor will be committed to the safety of its employees and non-employee workers at the worksite and will operate in collaboration with and to the requirements of the local health authorities. In addition, the contractor will have to prepare a Health and Safety Management Plan which outlines specific health and safety related policies and procedures to be followed during the construction phase of the Integrated Solid Waste Management Improvement Project (ISWMIP).

The contractor will comply with the Government of Bangladesh Act, 2006 which outlines the compensation to workers for injuries suffered and Scheduled diseases incurred during the course of employment.

LGED recognizes the importance that workplace must be safe and without risk of injury to employees. Bangladesh regulations require basic protective clothing for construction including proper foot protection, overalls where needed, protective gloves, and raincoats for wet weather work.

8.10.2.4 Spread of Infections in the Community

Labor influx increased risk of communicable diseases and burden on local health services. The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. Migrant workers are confronted with health risks at all stages of migration (area of origin, travelling, destination and on return). They may present with infections acquired in their area of origin, carry infections as a result of occupational or behavioral exposures in the destination area, or become infected after travel home visiting friends and relatives (VFR). This can result in an additional risk on local community. Host community is also at risk for imported infections. The review will focus on infectious diseases, and discuss them in four major categories: Vector-borne infections associated with mosquitoes (malaria, dengue, chikungunya, Zika) and zoonotic infections associated with rodents (murine typhus, leptospirosis); food-borne infections (enteric fever, viral hepatitis, cholera); vaccine-preventable infections (measles, rubella, chickenpox) and infections spread by close contact [HIV, tuberculosis (TB), sexually transmitted infections (STI)].

8.10.2.5 Risk of engaging child labor and forced labor

Child Labor: There is a risk of engaging child labor in different tasks during the construction period. Under the Bangladesh Labour Act 2006 (BLA), child labour is legal for children aged above 14, since the law creates a rather artificial distinction between children and adolescents. An "adolescent" is defined as a "person who has completed fourteenth year but has not completed eighteenth year of age" (Section 2(8), BLA). By contrast, a "child" is defined as a "person who has not completed fourteen years of age" (Section 2(63), BLA). An appropriate risk assessment is conducted before the work will commence; and the borrower will conduct regular monitoring of health, working conditions, hours of work and the other requirement of ESS1.

Forced Labor: Debt bondage and forced labor are strictly prohibited under "The Prevention and Suppression of Human Trafficking Act, 2012". The law says, "If any person unlawfully forces any other person to work against his/her will or compels to provide labor or services or holds in debt-bondage

to exact from the person any work by using force or other means of pressure of by threat to do such, s/he shall be deemed to have committed a punishable offense." Forced employment of laborers, especially of local laborers or internal migrants a serious offense and must be prohibited. Surprise and random inspection by the Project will be carried out regularly to ensure ESS1 compliance.

8.10.3 Brief overview of Labor and OHS Legislation: Terms and Conditions

The objectives of this act are to improve the working environment and working conditions in order to ensure and maintain the working capacity of employees as well as to prevent occupational accidents and diseases and eliminate other hazards from work and the working environment to the physical and mental health, hereinafter referred to as health, of employees.

Occupational safety and health policy: The employer shall have a policy for action needed in order to promote safety and health and to maintain the employees' working capacity. The policy must incorporate the need to develop the working conditions and the impact of the working environmental factors (occupational safety and health policy). The objectives for promoting safety and health and maintaining working capacity deriving from the policy must be taken into account in the workplace development and planning, and they must be discussed together with the employees or their representatives.

8.10.3.1 Child and Forced Labor

Child Labor: In order to protect children from jeopardy to their health, safety and morals, take all measures required so that children under the age of 18 are not employed for work under the project. There is a risk of engaging child labor in different tasks during the construction period. Under the Bangladesh Labour Act 2006 (BLA), child labour is legal for children aged above 14, since the law creates a rather artificial distinction between children and adolescents. An "adolescent" is defined as a "person who has completed fourteenth year but has not completed eighteenth year of age" (Section 2(8), BLA). By contrast, a "child" is defined as a "person who has not completed fourteen years of age" (Section 2(63), BLA). An appropriate risk assessment is conducted before the work will commence; and the Borrower will conduct regular monitoring of health, working conditions, hours of work and the other requirement of ESS1. In such cases of employment of children under the age of 18 under the project, conduct an appropriate risk assessment, together with regular monitoring, of their health, safety, working conditions and hours of work.

Force Labor: Take all measures required in connection with the project so that no work or service not voluntarily performed is exacted from an individual under threat of force or penalty (including any kind of forced or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements, or labor by trafficked persons.

8.10.3.2 Health and Safety Offenses in Bangladesh

Health and safety offenses are concerned with failures to manage risks to health and safety and do not require proof that the offence caused any actual harm. The offence is in creating a risk of harm. In Bangladesh, the occupational safety of different sectors is mainly affected by poor maintenance, operational system, less awareness and motivation for adherence to legal requirements and unemployed poverty-stricken population. In Bangladesh, the prevalence of COPD (Chronic Obstructive Pulmonary Disease) due to occupational exposures is unknown, although occupational exposure is a serious public health concern here. Many workers from all sectors suffered from workplace hazards whereas occupational exposure is identified as one of the main causes. Several occupational exposures in Bangladesh had been identified, like uncontrolled pesticides exposures in farm, hazardous chemical exposures in tanners, cotton dust exposures in garments, biomass fuel and fumes exposures among the domestic workers etc. In many rapidly developing countries, industrialization bring a radical alteration with it in the lives of the countries. But if required works are not well designed and appropriate safety measures are not adequately adopted, serious adverse health consequences can ensue. OHS culture is not a high priority for the Government of Bangladesh or any political party till now. Whether the state needs to adopt a more constructive OHS regulatory process

and strategy than what it has now to control both formal and informal sectors in Bangladesh. It is expected that if the Government of Bangladesh can control the most informal economic sector through its proper OHS policy and regulatory process, not only will workers be safer in the workplace, but it will also increase their productivity to the greater extent of the country's prosperity. The International Labour Organization (ILO) has recommended that employees' wellbeing can be augmented by supportive healthcare facilities and the establishment of appropriate work environments (ILO, 2021). However, there is a lack of studies focusing on employee health issues at work and presenteeism in Bangladesh. Moreover, there is a growing concern that employee health and behavioral issues are often violated in Bangladeshi workplaces.

Health and Safety Offences: There are five offenses in the act explicitly relating to health, safety, and welfare – the selling of unguarded machinery (Section 208), failure to give notice of an accident (Section 290), a breach causing death (Section 309a), a breach causing grievous bodily harm (Section 309b) and a breach causing any harm (Section 309c).

Besides, a 'catch-all' offense allows prosecutions against "whoever contravenes or fails to comply with any provisions of the code or any rules of the scheme made under it" – which is punishable by up to 3 months imprisonment or with a fine of up to Tk. 1,000 or both (Section 307). This offense would, for example, apply to any breach of the obligations involving health, safety, and welfare, not already covered by the offenses above. A repeat conviction for the same offense can result in double the fine or sentence of imprisonment (Section 308).

When there has been a breach of a duty imposed upon an employer, any one of the individuals defined as an employer can be prosecuted. Besides, when a company is prosecuted, "every director, partner, shareholder or manager or secretary or any other officer or representative directly involved in [its] administration" shall be deemed guilty unless he can prove the offense has been committed without his knowledge.

8.10.3.3 COVID 19 Considerations

The COVID-19 outbreak is the greatest global health crisis in many years. It has had a dramatic effect on workforces and workplaces all around the world, as it has spawned a massive change in the working atmosphere and raised the level of employees' concerns about their mental health and physical wellbeing. The construction industry has been significantly affected by the COVID-19 pandemic and has been challenged to improve the safety and wellbeing of its workforce. The objectives of this study are to identify the health and safety issues that construction workers have encountered during the pandemic and to recommend management strategies to combat them. A thorough literature search on recently published literature, industry experiences, reports, and other related documents was performed to collect and categorize the required data. Seventeen COVID-19 challenges were identified and classified into five categories, and the results revealed that the lack of a safe environment in the workplace, heavy workloads, home situations, and concerns about job stability often contribute to anxiety, depression, and even suicide. Eleven strategies were identified to overcome these challenges, and the results demonstrated that redefining worksite safety by placing signs, ensuring a safe distance between workers, providing sanitizers and washing stations in the fields, and utilizing effective technologies would enhance project productivity while keeping workers safe. The findings of this study will help the project managers and authorities in the construction industry understand the challenges of the pandemic and adopt effective strategies that will improve the health and safety of their workforce.

8.10.3.4 AIIB Environmental and Social Framework 2016 (amended February 2019)

Environmental and Social Standard (ESS-1):

Occupational Health and Safety: In addition to the above general provisions, implement the following measures designed to provide project workers with safe and healthy working conditions: (a) provide personal protective equipment at no cost to project workers; (b) provide project workers with facilities appropriate to their work (e.g., hygiene, rest, eating facilities); (c) where accommodation services are provided, provide adequate accommodations for project workers, including separate and

safe accommodations for female workers; (d) put in place workplace processes for project workers to: (i) report work situations that they believe are not safe or healthy; and (ii) remove themselves from situations which they have reasonable justification to believe present a danger to their life or health; and (e) put in place a system for regular review of occupational health and safety performance and the working environment. The client may, at its option, apply the relevant International Labor Organization's Labor Standards relating to occupational health and safety, consistent with the requirements of this Section.16

Labor Influx: Assess and appropriately manage the risks of adverse impacts on communities that may result from temporary project-induced labor influx. If such risks are likely to exist, apply the following principles to be implemented by the client: (a) seek to avoid or minimize the labor influx by tapping into the local workforce whenever feasible; and (b) assess and manage labor influx risk (including risk of disease transmission or of GBV or SEA) based on appropriate instruments, depending on the risk factors and their level. This may call for broad requirements in the ESMP if the risks are low, or more specialized instruments, such as a site-specific labor influx management plan, a workers' camp management plan, or other instruments with similar purpose, if the risks are high.

Building Safety: Where the project includes new buildings and structures that will be accessed by members of the public, consider the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events. Where technically and financially feasible, apply the principles of universal access17 to the design and construction of such new buildings and structures.

Traffic and Road Safety: Identify, evaluate and monitor traffic18 and road safety risks to project workers and affected communities throughout the project life cycle, develop measures and plans to address them, and incorporate technically and financially feasible road safety components into project design, where applicable, to prevent and mitigate potential road safety impacts on the affected communities. If the project involves operating construction and other moving equipment on public roads or if the use of project equipment could have an impact on public roads or other public infrastructure, implement measures to avoid the occurrence of incidents and injuries associated with the operation of such equipment, whether to workers or the public. Where appropriate, undertake a road safety audit and implement measures to address identified risks and impacts. Provide appropriate training to project workers on driver and vehicle safety, and regularly maintain all project vehicles (owned or leased)

Security Personnel: When project workers are assigned to provide security to safeguard the client's personnel and property (project security workers), assess risks posed by these security arrangements to persons within and outside the project site. In making such arrangements, apply the principles of proportionality and good international practice, and comply with applicable law relating to hiring, rules of conduct, training, equipping, and monitoring of project security workers. Implement measures designed to limit the security actions of Project security workers exclusively to preventive and defensive purposes, in proportion to the nature and extent of the threat. Require such security workers to take reasonable steps to avoid the use of force. If force is used, it must be in a manner consistent with applicable law, proportionate to the threat and appropriate to the situation. Where the client engages such security workers, provide appropriate training on these matters, including on risks relating to GBV. The client discloses security arrangements for the client's facilities to the public, subject to overriding security concerns.

Make reasonable inquiries so that any security workers who have been implicated in past abuses are excluded from the project. Train project security workers so that they conduct their security actions appropriately, and conduct themselves toward project workers and affected communities appropriately; and require them to act within the applicable law. Review all allegations of unlawful or abusive acts by project security workers, take appropriate action to prevent recurrence and where necessary, report unlawful acts to the relevant authorities. F. Labor and Working Conditions.

Labor Management Relationships: Provide a sound labor management relations system for Project workers, which includes the following, consistent with relevant national law:

- Clear and understandable written terms of employment made available to project workers in an accessible manner at the time of hiring and when any changes are made to the terms;
- Timely payment for Project work;
- Adequate periods of rest;
- Timely written notice of termination of the working relationship;
- Employment based on the principles of equal opportunity, fair treatment and nondiscrimination with respect to any aspect of the employment relationship;
- Compliance with national law relating to workers' organizations and collective bargaining;
- An accessible, understandable and transparent GRM for raising project workplace concerns, including gender-related concerns, that: (a) does not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration or mediation procedures, or substitute for grievance mechanisms provided through workers unions or collective agreements; (b) involves an appropriate level of management and addresses concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retaliation; (c) is proportional to the nature and scale and the potential risks and impacts of the project; and (d) allows for confidential

Complaints to be raised and addressed, including GBV-related complaints; and (e) provides measures to protect against retaliation; and

- A suitable system designed to inform project workers of the GRM at the time of hiring, and which is made easily accessible to them.
- Reflect the above requirements, as applicable, in the procurement documentation for the Project.
- **Civil Servants**. Where government civil servants are working in connection with the project (whether full-time or part-time) and they remain subject to the terms and conditions of their existing public sector employment agreement and related national laws applicable to the civil service, the provisions of Section 58, Labor Management Relationships above do not apply to them.
- **Child Labor and Forced Labor**.
    - **Child Labor.** In order to protect children from jeopardy to their health, safety and morals, take all measures required so that children under the age of 18 are not employed for work under the project. However, if the laws or regulations of the Member in whose territory the Project is located provide, in conformity with the International Labor Organization's Minimum Age Convention, 1973, that children at least 16 years of age may be employed for such work on condition that their health, safety and morals are fully protected and that they have received adequate specific instruction or vocational training in the relevant branch of activity, such children may be employed, but only in conformity with these laws and regulations. In such cases of employment of children under the age of 18 under the Project, conduct an appropriate risk assessment, together with regular monitoring, of their health, safety, working conditions and hours of work.
    - **Forced Labor.** Take all measures required in connection with the project so that no work or service not voluntarily performed is exacted from an individual under threat of force or penalty (including any kind of forced or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements, or labor by trafficked persons). Assess the risks of forced labor under the Project, and if applicable, include measures in the ESMP (or other bank-approved document) to address such risks in accordance with this Section.

- If cases of child labor or forced labor are identified, take immediate steps to correct them, to prevent similar occurrences in the future, and to facilitate the rehabilitation of victims

8.10.3.5 Overview of the OHS Legislation

Generally, the management of community health and safety of development projects is covered under ECA and ECR. Typically, OHS measures extend to the general public at construction sites.

There are two components of OHS. One is the physical safety of project communities exposed to the project activities during construction and operation, including risks of accidents and violence due to increased crimes and cultural conflict between locals and migrant populations. The other pertains to the community's exposure and/or increased risks of diseases due to influx of people during construction and operation and due to the changes in the project area, including pollution and ecological change. The OHS provisions of Labor Act partly address the physical safety aspects. Other laws have specific provisions that address part of ESS1.

Bangladesh has a well-structured health system with three tiers of primary health care – Upazilla Health Complexes (UHC) at the sub-district level, Union Health and Family Welfare Centers (UHFWC) at the union (collection of few villages) levels, and Community Clinics (CC) at the village level. These are backed by the district hospitals providing secondary level care and the tertiary hospitals in large urban centers. The system is decentralized, covering all districts, sub-districts, and rural towns and villages in the country. Bangladesh has a good infrastructure for delivering primary health care services. However, due to inadequate logistics, the full potential of this infrastructure has never been realized.

There are two kinds of formal means by which health, safety, and welfare obligations, first through the use of powers provided to inspectors to require improvements to make; and second through criminal prosecutions. 'Factory Inspectors' (DIFE) are given certain powers to take steps requiring improvement if inspectors believe certain circumstances exist.

8.10.4 Mitigation Measures to be Followed

To address the risks of the implementation and O&M phase of Solid Waste Management Plant, urgent mitigation measures are needed, such as Labour Influx plan, Gender Based Violence Prevention Plan, Terms and Conditions, Grievance Mechanism, Contractor Management Plan, Covid Management by the Contractors etc. The risk will be mitigated by following AIIB Guidelines, local and Government legislations.

8.10.4.1 Labor Influx and Gender Based Violence

Contractors will need to maintain labor relations with surrounding communities through a code of conduct. The code of conduct commits all persons employed by the contractor, including sub-contractors and suppliers, to acceptable standards of behavior. The code of conduct must include punishments for non-compliance, including non-compliance with specific policies related to gender-based violence, sexual exploitation and sexual harassment (e.g., termination). The code of conduct should be written in plain language and signed by each worker to indicate that they have:

- Received a copy of the code of conduct as part of their contract;
- Had the code of conduct explained to them as part of induction process;
- Acknowledged that adherence to this code of conduct is a mandatory condition of employment; and
- Understood that violations of the code of conduct can result in serious consequences, up to and including dismissal, or referral to legal authorities.

Issues of gender-based violence will be addressed through mandatory training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members and fellow workers, specifically women. The workers should also be informed about national laws that make sexual harassment and gender-based violence a punishable offence. The contractor with support

from LGED should develop a system to capture gender-based violence, sexual exploitation and workplace sexual harassment related complaints/issues.

8.10.4.2 Terms and Conditions

Standards for labor and working conditions are defined in the Labor Act 2006 and Bangladesh Labor Rules 2015, and Occupational Health and Safety Policy 2013. The Bangladesh Labor Act 2006 is comprehensive legislation. The act addresses three areas: (i) conditions of service and employment including wages and payment, establishment of wages boards, employment of young people, maternity benefits, working hours and leave; (ii) health, safety, hygiene, and welfare, injury compensation; and, (iii) trade unions and industrial relations.

8.10.4.3 Grievance Mechanism

Grievance Redress Mechanism

A 4 level GRM will be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints, and grievances. Level 1 GRM is the most significant and AIIB's perspective effectivefunctioning of the field level GRC is most significant. The GRM aims to provide a time bound and transparent mechanism to voice out and resolve social and environmental concerns linked to the project.

The ARIPA 2017 allows objections by the landowners to acquisitions at the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to address grievances and complaints that individual landowners may bring up in the later stages of the process. Since the act doesnot recognize them, there is no mechanism to hear and redress grievances of people who do not have legal titles to the acquired lands. As experienced in past projects, complaints and grievances may range from disputes over ownership and inheritance of the acquired lands to affected persons and assets missed by censuses, the valuation of affected assets, compensation entitlements, complains against noise, pollution, accident, GBV and other social and environmental issues.

In view of this, LGED will establish a procedure to deal with and resolve any queries as well as address complaints and grievances about any irregularities in the application of the guidelines adopted in this RAP for assessment and mitigation of social and environmental impacts through grievance redress mechanism (GRM). LGED is also planning to hire a consultant to set up a cloud based multi-channeled ways to acceptfeedback on the draft E&S instruments. The system will be also linked with the GRM.

The GRM will deal with complaints and grievances related to both social/resettlement and environmentalissues in this project. Grievance redress committees (GRC) will be formed to receive and resolve complaints as well as grievances from aggrieved persons from the local stakeholders including the project-affected persons. LGED will provide sufficient on boarding and training for the members of the GRCs to ensure their ability to resolve grievances in an effective and efficient manner. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrievedpersons from having to resort to expensive, time-consuming legal actions. The procedure will, however, not pre-empt a person's right to go to the courts of law. There will be four-tier grievance redress mechanism; 1st at local level (Ward), 2nd ULB level, 3rd project management level and final one is for ministry level.

8.10.4.4 Contractor Management

Effective contractor management relies first on a standardized prequalification form (PQF). A quality prequalification form will also allow for customized functionality, as needed. The prequalification form ensures that the necessary steps are in place for a contractor to work safely and sustainably, prior to establishing an agreement, or allowing a vendor to come on-site.

A per-qualification form (or an explanation of the requirements) is provided before bidding or quoting to assure and include the requirements in work plans and budgets.

Specifically, the prequalification form will allow the organization to track the most importance aspect of contractor management – contractor prequalification across these essential dynamics:

- Financial stability;
- Regulatory citation history;
- Safety and health statistics and programs;
- Environmental protection programs;
- Background checks and Security programs;
- Sustainability/ social responsibility background and programs, including human rights.
- Site-specific requirements (as needed);
- Major projects performed, including references;
- The length of time the contractor has been in business;
- Services performed, and a risk ranking based on the contractor's trade; and
- Insurance coverage and limits, additional insured, and waiver of subrogation.

A thorough pre-qualification form with each of these components is used to verify incidence rates and ensures that the contractor's insurance certification is in line with company requirements.

The pre-qualification form is then reviewed for OSHA logs and Experience Modification Ratings (EMR) to unearth any inconsistencies and to verify the contractor license status. Finally, references are contacted to provide actual work history and experience to further certify that the contractor is prequalified for performing work at that location.

8.10.4.5 COVID Management by the Contractor

The measures to limit the prevalence of COVID-19 have included maintaining social distancing, and implementing preventative measures in production and economic activities, mainly to counteract the spread of the virus. Many countries have decided to suspend non-essential activities.

Providing necessities and building up conventions:

During COVID 19, the first crucial steps of contractor management are recognizing the necessities that temporary workers have to meet to work onsite and to travel over numerous destinations, and guaranteeing that everybody complies with the current controls. These might include:

- The collection of particular information depending on work carried out by contractors such as: health and safety skills, licenses, certification and insurance.
- Ensure contractor compliance with all legal documents. For example, up to date with tax payments etc.
- Check to see if all contractors are meeting their job obligations, such as paying social security payments.

Recognizing additional factors of managing contractors in changing times:

On top of existing compliance guidelines, the following factors should be considered to effectively manage contractors amidst uncertainties.

- **Health risks -** The risks associated with COVID must be identified and assessed, and preventive or mitigating measures must be implemented;
- **New legislations -** Companies and their contractors must keep up with new laws and government guidelines;
- **Shared responsibilities –** Contractors must be aware of potential hazards they will face and understand their responsibilities in avoiding and managing hazards;
- **Updated operation plans –** For every location in which a firm operates, a COVID plan must be produced, and such plans must be clearly defined and readily accessed;

- **Revised induction training -** For incoming to existing contractors, the on-site induction training needs to be modified to include COVID prevention training;
- **Additional equipment –** Personal protection equipment (PPE), both full time employees and contractors will have to be given and worn;
- **Complete Records -** Each site visit must accurately record and collect information about all of the contractor's activities. Continuous monitoring measures should be in place to monitor performance and ensure that contractors meet their obligations; and
- In the end, the way firms function is now under a stricter scrutiny. This also involves the capacity to comply with long-standing norms and new steps to defend against the pandemic. Businesses are not only responsible for the safety and health of all workers on site but are also responsible for ensuring compliance in the workplace. It may be difficult to achieve 100% compliance at first, but you may come a lot closer with the correct contractor management system in place if you start considering those extra factors from now on.

Setting new standard:

The COVID19 pandemic has brought some permanent changes to the way we work and our companies must adapt to these changes. New processes, new security measures and new strategies to live in the new normal are necessary. First, build a safe work environment reduces the risks of COVID, and protects your company from the disastrous effects. Second, set up a system that manages the contractor pool efficiently if you continue to rely on contractors as a significant asset. Those two dimensions in turn produce an efficient and resilient contractor force that will be ready to adapt, perform work independently and bring noticeable results to the company.

8.10.5 Provision of LMP in bidding documents

This Labor Management Procedure will be included in the general specification of the bidding documents. The preparation and implementation of site-specific Labor Management Plan by the contractor will be incorporated in the Bill of Quantities (BoQ) as a component of the general items of bidding document. Moreover, LMP can be incorporated in the "Scope of Works and Particular Requirement" under the section "Work Requirements" along with Environmental Management Plan (EMP), Traffic Management Plan, Occupational Health Safety Plan, etc.

8.10.6 Monitoring and Evaluation

Monitoring and evaluation defined as:

Monitoring is the continuous assessment of program implementation in relationship to agreed schedules and the use of program outputs by beneficiaries.

Evaluation is the periodic assessment of the relevance, performance, efficiency, and impact of the program in relationship to stated goals of the program.

The key objectives of monitoring and evaluation are to assess overall progress and performance of the work force restructuring program, to identify the extent of adverse selection, and to reinforce accountability in the use of funds.

A. Monitoring Strategy

Monitoring in the ISWMIP will be done in a participatory manner and will be a bottom-up process. The participants in monitoring and evaluation particularly in reporting the grassroots level activities on labor management in subproject planning and implementation will be the beneficiary communities including the residents of ULBs, traders, marketers, pedestrians and visitors etc. in the ULB areas. Self-monitoring by communities through WLCC (Ward Level Coordination committee) will be a main input to both internal and external monitoring.

B. Internal Monitoring

LGED will carry out internal monitoring with the assistance from their respective project Social Management Officer and the Social Development (SD) Specialist. The Executive Engineer of the ULBs will be responsible for internal monitoring of the labor management actions. The SD Specialist will develop monitoring formats which will be filled in by the social development officer (SDO) at ULB. The SDOs will be thoroughly briefed about the SMF and any RAP and the bank's policy on social safeguards. The SDOs will visit the subproject areas routinely at both planning and implementation stages. The internal monitoring will broadly involve:

- Administrative monitoring
- Labor management issues
- Impact evaluation

C. External Review and Evaluation

External review and evaluation will be carried out to assess how effectively and efficiently social development and social safeguards issues have been identified, management and mitigation measures planned and implemented. An independent consultant (individual expert of ISWMIP) will be employed by LGED for carrying out independent evaluation. The external review and evaluation will specifically assess

- Whether the broader social management objectives of the subproject are met, what difficulties are there and suggest corrective measures.
- Whether the subproject impacts on key social, economic and environmental indicators show positive trend, what difficulties are there and suggest corrective measures.
- Whether the project strategy of inclusiveness, participation, transparency, social and Environmental accountability and equity are followed specifically in rehabilitation and improvement of urban infrastructures.

Monitoring will be undertaken for both direct hires (including casual labor) and contract workers. The Social Development Specialist will undertake both desk and field-based inspection programs to confirm that specified mitigation measures are being implemented effectively and achieving the intended outcomes.

Note: All labor management plan related annexes are annexed in the Annex section (annex-iv to ix) of this ESIA report.

8.13 TRAFFIC MANAGEMENT PLAN (TMP)

8.13.1 Objectives and Scope

Traffic Management Plan is aiming to establish the responsibilities and requirements for regular traffic rules during construction and operation stages of the project.

The objectives of the Munshiganj ISWMI project's Traffic Safety Management Plan are to:

- Prevent and control traffic related injuries and fatalities related to project construction;
- Minimize traffic congestion and maintain safe, fast, and easy access/egress by emergency vehicles; and
- Minimize fuel consumption at all stages, including construction and operation.

8.13.2 General Principles

The Munshiganj Municipality will give particular attention to minimizing:

- Traffic routes through communities;
- Distance travelled by employees during construction; and
- Distance over which equipment and goods are transported.

This will require the Munshiganj Municipality to inform and cooperate with LGED, the Transportation Coordination Center Munshiganj Municipality, to prepare a Traffic Management Plan incorporating adequate signalization, selection of alternate routes, announcement of time intervals when heavy vehicle movements within the municipality will occur for material and/or machinery transport to/from the site.

8.13.3 Responsibilities

Project manager has ultimate responsibility for all aspects of the project, including the transportation system.

Site manager is responsible for coordinating with operations traffic manager regarding all transport and traffic activities at all activities of the construction phase of the Project. The site manager supports construction staff in the planning and coordination of traffic management activities in a timely and efficient manner.

Operations Traffic Manager (OTM) is responsible for the planning, development, implementation, revisions, and approvals with the relevant authorities (where required) of the Traffic Management Plan. The OTM plays the key role in traffic safety, and has the following responsibilities:

- Support the construction staff in the planning and coordination of traffic management activities in timely and efficient manner.
- Manage the day-to-day operations and work load of the traffic control team.
- Ensure the OH&S needs of all staff, especially traffic control team members, are met.
- Manage the day-to-day delivery of materials and entry of vehicles into site. This includes providing traffic control as required. Specific day-to-day tasks include:
    - ❖ Ensure that access is via only specified access routes;
    - ❖ Develop necessary plans for the timing of deliveries and access to avoid heavy traffic loads on main public roads; and
    - ❖ Ensure that compliance with local traffic regulations.
- Liaise with construction staff and traffic control teams, in the planning, coordination, and monitoring of traffic operations, and to facilitate the implementation of corrective actions.
- Prepare necessary reports, and maintain incident records and inspections logs.

Public Communication Officer (PCO) has the following responsibilities:

- Represents the Project for all community and stakeholder issues.
- Conducts stakeholder consultations and provides an ongoing public liaison role related to traffic planning.
- Prepares and distributes information regarding changed traffic conditions and patterns to road users, transport operators, and local communities.

All environmental and operations staff on the ground are trained to receive and transmit grievances to the PCO.

8.13.4 Construction Phase Traffic Management

8.11.4.1 On-Site Traffic Management

The following OHS measures for pedestrian workers, drivers, and operators will be employed during the construction phase:

- Some construction machines, such as loaders, dozers, cylinders, and graders have blind spots that put workers at risk-especially when workers are kneeling and bending. To avoid these risks, operators shall use signaler or watchmen when using such equipment.
- Pedestrian workers shall be kept away from heavy duty machine work areas and other danger zones through the use of barricaded and marked walkways.
- A signaler shall be used to direct the movements of pedestrian workers.
- Signs will be placed on the equipment to warn operators and workers in the field.
- The public entrance shall be prohibited.
- Drivers and operators of equipment will use standard signs and labels, and will be trained to communicate with pedestrian workers, to quickly recognize dangerous situations and responses, and to understand the maneuvering limitations and blind spots of vehicles and equipment.

8.13.4.2 Off-site Traffic Management

Off-site traffic management measures during construction stage will comprise following measures:

- Trucks and vehicles will be equipped with silencers to reduce noise.
- Drivers will be trained to avoid making unnecessary noise.
- Vehicles will be covered on the top in order to prevent dust generation.
- Trucks and wheels will be washed regularly in order to prevent mud and hence, dust on state roads.
- Overloading of the trucks will be prohibited.
- Drivers will be required to comply with the National Traffic Legislation.
- Warning signs will be placed at roads and crossings as necessary, to alert non-project drivers and pedestrians of the presence of Project traffic.

8.13.5 Regular Trainings

The OTM will ensure that all drivers are trained in accordance with driver training requirements. The OTM will approves project driving certificates for each driver and for each type of vehicle based on drivers' skills and knowledge of driving rules and other contents of driving training. Regular trainings will include topics related to project EHS requirements, driver training, and project EMP requirements.

8.13.5 Road and Vehicle Maintenance

The OTM is responsible for monitoring the condition of the roads by project traffic. The OTM is also responsible, on behalf of the Munshiganj Municipality, for ensuring that these roads are maintained in a condition at least as good as the pre-construction conditions, to the satisfaction of authorities i.e. RHD/LGED and landowners. OTM will ensure that all vehicles are maintained in accordance with the manufacturers' specifications, and are in compliance of vehicles with all applicable safety related specifications.

9. GRIEVANCE REDRESS MECHANISM

9.1 GENERAL

To receive and facilitate the resolution of affected peoples' concerns, complaints, and grievances about the project's environmental and social safeguards performance a Grievance Redress Mechanism (GRM) has been proposed. When and where the need arises, this mechanism will be used for addressing any complaints that may arise during the pre-construction, construction and operation of the project. The grievance mechanism is scaled to the risks and adverse impacts of the project. It will address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. It will be accessible to members of the community but also workers upon approval of the project by AIIB. The mechanism is not impeding access to the Bangladesh judicial or administrative remedies. LGED with the support of ULBs will appropriately inform the affected people about the mechanism on approval of the project.

GRC redress committees (GRC) will be an instrument where the communities will exercise their basic rights of participation in the project cycle through suggestions and complaints. GRCs also be a para legal court of the sub-project at the ULB level to address local problems and complains related to social and environmental impacts as well as procurement and construction quality issues. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly without resorting to any expensive, time-consuming legal actions.

Project-affected-people (including workers) for the AIIB funded construction activities in the ISWMIP project and any other stakeholder may submit comments or complaints at any time by using the project's Grievance Redress Mechanism (GRM). The overall objectives of the GRM are to:

- Provide a transparent process for timely identification and resolution of issues affecting the project and people, including issues related to the environmental impact, resettlement and compensation program;
- Strengthen accountability to beneficiaries, including project affected people;
- Compensation payment;
- Failure to fulfill commitments;
- Poor management of construction activities;
- Accidents due to inappropriate planning of sub-project implementation;
- Cultural conflicts between migrant workers and local communities;
- Disturbance due to excessive noise or other nuisance during construction or operation tounfair treatment of workers or unsafe working conditions;
- GBV and gender issues;
- Complain on labor influx;
- Complain or comment from different public, private and international stakeholders;
- Complain, comments or suggestions from various stakeholders, labors and contractor.

The GRM will be accessible to all Internal, external, regional and international stakeholders, including affected people, workers, community members, civil society, media, vulnerable people and other interested parties. External stakeholders can use the GRM to submit complaints, feedback, queries, suggestions, or even compliments related to the overall management and implementation of the ISWMI-AIIB project. The GRM is intended to address issues and complaints in an efficient, timely, and cost-effective manner.

9.2 GRIEVANCE MECHANISM PROCESS

9.2.1 Formation of GRM

The fundamental objectives of the GRM, implemented through the GRC serving as a para-legal body, areto resolve any resettlement-related grievances locally in consultation with the aggrieved party to facilitatesmooth implementation of the social and environmental action plans. Another important objective is to democratize the development process at the local level and to establish accountability to the affected people. The procedures will however not a person's right to go to the courts of law anticipate. There willbe four-tier grievance redress mechanism; 1st at local level (ward level), 2nd district level, 3rd PMU (Project Management Unit) level and final one is for ministry level. Level I GRM is the most significant and AIIB's perspective effective functioning of the field level GRC is most significant.

The membership of the GRCs will ensure proper presentation of complaints and grievances as well as impartial hearings and investigations, and transparent resolutions. Where grievances are among the affected persons, the membership composition of the GRCs will take into account any traditional conflictresolution arrangements that communities may practice. If the aggrieved person is a female, LGED will askthe concerned female UP member (if the Sub project is located outside the UIB area) or Municipal Ward Councilor to participate in the hearings. Members of the GRCs will be nominated by the Mayor. First level GRC will be formed in the local level where community people will be able to complaint / raisegrievances directly to the field level project office. According to AIIB's perspective effective functioning ofthe field level GRM is most significant. NGO /Consulting firm together with Project Implementation Committee (PIC) will inform all affected people and local community about the project grievance Redress Mechanism in local language. This local GRC will ensure easy accessibility by the PAPs, local communitiesand interested stakeholders, so that any grievances can be solved directly or within a very short period oftime.

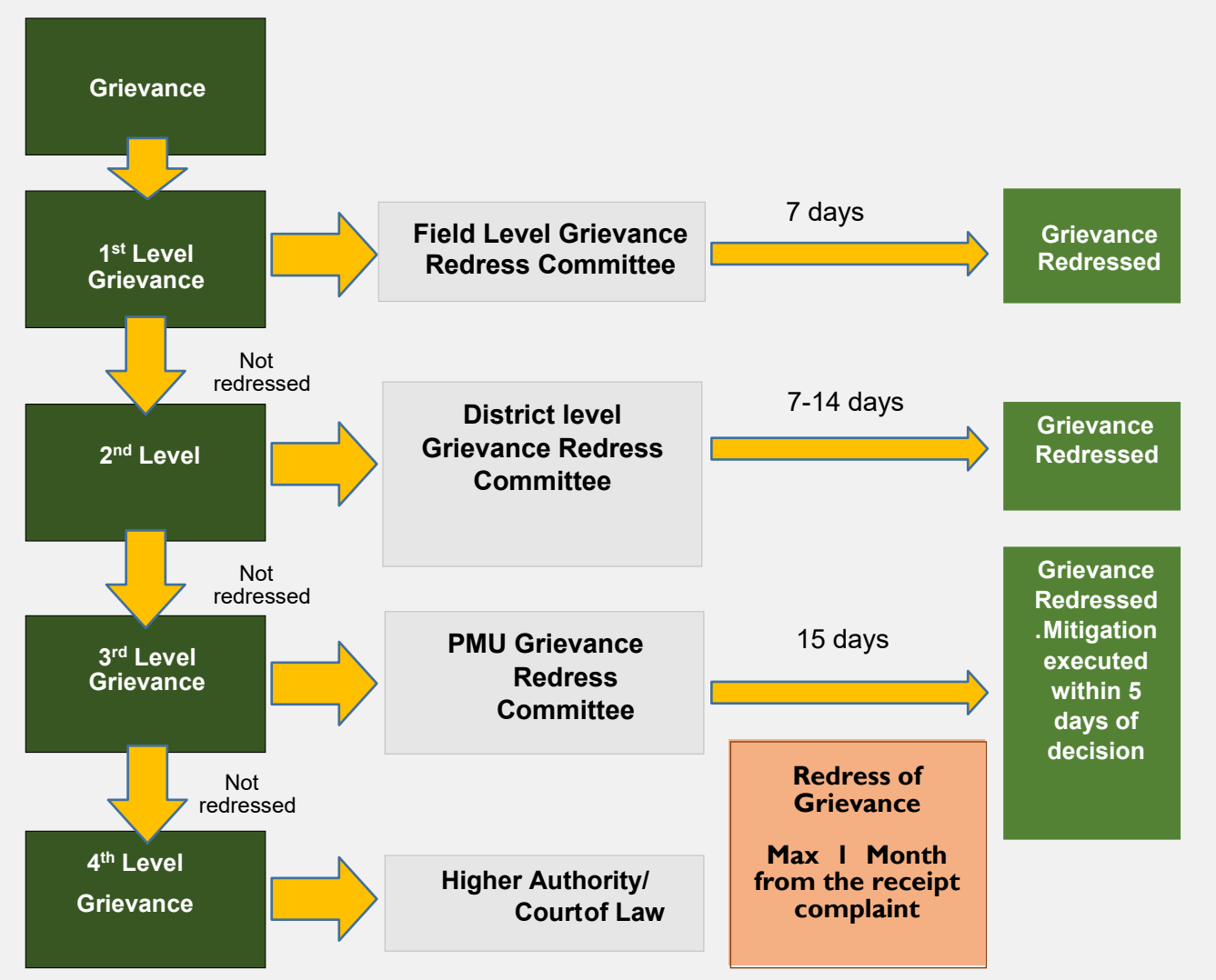


Figure 9-1: Different Levels of GRC for the Munshiganj Subproject

9.2.2 Composition of Field level GRC

Table 9-1: GRC membership at local level

1. Representative of the Mayor	Chairman
2. SAE of the Engineering Section of the ULB	Member Secretary
3. Social Specialist from NGO / consulting firm	Member
4. Related word Commissioner	Member
5. Teacher from Local Educational Institution	Member
6. Related female ward Councilor	Member
7. Representative from the PAP Group	Member

All complaints will be received at the Office of the XEN of the ULB. All cases at the local level will be heard within four weeks of their receipt. Grievances received through any channel will be registered and a notification of receipt with assurance of necessary review and resolution given in writing to the aggrieved persons.

9.2.3 Composition of District GRC

If the resolution attempt at the local level fails, the 1st level GRC will refer the complaint with the minutes of the hearings of the local GRC to district level for further review. With active assistance from the Area RP (NGO) implementing agency, the committee will make a decision and communicate it to the concerned GRC. Responsible staffs of ULB with the support of

NGO/Consulting firm will make periodic visit to the -sub project sites, interact with the communities and affected persons, and pick up issues of concerns, complaints and suggestions to register with the GRM books. The decisions on unresolved cases will be communicated to the GRC within one week of the complaint receipt.

Table 9-2: GRC membership at district level

1. Mayor	Chairman
2. Chief of the Engineering Section of the ULB	Member-Secretary
3. Resettlement Officer, Management Consultant/NGO)	Member
4. Concerned Ward Commissioner	Member
5. Concerned Woman Ward Commissioner	Member
6. One representative of APs	Member
7. One representative from the civil Society	Member

9.2.4 Composition at PMU (Project Management Unit, LGED) level GRC

If a decision at district level is again found unacceptable by the aggrieved person(s), RHD can refer the case to the ESU with the minutes of the hearings at local and district levels. PD will be the convener and senior social specialist will be the member secretary at PMU level. All the unsolved cases at the PMU level.

Decisions on unresolved cases, if any, at the PMO level will be made in no more than four weeks by an official designated by the Secretary, LGRD. A decision agreed with the aggrieved person(s) at any level of hearing will be binding upon LGED. There will be budgetary allocation for local and district committee members for participating meetings and refreshments during meeting.

To ensure that grievance redress decisions are made in formal hearings and in a transparent manner, the Convener will apply the following guidelines:

- Reject a grievance redress application with any recommendations written on it by a GRC member or others such as politicians and other influential persons.
- Remove a recommendation by any person that may separately accompany the grievance redress application.
- Disqualify a GRC member who has made a recommendation on the application or separately before the formal hearing: Where a GRC member is removed, appoint another person in consultation with the Project Director.
- The Convener will also ensure strict adherence to the impact mitigation policies and guidelines adopted in this RPF and the mitigation standards, such as compensation rates established through market price surveys.

The affected persons and their communities will be informed of the project's grievance redress mechanism in open meetings at important locations and in PAP group meetings. Bangla translations of the RPF in the form of information brochures will be distributed among the affected persons. The PAPs will also be briefed on the scope of the GRC, the procedure for lodging grievances cases and the procedure of grievance resolution at the project level.

Table 9-3: Grievance Redress Procedures

Step of the procedures	Functions for determining the Resolve of Grievance
Step-1	An AP has a grievance about any part of the Land Acquisition and Resettlement Process (LARP) and assumes/finds that it cannot be resolved.
Step-2	The AP can approach the assigned Resettlement Officer/NGO will provide clarification to the AP as per RP within one day.
Step-3	If not resolved or not satisfied with the clarification given by NGO/Resettlement Officer within two days, thus, the AP can approach to the issue before GRC in writing. Resettlement Officer/ NGO staff

	assist the AP in producing the complaints and organize hearing within 21 (twenty one) days/ three weeks of receiving the complaints.
Step-4	GRC will scrutinize applications to resolve the complaints. And cases are referred to DC through EA (Executing Agency) if beyond their mandate.
Step-5	If within its mandate, GRC sessions will be held with the aggrieved AP, minutes are recorded. If resolved, the Project Director will approve it in writing.
Step-6	If not resolved, the AP may accept GRC decision, if not, he/she may file a case to the court of law for settlement.
Step-7	The GRC minutes, approved by the Project Director, are received at the Convener's Office. The approved verdict is communicated to the complaint AP in writing.

Any grievance filed with the GRC, must be reported in the annual report to the CSC who will then submita consolidated report to AIIB via LGED.

First level GRC will be formed in the local level where community people will be able to complaint/ raise grievances directly to the field level project office. According to AIIB's perspective effective functioning of the field level GRM is most significant. NGO/consulting firm together with Project Implementation Committee (PIC) will inform all affected people and local community about the project grievance Redress Mechanism in local language. This local GRC will ensure easy accessibility by the PAPs, local communities and interested stakeholders, so that any grievances can be solved directly or within a very short period of time.

The membership of the GRCs will ensure proper presentation of complaints and grievances as well as impartial hearings and investigations, and transparent resolutions. Where grievances are among the affected persons, the membership composition of the GRCs will take into account any traditional conflict resolution arrangements that communities may practice. If the aggrieved person is a female, ULB will ask the concerned female Municipal Ward Councilor to participate in the hearings. Members of the GRCs will be nominated by the Mayor.

9.3 Grievance Mechanism Intake Channels

If grievances are raised, there will be various options to submit grievances through mediums such as websites, emails, phones and other appropriate communication methods, which will berecorded and dealt with accordingly.

Multichannel cloud GRM system will be established taking the best examples and practices to diminish the need for Project-affected people to physically interact with Project staff. A training program will be arranged with different stakeholders on how to raise grievances during this pandemic. It will ensure:

a. Accept, manage and respond to feedback/grievances through calls, text, social media andemails. Feedback is automatically logged and can be accessed remotely.

b. Ready-made, off-the-shelf solution which requires minimum set-up and training to deployand operate.

c. It will be easier to access off/on-line with/out smart phone.

d. It can be easily integrated with the spot.

LGED will operational the GRM channels at loan effect and the ULBs will establish GRM focal points, GRC channels for accepting suggestions and complaints at least 30 days before bidding process.

9.4 Grievance Registry, Referral, Resolution and Appeal Process

To ensure impartiality and transparency, hearings on complaints at the GRC level will remain open to the public. The GRCs will record the details of the complaints and their resolution in a register, including intake details, resolution process and the closing procedures. LGED will maintain the three GRM books.

Registration Book: (1) Serial No., (2) Date of receipt,: (3) Name of complaint, (4) Gender, story and expectation, (5) Father or husband, (6) Complete address. (7) Main objection (loss of land /property or entitlements. (8) Decision of GRC, (9) Previous records of similar grievances

Resolution Book: (1) Serial No.,(2)Case no., (3) Name of Complaint, (4) Complaint's story and expectation, (5) Date of hearing ,(6) Date of field investigation (if any) (7) results of hearing and field investigation, (8) Decision of GRC, (9) Progress (Pending, solved), and (10) Agreement of commitments.

Closing Book: (1) Serial No., (2) Case no., (3) Name of Complaint, (4) Decisions and response to complaints, (5) Mode and medium of communication, (6) Date of closing, (7) Confirmation of complaint's satisfaction and (8) Management actions to recurrence.

9.5 GRM Monitoring and Reporting

Grievance Resolution will be a continuous process during subproject implementation. The ULBs will keep records of all resolved and unsolved complaints and grievances (one file for each case record) and make them available for review as and when asked for by IDA (International Development Association) and any other interested person/entities. The ULB will also prepare periodic reports on the grievance resolution process and publish these on their websites. LGED will consolidate reports from the ULBs on GRM and post in their website.

9.6 GRM Contact Information - LGED

Information on the project and future stakeholder engagement programs will be available on the project'swebsite and will be posted on information boards in the project office in the site office, at the ULB office of contact regarding the stakeholder engagement program at LGED is given in the following page:

Table 9-4: GRM Contact Details

Description	Contact details
Client:	Local Government Engineering Department (LGED)
To:	Project Director, ISWMI Project
Address:	LGED HQs, Sher-e-Banglanagar, Agargaon, Dhaka-1207
E-mail:	pd.iswmip@lged.gov.bd
Website:	www.lged.gov.bd
Telephone:	

9.7 Monitoring and Reporting

LGED will set up its own monitoring and evaluation (M&E) system to report quarterly involving the XENs at the District level. The RP implementing agency will primarily be responsible for collection of monitoring data on land acquisition and implementation of resettlement plans, tribal peoples plans (if any) and gender actions in the process. LGED will engage a monitoring and evaluation (M&E) consultant to assist PMO in day to day monitoring and management support for implementation of CEIP-I. The DS Consultant includes a senior, experienced resettlement specialist who will prepare six monthly reports on monitoring of land acquisition and implementation of resettlement plans, tribal peoples plans (if any) and gender action plans in the process. The PMO will be responsible for monitoring, reporting and evaluation, including the design of the M&E system.

The LGED program intends to strengthen the GRM through information and communication technology to ensure that all complaints including those of sexual exploitation and abuse are immediately reported to the Government. LGED will integrate the GRM on a web-based dashboard, to adequately and promptly address any potential grievance related to Gender Based Violence and SEA. The complaints registered in this system will be managed by a dedicated administrator that will liaise immediately any GBV and SEA complaints with the contractors, consultant and LGED/ ESU (Environmental and Social Unit, ULB) for immediate measures. If the GRM receives acase on sexual exploitation and abuse related to the project, it will be recorded, and the complainant willbe referred to the relevant assistance, if needed, for referral to any other service providers. The supervision

consultant will keep the information confidential to protect privacy of GBV and SEA complainants. In cases, where the perpetrator(s) is linked to project activities then the contractor will takeappropriate actions as per the code of conduct signed by the particular person and under the effective law in Bangladesh. LGED will report activities and outcomes of GBV and SEA surveillance and management to the AIIB on a regular basis.

To ensure that grievance redress decisions are made in formal hearings and in a transparent manner,the convener will apply the following guidelines:

i. A standard application format will be used for receiving grievances which will be available at the office of INGO /Consulting firm. This application format would be concurred by the PD;

ii. Reject a grievance redress application with any recommendations written on it by a GRC memberor others such as politicians and other influential persons;

iii. Remove a recommendation by any person that may separately accompany the grievance redress application;

iv. Disqualify a GRC member who has made a recommendation on the application separately beforethe formal hearing;

v. Where a GRC member is removed, appoint another person in consultation with the Project Director; and

vi. The convener will also ensure strict adherence to the impact mitigation policies and guidelines adopted in this SIA and the mitigation standards, such as compensation rates established throughmarket price surveys.

9.8 Information Disclosure, Consultation and Participation

Prior to the start of the construction, LGED or its representative will publicize the establishments of the grievance redress steps and the process, and advertise all via contact information and the grievance redress steps posted at every UP office if any, involved, as well as at busy public places in the project corridor. The poster(s) will be in the local language(s) and posted within 30 days of the start of construction. The LGED representative will check at least monthly to ensure that the posters are prominently displayed andprovide clear contact instructions and numbers. This procedure and monitoring will be reported in the semi-annual monitoring report submitted to the AIIB.

9.9 Training

(1) Land acquisition and resettlement experience in former and ongoing projects of LGED formed the basis for RPF. LGED has prior experience of dealing with land acquisition and resettlement in compliance with on involuntary resettlement and on indigenous peoples. However, the PMU/ESU staff will be oriented on preparation of resettlement plans and implementation of them at the field level. An experienced implementing agency (or NGO) will be employed for social survey and implementation of RPs.

(B) In monitoring land acquisition and RP (and TPP, if needed) implementation activities, the LGED Land Acquisition and Resettlement Specialist (LARS) at the PMU will identify any issues that may be impeding progress and coordinate them with the PD and SMOs (social Management Officer) for actions by the XENs at the HQ, LGED level. Jointly with the DS (Design Supervision) consultant's, Resettlement Specialist, the LARS will design and conduct training of LGED field staff, especially those who will implement the project. On social safeguards compliance issues relating to involuntary resettlement and tribal peoples, as well as implementation of the various impact mitigation policies and measures adopted in this ISWMIP. Gender mainstreaming in project activities will be given special attention in all training and capacity building activities.

10. CONCLUSION AND RECOMMENDATION

The environmental assessment process has highlighted the environmental issues and concerns of the proposed subproject. This study has not identified any significant negative environmental impacts that cannot be mitigated. Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movement.

However, the routine nature of the impacts means that most can be easily mitigated. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on and off-site, document checks, and interviews with workers and beneficiaries.

The subproject will benefit the citizens of the Munshiganj Municipality by contributing to the long-term improvement of public health and community livability. Sustainability and scalability require the revenues generating from the citizens to cover the operation and maintenance of the integrated landfill and resource recovery facility as well as from sale of by-products (compost, recyclables, diesel etc.) so that the project can be run to cover the cost of operation. The potential adverse environmental impacts are mainly related to the abnormal or malfunctioning of the technologies during its operation, which can be minimized by the mitigating measures. All mitigation measures and involved costs are integrated with the operation and maintenance cost.

The stakeholders are involved in developing the ESIA through discussions on-site and public consultation, after which views expressed are incorporated into the ESIA. This ESIA will be made available at public locations in the camp and will be disclosed to a wider audience via the Munshiganj Municipality, LGED and AIIB websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the ESIA to ensure any public grievances are addressed quickly.

10.1 Recommendations:

The ESMP of this ESIA should be site specific ESMP (SESMP) including monitoring plan. During construction, the contractor will prepare contractor's Environmental Management Plan, which will include contractor's responsibility in implementing ESMP. The plan should be reviewed and approved by the employer at least 10 days before commencement of construction.

A copy of the ESMP shall be kept on-site during the construction period at all times. The ESMP shall be made binding on the contractor operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

LGED has fully endorsed the ESMP and is committed to implement all the mitigation measures. Munshiganj Municipality will also ensure that the work is carried out in an environmentally acceptable manner and the monitoring and reporting are completed in a compliant and timely fashion, acceptable to DOE.

As per Government of Bangladesh ECA, 1995 and ECR, 1997 & 2023, the sub-project is categorized as "red"; and SCC and ECC must be obtained from DoE. This ESIA report is prepared following the guidelines of DoE and the AIIB approved ESMPF.

REFERENCES

AIIB (2016), Environmental and Social Framework of AIIB, Approved February 2016 (Amended February 2019 and May 2021), February, 2016.

CCC (2021), Environmental Impact Assessment (EIA) Report of Medical Waste Incinerator by Chattogram City Corporation (CCC), November 2021.

GoB (1997), Environmental Conservation Rules 1997 by Department of Environment under Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, June 1997.

GoB (2006), National Biodiversity Strategy and Action Plan for Bangladesh (October 2006) by Ministry Of Environment and Forests Government of the People's Republic of Bangladesh, October, 2006.

GoB (2021), Solid Waste Management Rules by Department of Environment under Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, December 2021.

IUCN (2000), A Guide to the Assessment of Biological Diversity DRAFT Developed by The IUCN M&E Initiative and The IUCN Biodiversity Policy and International Agreements Unit, April, 2000.

KCC (2022), Environmental Impact Assessment (EIA) of Second City Region Development Project – Comprehensive Solid Waste Management Planning and Small Works (Landfilling/ Composting Plant and Associated Facilities) for Khulna City Corporation, May 2022.

KMTNC, UNEP-WCMC (2010), Guidelines for Biodiversity Assessment and Monitoring for Protected Areas (2010) published by The King Mahendra Trust for Nature Conservation, Nepal and the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

Mumtaz, S. (2002), Environmental impact assessment in Bangladesh: a critical review. Environ. Impact Assess. Rev., 22: 163-179.

World Bank (1999a), Operational Policies, OP- 4.01: Environmental Assessment by The World Bank, Washington, D.C., USA, January 1999.

World Bank (1999b), Pollution Prevention and Abatement Handbook 1998: Toward Cleaner Production by the World Bank, Washington, D.C., USA.

World Bank (2003), A User's Guide to Poverty and Social Impact Analysis, Washington, D.C., USA World Bank (2001) Operational Policies, OP- 4.12: Involuntary Resettlement by The World Bank, Washington, D.C., USA, December 2001.

World Bank (2004), Good Practice Note: Using Poverty and Social Impact Analysis to Support Development Policy Operations published by the World Bank, Washington, D.C., USA.

World Bank (2004a), Involuntary Resettlement Sourcebook, Planning and Implementation of Development Projects published by Washington, D.C., USA.

World Bank (2006), Operational Policies, OP- 4.11: Physical Cultural Resources published by The World Bank, Washington, D.C., USA, July 2006.

World Bank (2007), Environmental, Health, and Safety General Guidelines, International Finance Corporation (IFC) published by The World Bank Group, April 2007.

World Bank (2013), Conducting Social Assessments in Urban Solid Waste Management Projects published by The World Bank, Washington, D.C., USA, June 2013.

AIIB (2022), Technical Assistance on Integrated Solid Waste Management Improvement Project for the Environmental and Social Management Planning Framework (ESMPF) by AIIB.

ANNEXURE

Annex I: Sample Labor Court of Conduct covering the GBV/SEA/SHA related risks

Introduction:

The Company is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The company also strongly commits to creating and maintaining an environment in which Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) have no place, and where they will not be tolerated by any employee, sub-contractor, supplier, associate, or representative of the company. The purpose of this code of conduct is to:

1. Create a common understanding of what constitutes Sexual exploitation and abuse, and sexual harassment;

2. Create a shared commitment to standard behaviors and guidelines for company employees to prevent, report, and respond to SEA and SH; and

3. Create understanding that breach of this code of conduct will result in disciplinary action.

Definitions

Sexual Exploitation and Abuse (SEA):

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.

Sexual Abuse:

The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.

Sexual Harassment:

Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature.

Sexual Harassment versus SEA:

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff trainings can include specific instruction on the procedures to report each.

Consent is the choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. **Under this Code of Conduct consent cannot be given by anyone under the age of 18, regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense.**

There is no consent when agreement is obtained through:

- The use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation
- The use of a threat to withhold a benefit to which the person is already entitled, or
- A promise is made to the person to provide a benefit. While all forms of violence against a community resident or a co-worker are forbidden, this code of conduct is particularly concerned with the prevention and reporting of sexual exploitation and abuse (SEA) and sexual harassment which constitute gross misconduct, are grounds for termination or other consequences related to employment and employment status:

(1) Examples of sexual exploitation and abuse include, but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex;
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex;
- A project worker gets drunk after being paid and rapes a local woman;
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor;
- A manager tells a woman applying for a job that he will only hire her if she has sex with him; and
- A worker begins a friendship with a 17-year-old girl who walks to and from school on the road where project related work is taking place. He gives her rides to school. He tells her that he loves her. They have sex.

(2) Examples of sexual harassment in a work context include, but are not limited to:

- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability;
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses; and
- A male manager touches a female staff members' buttocks when he passes her at work. A male staff member tells a female staff member he will get her a raise if she sends him naked photographs of herself.

Individual signed commitment (to be translated in a language understood by the person signing):

I, _____, acknowledge that sexual exploitation and abuse (SEA) and sexual harassment, are prohibited. As an (employee/contractor) of (contracted agency / sub-contracted agency) in (country), I acknowledge that SEA and SH activities on the work site, the work site surroundings, at workers' camps, or the surrounding community constitute a violation of this Code of Conduct. I understand SEA and SH activities are grounds for sanctions, penalties or potential termination of employment. Prosecution of those who commit SEA and SH may be pursued if appropriate.

I agree that while working on the project I will:

- Treat all persons, including children (persons under the age of 18), with respect regardless of sex, race, color, language, religion, political or other opinion, national, ethnic or social origin, gender identity, sexual orientation, property, disability, birth or other status.;
- Commit to creating an environment which prevents SEA and SH and promotes this code of conduct. In particular, I will seek to support the systems which maintain this environment;
- Not participate in SEA and SH as defined by this Code of Conduct and as defined under (country) law (and other local law, where applicable);
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate;
- Not participate in sexual contact or activity with anyone below the age of 18. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense. I will not participate in actions intended to build a relationship with a minor that will lead to sexual activity;
- Not solicit/engage in sexual favors in exchange for anything as described above;

- Unless there is the full consent by all parties involved, recognizing that a child is unable to give consent and a child is anyone under the age of 18, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" under this Code.

I commit to:

- Adhere to the provisions of this code of conduct both on and off the project site. Attend and actively partake in training courses related to preventing SEA and SH as requested by my employer. If I am aware of or suspect SEA and SH, at the project site or surrounding community, I understand that I am encouraged to report it to the Grievance Reporting Mechanism (GRM) or to my manager. The safety, consent, and consequences for the person who has suffered the abuse will be part of my consideration when reporting. I understand that I will be expected to maintain confidentiality on any matters related to the incident to protect the privacy and security of all those involved.

Sanctions: I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning or formal warning;
- Additional training;
- Loss of salary;
- Suspension of employment (with or without payment of salary);
- Termination of employment; and
- Report to the police or other authorities as warranted.

I understand that it is my responsibility to adhere to this code of conduct. That I will avoid actions or behaviors that could be construed as SEA and SH. Any such actions will be a breach this Individual Code of Conduct. I acknowledge that I have read the Individual Code of Conduct, do agree to comply with the standards contained in this document, and understand my roles and responsibilities to prevent and potentially report SEA and SHA issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

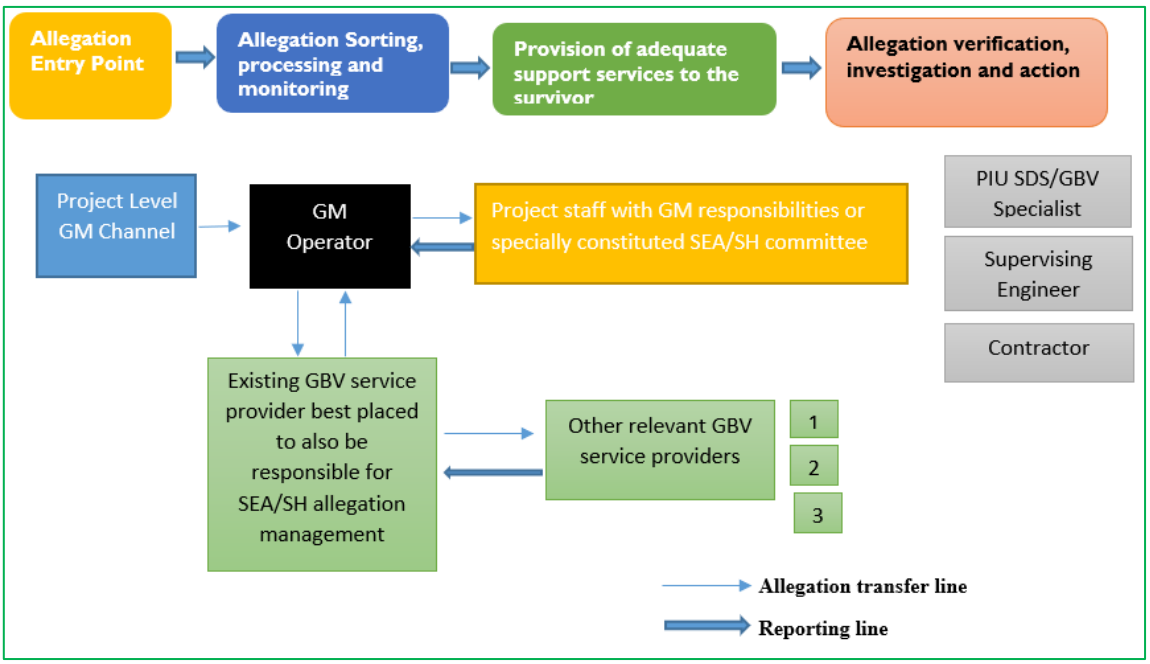
Title: _____

Date: _____

Annex II GBV service providers functioning in Bangladesh during COVID-19

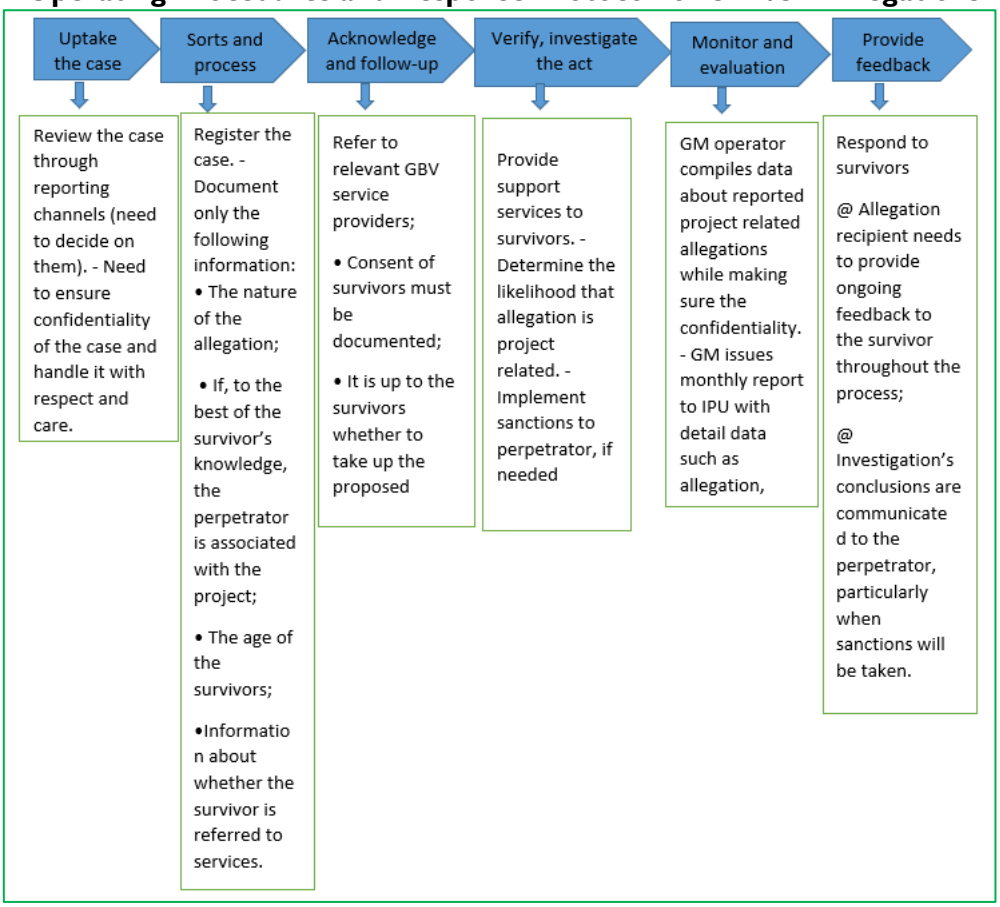
<table>
<tr>
<td><u>Helplines</u>
• National Helpline Centre for Violence against Women and Children: 10921;
• Legal Aid Helpline: 16430;
• Marie Stops Bangladesh: 08000222333;
• Acid Survivors Foundation (ASF): +8801713010461;
• Bangladesh Legal Aid and Services Trust (BLAST); +8801715- 220 220;
• Ain o Salish Kendra (ASK): +8801724415677;
• Rights Jessore: +8801977182023;</td>
<td><u>Immediate Rescue Information</u>
➢ OCC (Medical): 109
➢ OCC(Judicial)
• Faridpur: +8801711248085;
• Sylhet: +8801716128370;
• Barishal: +8801715635866;
• Rajshahi: +8801718620310;
• Chittagong: +88018199411O6;
• Bagerhat: +8801911100177;</td>
</tr>
<tr>
<td><u>Psycho-social counseling</u>
• Marie Stops Bangladesh: 02-58152538;
• Acid Survivors Foundation (ASF): +8801713010461;
• Ministry of Women and Children Affairs (focused on COVID19 Psychosocial Counselling):
•National: 12.00-3.00:+8801715297944, 3:00-6.00: +8801727209070 6.00-9.00:+880191431785</td>
<td><u>Regional</u>
9.00-12.00:
• Dhaka, Dhaka Medical College Hospital (DMCH): +8801780839944;
• Barishal, Sher e Bangla Medical College and Hospital (SBMCH): +8801913566477;
• Chattogram, Chattogram Medical College and Hospital (CMCH): +8801676095159;
• Rangpur, Rangpur Medical College and Hospital (RpMCH): +8801777337089
12.00-3.00:
• Rangpur, Rangpur Medical College and Hospital (RpMCH): +8801919137331,
• Khulna, Khulna Medical College and Hospital (KMCH): +8801723545731
3.00-6.00:
• Rajshahi, Medical College and Hospital (RMCH): +8801515621317,
• Dhaka, Dhaka Medical College and Hospital (DMCH): +8801675620992,
• Cox's Bazar Medical College and Hospital (CoxMCH): +8801847461880
6.00-9.00:
• Sylhet, Sylhet Osmani Medical College and Hospital (SOMCH): +8801766356094,
• Chattogram, Chattogram Medical College and Hospital (CMCH):+8801761362020,
• Faridpur, Faridpur Medical College and Hospital (FMCH): +8801673719894;
• Aparajita Jessore: +8801761222222-4</td>
</tr>
<tr>
<td><u>Shelters</u>
• Judicial OCC
• Faridpur: +8801711248085;
Sylhet: +8801716128370;
Barishal: +8801715635866;
Rajshahi: +8801718620310;
Chittagong: +88018199411O6;
Bagerhat: +8801911100177;
• Dhaka Ahsania Mission (shelter with transport) (880-2) 58155869, 9127943, 9123402, 9123420;</td>
<td><u>Legal Counseling</u>
• Bangladesh Legal Aid and Services Trust (BLAST): +8801715-220 220;
• Ain o Salish Kendra (ASK): +8801714-025069;
• Organization for Women's Development in Bangladesh (OWDEB) – Chittagong (Providing service to Ward 4,5,6 now): +8801711 – 171060
• Aparajita Jessore: +8801761222222-4</td>
</tr>
</table>

Annex III Subproject Grievance Mechanism to address SEA/SH Allegations (this modal will be further tailored to the subproject needs)



Annex IV Operating Procedure and Response Protocol

Operating Procedures and Response Protocol for SEA/SH Allegations



Annex V Sample Labor Code of Conduct covering the GBV/SEA/SHA related risks

Introduction:

The Company is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The company also strongly commits to creating and maintaining an environment in which Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) have no place, and where they will not be tolerated by any employee, sub-contractor, supplier, associate, or representative of the company. The purpose of this Code of Conduct is to:

1. Create a common understanding of what constitutes Sexual exploitation and abuse, and sexual harassment;
2. Create a shared commitment to standard behaviors and guidelines for company employees to prevent, report, and respond to SEA and SH; and
3. Create understanding that breach of this code of conduct will result in disciplinary action.

Definitions

Sexual Exploitation and Abuse (SEA):

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another.

Sexual Abuse: The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.

Sexual Harassment: Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature.

Sexual Harassment versus SEA (Sexual Exploitation and abuse):

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff trainings can include specific instruction on the procedures to report each.

Consent is the choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. **Under this Code of Conduct consent cannot be given by anyone under the age of 18, regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense.**

Individual signed commitment (to be translated in a language understood by the person signing):

I, _____, acknowledge that sexual exploitation and abuse (SEA) and sexual harassment, are prohibited. As an (employee/contractor) of (contracted agency / sub-contracted agency) in (country), I acknowledge that SEA and SH activities on the work site, the work site surroundings, at workers' camps, or the surrounding community constitute a violation of this Code of Conduct. I understand SEA and SH activities are grounds for sanctions, penalties or potential termination of employment. Prosecution of those who commit SEA and SH may be pursued if appropriate.

I agree that while working on the project I will:

Treat all persons, including children (persons under the age of 18), with respect regardless of sex, race, color, language, religion, political or other opinion, national, ethnic or social origin, gender identity, sexual orientation, property, disability, birth or other status.

Commit to creating an environment which prevents SEA and SH and promotes this code of conduct. In particular, I will seek to support the systems which maintain this environment.

Not participate in SEA and SH as defined by this Code of Conduct and as defined under (country) law (and other local law, where applicable).

Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.

Not participate in sexual contact or activity with anyone below the age of 18. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense. I will not participate in actions intended to build a relationship with a minor that will lead to sexual activity.

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Adhere to the provisions of this code of conduct both on and off the project site. Attend and actively partake in training courses related to preventing SEA and SH as requested by my employer. If I am aware of or suspect SEA and SH, at the project site or surrounding community, I understand that I am encouraged to report it to the Grievance Reporting Mechanism (GRM) or to my manager. The safety, consent, and consequences for the person who has suffered the abuse will be part of my consideration when reporting. I understand that I will be expected to maintain confidentiality on any matters related to the incident to protect the privacy and security of all those involved.

Sanctions: I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning or formal warning;
- Additional training;
- Loss of salary;
- Suspension of employment (with or without payment of salary);
- Termination of employment; and
- Report to the police or other authorities as warranted.

I understand that it is my responsibility to adhere to this code of conduct. That I will avoid actions or behaviors that could be construed as SEA and SH. Any such actions will be a breach this Individual Code of Conduct. I acknowledge that I have read the Individual Code of Conduct, do agree to comply with the standards contained in this document, and understand my roles and responsibilities to prevent and potentially report SEA and SHA issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Annex VI Suggested Due Diligence for Social and Environmental Mitigation Measures in Contracts

Environmental and Social Risk Assessment - Generic Checklist	
Project Name: Integrated Solid Waste Management Improvement Project(ISWMIP) Funding Agency: Asian Infrastructure Investment Project (AIIB)	
Date	
Name of Client	Local Government Engineering Department(LGED)
Location	Landfill area, Baradi mouza,Munshiganj Pouroshava,Munshiganj
Name of Construction firm	
Name of Relationship Official (Construction firm)	
DOE Categorization (Red, Orange A, Orange B, Green)	

S.N.	Question	Answer/option	Correct Answer
General Risks			
1	Are there any legal issues associated with the construction firm E&S performance?	a) Construction firm has all valid permits and has not faced any legal claims or any serious environmental/social incident in last three years; b) Construction firm does not have all valid permits but has taken definite steps to acquire them in next six months and/or firm has faced legal claims but has addressed or has definite plan to address all of them; and c) Not applicable.	Option (a)
2	Have operations ever been affected by local stakeholder grievances, media or non-governmental organization (NGO) campaigns over E&S issues?	a) There is no evidence of stakeholder grievances, media or NGO protest; b) There is evidence of stakeholder grievances, media or NGO protest for a particular operation and construction firm has taken adequate steps to address the issue; and c) Not applicable.	Option (b)
3	Does the construction firm has robust/ adequate Environmental and Social Management System (ESMS)?	a) Construction firm has robust ESMS, resources both people and budget to implement; b) Construction firm does not have robust ESMS yet, however definite steps have been taken to ensure one; and c) Not applicable.	Option (a)

S.N.	Question	Answer/option	Correct Answer
4	Is there any evidence of air and noise pollution due to construction firm operation?	a) There is no evidence of air /noise pollution and/or all mitigation measures and monitoring systems are in place; b) There is evidence of air emission/noise and there is no mitigation measure/monitoring system in place and construction firm has no definite plan to address the issues; and c) Not applicable.	Option (a)
5	Is there any evidence of water pollution due to construction firm operation?	a) There is no evidence of water pollution and /or all mitigation measures and monitoring systems are in place; b) There is evidence of water pollution and there is no mitigation measure/monitoring system in place and construction firm has no definite plan to address the issues; and c) Not applicable.	Option (a)
6	Is there any evidence of land pollution and lack of waste handling mechanism in the project operation?	a) There is no evidence of land contamination or all mitigation measures and monitoring systems are in place; b) There is evidence of land contamination and there is no mitigation measure/monitoring system in place and construction firm has no definite plan to address the issues; and c) Not applicable.	Option (a)
7	Are there any Climate Change related risks (flood, drought, cyclone etc.) and opportunities (GHG emission reduction) associated with the client's operation?	a) Construction firm has a robust disaster management plan to combat climatic risks and firm has procedures in place to measure, disclose, set targets and mitigate its GHG emissions; b) No disaster management plan and no definite plan to measure, disclose, set targets and mitigate its GHG emissions in future; and c) Not applicable.	Option (a)
8	Is there any evidence of occupational health & safety (OHS) risk?	a) The construction firm does not have any OHS concern or have mitigated them adequately; b) The construction firm has OHS concern in its operation and have no plans of correcting them; and d) Not Applicable.	Option (a)

S.N.	Question	Answer/option	Correct Answer
9	Are the labor and working conditions poor and breaching local regulations / standards?	a)There is proper working condition and labor practice and there is no evidence of poor working condition or labor practice for which construction firm may face legal challenge or labor unrest or negative media coverage or protest from activistb; b)Working condition is very poor and/or there is presence of significantly poor labor practice such as child labor/forced labor and construction firm is not addressing/has no definite plan to address the issuesd); and c) Not applicable.	Option (a)
10	Does the project pose a threat to Community Health, Safety and Security?	a) Presence of a robust plan for community health & safety which is developed in consultation with the local community and there is no evidence of issues that may create nuisance/accidents/injuries to local community in future; b) There is a plan for community health & safety but it is not robust or it is not developed in consultation with the community AND/OR there are a few evidences of issues that may create nuisance/accidents/injuries to local community AND the client intends to address the gaps; and c) Not applicable.	Option (a)
11	Is there any evidence of community consultation with key stakeholders including indigenous people?	a) There is evidence that the client consults /engages with the stakeholders including local community, indigenous people on all relevant issues (such as rehabilitation, compensation, their expectations as the case may be) b) There is limited /inadequate consultations with the stakeholders c) No consultations with the stakeholders d) Not applicable	Option (d)
		Risk Rating of the Project	

Annex VII Certificate of Age and Fitness

CERTIFICATE OF AGE & MEDICAL FITNESS

Issuance Date: _____

This is to certify that Mr./Ms. _____, of age _____, presently residing at _____
whose signature is given below.

Based on the examination, I certify that he/she is in good mental and physical health condition including normal eyesight, and is free from any physical defects.

Signature of the Applicant: _____.

Name & signature of the Medical Officer with seal and registration number.

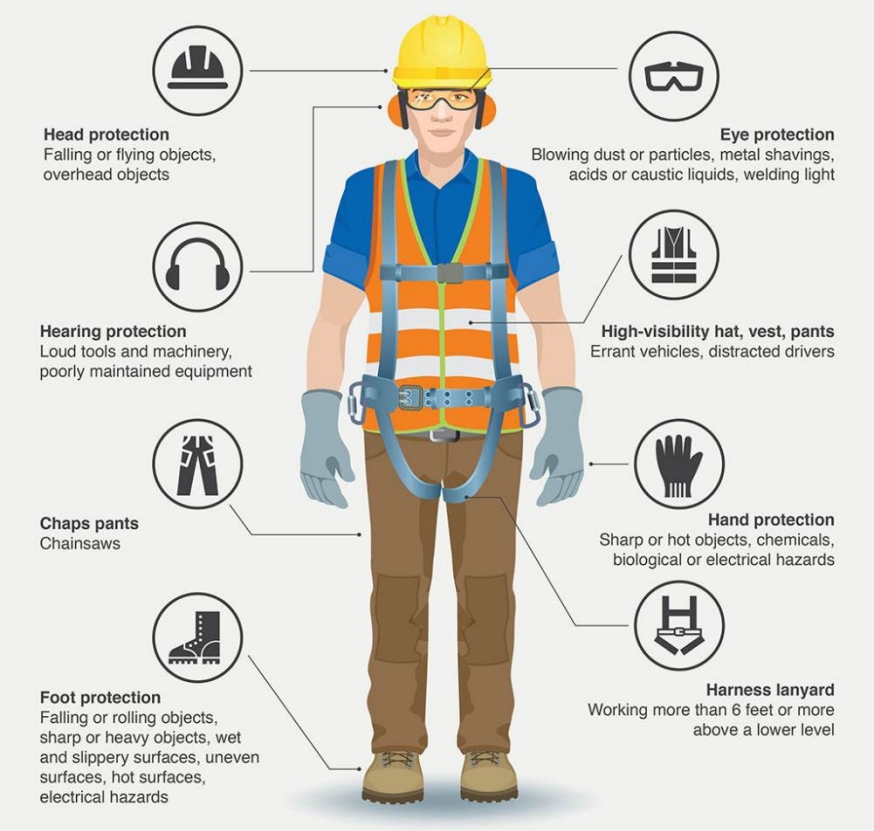
Record Book on the Testing of Fire Extinguisher

Fire Extinguisher Test Record

Location……

Date	Location or Number	Inspected or tested	Results Correct		Details of fault and action taken	Name	Signature
			Yes	No			

Annex VIII Register of Worker Working on or Near Machinery in Motion, and Provided with Personal Safety Materials



Annex IX Final Report of Accident and Professional Injury

ACCIDENT AND PROFESSIONAL INJURY REPORT FORM

This report should be completed within very short time of the event.

1. PERSON INVOLVED

Full Name: ……..

Address: …….

Identification: ☐ NID NO……☐ Passport No…….☐ Other: …….

Phone: ……E-Mail:…….

2. THE INCIDENT

Date of Incident: …….Time: ----------☐ AM ☐ PM

Location:……..

Describe the Incident:……

3. INJURIES

Was anyone injured? ☐ Yes ☐ No

If yes, describe the injuries:……..

4. WITNESSES

Were there witnesses to the incident? ☐ Yes ☐ No

If yes, enter the witnesses' names and contact info: …….

5. POLICE / MEDICAL SERVICES

Police Notified? ☐ Yes ☐ No If yes, was a report filed? ☐ Yes ☐ No

Was medical treatment provided? ☐ Yes ☐ No ☐ Refused

If yes, where was medical treatment provided? ☐ On site ☐ Hospital ☐ Other:……..

6. PERSON FILING REPORT

Signature: _____ Date: _____

Print Name: _____

OFFICE USE ONLY

Report received by:…….Date:……..

Follow-up action taken:

Action Taken:……

Annex X Report on Toxic and Infectious Disease

- Daily monitoring format should be filled up on health monitoring by the work supervisor at the construction site. Labour leader should fill up the monitoring format with help of the work supervisor. Work supervisor who will be monitoring entry to the site, conducting temperature checks and recording details of any worker that is denied entry.
- Confirming that workers are fit for work before they enter the site or start work. While procedures should already be in place for this, special attention should be paid to workers with underlying health issues or who may be otherwise at risk. Consideration should be given to demobilization of staff with underlying health issues.
- Checking and recording temperatures, cough, diarrhoea, of workers and other people entering the site or requiring self-reporting prior to or on entering the site.
- If any labor/staff has the symptoms health monitoring format should be send to the Pourashava and the PD office. weekly Health Monitoring Report should be prepared and send to the Pourashava and the PD office.

Possible signs and symptoms of toxic shock syndrome should be paid attention :

- A sudden high fever.
- Low blood pressure.
- Vomiting or diarrhea.
- A rash resembling a sunburn, particularly on your palms and soles.
- Confusion.
- Muscle aches.
- Redness of eyes, mouth and throat.
- Seizures.

Daily monitoring format

Name of the sick/feeling unwell labour	**NID No and Mobile No.**	**Temperature and symptoms**	**For how long the symptoms have been showing**