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ENVIRONMENTAL MANAGEMENT PLAN



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PREPARATION OF CHATTOGRAM METROPOLITON MASTER PLAN PERIOD: 2025 - 2050

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Chattogram Development Authority
Ministry of Housing and Public Works
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PREPARATION OF CHATTOGRAM METROPOLITAN MASTER PLAN (PERIOD: 2025-2050)

Draft Final Report Environmental Management Plan

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ABBREVIATIONS

ADB	: Asian Development Bank
AQMP	: Air Quality Management Plan
AQMC	: Air Quality Management Cell
BCCSAP	: Bangladesh Climate Change Strategy and Action Plan
BSF	: Black Soldier Fly
BMD	: Bangladesh Meteorological Department
BRTA	: Bangladesh Road Transport Authority
BEPZA	: Bangladesh Export Processing Zone Authority
BWDB	: Bangladesh Water Development Board
BIWTA	: Bangladesh Inland Water Transport Authority
CEMS	: Continuous Emission Monitoring Systems
CCC	: Chittagong City Corporation
CDA	: Chattogram Development Authority
CMP	: Chattogram Metropolitan Area
CPA	: Chattogram Port Authority
CBO	: Community-Based Organization
DoE	: Department of Environment
DC	: Deputy Commissioner
EMP	: Environmental Management Plan
EVs	: Electric Vehicles
EQSs	: Environmental Quality Standards
EPR	: Extended Producer Responsibility
GCF	: Green Climate Fund
GoB	: Government of Bangladesh
HPI	: Heavy Metal Pollution Index
HVACs	: Heating Ventilation and Air Conditioning System
IRRC	: Integrated Resource Recovery Centre
IEC	: Information, Education, and Communication
JICA	: Japan International Cooperation Agency
LGED	: Local Government Engineering Department
MoEFCC	: Ministry of Environment, Forest and Climate Change
MRF	: Material Recovery Facilities
M&E	: Management, Monitoring and Evaluation
NRCC	: National River Conservation Commission
NGOs	: Non-Governmental Organizations
PPR	: Public Procurement Rule
PPP	: Public Private Partnership
SCR	: Selective Catalytic Reduction
SWM	: Solid Waste Management
SCPs	: Secondary Waste Collection Points (SCPs)
SE	: Superintendent Engineer
SCL	: Service Level Agreement
WMS	: Waste Management Department
WSCs	: Waste Segregation Centers
WMC	: Waste Management Cell
WCT	: Waste Collection and Transportation
WMO	: Waste Management Officer

EXECUTIVE SUMMARY

Chattogram, as Bangladesh's second-largest city and a major economic hub, faces growing environmental management challenges. This comprehensive plan integrates four key components **Air Quality Management, Noise Pollution Control, Surface Water Management, and Solid Waste Management** aiming to build a resilient, sustainable, and livable urban environment. The approach emphasizes phased implementation, decentralized systems, multi-stakeholder engagement, and alignment with national and international best practices.

1. Air Quality Management Plan

To combat deteriorating air quality driven by industrial emissions, vehicular pollution, and construction activities, a comprehensive Air Quality Management Plan (AQMP) has been developed. Key strategies include:

- Adoption of cleaner technologies and emission control standards for industries.
- Promotion of low-sulfur fuels and transition to electric vehicles (EVs).
- Expansion of public transport systems and traffic management measures to reduce congestion.
- Enclosure of dust-generating activities and strict construction site controls.
- Establishment of a City-Level Air Quality Management Cell (AQMC) for monitoring and enforcement.
- Public access to real-time emissions data through Continuous Emission Monitoring Systems (CEMS).
- Community engagement through awareness campaigns and grievance redress systems.

2. Noise Pollution Management Plan

Noise pollution, particularly from traffic, construction, and commercial activities, is a growing public health concern. The Noise Pollution Management Plan proposes:

- Enforcement of the Noise Pollution (Control) Rules, 2006.
- Installation of noise barriers along major corridors and around sensitive areas like schools and hospitals.
- Introduction of noise mapping and monitoring at 20 critical locations across the city.
- Restrictions on nighttime construction and loud commercial activities.
- Public awareness programs and capacity building of enforcement agencies.
- Establishment of a city-level Noise Control Cell for ongoing monitoring and grievance handling.

3. Surface Water Management Plan

Preserving and restoring surface water bodies is critical for Chattogram's environmental and urban resilience. The Surface Water Management Plan focuses on:

- Restoration and conservation of canals, ponds, and wetland systems.
- Enforcement against illegal encroachments and polluting discharges.
- Integration of green infrastructure solutions such as rain gardens, permeable pavements, and retention ponds.

- Decentralized wastewater treatment for markets and high-density areas.
- Flood management strategies combining structural (e.g., embankments) and non-structural (e.g., early warning systems) measures.
- Public awareness and community-based maintenance programs to sustain improvements.

4. Solid Waste Management Plan

Recognizing varying needs, two tailored solid waste management frameworks have been developed:

a) Paurashava-Level Waste Management Plan

- **Scenario 1 (Paurashava-Led Management):** Emphasizes direct municipal service delivery, staff training, and phased development of infrastructure like Waste Segregation Centers (WSCs), composting plants, and controlled landfills.
- **Scenario 2 (PPP/CBO Model):** Advocates partnering with private operators and community-based organizations for waste collection, processing, and recycling services while retaining strong municipal oversight.
- **Key Innovations:** Introduction of two-bin segregation at source, mobile grievance redress systems, integration of Black Soldier Fly (BSF) composting, and performance-based incentives for service providers.

b) CCC-Level Waste Management Plan

- **Scenario 1 (CCC-Led Management):** Envisions a fully zonal, decentralized waste management structure with expanded workforce, upgraded transport fleet, citywide source segregation, new composting units, and rehabilitation of existing dumping sites into sanitary landfills following international best practices (e.g., Pune and Matuail models).
- **Scenario 2 (PPP/CBO Model):** Proposes systematic outsourcing of selected services under strict performance standards, backed by real-time monitoring, GPS tracking of waste vehicles, and dynamic grievance systems.
- **Implementation Roadmap:** A phased timeline from immediate (0–1 year) awareness campaigns to long-term (3–5 years) full landfill transition, expanded Integrated Resource Recovery Centers (IRRCs), and advanced processing initiatives (Waste-to-Energy, RDF production).

The Way Forward

The integrated environmental management approach proposed herein is both ambitious and realistic. By following a structured roadmap, strengthening institutions, and fostering community participation, Chattogram can transform its environmental management systems into models for other growing cities of Bangladesh.

Dedicated budget allocations, capacity building, public-private partnerships, and leveraging international climate finance (e.g., GCF, ADB, JICA) will be critical to achieving these goals.

The time to act is now to ensure that Chattogram evolves into a cleaner, healthier, and more resilient city for future generations.

CHAPTER ONE

INTRODUCTION

1 INTRODUCTION

1.1 Background

The rapid urbanization of Chattogram, Bangladesh's principal port city and a key economic hub, has placed significant pressure on its environment, infrastructure, and public health systems. In response to the growing need for integrated planning and sustainable urban development, the Chattogram Development Authority (CDA) has initiated the preparation of the **Chattogram Metropolitan Master Plan (2025–2050)** to guide the city's orderly growth over the next two decades.

In this context, the **Environmental Management Plan (EMP)** has been formulated to ensure that the implementation of the Master Plan is both environmentally sustainable and compliant with national environmental standards. The EMP serves as a strategic instrument to prevent, mitigate, and manage the environmental impacts associated with urban development in the Chattogram Metropolitan Area (CMA), while promoting environmental quality and enhancing public well-being.

This EMP is based on comprehensive environmental assessments across key sectors such as **air quality, solid waste management, water and wastewater, and noise pollution**. It aligns with national regulations, including the **Environment Conservation Rules 2023, Air Pollution (Control) Rules 2022**, and **Solid Waste Management Rules 2021**, while integrating principles of resilience, decentralization, and community participation.

Specifically, the Environmental Management Plan (EMP) aims to-

- Provide a clear framework for managing environmental risks associated with land use, infrastructure, and urban services under the Master Plan;
- Support Chittagong City Corporation (CCC) and Paurashavas in strengthening service delivery, particularly in solid waste management and air quality control;
- Foster collaboration among stakeholders, including local government bodies, development partners, and civil society, to promote environmental sustainability;
- Facilitate access to climate finance and donor support through structured, compliance-ready environmental planning.

Against this backdrop, the EMP outlines a comprehensive strategy to improve air and water quality, manage urban noise, promote sustainable waste practices, and enhance the overall environmental health of Chattogram Metropolitan Area.

1.2 Objectives of the EMP

The main objectives of the Environmental Management Plan are to-

- **Improve Air Quality**
 - Identify and control major sources of air pollution, including vehicular emissions, industrial discharges, and construction activities.

- Promote cleaner transportation systems, industrial practices, and construction standards.
- Ensure compliance with national air quality standards to protect public health and the environment
- **Protect and Restore Water Resources**
 - Prevent the discharge of industrial, domestic, and slaughterhouse waste into the Karnaphuli and Halda rivers.
 - Rehabilitate and conserve urban canals, wetlands, and drainage systems to support ecological balance and reduce flood risks.
 - Strengthen enforcement of existing environmental regulations to protect water bodies.
- **Manage and Reduce Noise Pollution**
 - Identify major noise hotspots in the city, including traffic intersections, industrial zones, and construction sites.
 - Implement noise control measures such as zoning regulations, designated quiet zones, improved urban planning, and public awareness campaigns to reduce harmful noise exposure.
 - Raise public awareness on the health impacts of noise pollution and promote community engagement in noise reduction efforts.
- **Strengthen Waste Management**
 - Develop and implement strategies for effective waste segregation, collection, treatment, and disposal.
 - Minimize waste generation at the source through public awareness and incentives.
 - Promote efficient collection, segregation, recycling, and safe disposal of municipal, industrial, and hazardous waste.
 - Eliminate open dumping and prevent waste discharge into water bodies through improved monitoring and enforcement.
- **Support Sustainable Urban Development**
 - Integrate environmental considerations into urban planning and infrastructure development.
 - Promote green infrastructure, such as urban parks and green belts, to mitigate pollution impacts.
 - Strengthen institutional capacity and coordination among relevant agencies.
- **Enhance Public Health and Ecosystem Resilience**
 - Mitigate health risks associated with air, water, and noise pollution.
 - Protecting and enhancing urban green spaces, biodiversity, and ecosystem services are critical for the city's resilience and quality of life.

- **Ensure Compliance, Monitoring, and Enforcement**

- Strengthen the institutional framework for environmental governance.
- Establish effective monitoring systems, enforce environmental laws rigorously, and promote transparency and accountability in environmental management.

1.3 Scope of the EMP

The Environmental Management Plan will cover the following areas under CDA jurisdiction:

- **Air Quality Management:** Monitoring, source identification, mitigation actions, and policy enforcement.
- **Water Resource Protection:** Pollution control in rivers, canals, and drains; habitat restoration; water quality monitoring.
- **Noise Pollution Management:** Urban noise mapping, control strategies, enforcement of noise standards.
- **Waste Management:** Integrated municipal, industrial, and hazardous waste management systems, including recycling and safe disposal.
- **Environmental Awareness and Capacity Building:** Public education campaigns, stakeholder engagement, and training programs.
- **Institutional Strengthening and Coordination:** Enhancing the capacities of CDA, CCC, DoE, and related agencies for effective environmental governance.

CHAPTER TWO

LEGAL & POLICY FRAMEWORK

2 LEGAL AND POLICY FRAMEWORK

A wide range of laws and regulations related to environmental and social issues are in place in Bangladesh. Many of these are cross-sectoral and partially related to environmental issues. To address the environmental and social risks of any project and its associated components to protect and conserve the environment from any adverse impacts, the GoB has specified regulations, policies and guidelines. This section presents an overview of the major national environmental laws and regulations that are relevant and applicable to the activities supported by the project.

2.1 Environment Related Legislation and Policy in Bangladesh

2.1.1 Bangladesh Environmental Conservation Act (Amendment) in 2010

The provisions of the Act authorize the Director General of the Department of Environment (DoE) to undertake any activity that is deemed fit and necessary to conserve and enhance the quality of the environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Ensure proper management of hazardous wastes to prevent Environmental Pollution and Health Risk;
- No remarked water body cannot be filled up/changed; in case of national interest, it can be done after getting clearance from the respective department;
- Emitters of any activities/incident will be bound to control the emission of environmental pollutants that exceed the existing emission standards and
- The government may declare any ecosystem as an “Ecologically Critical Area” if it appears to be degraded or expected to be degraded and take all precautionary measures to protect that ecosystem. In addition, the government shall stop any ongoing activities and will not allow any new developments in the ecosystem after the declaration of “Ecologically Critical Area”.

2.1.2 Environment Conservation Rules (ECR), 2023

The Ministry of Environment, Forest and Climate Change (MoEFCC) of the People's Republic of Bangladesh issued a new Environmental Conservation Rules, 2023 in March 2023. The Environment Conservation Rules, 2023 are the first set of rules promulgated under the Environment Conservation Act, 1995. The Rules provide for, inter alia, the following:

- The National Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining Environmental Clearance;
- Requirements of undertaking Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA's) as well as formulating EMP's according to categories of industries/development projects/activities and

- Procedures of damage-claim for the persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon the location, size and severity of pollution loads, projects/activities have been classified in ECR, 2023 into four categories as Green, Orange, Yellow and Red, respectively.

2.1.3 Air Pollution Control Rules, 2022

Air Pollution Control Rules, 2022 has been published by the government based on section 20 of The Bangladesh Environment Conservation Act, 1995 to control and manage air pollution in the country. The rules set:

- The standard for ambient air quality and odor, vehicular emissions, industrial emissions (stack emissions, fugitive emissions), municipal solid waste incineration emissions, the standard for construction dust control.
- The Director General of the Department will be responsible for- implementing The National Air Quality Management plan, the declaration of an area as a degraded air shed and its management, listing of activities related to air pollution and its management, air pollution prevention plan.
- The law commands the owner of the industries and projects to keep in the limit of their air emissions within the national standard by applying best practicable means. Also commands the vehicle management person and authority to comply the mentioned air quality standard and follow the references mentioned in the national air quality management plan in the law.
- The department will establish and manage the adequate number of Continuous Air Quality Monitoring Station at a proper place throughout the country.

2.1.4 Solid Waste Management Rules, 2021

The Solid Waste Management Rules, 2021 sets out the procedures for collecting, transporting, and disposing of solid waste, including plastic waste and requires the manufacturers to report the amount of plastic that has been recycled. The regulations defines the responsibilities of businesses engaged in Solid Waste Management (SWM) 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 main provisions of the SWM rules are:

- The rules aim to regulate the proper collection, transportation, disposal, and processing of solid waste. The rules prioritize source segregation, recycling, and waste-to-energy projects. The rules also emphasize the responsibilities of local authorities, businesses, and citizens to reduce environmental pollution and promote sustainable waste management.
- The Rules incorporate the 3R strategy: Reduce, Reuse, and Recycle. This strategy encourages minimizing waste generation, reusing materials and products whenever possible, and promoting recycling to reduce the environmental impact of solid waste disposal. It emphasizes sustainable practices to manage waste effectively and reduce environmental pollution.
- Specific sub-clauses have been added to ensure proper management of solid waste. One notable inclusion is the concept of Extended Producer Responsibility (EPR), which holds producers accountable for the waste generated from their products throughout its lifecycle. This approach

encourages manufacturers to adopt sustainable production practices and take responsibility for the proper disposal or recycling of their products.

2.1.5 National Environmental Policy, 2018

The Bangladesh National Environmental Policy, 2018, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the Policy are:

- Encourage collection and promotion of low carbon emission technology in the country;
- Identifying and controlling all types of environmental pollution and degradation activities;
- Ensure sustainable, long-term and environmentally friendly use of all-natural resources;
- Adopt Public Private Partnership (PPP) for the development of the environment;
- Maintain and streamline the environmental policies and strategies among other policy strategies in the interest of sustainable development;
- Ensure the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) in all necessary sectors.

2.1.6 National Water Act, 2013

The recently published Water Act 2013 is based on the National Water Policy, and designed for integrated development, management, extraction, distribution, usage, protection, and conservation of water resources in Bangladesh. In general, if one takes a critical look at the Act, the new law has provided the right framework for better management of water resources in the country. As per this Act, all forms of water (e.g., surface water, groundwater, seawater, rainwater, and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people. The private landowners will be able to use the surface water inside their property for all purposes in accordance with the Act. A worthwhile initiative is the requirement for permits/licenses for large scale water withdrawal by individuals and organizations beyond domestic use. 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. However, the maximum amount of surface water or groundwater that can be withdrawn by individuals or organizations is not mentioned in the Act. Setting up a priority order for water usage in an area where the water resources are in critical condition is also a significant step.

2.1.7 Environmental Court Act, 2010

The rapid population growth and economic development has imposed pressure on natural resources and ecosystem. Environmental disputes are frequently aroused throughout the country because of development activities. Therefore, Bangladesh government has enacted Bangladesh Environment Court Act, 2010 in order to resolve those disputes and establish justice over environmental and social damage raised due to any development activities. This act allows government to take necessary legal action against any party who creates environmental hazards/damage to environmentally sensitive and ecologically critical areas as well as human society. DoE as government agency can take legal actions if any environmental problem occurs due to the project interventions according to this act.

2.1.8 Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009

The GoB prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised it in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. It is built around the following six themes:

- **Food security, social protection, and health** to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programs focus on the needs of this group for food security, safe housing, employment, and access to basic services, including health.
- **Comprehensive disaster management** is needed to strengthen the country's already proven disaster management systems further to deal with increasingly frequent and severe natural calamities.
- **Infrastructure** to ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructure (cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change.
- **Research and Knowledge** to predict the likely scale and timing of climate change impacts on different sectors of the economy and socioeconomic groups; to underpin future investment strategies, and to ensure that Bangladesh is networked into the latest global thinking on climate change.
- **Mitigation and low carbon development** to evolve low carbon development options and implement these as the country's economy grows over the coming decades.
- **Capacity building and Institutional strengthening** to enhance the capacity of government ministries, civil society, and the private sector to meet the challenge of climate change.

There are Forty-Four (44) specific programs proposed in the BCCSAP under the above six themes. This is relevant for the project as the country is vulnerable to climate change effect.

2.1.9 Public Procurement Rule (PPR), 2008

This is the public procurement rules of Bangladesh and this rule shall apply to the Procurement of Goods, Works or Services by any government, semi-government or any statutory body established under any law. The PPR Rule includes Principles of Public Procurement, Preparation of Tender or Proposal, Methods of Procurement for goods and related services, works, physical services and their use, Preparation of Specification, Processing of Procurement, Contract Administration and Management, Procurement of Intellectual and Professional services and e-Government Procurement, etc.

2.1.10 Noise Pollution Control Rules, 2006

The Department of Environment (DoE) [under the Ministry of Environment, Forest and Climate Change (MoEFCC)] developed a guideline in 2006 called Noise Pollution Control Rules which are currently the only noise-related laws or recommendations in Bangladesh. All Union Councils, Paurashavas/ Municipalities, City Corporations, and City Development Authority (i.e. RAJUK, CDA, KDA, RDA, CoxDA etc.) are authorized to mark off the areas under their jurisdiction as silent, residential, mixed, and commercial or industrial zones according to the Noise Pollution (Control) Rules, 2006. They should also put signs to mark those

areas. The act also describes the approved standard limit of sound in the added schedule 1 and 2 which are described in **Table 2-1** below.

Table 2-1 Noise Permissible Standard as per Noise Pollution Control Rules, 2006¹

Area Category	Permissible Noise Limits [dB]	
	Day Time	Night Time
Mixed Area	60	50
Residential Area	55	45
Silent Area	50	40
Commercial Area	70	60
Industrial Area	75	70

In the Schedule 1, silent area means area up-to a radius of 100 meters around hospitals or educational institutions or special institutions/ establishments identified/ to be identified by the government. In the silent area it is prohibited to use any kind of horns of vehicles, audio signals and loudspeakers. According to this act, daytime is counted from 6am to 9pm whereas nighttime is counted from 9pm to 6am.

2.1.11 National Land Use Policy, 2001

The National Land Use Policy was adopted by Bangladesh government in 2001, setting out guidelines for improved land-use and zoning regulations. The main objectives of this policy are to ensure criteria based uses of land and to provide guidelines for usage of land for the purpose of agriculture, housing, afforestation, commercial and industrial establishments, rail and highway and for tea and rubber gardens. Overall, this policy promotes a sustainable and planned utilization of land. The main contents of this policy are:

- Stopping the high conversion rate of agricultural land to nonagricultural purposes;
- Utilizing agro-ecological zones to determine maximum land use efficiency;
- Adopting measures to discourage the conversion of agricultural land for urban or development purposes;
- Improving the environmental sustainability of land-use practices.

2.1.12 Wetland Protection Act, 2000

The latest Wetland Act -The Playground, Open Spaces, Gardens, and Wetland Conservation Act 2000 -- suffers from loopholes and inadequacies regarding protection of water bodies. Section 1 of this Act suggests that it has application on the water bodies of the cities, divisional and district towns and municipalities. The water bodies in the rural areas are outside the jurisdiction of this Act.

The Act does not have any provision that prohibits construction of any kind of permanent or temporary structure within a determined distance of the water bodies. The Act also does not have any provision that provides that the water bodies that have been marked in survey records and exist in other approved government documents will be recovered if they have been encroached on.

¹ Noise Pollution Control Rules, 2006

The Act specifies the fine and imprisonment term for violation of any of its provisions, it does not direct the government to recover the original characteristics of the water bodies if someone fills them up.

2.1.13 The Motor Vehicle Ordinance, 1983

The Motor Rules, 1983 stated to impose a penalty of maximum two hundred taka for those vehicles that are emitting smokes that poses health hazard in the public places. It also restricts the passenger from smoking in public service vehicles and in any other vehicles with notice of not smoking. This ordinance is enforced occasionally but a regular enforcement would be helpful to reduce air pollution in big cities including Chattogram. However, it is to be noted that amount of the penalty is very low which may be revised as well.

2.1.14 The Embankment and Drainage Act, 1952

This Act consolidates the laws relating to Embankments and drainage. It provides 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.

2.2 Applicability of Legislation Related to the Project

Government of Bangladesh (GoB) has developed a policy framework that requires environmental issues to be incorporated in relation to protection of environment and its resources for economic development planning. A brief description of the key environmental legislation with their applicability for the project is presented in **Table 2-2**.

Table 2-2 Applicability of Key Environmental Legislation at a Glance

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002 and 2010	Department of Environment (DoE) Ministry of Environment, Forests and Climate Change (MoEFCC)	- Define Applicability of environmental clearance - Regulation of development activities from environmental perspective - Framing applicable limits for emissions and effluents - Framing of standards for air, water, and noise quality - Formulation of guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of environment	Applicable	According to the Act “no industrial unit or project shall be established or undertaken without obtaining an ECC from DoE. Therefore, the provisions of the act apply to all of the project intervention phases during the project life cycle.
Environment Conservation Rules (ECR), 2023	Department of Environment (DoE) Ministry of Environment, Forests and Climate Change (MoEFCC)	- Requirement of environmental clearance certificate for various categories of projects - Requirement of IEE/EIA as per category - Renewal of the environmental clearance certificate within 30 days after the expiry - Provides standards for quality of air, water and sound and acceptable limits for emissions/discharges from vehicles and other sources.	Applicable	All development and municipal activities must comply with environmental clearance procedures based on category (Green, Orange-A/B, Red), as defined in ECR 2023. The plan must ensure that solid waste management, infrastructure projects, and industrial activities undergo proper Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) as required. Additionally, air quality standards, noise limits, waste disposal, and effluent

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
				discharge must align with the prescribed environmental quality standards set by the rules.
Air Pollution (Control) Rules, 2022	Department of Environment (DoE) Ministry of Environment, Forests and Climate Change (MoEFCC)	- The standard for ambient air quality and odor, vehicular emissions, industrial emissions (stack emissions, fugitive emissions), municipal solid waste incineration emissions, standard for construction dust control - The Director General of the Department will be responsible for- implementing The National Air Quality Management plan, declaration of an area as a degraded air shed and its management, listing of activities related to air pollution and its management, air pollution prevention plan. - The law commands the owner of the industries and projects to keep in the limit of their air emissions within the national standard by applying best practicable means. Also commands the vehicle management person and authority to comply the mentioned air quality standard and follow the references mentioned in the national air quality management plan in the law. - The department will establish and manage the adequate number of Continuous Air Quality Monitoring Station at a proper place	Applicable	All activities must comply with the National Ambient Air Quality Standards (NAAQS) and control measures outlined in the rules. The EMP must address control of emissions from vehicles, industries, construction sites, and open burning, and promote air quality monitoring, use of pollution control technologies, and enforcement of emission standards. Coordination with the Department of Environment (DoE) is required for air quality reporting and mitigation in high-pollution zones.

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
		throughout the country.		
Environment Court Act, 2010	Ministry of Environment, Forests and Climate Change (MoEFCC) & Judiciary	- Establishment of one or more environment courts in each district and one or more special magistrate courts in each district; - Also provides the jurisdictions of environment court, the penalty for violating courts order, trial procedure in special magistrate court, power of entry and search, procedure for investigation, procedure and power of environment court, authority of environment court to inspect, appeal procedure and formation of the environment appeal court.	Applicable	Under the Environment Court Act, 2010, the EMP must ensure compliance with all environmental laws, as violations such as illegal dumping, air/water pollution, or non-compliance with EIA conditions—may be subject to trial, penalties, or compensation through the Environment Court. The Act empowers the court to take legal action against offenders and provides a mechanism for addressing environmental harm and public grievances, reinforcing the need for strict enforcement and documentation within the EMP.

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
Solid Waste Management Rules, 2021	Ministry of Environment, Forests and Climate Change (MoEFCC)	- The Solid Waste Management Rules, 2021 provide a comprehensive legal framework for the safe and sustainable management of solid waste in Bangladesh. The rules apply to all types of waste generators including households, commercial entities, institutions, and local authorities. Key Provisions. - Source Segregation, Collection & Storage, Prohibition of Open Dumping, Treatment & Disposal, Extended Producer Responsibility (EPR), Institutional Roles, & Public Participation.	Applicable	All urban local bodies, including Chattogram City Corporation, must ensure environmentally sound collection, segregation, storage, transportation, treatment, and disposal of solid waste. The rules mandate source segregation (dry, wet, hazardous), door-to-door collection, prohibition of open dumping and burning, promotion of 3Rs (Reduce, Reuse, Recycle), and establishment of sanitary landfills and composting/recycling facilities in line with public health and environmental safety standards.
The Penal Code	Ministry of Law, Justice, and Parliamentary Affairs	The Penal Code, 1860 is the main criminal law of Bangladesh. It contains provisions that address environmental offenses such as public nuisance (Section 268), negligent acts likely to spread disease (Section 269), water pollution (Section 277), air pollution (Section 278), mishandling of toxic substances (Section 284), and obstruction to public infrastructure (Section 431). These sections allow for criminal penalties—including fines and imprisonment—against individuals or entities causing harm to the environment or public health. The Code complements environmental laws by enabling legal enforcement	Applicable	The Penal Code, 1860 includes provisions (e.g., Sections 277, 278, 284, 285, and 286) that criminalize acts causing public nuisance, negligent handling of hazardous substances, pollution of air or water, and obstruction of public spaces or infrastructure. The EMP must ensure that environmental activities such as waste handling, air pollution control, and construction practices do not violate these provisions, as such actions may lead to

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
		against violators.		fines, imprisonment, or both under criminal law.
Bangladesh National Building Code (BNBC)	Bangladesh Building Regulatory Authority (BBRA) Ministry of Housing and Public Works	The Bangladesh National Building Code (BNBC) is a comprehensive legal framework that sets out minimum standards for planning, design, construction, and maintenance of buildings and related infrastructure in Bangladesh. It aims to ensure structural safety, fire safety, health, sanitation, energy efficiency, environmental protection, and disaster resilience. The BNBC applies to all new and existing buildings and covers both public and private construction.	Applicable	- Construction and Site Management must comply with BNBC provisions for dust control, noise mitigation, waste disposal, and worker safety. - Environmental safeguards—such as erosion control, green buffer zones, and safe material handling—must be integrated into design and construction as per BNBC guidelines. - During construction, ensure proper storage, coverage, and transportation of materials to prevent air and water pollution.
Noise Pollution (Control) Rules 2006	Department of Environment (DoE) Ministry of Environment, Forests and Climate Change (MoEFCC)	The Noise Pollution (Control) Rules, 2006, issued under the Bangladesh Environment Conservation Act, 1995, regulate noise levels across different zones (residential, commercial, industrial, mixed, and silent zones) by setting permissible noise limits (in decibels, dBA). The Rules prohibit use of loudspeakers, vehicle horns, and construction machinery above these limits, especially during restricted hours, and require prior permission for	Applicable	- Ensure noise levels stay within the prescribed limits for each zone (e.g., 55 dBA for residential areas during the day, 45 dBA at night). - Identify and declare silent zones (around schools, hospitals, mosques, etc.) and strictly prohibit honking and loud machinery in these areas.

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
		any public event or construction work that may exceed noise thresholds. Enforcement lies primarily with the Department of Environment (DoE) and local authorities.		• Monitor and report ambient noise levels regularly, especially in high-traffic and construction-prone areas. • Raise public awareness on noise pollution and coordinate with CCC and DoE for enforcement and penalty mechanisms against violators.
National Environment Policy, 2018	Ministry of Environment, Forests and Climate Change (MoEFCC)	The National Environment Policy, 2018 of Bangladesh aims to ensure sustainable environmental management, conservation of natural resources, and pollution control across all sectors. It emphasizes integration of environmental concerns into development planning, adoption of environmentally sound technologies, and promotion of public participation in environmental protection. The policy aligns national goals with the Sustainable Development Goals (SDGs) and international environmental commitments.	Applicable	• Integrate environmental considerations (air quality, waste management, noise, green infrastructure) into all city development plans and activities. • Promote reuse, recycling, and resource recovery through environmentally sound solid waste management. • Encourage community participation in environmental protection activities, including awareness campaigns on pollution and conservation. • Support inter-agency coordination (e.g., CCC, DoE, CDA) for effective enforcement of environmental laws and urban sustainability.

Act/ Rule/ Law/ Ordinance	Enforcement Agency/Ministry/Authority	Summary of Legislation	Applicability to this Project	Applicable Requirement
National Land use Policy, 2001	Ministry of Land (MoL)	The National Land Use Policy, 2001 aims to ensure sustainable and equitable use of land resources in Bangladesh. It promotes planned land use to balance agricultural, residential, industrial, commercial, and environmental needs. The policy focuses on preventing unplanned urban sprawl, protecting agricultural land, wetlands, forests, and environmentally sensitive areas, and integrating land use planning with environmental conservation.	Applicable	• Promote planned and sustainable urban development by integrating land use with environmental management to avoid haphazard expansion. • Protect agricultural lands, wetlands, and green spaces within the city to maintain ecological balance. • Control encroachment and unauthorized land use, especially in environmentally sensitive zones. • Encourage land use practices that reduce environmental degradation and support urban resilience against climate change impacts.

CHAPTER THREE

ENVIRONMENTAL BASELINE

3 ENVIRONMENTAL BASELINE

This section presents the existing environmental baseline status of the project area, focusing on the natural environment. The analysis was conducted using a combination of primary and secondary data, along with extensive on-ground reconnaissance and baseline studies to establish an understanding of the project's natural environmental conditions.

The baseline condition of environmental quality at the project site serves as the foundation for identifying, predicting, and evaluating potential impacts. Environmental quality has been assessed through field studies within the impact zone for various components such as air, noise, and water.

3.1 Meteorology

The Himalaya Mountain range influences Bangladesh's tropical macroclimate because less than half of the country lies within the tropics (Rashid, 1991² and Brammer, 1996³). This results in four distinct seasons-

- **Pre-monsoon season (March to May):** Highest temperatures (up to 36°C), occasional tropical cyclones, and some rainfall.
- **Monsoon Season (June to September):** Highest rainfall (up to 80% annually), high humidity, and cloud cover, causing slight cooling.
- **Post-Monsoon Season (October to November):** Hot and humid conditions with reduced cloud cover; occasional coastal thunderstorms.
- **Dry Winter Season (December to February):** Coolest period, with minimum temperatures dropping below 10°C in some areas; low humidity, scarce rainfall.

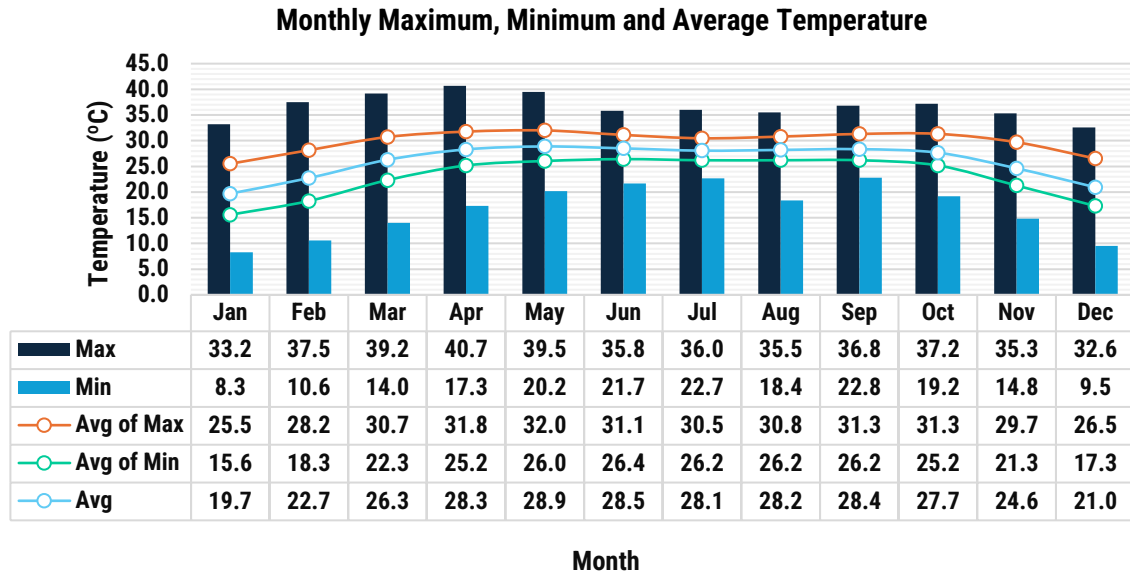
While seasonal patterns are generally predictable, local variations occur across Bangladesh, which is divided into seven climatic zones based on rainfall, temperature, evapotranspiration, and seasonality (Rashid, 1991). The Chattogram City area lies within the southeastern climatic zone. Long-term meteorological data of Chattogram Weather Station from the last 30 years (1994-2023), collected from the Bangladesh Meteorological Department (BMD), was analyzed to determine the study area's microclimatic conditions.

3.1.1 Temperature

The maximum, minimum, and average temperatures recorded at the Chattogram weather station over the last 30 years (1994-2023) are presented in **Figure 3-1**. Monthly maximum temperatures ranged from 32.6°C to 40.7°C, and minimum temperatures from 8.3°C to 22.8°C. The lowest temperature (8.3°C) was recorded in January, and the highest (40.7°C) in April. Peak temperatures occur between March and May, while the coolest months are December and January.

² Rashid, H. E. (1991). "Geography of Bangladesh". University Press Limited, Dhaka.

³ Brammer, H. (1996). "The Geography of the Soils of Bangladesh". University Press Ltd., Dhaka.

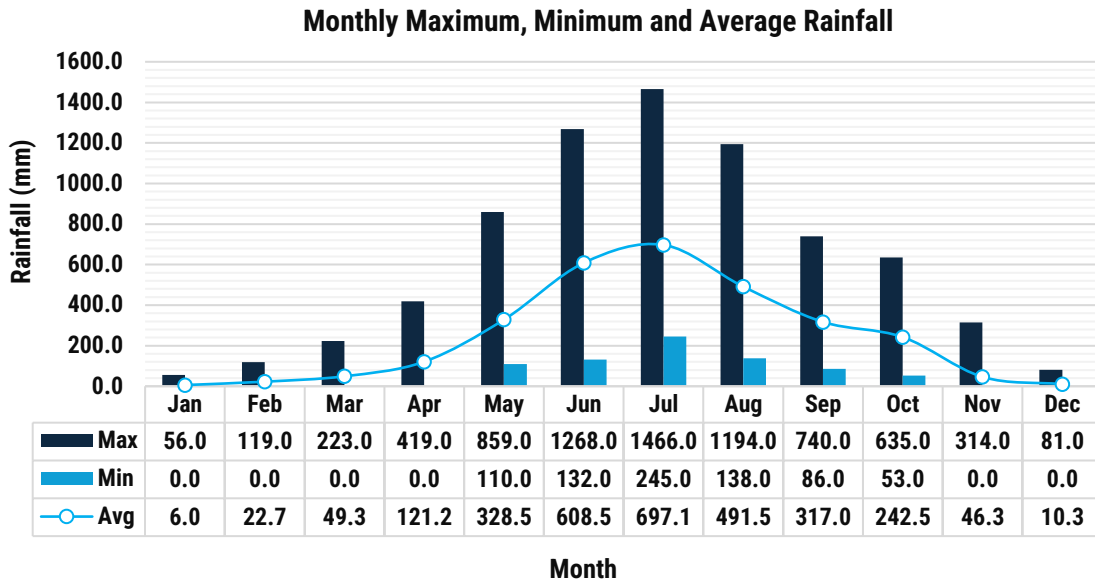


Source: Bangladesh Meteorological Department (BMD)

Figure 3-1 Maximum, Minimum and Average Temperatures of Chattogram Weather Station

3.1.2 Rainfall

About 80% of rainfall occurs during the monsoon season (May to October), with peak rains in June and July. Minimal rainfall is recorded from November to February, while moderate showers occur in March, April, and November. Data shows an annual average rainfall of 2940.9 mm, with the highest monthly rainfall (1466 mm) in July and the lowest during winter months. Monthly maximum, minimum and average rainfall patterns of the at the Chattogram weather station are presented in **Figure 3-2**.

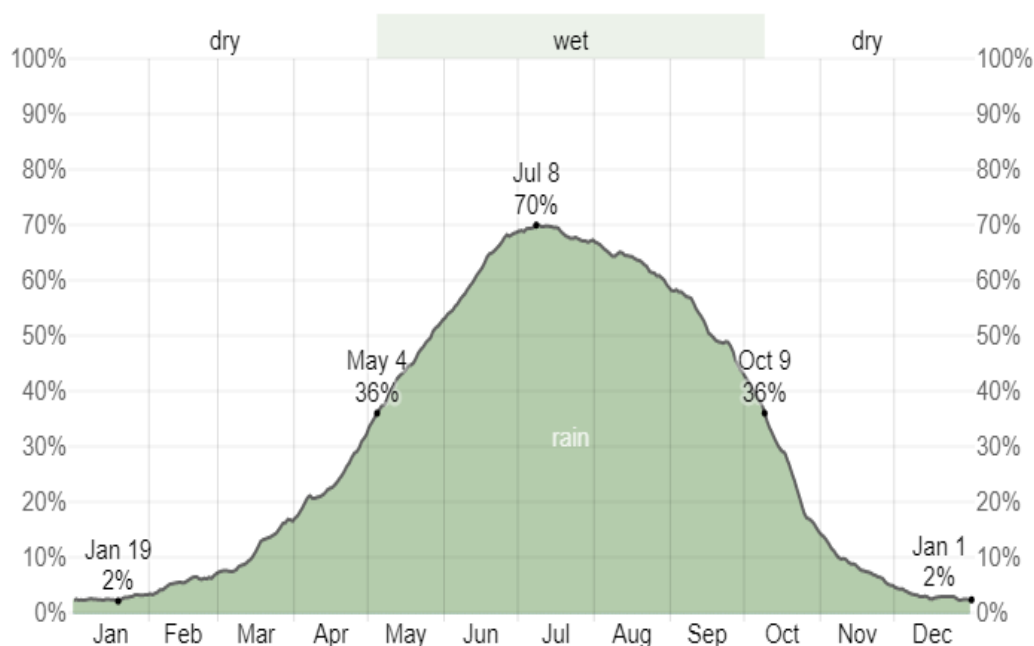


Source: Bangladesh Meteorological Department (BMD)

Figure 3-2 Maximum, Minimum and Average Rainfall of Chattogram Weather Station

A wet day is defined as having at least 0.04 inches of precipitation. The wetter season lasts from May 4 to October 9, with a daily chance of rain above 36%, peak in July with an average of 21.3 wet days. The drier season runs from October 9 to May 4, with January having the fewest wet days (0.8 days). Rain alone

is the most common form of precipitation year-round, reaching a peak probability of 70% on July 8. The daily chance of precipitation in Chattogram are presented in **Figure 3-3**.

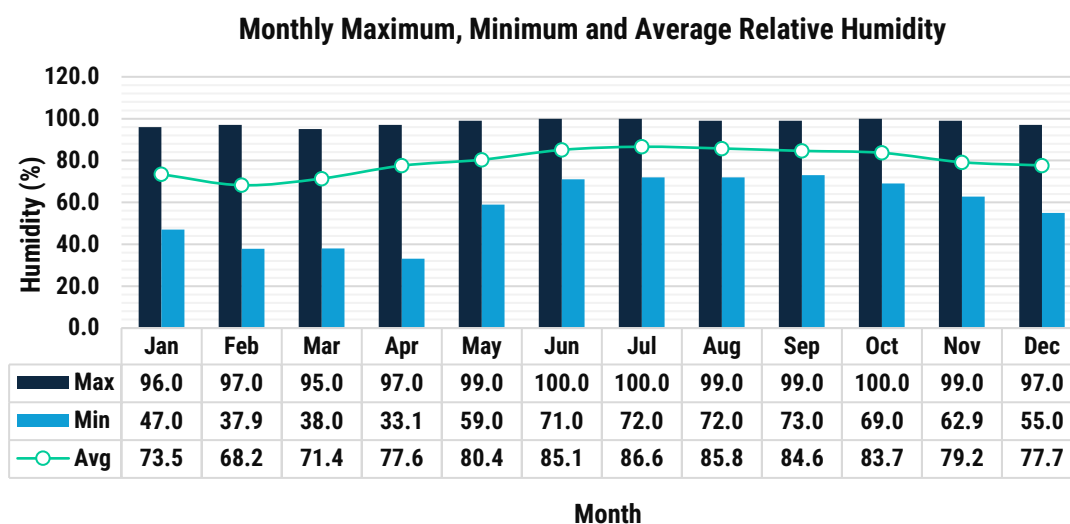


Source: Bangladesh Meteorological Department (BMD)

Figure 3-3 Daily Chance of Precipitation in Chattogram⁴

3.1.3 Humidity

Due to heavy rainfall and proximity to the Bay of Bengal, humidity levels in Bangladesh remain high. In Chattogram, average relative humidity exceeds 80% from May to October, while February is the driest month at around 68.2%. Throughout the year, monthly humidity ranges between 68.2% and 86.6%. **Figure 3-4** shows the monthly maximum, minimum, and average humidity of the Chattogram Weather Station over the past 30 years.



Source: Bangladesh Meteorological Department (BMD)

⁴ Chittagong Climate, Weather By Month, Average Temperature (Bangladesh) - Weather Spark

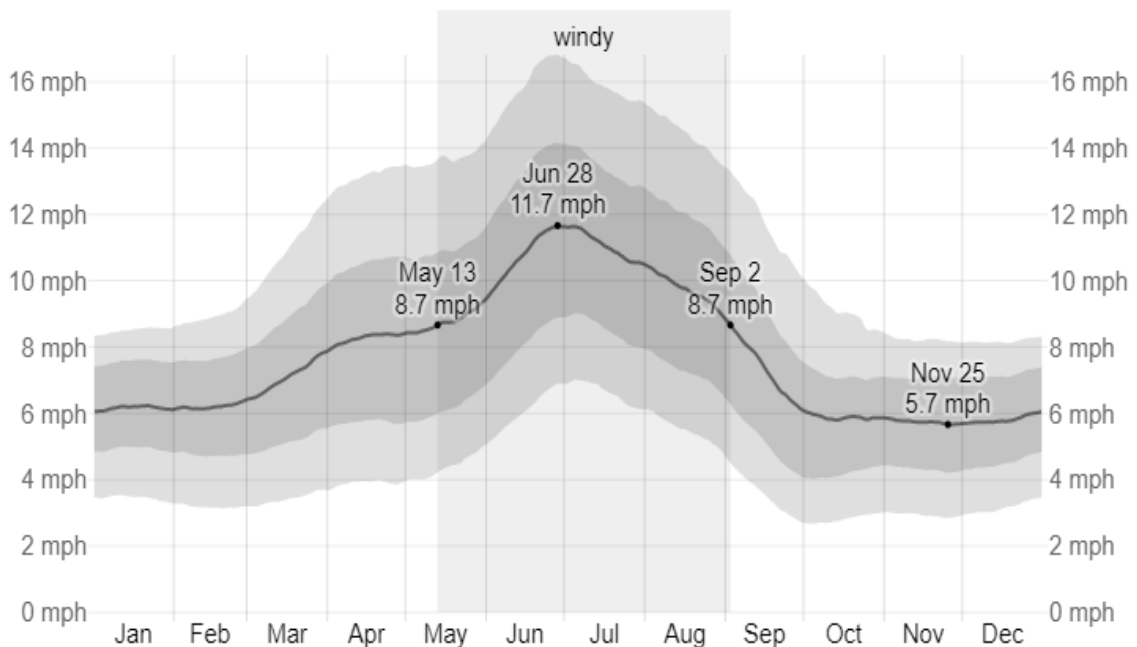
Figure 3-4 Maximum, Minimum and Average Humidity of Chattogram Weather Station

3.1.4 Evaporation

Maximum evaporation in Bangladesh occurs during summer (March-May), peak in April. Mean monthly evaporation ranges from 51 mm in winter to 183 mm in summer. Evaporation rates are generally lower in the eastern region compared to the west and northwest.

3.1.5 Wind and Sunshine

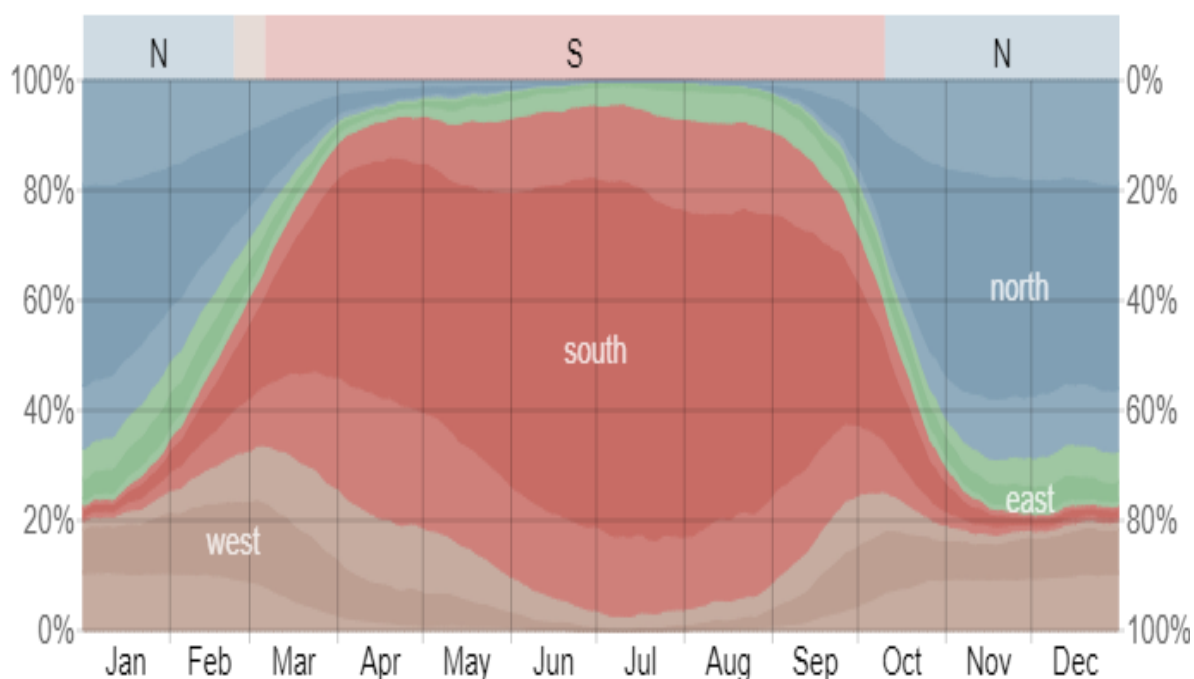
This section covers the wide-area hourly average wind speed and direction 10 meters above ground. Wind patterns vary with local topography, and actual wind speeds fluctuate more than hourly averages. In Chattogram, the windier season lasts from May 13 to September 2, with speeds above 8.7 mph, peak in July at 11.0 mph. The calmer season runs from September 2 to May 13, with November being the calmest month at 5.7 mph. The average mean wind speed of Chattogram are given in **Figure 3-5**.



Source: Bangladesh Meteorological Department (BMD)

Figure 3-5 The Average of Mean Hourly Wind Speeds of Chattogram Weather Station

The predominant wind direction in Chattogram changes throughout the year. Winds are mostly from the west for 1.6 weeks (February 23–March 6), peaking at 34% on March 5; from the south for 7.1 months (March 6–October 10), peak at 93% on July 10; and from the north for 4.4 months (October 10–February 23), peak at 67% on January. The wind direction of Chattogram are presented in **Figure 3-6**.

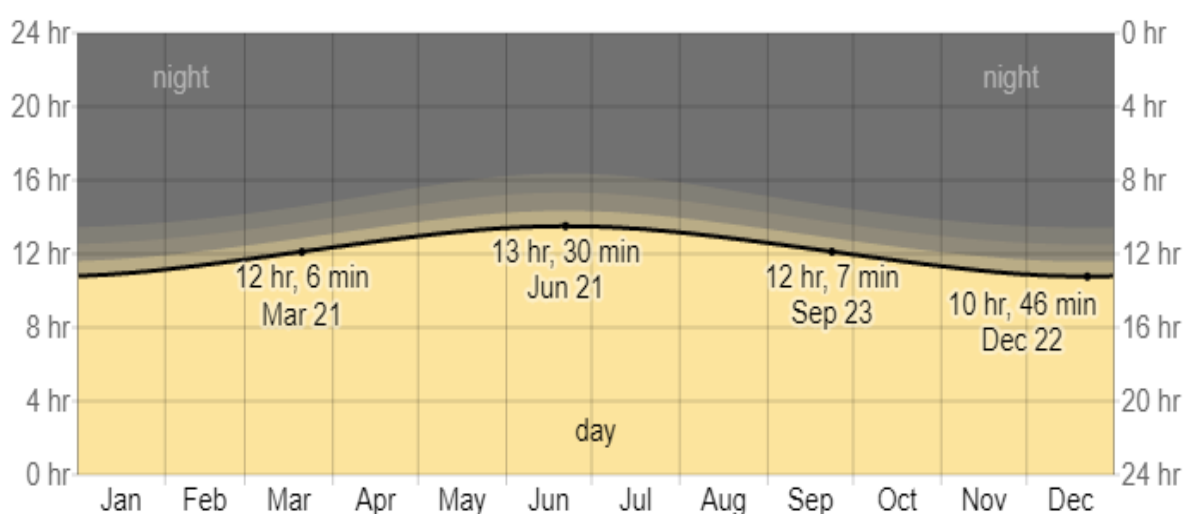


Source: Bangladesh Meteorological Department (BMD)

Figure 3-6 Wind Direction of Chattogram Weather Station

The percentage of hours with mean wind direction from each cardinal point is shown, excluding hours with wind speeds below 1.0 mph. Lightly shaded areas represent intermediate directions (northeast, southeast, southwest, and northwest)⁵. In Chattogram, day length varies from 10 hours 46 minutes on December 22 (shortest day) to 13 hours 30 minutes on June 21 (longest day) in 2023. The hours of daylight and twilight of Chattogram are given in **Figure 3-7**.

The black line shows the number of hours the Sun is visible. Color bands represent full daylight, twilight (civil, nautical, astronomical), and full night. The figure below shows the sun's elevation (the angle of the sun above the horizon) and azimuth (its compass bearing) for each hour and day of the year, with background colors indicating azimuth and black isolines marking constant solar elevation.

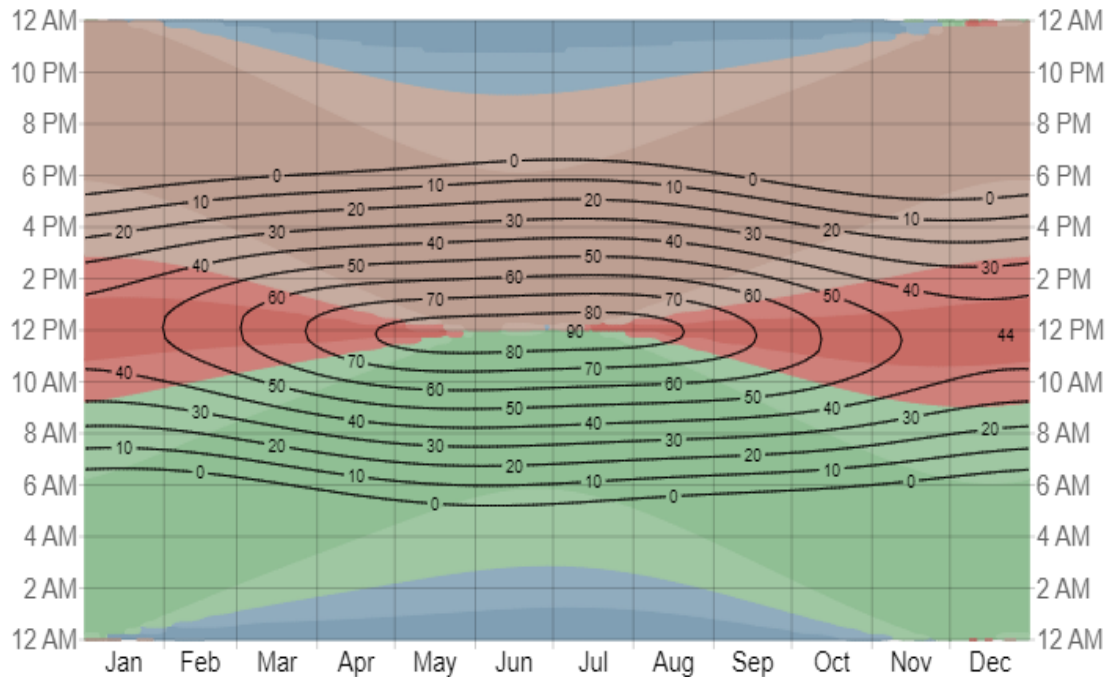


Source: Bangladesh Meteorological Department (BMD)

⁵ Chittagong Climate, Weather by Month, Average Temperature (Bangladesh) - Weather Spark

Figure 3-7 Hours of Daylight and Twilight of Chattogram Weather Station⁵

Solar elevation and azimuth of Chattogram weather station for 2023 are shown in **Figure 3-8**, with black lines indicating constant solar elevation (degrees above the horizon) and background colors representing azimuth (compass bearing). Lightly tinted areas mark intermediate directions between cardinal points (northeast, southeast, southwest, and northwest)⁶.



Source: Bangladesh Meteorological Department (BMD)

Figure 3-8 Solar Elevation and Azimuth of Chattogram Weather Station⁶

3.2 Air Quality

The air quality analysis of the project area from 2013 to 2021 shows fluctuations in the AQI, with 2016 being the highest (145) and 2019 the lowest (107). $PM_{2.5}$ is the main contributor to AQI, followed by PM_{10} , with minor contributions from NO_2 , CO, O_3 , and SO_2 . Winter consistently shows the highest levels of $PM_{2.5}$ and PM_{10} , while the monsoon has the lowest concentrations. Overall, the air quality trend indicates worsening conditions, driven by urbanization and industrialization. The reference pictures of existing air pollution scenario of Chattogram is presented in **Figure 3-9⁷**. Urgent actions, including stricter emission controls, green technologies, and public awareness campaigns, are needed to reduce air pollution.

Further details of air quality are provided in the **Air Quality Management Plan of CMMP** report.

⁶ Chittagong Climate, Weather by Month, Average Temperature (Bangladesh) - Weather Spark

⁷ <https://www.thedailystar.net/views/opinion/news/chattogram-needs-urgent-solution-dust-pollution-2921946>



Source: Secondary Sources

Figure 3-9 Photos of Existing Air Pollution Scenario in Chattogram

3.3 Noise Level

During baseline studies in November 2022, noise levels were measured across commercial, residential, industrial, mixed, and silent zones of the project area. Analysis shows that noise levels at most locations exceeded national standards. Key factors influencing noise include city center traffic flow, road dimensions and materials, crossroad signal systems, and people mobility. Religious, commercial, and refreshment areas also contribute to continuous noise due to large gatherings and chaos. The reference pictures of noise pollution in Chattogram are presented in **Figure 3-10**⁸. In commercial zones, sound pressure level (SPL) ranged from 82.3 to 65.3 dBA (day) and 73.3 to 60.2 dBA (night); in residential areas, 60.9 to 50.5 dBA (day) and 55.5 to 43.3 dBA (night); in industrial areas, 78.2 to 63.1 dBA (day) and 76.5 to 60.2 dBA (night); and in mixed areas, 89.4 to 58.8 dBA (day) and 83.8 to 42.1 dBA (night). At silent zones, SPL (sound pressure level) ranged from 75.4 to 46.8 dBA (day) and 65.2 to 40.4 dBA (night).



Source: Secondary Sources

Figure 3-10 Photos of Existing Noise Pollution Scenario in Chattogram

Further details are provided in the **Noise Level Management Plan of CMMP** report.

⁸ <https://dailyinqilab.com/index.php/health/article/669152>

3.4 Solid Waste Management of Pourashavas under CDA Jurisdiction

3.4.1 Waste Collection

Currently, waste in these Paurashavas (Boal Khali, Patiya, Raozan, Hathazari and Rangunia) is collected using traditional methods, mainly through a one-way system: waste from fixed or mobile roadside bins is collected by rickshaw vans, dump trucks, or other vehicles and transported directly to dumpsites. The existing waste collection systems of the Pourashavas is presented in **Figure 3-11**. Community bins are placed along streets for residents and waste generators. Patiya, Raozan, and Hathazari occasionally provide door-to-door collection, while Boalkhali and Rangunia have no such service.

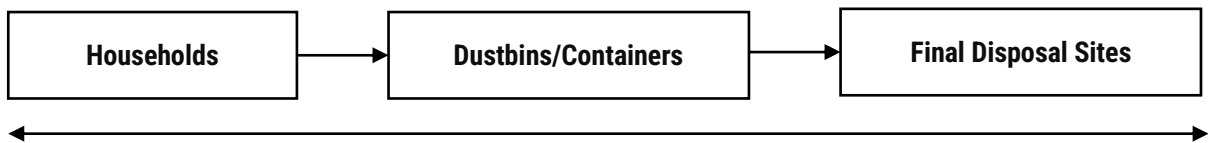


Figure 3-11 Waste Collection Path of the Pourashavas

Two types of storage bins are used in the Paurashavas: 60 kg concrete bins and 20 kg plastic bins, mostly placed along roadsides. The number and types of dustbins typically use in the Pourasvas is given in below **Table 3-1**. Many plastic bins are stolen or damaged, and concrete bins are poorly maintained. Open bins often emit foul odors, attract stray animals, and increase the risk of diseases like malaria and typhoid. The pictures of different waste collection bins/dustbin which are typicallu use in the Pourashavas is given in **Figure 3-12**. Primary waste collection occurs between 6 AM and 12 PM.

Table 3-1 Number and Types of Dustbins in the Pourashavas

Type of Dustbin	Pourashavas				
	Boal Khali	Hathazari	Patiya	Raozan	Rangunia (Partial)
Concrete Bin	10	10	12	15	09
Plastic Bin/Containers	120	80	150	250	90

Source: Discussion with the Respective Pourashavas Representative and Literature Review



Concrete Bin



Plastic Container/Waste Bin

Figure 3-12 Existing Waste Collection Practices in the Pourashavas

3.4.2 Waste Transportation

Solid waste transportation system in Paurashavas is complex and labor-intensive. The Conservancy Department schedules MSW (Minicipal Solid Waste) collection and assigns vehicles like dump trucks, non-motorized and motorized vans, payloaders, and hand trolleys. The list of different waste trasnporation vehicles use in the Pourashavas is given in **Table 3-2**. Dump trucks (1.5 tons) and vans (60 kg) collect waste from bins and transport it to open dumpsites. Most vehicles are outdated, causing high costs, low efficiency, and more pollution. Unplanned trips and low worker awareness further reduce efficiency and increase overall costs. Dump trucks are primarily used for transporting waste to distant dumping sites. Different types of waste vehicles usually used in the Pourashavas are presented in **Figure 3-13**.

Table 3-2 Waste Transportation Vehicles Used in the Pourashavas

Type of Vehicles	Pourashavas				
	Boal Khali	Hathazari	Patiya	Raozan	Rangunia (Partial)
Dump Truck	02	03	02	02	01
Normal Truck	-	-	01	-	01
Van	13	08	15	13	10
Excavator	-	-	01	01	-

Type of Vehicles	Pourashavas				
	Boal Khali	Hathazari	Patiya	Raozan	Rangunia (Partial)
Tractor	-	01	-	-	-
Pay Loader	-	-	01	-	-
Hand Trolley	10	15	21	30	16

Source: Discussion with the Respective Pourashavas Representative and Literature Review



Non-Motorized Van



Motorized Van



Dump Truck/Normal Truck



Hand Trolley



Excavator

Figure 3-13 Different Waste Transportation Vehicles in the Pourashavas

3.4.3 Collection Route

The waste collection system of the Pourashavas does not follow a predetermined route plan. Instead, waste collection vehicle drivers have the freedom to choose routes taking into account real-time factors such as road conditions and traffic congestion.

3.4.4 Training

There is no official (monthly, annually etc.) training provisions for the workers and cleaners. However, Conservancy inspectors and supervisors are sometimes given safety and sanitation workshops so that cleaners/laborers can maintain safety precautions while working.

3.4.5 Working Environment and Occupational Safety

Waste collectors in these Paurashavas generally work under unsafe conditions. Unfortunately, only a small portion of these staff members have access to safety equipment such as vests, while other essential items like masks, gloves, and occasionally boots are often unavailable. Moreover, they frequently work alongside heavy vehicles on roads that lack specific traffic signs, signals, or markings to ensure their safety.

3.4.6 Workshop for Maintenance and Purchase of Vehicle

None of the Paurashavas have their own workshop for repairing and servicing works. Therefore, they usually use local sources for vehicle repair and servicing work.

3.4.7 Final Disposal

Open dumping is the primary method of solid waste disposal in the Paurashavas, with waste transported to inadequate and mostly illegal temporary sites. The list of the disposal sites of the Pourashavas with the land status is given in **Table 3-3**. Waste is dumped without segregation, compaction, or cover, creating unhygienic conditions. None of the sites have DoE clearance, and waste is often crudely dumped in open areas, lowlands, or water bodies. The system is unsanitary and needs urgent improvement. The pictures of the final disposal sites of the Pourashavas is presented in **Figure 3-14**.

Table 3-3 Number of Final Disposal Sites of the Pourashavas

Type of Land	Pourashavas				
	Boal Khali	Hathazari	Patiya	Raozan	Rangunia (Partial)
Rented Land	01	01	01	02	01
Govt. Land	02	01	01	-	-
Total Number	03	02	02	02	01

Source: Discussion with the Respective Pourashavas Representative and Literature Review



Figure 3-14 Final Waste Disposal/Dumping Sites of the Pourashavas

3.4.8 Present Recycling Process

Among the five (05) Paurashavas under the CDA jurisdictions, only Raozan Paurashava has initiated the efforts for organic waste management, including Black Soldier Fly (BSF) farming, although this initiative remains limited in scale. Additionally, Raozan Paurashava hosts a Plastic Recycling Plant. The pictures of the present scenario of the recycling process in Raozaon pourashav is given in **Figure 3-15**. Other Paurashavas lack formal recycling programs, although some marketable waste items like plastic bottles, metal, and paper are collected and sold to the recycling market.



Figure 3-15 Existing Scenario of Recycling Process in Raozan Pourashava

Clarification of the details are provided in the **Working Paper: Solid Waste Management of Pourshavas.**

3.5 Solid Waste Management of Chittagong City Corporation (CCC)

3.5.1 Organizational Structure of CCC Related to Waste Management

Chittagong City Corporation (CCC) has not yet established a full Waste Management Department (WMD) to handle solid waste management. Currently, the responsibility for solid waste management is divided between two functional departments: the conservancy and engineering departments. However, in 2019, a Waste Management Cell (WMC) was created to oversee solid waste management activities and coordinate with various departments involved in these responsibilities⁹.

3.5.2 Waste Collection

Waste generation in CCC is influenced by socio-economic factors like diet, income, lifestyle, demographics, and population density. In Fiscal Year (FY) 2019-2020, CCC generated about 3,000 tonnes/day: 67% (2,010 tonnes) collected, 8% (240 tonnes) recycled, and 25% (750 tonnes) uncollected⁸. Per capita generation was 0.60 kg/day. Households produced 1,830 tonnes/day (61%), businesses 510 tonnes/day (17%), and road sweeping/construction 660 tonnes/day (22%). Special occasions like Eid-ul-

⁹ Waste Transportation and Collection Plan 2021 of Chittagong City Corporation (CCC),

Azha cause temporary spikes. In FY 2020-2021, generation rose to 3,063 tonnes/day, with domestic waste at 1,868 tonnes/day (61%), road/construction waste 521 tonnes/day (17%), and commercial waste 674 tonnes/day (22%)⁸. Waste generation varies across wards, with Wards 07, 08, and 14 being major contributors.

3.5.3 Solid Waste Composition

Food waste is the largest component, making up 63.28% of total waste: 73.40% of household, 55.70% of market, 77.10% of restaurants, 44.50% of office, and 27.40% of street waste⁸, highlighting the need for frequent collection and recycling opportunities.

3.5.4 Waste Flow

The waste flow traces waste from generation to disposal. Street and construction waste is managed by CCC and sent to municipal points or landfills (LFS). Non-recyclable household and commercial waste is collected by primary collectors and moved to landfills, while recyclables are handled by recycling buyers, primary collectors, and landfill workers. About 254 tonnes (8%) are recycled daily, but around 785 tonnes (26%) are uncollected or improperly dumped in canals, drains, or open spaces. As of 2021, about 2,024 tonnes/day (71%) are landfilled⁹.

3.5.5 Existing Waste Collection System

3.5.5.1 Primary Collection

▪ Door-to-Door Collection

Since 2016, CCC workers have been collecting waste from households, commercial buildings, and markets, transporting it to Secondary Collection Points (SCPs). About 1,995 daily collectors, 1,000 rickshaw vans, and 56 Tom-Toms are engaged¹⁰. With JICA's assistance, CCC introduced compactor truck-based collection in Nasirabad Housing Society (Ward 8) and Agrabad Commercial Area (Ward 28) in 2018, using primary collectors on fixed routes and schedules¹¹.

▪ Primary Waste Collection Vehicles

CCC's fleet includes 1,069 Rickshaw Vans (RVs) 801 traditional and 56 motorized Tom-Toms serving 5.07 million people. The absence of top covers on these vehicles causes odor during transport. CCC recently added 200 donated RVs and purchased 50 modified RVs compatible with 7.5-ton compactors for efficient unloading. JICA also provided 35 prototype RVs⁹. The pictures of different primary waste collection vehicles of CCC is given in **Figure 3-16**. To overcome the labor-intensive nature of traditional vehicles, CCC and JICA introduced and tested new RV and HT designs compatible with compactors. CCC is currently piloting 6 JICA-provided prototype RVs, with ongoing research for further improvements⁸.

¹⁰ Waste Report 2019-2020 of Chittagong City Corporation (CCC)

¹¹ Conservancy Department of Chittagong City Corporation (CCC)



Figure 3-16 Different Primary Waste Collection Vehicles of CCC

3.5.5.2 Secondary Collection

Waste accumulated in SCPs, STSs, and dustbins is categorized into household waste, street waste (including drain sludge), and business waste. CCC cleaners collect street and drain waste daily after sweeping and cleaning, transporting it by trolley to nearby SCPs. Primary collectors drop waste into containers or directly load it into Compactors (CM), Open Trucks (OT), or Dump Trucks (DT); sometimes, they end up tossing the waste at a nearby Secondary Transfer Station (STS) or, unfortunately, in open areas near roads or drains. The collected waste is then transported to the landfill by compactors, container carriers, dump trucks, or open trucks.

▪ Secondary Waste Collection Vehicles

CCC operates 189 vehicles for secondary collection, including compactor trucks, open trucks, dump trucks, and container carriers. The pictures of different secondary waste collection vehicles of CCC are given in **Figure 3-17**. In 2018, JICA provided 38 vehicles (13 compactors, 13 container carriers, and 12 dump trucks), introducing compactor trucks for the first time. Dump trucks account for over 70% of the fleet, followed by container carriers at 15%. CCC also uses 19 payloaders for loading waste into dump trucks.





Container Carrier



Proto-type RV & Compactor Truck

Figure 3-17 Different Types of Secondary Waste Transportation Vehicles of CCC

▪ Secondary Waste Collection Points (SCPs)

CCC has 888 SCPs, categorized as concrete bin spots (CBS), open spots (OS), container spots (CTS), plastic bin spots (PBS), and STS. Open spots make up 58% and concrete bins 29%. Additionally, 35 plastic bin spots and 70 container spots have been installed. Only six STSs are functional (in wards 4, 10, 14, 29, 37, and 41), but are underutilized due to poor road conditions. The total capacity of SCPs (excluding open spots) is only 655 tons, insufficient for the 5.07 million population⁹.

▪ Waste Transportation from SCPs to Landfill Sites

Waste is transported using compactor trucks, open trucks, dump trucks, and container carriers. CM, OT, and DT haul waste directly to landfills, while OT and DT also collect from STSs using payloaders. Container carriers swap full containers with empty ones and transport the waste as part of a hauled container system⁹.

3.5.6 Waste Collection Management

The Conservancy Department of CCC manages the entire solid waste collection process, from household collection to transporting waste to SCPs (dustbins, containers, STSs) and handling loading and unloading at Halishahar and Arefin Nagar landfill sites (LFS).

3.5.7 Collection Route

CCC has no route plan for waste collection. Instead, waste collection vehicle drivers can choose routes considering real-time factors such as road conditions and traffic congestion⁹.

3.5.8 Working Hours

Since March 2020, CCC collects and transports waste from 2 PM to 8 PM due to COVID-19, while container carriers and some open trucks start early mornings to minimize daytime disruption⁹.

3.5.9 Work Standard

CCC ensures regular waste collection on set daytime schedules, but specific performance standards like frequency, complaint response, route adherence, and collection point cleanliness are yet to be established.

3.5.10 Collection Zone

CCC's 41 wards are divided into two zones: the North Zone (22 wards) transports waste to Arefin Nagar LFS, while the South Zone (19 wards) uses Halishahar LFS⁹.

3.5.11 Waste Collection Crew

Around 2,000 contractual "Sebok" collectors begin waste collection from households, markets, and offices at 2:00 PM using rickshaw vans or tri-cycle tom-toms. Additionally, 312 workers (146 permanent, 166 temporary) handle loading and unloading, while 196 workers are assigned to special cleaning in zones and VIP areas⁹.

3.5.12 Waste Segregation

Primary collectors use rickshaw vans or tom-toms and they perform minimal segregate of recyclables like PET bottles, plastics, and metals. Despite CCC and JICA's promotion efforts, source segregation by citizens remains limited at the pilot stage.

3.5.13 Training

Currently, conservancy inspectors and supervisors have attended safety and sanitation workshops in each ward to ensure that cleaners can maintain safety precautions while working.

3.5.14 Working Environment and Occupational Safety

Waste collectors work in unsafe conditions, with limited access to safety gear and little protection from traffic due to the lack of signs or signals.

3.5.15 Waste Collection Vehicle Maintenance

The Mechanical Division of the Engineering Department handles the procurement and maintenance of waste collection vehicles, funded by the department's budget. JICA also supports this through the Grant Aid Project (GAP), providing new vehicles like compactors and dump trucks. The division manages workshops, fuel, driver supervision, and vehicle operations, maintenance, and repairs. Vehicle allocation is decided by the Engineering Department based on proposals from the Conservancy Department. The Mechanical Engineering Branch, led by a Superintendent Engineer (SE), oversees tool and equipment maintenance and reports to the Chief Engineer.

3.5.16 Street Sweeping

A team of 752 street sweepers, including 297 permanent and 455 temporary staff, keeps the city clean. Of these, 634 are assigned to various wards, while 118 focus on specialized cleaning tasks at CCC headquarters, zonal offices, and the Chattogram shopping complex. All staff wear green uniforms and use wheelbarrows. Street sweeping in CCC is mainly done manually using brooms, with wheelbarrows for transporting waste to secondary collection points. These wheelbarrows are stored at ward offices. CCC also has five mechanical street sweepers, two of which have been idle since 2013 due to dust issues. Recently, three new eco-friendly Dulevo 850 sweepers were received and will soon be operational after

operator training. These compact sweepers are designed for both environmental friendliness and access to difficult areas.

3.5.17 Drain Cleaning

In CCC, drain cleaning is primarily done manually. A total of 512 cleaners are assigned to 41 wards for drain cleaning. These cleaners unclog water-filled drains and sometimes take part in special drain cleaning programs.

3.5.18 Waste Processing and Treatment Facility

3.5.18.1 Recycling

In CCC, recycling is mainly handled by the informal sector, recovering about 240 tons daily (8% of total waste). It happens in three phases: **(1) Source Separation**—residents sell recyclables to hawkers, though this is declining; **(2) Collection by Tokai**—poor children collect low-value recyclables from bins and dumps; and **(3) Recovery at Dump Sites**—scavengers collect materials at landfills, selling them to recycling shops and factories.

3.5.18.2 Compost Plant

In 2005, CCC established a compost plant at the Hali Shahar landfill with support from UNICEF, the Public Health Department, and Waste Concern. Initially focused on fuel and fiber production, it later shifted to composting, producing about 25 tons of compost annually. Currently, the plant produces 1 ton of compost per day, operated by a team of 1 manager and 4 workers. The input materials are: fruit and vegetable market waste (55%), food waste (15%), cow dung (10%), grass and leaves (10%), and drainage waste (10%) by weight. The plant uses aerobic composting with passive aeration and also has a blower system for forced aeration.

3.5.19 Final Disposal/Landfill Sites

Presently, Chattogram has two disposal stations: Arefin Nagar (Bayazid Bostami) for northern 22 wards and Hali Shahar (Anandabazar) for southern 19 wards. The existing conditions of the landfill sites of Chittagong City Corporation (CCC) is given in **Figure 3-18**. Due to poor management, these sites have grown into massive garbage mounds, with the Hali Shahar dump reaching about 300 feet in height⁹. Presently, the operation method of solid waste at both landfill sites is crude open dumping. The Conservancy Department dispatches conservancy supervisors and cleaners, while the Mechanical Engineering branch provides additional support (pool assistance) to both landfill sites (LFSs) for daily operations. The staffs work in two shifts in both LFSs. The Mechanical Eng. branch also provides heavy equipment and operators to landfill sites; however, there is no task description, work record, or operation plan for the landfill sites.



Arefin Nagar Landfill Site



Haliashahar Landfill Site

Figure 3-18 Existing Landfill Sites of CCC

For detailed information, please refer to the **Working Paper on Solid Waste Management for CCC**.

3.6 Water Quality

3.6.1 Surface Water/Industrial Effluents

Surface water in and around the city is polluted by untreated municipal and industrial waste dumped into swamps and natural channels. The reference pictures of Surface Water/ Industrial Effluents Pollution Scenario in Chattogram in given in **Figure 3-19**. During baseline studies in November 2022, twelve surface water/industrial effluent samples were analyzed from the Karnaphuli and Halda Rivers, Vatiary Lake, Bay of Bengal, and project corridor canals. Heavy metal concentrations (Cd, Cr, Pb) were within DoE standards. However, turbidity was present at all locations, causing discoloration. DO levels were below standard in some sites, mainly due to untreated household, industrial, and municipal discharges, especially in the dry season. Low DO and high BOD levels indicated significant organic pollution. TSS levels were well below the inland surface water standard (150 mg/l). Overall, commercial, industrial, and household activities are major contributors to surface water deterioration.

In addition, according to the Heavy Metal Pollution Index (HPI), the relative abundance of heavy metals was in the order of Lead (Pb) > Chromium (Cr) > Cadmium (Cd). The concentration ranges varied widely: Pb (2.14–35.71 mg/L), Cr (0.01–1.31 mg/L), and Cd (0.00–0.00 mg/L). Industrial activities around the study area likely contributed to the elevated levels of heavy metals observed. Detailed clarification is provided in the **Baseline Environmental Monitoring Report for CMMP** report.

The Karnaphuli and Halda rivers, vital to Chattogram's economy and ecology, face severe threats from unchecked pollution. Chattogram's six million residents generate 1,800–2,000 tons of garbage daily, with 22 tons of waste entering the Karnaphuli River daily through 52 canals and drains (Source: CCC). Additionally, blood from 400 slaughterhouses is dumped into the river daily (Source: DoE). Key dumping points include Mahesh Khal, Murari Khal, and Chaktai Khal¹².

Pollution from 720 industrial units, ranging from Chandraghona to the river mouth, worsens the situation. Despite a 2013 High Court directive to stop encroachment and pollution, violations persist. Industries—such as tanneries, textile factories, oil refineries, fertilizer and chemical plants, fisheries units, pesticide factories, cement factories, and Karnaphuli Paper and Rayon Mills—continue discharging hazardous

¹² <https://www.dhakatribune.com/bangladesh/development/84975/master-plan-for-karnaphuli-river-underway>

waste. Notably, 1.5 lakh liters of tannery waste, 35 tons of China clay, and 4 tons of fibers are dumped daily. Fertilizer factories release 145 m³ of pollutants per hour and 35 metric tons of China clay daily, while tanneries flush over 100 metric tons of hazardous waste weekly¹³. Alarming, scientists detected near-risk levels of radioactivity in the riverbed¹⁴. Locals report that Chaktai Khal carries 70% of the city's liquid waste to the Karnaphuli, highlighting pollution from black water and oil spills by boats¹³.

Similarly, the Halda River, a key carp spawning ground, is severely polluted by industries like Asian Paper Mill, Madina Tannery, Riff Leather, and others. Wastewater flows into Halda through feeder canals like Katakali, Krishnakali, Khandakia, Madari, and Kuaish. ETP overflow from Asian Paper Mill and scattered solid waste further worsen the situation. Household waste from Bayezid-Oxygen areas also drains directly into Halda¹⁵.

Detailed clarification are provided in the **Water Quality Management Plan of CMMP Report**.



Source: Primary and Secondary

Figure 3-19 Existing Surface Water/ Industrial Effluents Pollution Scenario in Chattogram

3.6.2 Groundwater Quality

During baseline studies in November 2022, eight groundwater samples were analyzed from supply water, deep tube wells, and tube wells near the project corridor. Most parameters met DoE standards, though BOD and COD levels were slightly above limits due to leaching of municipal waste, increasing organic content and oxygen demand¹⁶. Iron (Fe) and Manganese (Mn) concentrations were slightly high, while chloride was lower than standard. Total and fecal coliforms were absent in all samples. Heavy metal analysis (arsenic, cadmium, chromium, iron, manganese) showed groundwater was suitable for drinking, with metal abundance in the order Mn>Cr>Cd>Fe>As. Chattogram WASA supplies both treated surface water (from Karnaphuli River via Modunaghat Plant) and treated groundwater [via Kalurghat Iron Removal Plant (KIRP)].

Further details are described in the **Baseline Environmental Monitoring of CMMP Report**.

¹³ <https://dailyasianage.com/news/27028/countinous-pollution-of-Karnafuli-River>

¹⁴ <https://www.thedailystar.net/news-detail-210384>

¹⁵ <https://www.dhakatribune.com/bangladesh/6938/industrial-household-waste-killing-halda-river>

¹⁶ <https://www.scrip.org/reference/referencespapers?referenceid=2049925>

CHAPTER FOUR

ENVIRONMENTAL MANAGEMENT PLAN

4 ENVIRONMENTAL MANAGEMENT PLAN

The Environment Management Plan (EMP) is required to ensure sustainable development in the area surrounding the project. Hence, it needs to be an all encompassive plan for which the industry, Government, Regulating agencies; like the Department of Environment (DoE) working in the region, and the local residents of the area need to extend their co-operation and contribution.

The mitigation measures are recommended in order to synchronize the economic development of the project area with the environmental protection of the region. The environmental impacts are due to continuous operation of the project; hence, the emphasis in the Environment Management Plan (EMP) is to minimize such impacts. Compliance monitoring of mitigation measures would be ensured through implementation of the EMP while attending necessary corrective measures, if any impacts are identified through monitoring and feedback.

4.1 Air Quality Management Plan

The Air Quality Management Plan is to create a framework for identifying major pollution sources and implementing control measures key prerequisites for sustainable urban development. By establishing a proactive and coordinated response framework, this plan aims to address high pollution episodes effectively and ensure the resilience of the community in the face of air quality challenges. The below **Table 4-1** describes the respective sets of source & impact, mitigation measures, their responsible agency and timeline for ensuring implementation of the proposed mitigation measures.

Table 4-1 Environmental Management Plan for Air Quality

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
Industrial Emissions (Stationary Sources)	Air pollution (PM, SO ₂ , NO ₂ , VOCs)	• Adopt cleaner & energy efficient technologies • Enforce emission standards • Implement Emission Control Devices and Technology Upgrades • Transition to cleaner fuels • Enforce strict zoning regulations for heavy industries, ensuring they are away from schools, hospitals, and homes. • relocate high-emission industries from densely populated areas to industrial zones equipped with air quality management systems. • Promote and support the development of Eco-Industrial Parks/zones in Chattogram to support industries in adopting sustainable practices. • Provide financial and technical support for the establishment of Eco-Industrial Parks, particularly in heavy industrial areas of Chattogram. • Develop and enforce zoning laws that limit industrial activities in urban and residential areas. • Provide relocation assistance and incentives for industries that move to designated eco-industrial zones. • Mandate CAMS installation for real-time emissions monitoring linked to government agencies, and create an online platform for public access to industrial emissions	Department of Environment (DoE); Chittagong City Corporation (CCC)	Immediate and ongoing

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
		data. - Promote circular economy practices and encourage industry partnerships to share best practices in waste reduction, energy efficiency, and emissions control to lower overall emissions. - Prohibit the open burning of industrial waste, enforce proper disposal under the Solid Waste Management Rules 2021, and require industries in the Orange and Red Categories to submit approved Waste Management Plans and AQMPs/EMPs to obtain occupancy certificates.		
Fugitive Dust from Industries	Localized air pollution, health risks	- Enclose material storage and handling areas - Install dust extraction and suppression systems	Industries; Department of Environment (DoE)	6–12 months
		Advocacy Actions - Advocate with national bodies (MoEFCC, BPC, DOE, Ministry of Finance) to promote the import and use of low-sulfur (50 ppm) diesel for vehicles, farming machinery, and fishing trawlers. - Advocate with the Ministry of Agriculture to include policies on cleaner fuel for machinery in farming. - Advocate with the Ministry of Agriculture to include policies on cleaner fuel for fishing trawlers and boats in the fishing industry. - Promote the introduction of cleaner vehicle models (Euro-3 and Euro-4 standards) on the roads. Direct Actions - Monitor fuel stations to ensure compliance with cleaner	Bangladesh Road Transport Authority (BRTA); Department of Environment (DoE); Chattogram Metropolitan Police	Immediate and ongoing
Vehicle Emissions (Mobile Sources)	Traffic-related air pollution, GHG emissions			

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
		fuel standards. - Regular fitness tests must be conducted, with computerized emission testing for all vehicles. - BRTA must operate mobile courts to penalize vehicles emitting noxious fumes. - Enforce mandatory retirement or retrofitting of aging vehicles (buses >20 years, trucks >25 years), prioritizing high-emission heavy-duty vehicles. - BRTA and Chattogram Metropolitan Police must remove unfit vehicles from the roads under Article 36 of the Road Transport Act 2018. - Expand high-quality public transport systems, including Bus Rapid Transit (BRT) and metro rail, to reduce reliance on private vehicles. - Promote smart and multi-story parking solutions through public-private partnerships.		
Traffic Congestion	Increased emissions, public health impact	- Effective steps must be taken to reduce traffic congestion, including introducing signal automation. - Create dedicated bus lanes and improve traffic flow	Chittagong City Corporation (CCC); Chattogram Metropolitan Police	1–2 years
Promotion of EVs	Reduced vehicular emissions	- Promote EV adoption by offering tax rebates, registration discounts, low-interest loans, subsidies for EV purchases, and privileges like free parking, access to priority lanes, or exemption from traffic restrictions. - Support EV infrastructure by subsidizing businesses and developers to install fast-charging stations in public parking lots, shopping centers, and residential areas.	Ministry of Finance; Chittagong City Corporation (CCC); Private Sector	1–3 years

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
Emission from Brick Kiln	Severe air pollution, health risks	Encourage fleet transition by providing incentives for public and private operators to shift to electric buses, vans, and service vehicles, and by designating EV-only zones in densely populated areas.	Chittagong Development Authority (CDA); Department of Environment (DoE); Chittagong City Corporation (CCC)	Immediate and ongoing
		- Ban high sulfur coal ✓ Close illegal brick kilns ✓ Use eco-friendly blocks ✓ Promote Hoffman and VSBK kilns ✓ Form task force for enforcement - Mandate use of blocks as per government targets (10%-100% from 2019-2025) ✓ Include block use in tender schedules ✓ Extend block use to private sector ✓ Offer incentives for block production		
		Conduct awareness campaigns		
Air Pollution from Waste	Air pollution, health hazard, odor	- Refuse licenses without waste management plan - Monitor compliance through mobile courts - Form task force to monitor hospitals, to stop waste burning - Enforce penalties under "Polluter Pay" principle - Ensure quick, covered transport of waste - Clear roadside drains promptly - Sensitize markets and commercial areas - Penalize households for littering	Chittagong Development Authority (CDA); Department of Environment (DoE); Chittagong City Corporation (CCC)	Immediate and ongoing

Chattogram Metropolitan Master Plan (Period 2025 – 2050)

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
Road Dust (Area Sources)	Dust pollution, respiratory diseases	- Regular vacuum sweeping - Dust suppression measures like dust suckers & water spraying (non-groundwater) on the streets especially on the hot spots - Repair footpath gaps and green divider islands	Chittagong City Corporation (CCC)	Daily and ongoing
Mud on Vehicle Wheels	Spread of dust on roads	- Clean wheels before city entry - Letter from BRTA to Transport Owners Association	Bangladesh Road Transport Authority (BRTA); Chittagong City Corporation (CCC)	3–6 months
Construction Site Dust	Air pollution from exposed materials	- Enclosed sites and cover materials - Water spraying twice daily - Temporary shelters to prevent dust spread	Contractors; Chittagong City Corporation (CCC)	Immediate and ongoing
Road Construction Dust and Delays	Prolonged dust exposure, traffic disruptions	- Timely completion of works - Impose fines and blacklist delayed contractors - Install Mini Asphalt Plants to prevent open bitumen burning	Chittagong City Corporation (CCC); Utility Agencies	Within project duration
Open Burning of Bitumen	Severe air pollution	- Installation of advanced technologies such as Mini Asphalt Plants where possible - Launch public awareness campaigns	Chittagong City Corporation (CCC); Department of Environment (DoE)	Immediate and ongoing
Uncoordinated Utility Excavations	Dust pollution, prolonged disruption	- Coordinate all utility works through the City Corporation - Install Common Utility Ducts where possible	Utility Agencies; Chittagong City Corporation (CCC)	Ongoing

Source	Impact	Mitigation Measures	Responsible Agency	Timeline
Inadequate green infrastructure in zoning regulations	Increased heat island effect, poor air quality	- Initiate large-scale street tree planting involving students - Launch a city-wide tree planting campaign - Revise zoning regulations to promote mixed-use developments, integrating green infrastructure - Design parklets in the urban areas	Chittagong City Corporation (CCC)	Immediate
Lack of guidance for street planting	Poorly executed street planting	Develop a “Handbook on Street Planting” by experts	Chittagong City Corporation (CCC); Sectoral Experts	Immediate
Sand storage along Roads	Air pollution, safety hazards	Legal action against unauthorized sand storage along roads or highways	Chittagong City Corporation (CCC); Department of Environment (DoE)	Immediate and ongoing

4.1.1 Area Specific Management Plan

According to baseline air quality monitoring findings of the project area, the identified hotspots are mainly located on the busy streets within the city including Alongkar Circle, Baddarhat Circle, Tigerpass Circle, and Oxygen Circle, Khatungonj & Chaktai Commercial Area, Kalurghat Area, CEPZ area and other important sensitive locations. The air pollution sensitive locations map of the project area is given in below **Figure 4-1**. The sensitive locations are fixed based on baseline outcomes, local emission sources, population exposure, and environmental sensitivities. In this particular locations, the concentration of Particulate Matter (PM_{2.5}) has been estimated up to 90 µg/m³, exceeding the permissible limit of 65 µg/m³ as stipulated by the Air Pollution (Control) Rules, 2022.

Table 4-2 describes the respective sensitive locations, along with their probable action plan, indicators, target outputs, time frame and responsible agency for ensuring and maintaining air quality that safeguards public health and the environment in a sustainable and cost-effective manner, through a well-defined, implemented, and adaptive management framework.

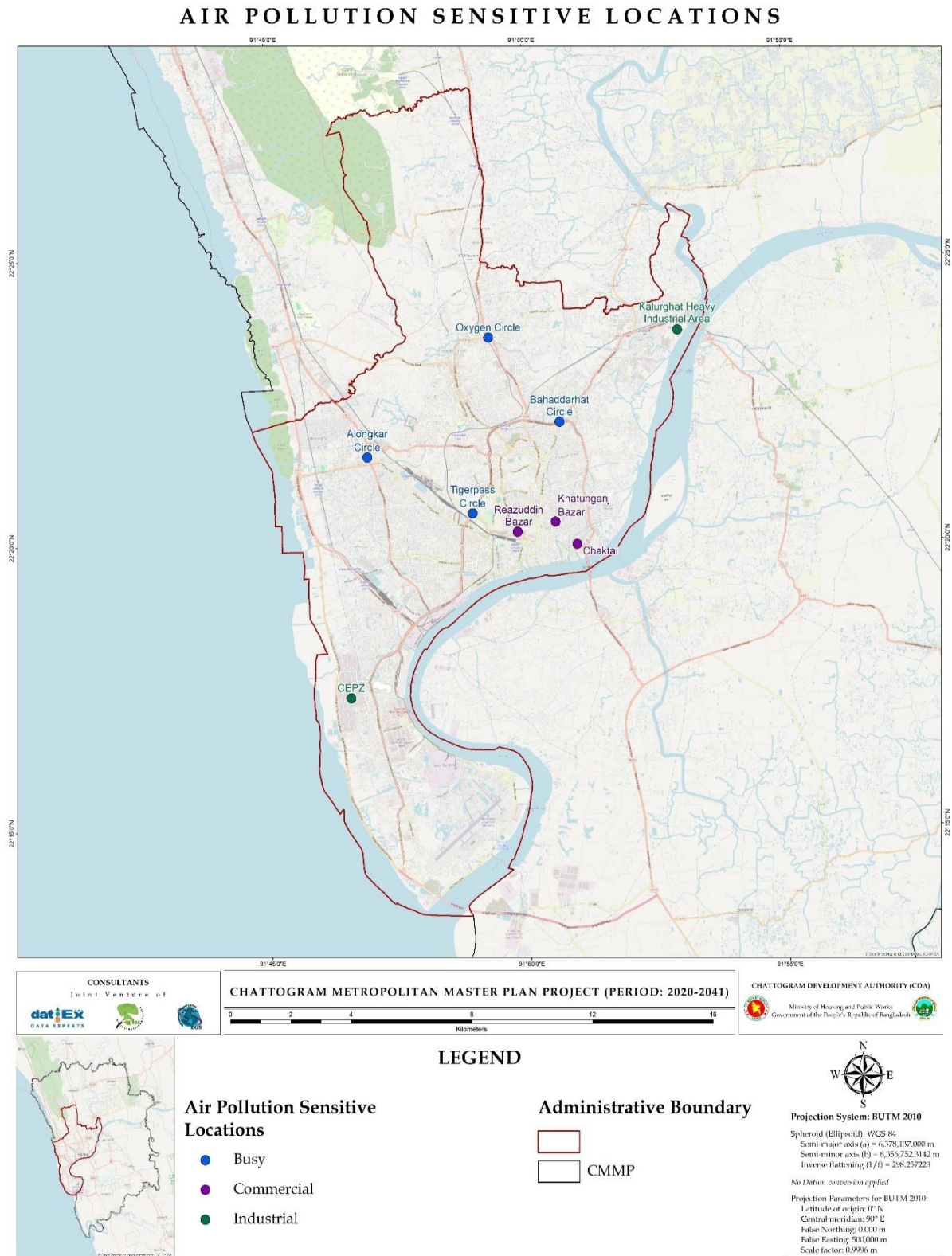


Figure 4-1 Map of Air Pollution Sensitive Locations in the Project Area

Table 4-2 Area Specific Air Quality Management Plan

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
Busy Streets (Alongkar, Baddarhat, Tigerpass, Oxygen Circle)	Strengthen Emission Control	Enforce dust suppression	• Area (Road Dust)	• Regular water-spray dust suppression using non-groundwater	• % improvement in roadside PM _{2.5} levels	15-20% PM _{2.5} reduction	Short-Term (1–3 Years)	CCC, DoE
	Reduce Vehicle Emission	- Conduct random vehicular emissions checks with fines - Promote hybrid or electric vehicle/car	• Mobile (Transport)	• Promote cleaner fuels; Enforce Euro 3/4 standards ¹⁷	• % of vehicles complying with Euro standards	20% compliance with Euro 4/5 by 2030	Medium-Term (3–7 Years)	BRTA, CCC, DOE, CMP
				• Encouraging the use of hybrid or electric vehicles through Tax rebates or reduced registration fees	• % increase in registered hybrid/EV vehicles	25% increase in hybrid/EV registration by 2030	Medium-Term (3–7 Years)	BRTA, Ministry of Road Transport & Bridges, DoE, CCC
				• Installation of EV charging stations in commercial and public areas	• % of public charging infrastructure coverage	50% of key locations covered with EV chargers by 2030	Medium-Term (3–7 Years)	DoE, BRTA, CCC
				• Phasing out older diesel/petrol vehicles	• % reduction in vehicular PM and CO ₂ emissions from targeted fleet	20% reduction in transport-related PM _{2.5} and CO ₂		
				• Awareness campaigns and incentives for ride-share EV fleets	• % awareness level on EV benefits (from			

¹⁷ <https://connectedfleet.michelin.com/blog/euro-emissions-standards/>

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
					public survey)	emissions by 2032	Long-Term (7+ Years)	
						30% increase in EV adoption awareness by 2028		CCC, DOE, NGOs/CSOs
							Short-Term (1–3 Years)	
	Expand green infrastructure	Expand green infrastructure by piloting green buffer strips in vacant spaces	• Area-wide	• Tree planting (Neem, Raintree) along roads; repair of broken footpaths to reduce dust	• % increase in pollution-tolerant vegetation	30% buffer increase by 2030	Medium-Term (3–7 Years)	CCC, CDA
	Promote public awareness and transparency in air quality management	Enhance public access to real-time air quality data	• Area-wide	• Install AQI display boards in high-traffic zones (intersections)	• % increase in public AQI awareness	20–30% coverage by 2025	Short-Term (1–3 Years)	CCC, DoE

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
Commercial Areas (Reazuddin Bazar, Khatunganj, Chaktai)	Control Air Pollution from Waste	Ban open burning and enforce waste segregation	• Area (Waste)	- Ensure daily collection of segregated waste; - Conduct mobile court operations against illegal dumping/buring	• % reduction in PM _{2.5} from waste burning	Eliminate open burning by 2030	Medium-Term (3–7 Years)	CCC, DoE
		Expand green infrastructure by encouraging green vertical facades	• Area-wide	Incentivize tree planting on buildings through tax rebates, recognition programs, or planning permissions etc.	• % increase in greenery in dense areas	30% increase by 2030	Medium-Term (3–7 Years)	CDA, CCC
		Enforce urban zoning regulations to manage incompatible land use and reduce local pollution	• Area-wide	Relocate high-emission garages from commercial/residential zones to designated industrial areas	• % decrease in localized air pollution	15% PM _{2.5} reduction	Long-Term (7+ Years)	CDA, CCC
Industrial Areas (CEPZ, Kalurghat)	Strengthen emission control in industrial sectors	Apply Best Available Techniques (BAT)	• Stationary (Industry)	Mandate emission control technologies (filters, ESPs) in all Red Category industries	• % industries complying with mandates	25% PM _{2.5} reduction by 2030	Medium-Term (3–7 Years)	DoE, CCC, CDA

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
	Improve industrial waste and air quality management	Promote centralized and standardized pollution control solutions for small and medium industries	Stationary (Industry)	- Promote shared effluent and emission treatment hubs for small industries, - Ban open burning of industrial by-products and enforce hazardous waste protocols, and - Establish filtration and dust suppression units in pollution-prone facilities.	% industries retrofitted with clean tech	40% retrofitting by 2032	Long-Term (7+ Years)	DoE, Industry
	Expand green infrastructure to mitigate urban and industrial air pollution	Develop tree belts around CEPZ & industrial zones as pollution buffers	Area-wide	Establish pollution-tolerant green buffer belts around CEPZ and Kalurghat Industrial Area using tree species such as Jhau, Debdaru, and Mehogani.	% greenery coverage near industries	50% greenery by 2033	Long-Term (7+ Years)	CCC, CDA

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
	Strengthen air quality governance through institutional coordination and accountability	Form an Air Quality Task Force to coordinate and oversee pollution control	• Policy	Establish an Air Quality Task Force within DoE- Chattogram, with joint oversight from the Chittagong Export Processing Zone (CEPZ) Authority and the Kalurghat Industrial Zone Authority.	% improvement in enforcement efficiency	Full monitoring by 2032	Medium-Term (3–7 Years)	DoE, BEPZA, CCC
Citywide	Control road dust to reduce particulate matter (PM _{2.5}) pollution in urban areas	Improve road cleaning operations through mechanized sweeping and targeted water spraying	• Area-wide	Conduct regular vacuum sweeping and water-spraying on major and dust-prone roads, especially during dry seasons.	% reduction in road dust	15-20% reduction	Short-Term (1–3 Years)	CCC, CDA
	Establish clear coordination protocols among all utility stakeholders to prevent conflicts,	Develop a detailed excavation schedule that staggers utility works to avoid overlaps, reduce risks, and ensure smooth progress.	• Area-wide	- Implement installation of shared utility ducts to consolidate multiple utilities in one conduit, - Facilitating easier maintenance and	% decrease in dust complaints	50% reduction	Medium-Term (3–7 Years)	CCC, CWASA, PDB

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
	ensure safety, and minimize service disruptions during excavation and construction activities	Maintain communication with utility providers to allow flexibility and timely adjustments		- reducing repeated excavation. - Ensure ducts comply with standards and provide accessibility for all utilities. - Apply water spraying during excavation and construction to control dust and improve air quality.				
	Enhance Green Infrastructure within urban planning to improve environmental quality, biodiversity, and community well-being	Incorporate green infrastructure elements—such as street trees, green roofs, permeable surfaces, and urban parks/parklets directly into zoning plans to ensure systematic and equitable distribution of green spaces	Area-wide	Revise and enforce zoning regulations to mandate inclusion of urban greenery features, including parklets, pocket parks, green buffers, and tree-lined streets, as essential components of new developments and redevelopment projects.	% green compliance in urban design	50% compliance	Long-Term (7+ Years)	CCC, CDA

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
		throughout urban areas						
	Control road dust to reduce particulate matter (PM _{2.5}) pollution in urban areas	Improve road cleaning operations through mechanized sweeping and targeted water spraying	Area-wide	Conduct regular vacuum sweeping and water-spraying on major and dust-prone roads, especially during dry seasons.	% reduction in road dust	15-20% reduction	Short-Term (1–3 Years)	CCC, CDA
Enforce Air Pollution Control Regulations (Air Pollution Control Rules, 2022)		Regulate construction Sites		Enforce mandatory coverage and storage of construction materials	% of construction sites complying with dust control norms	20% compliance by 2030	Medium-Term (3-7 Years)	CCC, CDA, DoE
				Regulate on-site dust generation (e.g., mandatory barriers, sprinkling)	% decrease in PM_{2.5} near major construction corridors	20% reduction in construction-related PM _{2.5} by 2030	Medium-Term (3-7 Years)	DoE, CCC
				Mandate covered transportation of sand, cement, and	Number of penalties/fines issued for non-	40% increase in enforcement		

Location	Policy	Strategy	Source	Proposed Action/ Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
				other fine materials	compliance	actions by 2030	Short-Term (1-3 Years)	CCC, DoE, CMP
				Penalize non-compliance through site inspections and mobile courts	% of construction transport using covered vehicles	50% of construction transport to be covered by 2028	Medium-Term (3-7 Years)	CCC, DoE, CMP

4.1.2 Institutional Setup and Monitoring

- **City-Level Air Quality Management Cell (AQMC)**

- CCC will establish a dedicated cell responsible for coordination, enforcement, monitoring, and reporting.

- **Capacity Building**

- Train CCC officials, law enforcement agencies, and contractors on air quality management best practices.

- **Public Participation**

- Foster citizen engagement through regular feedback mechanisms and awareness programs.

- **Periodic Review and Update**

- The EMP will be reviewed annually and updated based on monitoring outcomes and technological advancements.

4.1.3 Budget and Resources

- Dedicated budget allocation by CCC for AQMP activities.
- Mobilization of national and international funds [e.g., United Nations Development Programme (UNDP); Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), KfW Development Bank; Japan International Cooperation Agency (JICA); Green Climate Fund (GCF); The World Bank; Asian Development Bank (ADB) etc.]

4.2 Noise Level Management Plan

The Noise level Management Plan aims to establish a framework to identify, monitor, and reduce noise from various sources, including transportation, industrial activities, construction, and public gatherings, in alignment with national noise control regulations. By addressing the impacts of noise on urban health, productivity, and the environment, this plan aims to create a healthier and more sustainable urban setting. The below **Table 4-3** describes the respective sets of action plans with their responsible agency and timeline for ensuring implementation of the proposed mitigation measures and strategies.

Table 4-3 Environmental Management Plan for Noise Level

Action Items	Responsible Agency	Timeline
Identify noise hotspots and prepare noise maps	Chattogram Development Authority (CDA) Department of Environment (DoE)	1 Year
Install noise monitoring stations in sensitive areas	Department of Environment (DoE); Chittagong City Corporation (CCC)	1-2 Year
Public disclosure of real-time noise levels via online platform	Department of Environment (DoE); Chittagong City Corporation (CCC) IT Dept.	2 Year
Formulate zoning regulations for noise-sensitive areas	Chattogram Development Authority (CDA); Department of Environment (DoE); Chittagong City Corporation (CCC)	1-2 Year
Develop and enforce buffer zones along major roads and sensitive sites	Chattogram Development Authority (CDA); Chittagong City Corporation (CCC)	2-4 Year
Construct noise barriers and green belts along major roads and industrial zones	Chattogram Development Authority (CDA); Chittagong City Corporation (CCC); Roads and Highways Department (RHD)	2-5 Year
Implement traffic management measures (speed limits, heavy vehicle restrictions)	Chittagong City Corporation (CCC) Traffic Dept.; Chattogram Metropolitan Police (CMP)	1-3 Year
Identify noise hotspots and prepare noise maps	Chattogram Development Authority (CDA); Department of Environment (DoE)	1 Year
Enforce time restrictions for high-noise construction activities	Department of Environment (DoE); Chittagong City Corporation (CCC)	Immediate and Ongoing
Mandate use of noise-dampening construction equipment	Department of Environment (DoE); Chittagong City Corporation (CCC)	2 Year
Public awareness campaigns on noise pollution	Department of Environment (DoE); Chittagong City Corporation (CCC);	Continuous from 1 Year

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Action Items	Responsible Agency	Timeline
	Non-Governmental Organizations (NGOs)	
Set up citizen reporting platform for noise complaints	Department of Environment (DoE); Chittagong City Corporation (CCC)	2 Year
Conduct regular inspections and enforcement drives	Department of Environment (DoE); Chittagong City Corporation (CCC)	Continuous
Integrate noise management into Chattogram Metropolitan Master Plan	Chattogram Development Authority (CDA)	2-3 Year
Promote mixed-use development to reduce traffic noise	Chattogram Development Authority (CDA)	3-5 Year

4.2.1 Area Specific Management Plan

It is a targeted strategy developed to manage and mitigate noise in a particular geographic area, especially one that is experiencing noise issues due to industrial, transportation, or other human activities. The noise sensitive locations map of the project area is given in below **Figure 4-2**. The sensitive locations are fixed based on baseline outcomes, land use category, population exposure, and environmental sensitivities. According to baseline noise level monitoring findings, Chattogram City's busy marketplaces like Reazuddin Bazar, Kalurghat & Khatungonj & Chaktai Commercial Area, the estimated average noise level ranges from 78.7 to 74.1 dB (Day) and 68.3 to 64.4 dB (Night), where the standard is 70 dB (day) and 60 dB (Night). In the busy streets and mixed areas like Alongkar Circle, Oxygen Circle & Patiya (Shantirhat), the estimated noise level ranges from 84.8 to 68.2 dB (Day) and 76.7 to 58.3 dB (Night), where the standard is 60 dB (day) and 50 dB (Night). Furthermore, in silent areas like Chittagong Medical College, Imperial Hospital Limited, Chattogram Veterinary and Animal Sciences University, the estimated average noise level ranges from 68.9 to 53.2 dB (Day) and 60.3 to 44.1 dB (Night), where the standard is 50 dB (day) and 40 dB (Night) according to Noise Pollution Control Rules, 2006.

Table 4-4 describes the respective sensitive locations with their probable action plan, indictors, target outputs, time frame and responsible agency for reducing the noise pollution through zoning, monitoring and enforcement, and community engagement, in compliance with the national regulations.

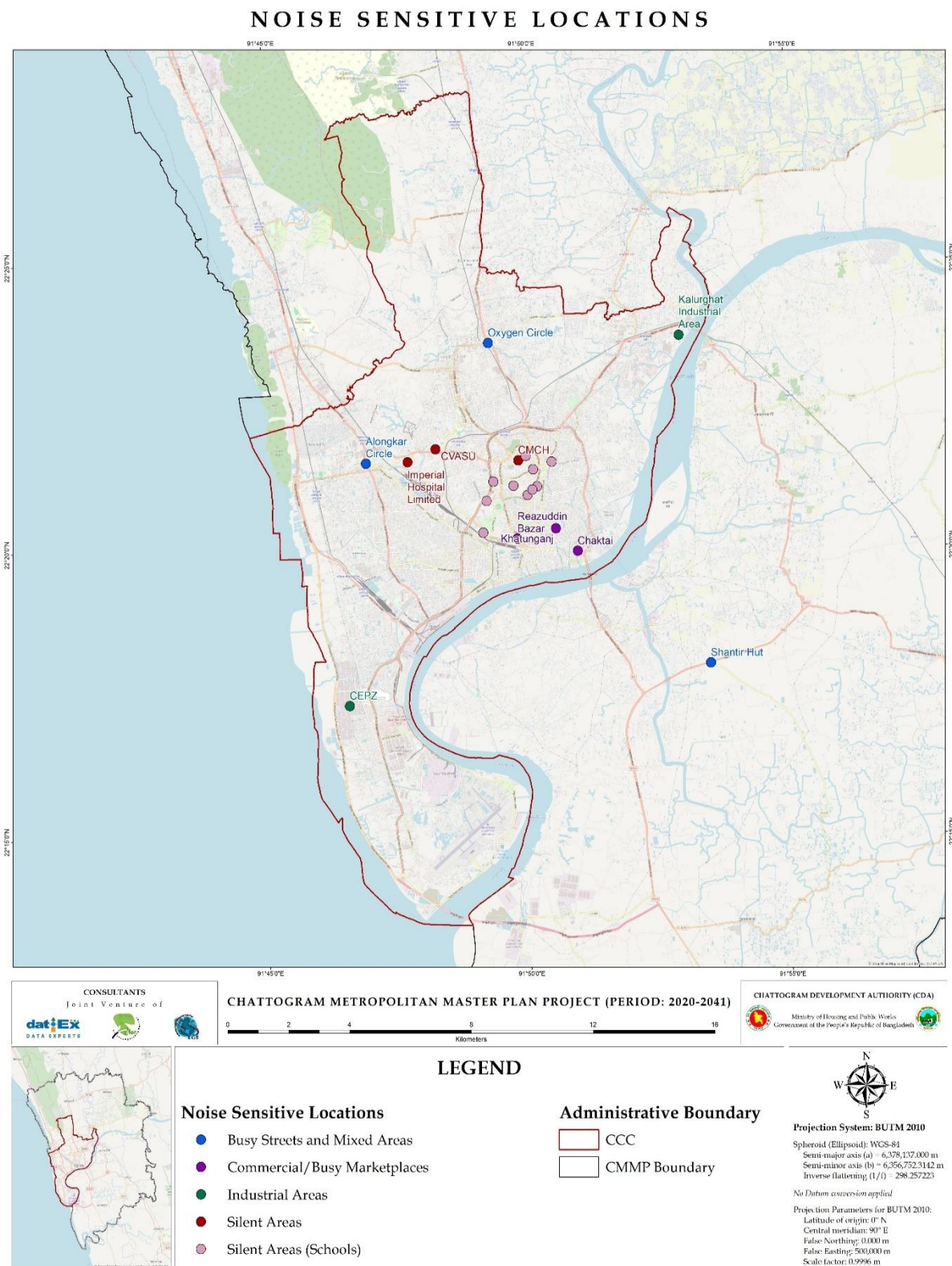


Figure 4-2 Map of Noise Sensitive Locations in the Project Area

Table 4-4 Area Specific Noise Level Management Plan

Location	Strategy	Proposed Action / Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
Busy Marketplace (Reazuddin Bazar)	Install real-time noise monitoring sensors near key receptors, restrict loudspeakers, manage traffic flow	- Restrict the use of loudspeakers during designated hours in consultation with stakeholders and the market committee. - Conduct awareness sessions for shop owners and the market committee on the health impacts of high noise levels. - Develop and install signage for alternative traffic routes to divert high-noise vehicles during peak hours.	- Recorded noise level - Honking frequency	<75 dB	Short-Term (1–3 Years)	CCC, DoE, CMP
	Install automated horn detection,	Impose fine and penalties for unnecessary honking, enhance road infrastructure to facilitate smoother traffic flow.	% of fines issued - Recorded noise level	<75 dB	Long-Term (7+ Years)	CCC, DoE, CMP
Oxygen Circle	Pilot program on “banning prolonged and unreasonable honking”.	Install real-time noise monitoring sensors; develop and install signage for alternative traffic routes to divert high-noise vehicles during peak hours.	- Reduction in prolonged honking - Recorded noise level	<70 dB	Medium-Term (3-7 Years)	CCC, DoE, CMP

Location	Strategy	Proposed Action / Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
Industrial Areas (Kalurghat)	Promote retrofits with low-noise equipment & enclosures	Awareness with the owner of the industry & other stakeholders; funding for retrofitting	% of industries adopting low-noise technology % reduction in factory noise	40% of industrial units retrofitted by 2028	Medium-Term (3–7 Years)	CCC, CDA, DOE
	Establish green buffer zones in industrial parks	Launch tree planting program	% increase in tree coverage surrounding industrial zones	80% of industrial areas covered with vegetation buffers within 7 years	Long-Term (7+ Years)	Industry Associations, CCC, CDA
Silent Areas Hospital (CMCH) School (Quaish Burischar Sheikh Mohammed City Corporation School and College)	Enforce Silent zone regulations (as per Noise Pollution (Control) Rules 2006) and install signage, Install real-time noise monitors, reroute traffic	Deploy signage, train Develop and install signage for alternative traffic routes to divert high-noise vehicles during peak hours.	% decrease in honking - Hourly noise level log	<55 dB at daytime & 45 dB at nighttime	Short-Term (1–3 Years)	CCC, CDA, DoE, CMP

Location	Strategy	Proposed Action / Mitigation Measures	Key Performance Indicators (KPIs)	Target Output	Timeframe	Responsible Agency
	Establish green buffer zones in & around the hospital & school, introduce Pilot Programs on “banning prolonged and unreasonable honking”	Implement fines and penalties for unnecessary & prolonged honking, supported by clear signage and consistent enforcement.	% decrease in noise level	Close to the Standard Limit of DoE	Long-Term (7+ Years)	CCC, Hospital Authority, School Management Committee
Public Awareness (Cross-cutting)	Education on health impacts of noise	Radio, TV, leaflets, school events, social media	% of outreach programs - pre-post awareness surveys	80% of residents reached	Continuous	CCC, DoE, NGoS
All high-noise areas (e.g., intersections, hospitals, schools, markets)	Sensitize traffic police to monitor and control noise pollution, especially from honking	Conduct quarterly training and orientation workshops for traffic police on noise regulations, health impacts, enforcement mechanisms; distribute standard operating procedures (SOPs)	- Number of trainings conducted - Change in awareness levels among traffic police (pre- and post-training survey) - Enforcement actions taken against unnecessary honking	100% of traffic police in noise hotspots trained; SOPs available in all traffic control booths	Ongoing, Long-Term (7+ Years)	CCC, DoE, NGOs, CMP

4.2.2 Institutional Setup and Monitoring

▪ Noise Mapping and Monitoring

- Noise monitoring stations will be established in critical areas across city especially in sensitive areas to measure compliance with noise standards and identify and mapping high-noise zones needing with additional measures.

▪ Enhanced Compliance and Raise Awareness

- Enhanced awareness among the CCC officials, law enforcement agencies, and the residents about the effects of noise pollution and its health impacts.
- Foster citizen engagement through regular feedback mechanisms and awareness programs.
- Implement traffic control measures, such as speed limits, optimized traffic flow, and dedicated lanes for heavy vehicles, to reduce road noise.

▪ Zoning and Land Use Planning

- Designate specific zones, such as residential and healthcare areas, as noise-sensitive, with stricter noise limits and buffer zones from high-noise activities.
- Establishing buffer zones on both sides of a road. Resurfacing roads with low-noise material.

▪ Periodic Review and Update

- The EMP will be reviewed annually and updated to reflect changes in regulations, project activities, or environmental conditions.
- Incorporate lessons learned from previous monitoring results and stakeholder feedback.

4.2.3 Budget and Resources

- Dedicated budget allocation by CCC for NMP activities.
- Mobilization of national and international funds [e.g., United Nations Development Programme (UNDP); Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), KfW Development Bank; Japan International Cooperation Agency (JICA); Green Climate Fund (GCF); The World Bank; Asian Development Bank (ADB) etc.]

4.3 Surface Water Quality/Industrial Effluents Management Plan

The Surface Water Quality/Industrial Effluents management plan involves identifying key water bodies, evaluating current pollution sources and water quality, and proposing strategic actions for improvement based on the city's unique environmental, industrial, and urban characteristics. **Table 4-5** describes the respective sets of action plans with their responsible agency and timeline for ensuring implementation of the proposed mitigation measures and strategies.

Table 4-5 Environmental Management Plan for Surface Water Quality/Industrial Effluents

Activity	Lead Agency	Supporting Agency	Timeline
Demarcate and mark river, canal, and wetland boundaries	Deputy Commissioner (DC) Office, Chattogram	Assistant Commissioner (Land); Department of Land Record (DGLR); Bangladesh Water Development Board (BWDB); Chittagong City Corporation (CCC)	0–12 months
Develop GIS-based digital mapping and public portal	Deputy Commissioner (DC) Office, Chattogram	Department of Environment (DoE); Chittagong City Corporation (CCC) IT Dept.	6–18 months
Conduct joint eviction drives against encroachment	Deputy Commissioner (DC) Office, Chattogram	Bangladesh Water Development Board (BWDB); Bangladesh Inland Water Transport Authority (BIWTA); District Fisheries; Department of Environment (DoE); Local Police	Every 6 months (starting within 3 months)
Identify and penalize major polluters (industries, shipbreaking yards)	Department of Environment (DoE)	Deputy Commissioner (DC) Office, Chattogram; Bangladesh Inland Water Transport Authority (BIWTA); Department of Environment (DoE)	0–6 months (initial), continuous thereafter
Amend environmental laws and decentralize DoE authority	Ministry of Environment, Forest and Climate Change (MoEFCC)	National River Conservation Commission (NRCC); Department of Environment (DoE) (HQ); Ministry of Law	6–12 months
Establish sewage treatment plants (STPs)	Chittagong City Corporation (CCC); Chattogram WASA (CWASA)	Ministry of Environment, Forest and Climate Change (MoEFCC); Local Govt. Engineering Department (LGED); PPP Partners	1–5 years

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Activity	Lead Agency	Supporting Agency	Timeline
Strengthen regulation of shipbreaking industries	Ministry of Industries	Department of Shipping, Department of Environment (DoE)	0–12 months (regulations), ongoing monitoring
Launch plastic waste reduction campaigns and promote biodegradable products	Chittagong City Corporation (CCC)	Ministry of Environment, Forest and Climate Change (MoEFCC); Ministry of Commerce, NGOs	3–6 months (launch), continuous
Implement effluent taxes and polluter-pays schemes	NBR (National Board of Revenue); Ministry of Environment, Forest and Climate Change (MoEFCC)	Department of Environment (DoE); MoF (Ministry of Finance)	12–24 months
Community engagement and public awareness programs	Chittagong City Corporation (CCC)	Local NGOs, Educational Institutions, Media	0–3 months (start), continuous
Regular monitoring and public reporting of river health	National River Conservation Commission (NRCC)	Department of Environment (DoE); Chittagong City Corporation (CCC); Universities (e.g., CUET, CU)	Every 6 months
International collaboration and funding mobilization (e.g., Green Climate Fund, World Bank)	Ministry of Environment, Forest and Climate Change (MoEFCC)	Economic Relations Division (ERD), Department of Environment (DoE); Chittagong City Corporation (CCC)	6–24 months

4.3.1 Area-Specific Management Plan

The surface water challenges in Chattogram are spatially diverse and it requires a multi-disciplinary, and location-sensitive approach. This area specific management plan is aligned with national environmental regulations and integrate local socio-economic and industrial characteristics. **Table 4-6** outlines targeted interventions for high-priority water bodies based on their condition, pollution sources, and urban context.

Table 4-6 Area Specific Surface Water Quality Management Plan

Location	Source	Proposed Action/Mitigation Measures	Responsible Agency
Karnaphuli River (Kalurghat Industrial Area)	Industrial effluent discharge, lack of ETPs	- Develop and enforce regulations requiring industries to install and maintain effluent treatment plants (ETPs) and other pollution control devices - Establish CETP for Small and Medium Enterprises (SMEs) - Conduct quarterly inspections and impose penalties for violations - Organize training programs for industry personnel on best practices for reducing heavy metal emissions and waste - Provide incentives such as tax breaks, subsidies, or grants to industries that invest in pollution control technologies and sustainable production methods.	CDA, DoE, BIWTA
Halda River (Hathazari, Bayezid-Oxygen stretch)	Industrial and household waste, fish habitat degradation	- Relocate Red-category industries away from riverbanks - Ban mechanized boats during spawning season - Connect unserved households to sewer networks	DoE, Department of Fisheries, LGED
Chaktai & Rajakhali Khal	Encroachment, plastic waste, waterlogging	- Conduct joint eviction drives for illegal structures - Dredge canals to restore natural flow - Install floating trash traps at inlet points	CCC, DC Office, BWDB
Firingi Bazar & Dewanhat	Slaughterhouse and medical waste	- Construct bio-medical & slaughterhouse waste incineration plants - Ban direct waste discharge into stormwater drains/canals	CCC, Department of Health, LGED

Location	Source	Proposed Action/Mitigation Measures	Responsible Agency
Port Area Zone	Oil spills, ship waste, plastic accumulation	- Install oil/waste reception facilities at port terminals - Enforce IMO-compliant ship waste handling rules	CPA, DoE, BIWTA
Plastic Waste Hotspots (Bahaddarhat, Chawkbazar, Reazuddin Bazar)	Polythene and plastic clogging canals	- Enforce ban on single-use plastics under existing MoEFCC rules - Organize Regular Cleanup Campaigns: Collaborate with local NGOs, educational institutions, and community groups to conduct periodic cleanup drives. - Establish an interagency task force that includes representatives from all relevant stakeholders to coordinate efforts, share information, and develop joint strategies for tackling. - Engage Informal Waste Collectors: Recognize and integrate the efforts of informal waste pickers by providing them with protective gear, fair compensation, and training. Their involvement is crucial, as they play a significant role in waste collection and recycling. - Install Trash Traps in Waterways: Implement passive litter traps in canals and drains to capture floating plastics before they reach larger water bodies. These traps are cost-effective and can be maintained with minimal resources¹⁸	CCC, DoE, NGOs, Market Committees; Educational Institutions, Local Club, and Volunteers

4.3.2 Institutional Setup and Monitoring

▪ River, Khal, and Canal Rehabilitation/Protection

- Riverbank Protection and Conservation strategy need to be ensured for Non-Transferable and Protected Floodplains.
- Development of stormwater management systems and retention ponds to reduce runoff and pollution.
- Penalty/Fining system will be developed for the organizations that release untreated wastewater into the river or other surface water bodies.

¹⁸ <https://www.urbanagendaplatform.org/best-practice/clean-urban-waterways>

▪ Land Use and Physical Planning

- Effective detailed planning of urban and rural water service will be contingent upon well-laid physical plans that address the burning issue of rapid urbanization and increased industrialization.
- Establishment of buffer zones along waterbodies to prevent encroachment and pollution.

▪ Periodic Review and Update

- The EMP will be reviewed annually and updated based on monitoring results, changes in pollution sources, regulatory updates, and advancements in monitoring technologies
- Incorporating feedback from stakeholders to improve the monitoring program.

4.3.3 Budget and Resources

- Dedicated budget allocation by CCC for SWQMP activities.
- Mobilization of national and international funds [e.g., United Nations Development Programme (UNDP); Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), KfW Development Bank; Japan International Cooperation Agency (JICA); Green Climate Fund (GCF); The World Bank; Asian Development Bank (ADB) etc.]

4.4 Solid Waste Management Plan for the Paurashavas

The future waste management guidelines outline two potential scenarios for waste management: one where the **Paurashava manages waste on its own**, and the other where a **Public Private Partnership (PPP) or Community Based Organization (CBO) model** is adopted.

4.4.1 Scenario 1: Paurashava-Led Waste Management

4.4.1.1 Step 1: Awareness Campaign

Launch a Paurashava-wide campaign, with potential names like "Trash to Treasure," "Clean [Paurashava Name] Initiative," or "Cleaner Tomorrow, Today." Partnerships with schools, community groups, and local media will enhance impact. The following activities are part of the awareness campaign:

- **Civic Awareness:** Focus on hygiene, disease prevention, and public engagement. Promote waste storage at home and discourage roadside disposal.
- **IEC Activities:** Form Ward committees, organize group meetings, show short films, use TV/local cable, distribute pamphlets, display banners, and arrange street plays and student rallies. Women volunteers will conduct household visits. Involve schools, religious institutions, media, local artists, and women's groups.
- **Municipal Staff Training:** Provide awareness training to staff and councilors; collaborate with trade associations, schools, and colleges.
- **Involving Local Talent:** Engage musicians, local designers, and engineers to support public messaging and infrastructure designs.

- **Cultural Programs:** Host music festivals, fairs, and carnivals to reinforce the hygiene message.
- **Mobile Court:** Establish a Mobile Court to fine littering offenders, modeled on Ahmedabad's successful Sanitation Mobile Court example.

4.4.1.2 Step 2: Institutional Strengthening and Capacity Building

Focusing on institutional strengthening and capacity building is essential for improving existing SWM systems in Pourashavas under CDA and ensuring their long-term sustainability. This can be achieved through decentralized administration, the recruitment of skilled professionals, and comprehensive staff training. The following are some ideas that can be followed:

▪ Hiring a Compatible Workforce for SWM

To meet the immediate operational needs of waste management and ensure long-term sustainability in the Paurashava, sufficient and qualified staffing is essential. Setting a clear timeline for the recruitment process from advertisement to final hiring is crucial to expedite staffing. The following key positions are critical for strengthening the waste management system:

Waste Management Officer (WMO)

- Appoint qualified WMO with a background in environmental science and demonstrated leadership skills under the Health, Family Planning, and Conservancy Department.

New Landfill Management Division

- Establish under the Executive Engineer in the engineering wing.
- Oversee landfill operations, manage workshops, and supervise the development of Integrated Resource Recovery Centre (IRRC).

Role Differentiation Based on Paurashava Rating

- In "KHA" rated Paurashavas, the WMO handles public awareness and HR development.
- In "KA" rated Paurashavas, an Urban Planner within the Civil, Electrical, and Mechanical Section under the Executive Engineer can address public awareness, human resource development, and community engagement activities in waste management.

Workforce Development

- Expedite hiring of skilled workforce, addressing shortages of Conservancy Inspectors and Supervisors.
- Improve recruitment quality.
- Conduct focused training for supervisors and contract oversight.

Regular Supervision

- Supervisors must routinely check street sweeping, market cleaning, and public space maintenance.

▪ Human Resource Development

Training Programs

- Provide in-service training to unqualified supervisory staff.
- Conduct periodic comprehensive training for field-level supervising staff, covering governance and technical aspects.
- Develop an annual capacity-building plan with on/off-job training, site visits, and knowledge exchange.
- Mandatory training on the Solid Waste Management Rules, 2021 for all waste management personnel.
- Evaluate training performance for professional development and future promotions.
- Conduct refresher courses for all levels of staff at least once every 5 years.

Exposure Programs

- Organize orientation programs for Mayors/Chief Executives and elected members to sensitize them about urban waste management.

4.4.1.3 Step 3: Door-to-Door Waste Collection

In line with Solid Waste Management Rules, 2021 (Rule 10, Sub-Rule 4), Paurashava should launch a door-to-door waste collection service with proper planning and trained personnel. Workers will collect segregated household waste for a monthly fee set by the Paurashava. Collection schedules can be finalized through community consultations, preferably starting in the afternoon after morning street sweeping.

Collection Frequency

- Wet waste: Daily
- Dry waste: Twice weekly

Collection and Transportation Process

- **Household Waste:** Collection workers collect waste stored in 20-liter and 40/50-liter bins at households, and transfer them into larger 240-liter trolley bins. Trolley bins are more functional than traditional tricycle rickshaws. On days when both wet and dry waste are collected, dry waste is placed in a separate bag. Once full or upon completing collection, trolley bins are rolled to marked pickup points along preplanned routes. Municipal Solid Waste (MSW) compactor or drum trucks, equipped with pneumatic arms, collect one type of waste fraction at a time (either wet or dry) from these points. After the final pickup, the truck proceeds to the landfill where each fraction is properly disposed of. To improve efficiency and reduce manual handling, garbage trucks can be locally modified with hydraulic arms to transfer waste directly from trolley bins, offering significant cost savings compared to purchasing specialized vehicles.
- **Hotel/Restaurant Waste:** Waste from hotels and restaurants follows a process similar to household waste collection, with dry waste collected twice a week and wet waste collected daily.
- **Slum & Street Waste:** Waste from slum areas is collected in common storage bins, while street-swept waste is placed in trolley bins for transfer to garbage trucks.
- **Market Waste:** Market waste is loaded directly into trucks stationed at market locations, ensuring regular clearing throughout the day, especially where composting plants are not available.

Additionally, with the phasing out of traditional community bins, strategically placed street litter bins will be installed citywide to manage roadside litter effectively.

Use of Collection Equipment and Vehicles

- Trolley bins, MSW compactor trucks, and local vehicle modification for cost efficiency.

Post-Collection Activities

- Returning trolley bins to enclosures to maintain cleanliness.

4.4.1.4 Step 4: Infrastructure Development

- **Color-Coded Bins:** Promote two-bin systems at the household level (green for wet waste, yellow for dry waste) at subsidized rates.
- **Trolley Bins and Truck Modifications:** Replace community bins with trolley bins and modify garbage trucks for mechanical loading.
- **Establish Waste Segregation Centers (WSC):** Establish waste segregation centers near dumping sites. As source segregation improves, these can evolve into Integrated Resource Recovery Centers (IRRC).
- **Composting Plants:** Locations for setting up composting plants including:
 - ✓ Near Katcha bazaars and wholesale markets
 - ✓ Adjacent to waste segregation centers
 - ✓ Existing dumping sites
 - ✓ Unused municipal land on city outskirts
 - ✓ Community gardens or agricultural areas
 - ✓ Community-based composting units in Paurashava Wards
- **Introduce Black Soldier Fly (BSF):** Introduce Black Soldier Fly (BSF) composting where feasible.
- **Demolish Concrete Bins:** Phase out open community bins to eliminate odor, pests, and health risks.

4.4.1.5 Step 5: Closure or Conversion of Open Landfill to Controlled Landfills of Existing Dumping Site/s

- **Transition to Controlled Landfills:** Gradually convert open dumping sites into controlled landfills, reusing construction waste for landfill cover material, following examples like Pune's dumpsite rehabilitation.

4.4.1.6 Step 6: Privatization

- **Outsourcing Services:** Contract private operators for waste collection from Katcha bazaars, slaughterhouses, hotels/restaurants, and IRRC operation, while retaining ownership of assets.

4.4.1.7 Step 7: Operating System

- **Decentralization/Zonal Division:** Decentralization is essential for effective waste management, each Paurashava can be divided into three to four zones, managed by dedicated conservancy

supervisors. Supervisors will oversee waste collection and transportation in their zones, supported by 10–15 permanent and temporary workers. A total of three to four supervisors will be needed per Paurashava.

- **Worker Assignment:** Each collection worker will manage about 250 households, sweeping streets in the morning and collecting waste in the afternoon. Their daily tasks will include street sweeping in the morning, followed by door-to-door waste collection in the afternoon. Workers will handle primary waste collection, street sweeping, transporting waste, clearing debris, and cleaning drains and public spaces. Zone-level supervisors will regularly oversee cleaning to maintain standards.
- **Year-Round Operation:** Waste will be transported year-round using fully enclosed trucks with a seven-ton capacity preferably, some equipped with hydraulic loading to reduce manual handling. Each truck will operate twice daily—morning trips for street waste and evening trips for household collection.
- **Monitoring Team:** Establish a dedicated unit for overseeing waste collection, segregation, compost plant operation, street sweeping, and final disposal.

4.4.1.8 Step 8: Public Grievance Redress

- 24/7 helpline and mobile app for promptly addressing public waste management complaints.
- Implement formats for registering, responding to, and tracking resolutions.
- Plan for the closure and rehabilitation of existing dumping sites.

4.4.2 Scenario 2: Public-Private Partnership (PPP) or Community-Based Organization (CBO) Model

Under this model, the Paurashava outsources key waste management services to qualified private operators or organized CBOs, while maintaining regulatory and supervisory control. This approach can significantly improve service quality, encourage innovation, and ensure cost-effectiveness if properly managed.

4.4.2.1 Partner Selection

- Select partners through a **competitive, transparent bidding** process.
- Set clear **eligibility criteria** (technical capacity, past experience, financial stability) to ensure only capable operators are engaged.
- Prioritize partnerships with operators demonstrating commitment to environmental sustainability and community engagement.

4.4.2.2 Paurashava's Role

- Retain strong ownership and oversight of the waste management system.
- Establish **clear service guidelines** covering collection frequency, segregation targets, complaint handling, and environmental compliance.
- Conduct **regular audits and inspections** to monitor partner performance.
- Enforce compliance through **service contracts** with clearly defined penalties for non-performance and incentives for excellent service.

4.4.2.3 Infrastructure Support

- Provide essential infrastructure, including **segregation centers, composting facilities, recycling units, and vehicle depots**, to support the contracted operators.
- Maintain responsibility for major capital investments to lower entry barriers for private or community partners.

4.4.2.4 Institutional Strengthening under PPP/CBO Model

- Although waste collection services will be outsourced, Paurashava must strengthen internal capacity to supervise, regulate, and monitor the performance of private or CBO operators effectively.
- Establish a **dedicated Contract Management and Monitoring Unit** within the Conservancy Department.

4.4.2.5 Human Resource Development

- Recruit and train staff specializing in **contract management, monitoring and evaluation (M&E), grievance handling, and public communication**.
- Ensure that internal teams can oversee service delivery independently of service providers.

4.4.2.6 Staff Training

Provide periodic training on:

- Service quality monitoring
- PPP contract administration
- Financial oversight
- Grievance redress procedures
- Environmental and occupational health standards
- Facilitate exposure visits to successful PPP/CBO-managed waste systems in other cities.

4.4.2.7 Decentralization

- Divide the Paurashava into **three to four operational** zones.
- Appoint dedicated supervisors for each zone to ensure **localized oversight** of contracted services.
- Empower supervisors to make immediate decisions and escalate non-compliance issues promptly.

4.4.2.8 Performance Monitoring and Incentives

Set clear performance targets for private/CBO partners, such as:

- Household collection coverage rate
- Waste segregation rate at source
- Timely waste transport and disposal
- Customer satisfaction rates

Introduce **performance-based incentives** for contractors who exceed service standards, including contract extensions, bonus payments, or public recognition.

4.4.2.9 Public Grievance Redress

- Maintain a **24/7 helpline, mobile app, and online portal** to allow residents to lodge complaints and feedback.
- Implement a system to **register, respond to, and track** complaints with mandatory resolution within a specified timeframe (e.g., 48 hours).
- Share quarterly public reports on grievance redress status to ensure transparency and build trust.

4.4.2.10 Closure and Rehabilitation of Existing Dumping Sites

- Integrate plans for the **phased closure and rehabilitation** of open dumping sites as part of the PPP/CBO operator's responsibility, wherever feasible.
- Operators managing transfer stations or composting units may be involved in phased landfill management under proper Paurashava supervision.

4.4.3 Implementation Roadmap: Solid Waste Management for Paurashavas

Timeline	Action Area	Key Activities	Responsible Authority	Remarks
0–6 Months	Institutional Setup	Appoint Waste Management Officer (WMO); Form local SWM cell; Finalize ward-level zones	Paurashava Mayor's Office, Local Government Department (LGD)	Service Level Agreement (SLA) based TOR to ensure performance
0–12 Months	Awareness & Community Engagement	Launch source segregation campaign; Begin household registration for door to door service	Waste Management Officer (WMO), NGOs, Ward Councillors	Integrate with health/education campaigns
6–18 Months	Door-to-Door Collection	Implement in pilot wards; Procure bins, trolley bins; Train workforce	Paurashava + PPP/CBOs	Prioritize mixed and densely populated wards
12–24 Months	Processing & Recycling	Establish IRRCs or composting units (start with market waste); formalize informal sector	PPP/CBO, Department of Environment (DoE), Private	Promote BSF, compost, plastics recovery
24–36 Months	Infrastructure & Logistics	Designate transfer points; Improve route planning; Build/upgrade landfill or disposal site	Local Government Engineering Department (LGED), Department of	Ensure environmental clearance

Timeline	Action Area	Key Activities	Responsible Authority	Remarks
			Environment (DoE), Private Operators	
36–60 Months	Monitoring & Expansion	Rollout full program across wards; Launch digital tracking for complaints & collection; Scale IRRCs	Paurashava, Local Government Department (LGD), NGOs	Explore Waste-to- Energy or RDF for non-recyclables

4.5 Waste Management Plan for Chittagong City Corporation (CCC)

4.5.1 Introduction

Chattogram, Bangladesh's second-largest city, faces increasing challenges in managing its growing volume of municipal solid waste (MSW). Currently, CCC's waste management practices are limited by inadequate infrastructure, insufficient manpower, and low public participation. This Waste Management Plan proposes a phased, decentralized, and multi-stakeholder approach based on two scenarios:

- CCC-led implementation
- Public-Private Partnership (PPP)/Community-Based Organization (CBO)-driven model

4.5.2 Objectives

- Achieve 100% door-to-door waste collection coverage
- Promote source-level segregation into wet and dry waste.
- Minimize waste sent to landfills by promoting composting and recycling.
- Build institutional and human resource capacity.
- Establish a robust monitoring and grievance redress system.

4.5.3 Guiding Principles

- Compliance with **Solid Waste Management Rules 2021**
- Alignment with **3Rs (Reduce, Reuse, Recycle)**
- **Decentralization and zone-based** operations
- Inclusion of **informal sector** (ragpickers, waste pickers)
- Encourage **public participation**

4.5.4 Scenario 1: CCC-Led Waste Management System

4.5.4.1 Awareness and Behavioral Change Campaign

A city-wide campaign should be launched under a recognizable brand like "Trash to Treasure" or "Cleaner Chattogram, Today." Key Components:

- **Civic Awareness:** House visits, rallies, and street theatre to promote household-level hygiene and proper waste storage & segregation.

- **Information, Education, and Communication (IEC):** Form Ward committees, organize group meetings, show short films, use TV/local cable, distribute pamphlets, display banners, and arrange street plays and student rallies. Women volunteers will conduct household visits. Involve schools, religious institutions, media, local artists, and women's groups.
- **Staff Training:** Provide awareness training to staff and councilors; collaborate with trade associations, schools, and colleges.
- **Involving Local Talent:** Engage musicians, local designers, and engineers to support public messaging and infrastructure designs.
- **Cultural Programs:** Host music festivals, fairs, and carnivals to reinforce the hygiene message.
- **Mobile Environmental Courts:** Enforce cleanliness through fines and behavioral correction by establishing mobile courts.

4.5.4.2 Institutional Strengthening

- **Reform of Waste Management Department:** To streamline and enhance the efficiency of solid waste management (SWM) operations, it is proposed to consolidate all SWM-related functions under a single umbrella to the **Waste Management Department (WMD)** in CCC. Key Components of the Reformed WMD:
 - ✓ Waste Management Wing - Oversees daily waste operations, including vehicle management, zonal coordination, and budgeting.
 - ✓ Research, Development & Planning Wing - Focuses on strategic planning, coordination, monitoring, human resource development, public awareness, and intermediate treatment facilities.
 - ✓ Technical Wing - Handles facility construction, vehicle procurement, vehicle & workshop maintenance, and landfill management.
- **Hiring an Adequate Compatible Workforce for SWM:** To meet the immediate operational needs of waste management and ensure long-term sustainability in the CCC, sufficient and qualified staffing is essential. Setting a clear timeline for the recruitment process—from advertisement to final hiring is crucial to expedite staffing.
- **Inclusion of Academics, Experts, Researchers, and NGOs in the Standing Committee:** The existing SWM Standing Committee must include academics, practicing professionals with SWM-related expertise, researchers, and other relevant organizations such as NGOs and research institutions to get their expert opinions. Initially, CCC may appoint an environmental engineer or expert in an advisory capacity to improve the efficiency of the waste management system.
- **Encourage NGOs to Support Rag Pickers:** Collaborate with NGOs to provide financial and logistical support for engaging waste pickers in doorstep waste collection and in the collection of recyclable and organic materials.
- Appoint qualified **Waste Management Officers (WMOs)** with environmental science backgrounds.

- **Prepare an Administrative Procedure Book or Operational Manual:** CCC must develop an **Administrative Procedure Book** and an **Operational Manual** to streamline solid waste management (SWM) operations.

4.5.4.3 Workforce Development

- Expedite hiring of skilled workforce, addressing shortages of Conservancy Inspectors and Supervisors.
- Improve recruitment quality.
- Conduct focused training for supervisors and contract oversight.
- Opportunities of professional growth.
- Develop detail job description.
- Prioritize converting existing temporary employees to permanent positions.

4.5.4.4 Regular Supervision

- Supervisors must routinely check street sweeping, market cleaning, and public space maintenance.

4.5.4.5 Human Resource Development

▪ Staffing Plan

- Fill gaps in conservancy staff at central, ward, and zonal levels.
- Provide job descriptions, duties, and training modules.

▪ Training Programs

- Provide in-service training to unqualified supervisory staff.
- Conduct periodic comprehensive training for field-level supervising staff, covering governance and technical aspects.
- Develop an annual capacity-building plan with on/off-job training, site visits, and knowledge exchange.
- Mandatory training on the Solid Waste Management Rules, 2021 for all waste management personnel.
- Evaluate training performance for professional development and future promotions.
- Conduct refresher courses for all levels of staff (Collection workers, supervisors, truck drivers, processing plant staff) at least once every 5 years.

▪ Exposure Programs

- Organize orientation programs for Mayors/Chief Executives and elected members to sensitize them about urban waste management.
- Collaborate with other city corporation and Waste Concern for exposure visits and training.

4.5.4.6 Door-to-Door Waste Collection

- Implement a **two-bin** system (Green: Wet, Yellow: Dry).
- Provide **subsidized bins** to residents.
- Assign **1 waste collector per 250 households**.
- **Daily collection** of wet waste; **twice-weekly** collection of dry waste.
- Utilize **trolley bins** and **modified compactor trucks** with hydraulic lifts for efficiency.
- Hotel and restaurant waste will be collected using the same system as households.
- Waste from slum areas is collected in common storage bins, while street-swept waste is placed in trolley bins for transfer to garbage trucks.
- Market waste is loaded directly into trucks stationed at market locations, ensuring regular clearing throughout the day, especially where composting plants are not available. Additionally, with the phasing out of traditional community bins, strategically placed street litter bins will be installed citywide to manage roadside litter effectively.

4.5.4.7 Infrastructure Development

- **Color-Coded Bins:** Promote two-bin systems at the household level (green for wet waste, yellow for dry waste) at subsidized rates.
- **Trolley Bins and Truck Modifications:** Replace community bins with trolley bins and modify garbage trucks for mechanical loading.
- **Composting Plants:** Locations for setting up composting plants include:
 - ✓ Near Katcha bazaars and wholesale markets
 - ✓ Adjacent to waste segregation centers
 - ✓ Existing dumping sites
 - ✓ Unused municipal land on city outskirts
 - ✓ Community gardens or agricultural areas
 - ✓ Community-based composting units in Paurashava Wards
- **Establish Waste Segregation Centers (WSC)** near dumpsites. These will evolve into **Integrated Resource Recovery Centres (IRRCs)**.
- **Introduce Black Soldier Fly (BSF)** composting plant in key zones.
- **Phasing out of open concrete bins** and installing closed street litter bins.

4.5.4.8 Sanitary Landfill Development

- Rehabilitate the existing crude dumping site using the **Pune Model¹⁹/Matuail Landfill Model of DNCC²⁰**:
 - ✓ Capping old dumps
 - ✓ Gas venting

¹⁹ Municipal Solid Waste Management Manual, prepared by Ministry of Urban Development, India 2016

²⁰https://dncc.portal.gov.bd/sites/default/files/files/dncc.portal.gov.bd/project/15c19c7b_3028_45cf_84d1_f8096e95eabd/2022-03-02-09-56-054bad8bb2b11fce6560d9cc181babe3.pdf

- ✓ Leachate drainage
- ✓ Establish controlled landfill cells above the capped site
- Develop a **new scientific/sanitary landfill** with DoE clearance.

4.5.4.9 Privatization of Selected Services

- Outsource
 - ✓ Waste collection from markets, restaurants, slaughterhouses
 - ✓ IRRC operations
- Maintain asset ownership while outsourcing O&M functions.

4.5.4.10 Operating System

- **Decentralization/Zonal Division:** Decentralization is key to effective waste management. This approach ensures that senior officials at each level can operate independently within their delegated powers. The SWM functions may be decentralized as below:
 - ✓ Ward-level Administration
 - ✓ Zonal Level Administration
 - ✓ Central Level Administration
- **Worker Assignment:** Each collection worker will manage about 250 households, sweeping streets in the morning and collecting waste in the afternoon. Their daily tasks will include street sweeping in the morning, followed by door-to-door waste collection in the afternoon. Workers will handle primary waste collection, street sweeping, transporting waste, clearing debris, and cleaning drains and public spaces. Zone-level supervisors will regularly oversee cleaning to maintain standards.
- **Year-Round Operation:** Waste will be transported year-round using fully enclosed trucks with a seven-ton capacity preferably, some equipped with hydraulic loading to reduce manual handling. Each truck will operate twice daily—morning trips for street waste and evening trips for household collection.

4.5.4.11 Public Grievance Redress

- A **Service Level Agreement (SLA)** should be established for timely resolution of public complaints related to waste management. For example, **at least 80% of waste management complaints must be resolved within 48 hours** of registration. This SLA should be regularly monitored and updated based on performance trends and community feedback.
- In addition, a **public disclosure mechanism** should be introduced to promote transparency. The Paurashava will **publish half-yearly/yearly report** detailing key performance indicators such as complaint resolution rates, waste collection coverage, segregation compliance, and progress in community engagement. These reports will be **made accessible to citizens through official websites, public notice boards, and community meetings**, fostering trust and encouraging active participation in waste management improvement efforts.
- 24/7 helpline and mobile app for complaints.
- Implement formats for registering, responding to, and tracking resolutions.

4.5.4.12 Mobile Courts

- Under Rule 15 of the Solid Waste Management Rules, 2021, violations of specific provisions (Sub-Rules 7, 8, and 9) are subject to penalties. City Corporations are authorized to conduct monthly mobile courts to enforce these rules. Establishing such courts is recommended to impose immediate fines on individuals breaching cleanliness laws and civic guidelines.

4.5.4.13 Financial Planning and Cost Recovery

- Introduce user charges linked to service levels.
- Explore Clean Development Mechanisms (CDM) funding for composting (Certified Emission Reduction sale).
- Leverage GCF, ADB, JICA or other donors support for infrastructure development.

4.5.4.14 Special Initiatives

- **Black Soldier Fly Farming** for decentralized, odor-free composting.
- **Material Recovery Facilities (MRFs)** for sorting dry waste.
- Promote **home composting**, especially in peri-urban and low-rise areas.

4.5.5 Scenario 2: PPP/CBO Based Waste Management Model

Under this model, CCC outsources key waste management services to qualified private operators or organized CBOs, while maintaining regulatory and supervisory control. This approach can significantly improve service quality, encourage innovation, and ensure cost-effectiveness if properly managed.

4.5.5.1 Partner Selection

- Select partners through a **competitive, transparent bidding** process.
- Set clear **eligibility criteria** (technical capacity, past experience, financial stability) to ensure only capable operators are engaged.
- Prioritize partnerships with operators demonstrating commitment to environmental sustainability and community engagement.

4.5.5.2 CCC's Role

- Retain strong ownership and oversight of the waste management system.
- Establish **clear** service **guidelines** covering collection frequency, segregation targets, complaint handling, and environmental compliance.
- Conduct regular **audits and inspections** to monitor partner performance.
- Enforce compliance through **service contracts** with clearly defined penalties for non-performance and incentives for excellent service.

4.5.5.3 Infrastructure Support

- Provide essential infrastructure, including **segregation centers, composting facilities, recycling units, and vehicle depots**, to support the contracted operators.

- Maintain responsibility for major capital investments to lower entry barriers for private or community partners.

4.5.5.4 Institutional Strengthening under PPP/CBO Model

- Although waste collection services will be outsourced, CCC must strengthen internal capacity to supervise, regulate, and monitor the performance of private or CBO operators effectively.
- Establish a **dedicated Contract Management and Monitoring Unit** within the Conservancy Department.

4.5.5.5 Human Resource Development

- Recruit and train staff specializing in **contract management, monitoring and evaluation (M&E), grievance handling, and public communication.**
- Ensure that internal teams can oversee service delivery independently of service providers.

4.5.5.6 Staff Training

Provide periodic training on:

- ✓ Service quality monitoring
- ✓ PPP contract administration
- ✓ Financial oversight
- ✓ Grievance redress procedures
- ✓ Environmental and occupational health standards
- ✓ Facilitate exposure visits to successful PPP/CBO-managed waste systems in other cities.

4.5.5.7 Decentralization

- Decentralization is key to effective waste management. This approach ensures that senior officials at each level can operate independently within their delegated powers. The SWM functions may be decentralized as below:
 - ✓ Ward-level Administration
 - ✓ Zonal Level Administration
 - ✓ Central Level Administration
- Each zone will be managed by dedicated conservancy supervisors to ensure **localized oversight** of contracted services.
- Empower supervisors to make immediate decisions and escalate non-compliance issues promptly.

4.5.5.8 Performance Monitoring and Incentives

- Set **clear performance targets** for private/CBO partners, such as:
 - ✓ Household collection coverage rate
 - ✓ Waste segregation rate at source

- ✓ Timely waste transport and disposal
- ✓ Customer satisfaction rates

Introduce **performance-based incentives** for contractors who exceed service standards, including contract extensions, bonus payments, or public recognition.

4.5.5.9 Strengthening Accountability and Transparency in Waste Management

To ensure high service standards under the Public-Private Partnership (PPP) or Community-Based Organization (CBO) approach, the Paurashava will implement robust accountability and transparency measures:

- **Service Level Agreements (SLAs) for Complaint Resolution:** A Service Level Agreement will be established requiring that at **least 80% of waste management** complaints are resolved within 48 hours of registration. This SLA will be embedded into all contracts with service providers to maintain consistent service quality.
- **Public Disclosure of Performance:** CCC will publish **quarterly public reports** summarizing key performance indicators, including complaint resolution rates, waste collection coverage, and progress in waste reduction and recycling initiatives. These reports will be accessible through CCC website, social media platforms, community centers, and notice boards.
- **Grievance Redress Mechanism:** A 24/7 helpline and a dedicated mobile application will be developed to allow citizens to lodge complaints, track their status, and provide feedback on services received. Quick grievance redressal will be a priority to maintain public trust.
- **Monitoring and Evaluation:** Standardized tracking formats and monitoring tools will be introduced for performance audits. These tools will help evaluate service providers' compliance with SLAs and guide any necessary corrective actions.

4.5.5.10 Special Initiatives

- **Black Soldier Fly Farming** for decentralized, odor-free composting.
- **Material Recovery Facilities (MRFs)** for sorting dry waste.
- Promote **home composting**, especially in peri-urban and low-rise areas.

4.5.6 Timeline: CCC Waste Management Plan Implementation

Activities	Immediate (0–1 Years)	Short-Term (1–2.5 Years)	Medium-Term (2.5–3.5 Years)	Long-Term (3–5 Years)
Awareness & Behavioral Change Campaign	●			
Set up Monitoring Cell & Grievance System	●			
Procurement of Bins, Trolleys, Trucks	●			
Door-to-Door Segregated Collection		●		

Activities	Immediate (0–1 Years)	Short-Term (1–2.5 Years)	Medium-Term (2.5–3.5 Years)	Long-Term (3–5 Years)
Deploy Trolley Bins & Modified Trucks		•		
Compost Plant Setup (near markets)		•	• (Expansion)	
Establish Waste Segregation Centers (WSCs)		•	• (Operationalize IRRCs)	
PPP/CBO Operator Contracting		•	• (Expansion)	
Dumpsite Rehabilitation (Capping, Gas/Vent)	•			
Black Soldier Fly (BSF) Compost Units		• (Initial)	• (Expansion)	• (Citywide)
Material Recovery Facilities (MRFs)			• (Pilot)	• (Citywide)
New Sanitary Landfill Development			• (Planning)	• (Commissioning)
Waste-to-Energy (WTE) Pilot Projects			• (Pilot)	• (Scale-up)
Achieve 100% Source Segregation				•

Legend: • = Activity period/Active Implementation Phase.

4.6 Identification of Potential Sanitary Landfill Site for Chattogram City Corporation (CCC)

4.6.1 Locational Criteria

According to the **Solid Waste Management Rules 2021**, landfill site selection criteria and minimum siting distances are:

Criteria Category	Requirement / Location Type	Minimum Siting Distance / Condition
Restricted Areas	Environmentally Critical Areas (ECA), protected areas, sanctuaries, declared environmentally sensitive areas & flood-prone / flood flow land	Landfill not permitted
Operational Planning	Site usability	Minimum operational life of 20–25 years

Criteria Category	Requirement / Location Type	Minimum Siting Distance / Condition
	Landfill design	Phase-wise development using landfill cells
Buffer Zone	Waste processing & disposal sites (>5 tons/day)	Mandatory buffer zone with no development
	Buffer zone specification	To be determined by the Local Authority in consultation with DoE
Water Bodies	Rivers, wetlands, ponds	≥ 200 meters
Residential Areas	Residential development projects	250 meters
	Existing residential areas, public parks, & water supply wells	500 meters
Transport Infrastructure	National highways	500 meters
Aviation Safety	Airports and airbases	3 km

4.6.2 Rule of Thumb for Landfill Land Requirement

The selection of landfill sites in Bangladesh are guided by the Solid Waste Management (SWM) Rules, 2021. As a general rule, small to medium cities require approximately 8–10 acres of landfill land per 100,000 population for a service life of 20–25 years, assuming landfill heights of 12–15 meters and partial diversion of waste through composting and recycling. About 25% of the total land area is typically allocated for composting and ancillary facilities, while the remainder is used for landfill cells. Where landfill height is limited (e.g., 4–5 meters), land requirements increase substantially (source: Improving Municipal Solid Waste Management in India, A Sourcebook for Policy Makers and Practitioners, P-42).

Given the current population of Chattogram City Corporation (CCC) (~50 lakh), the indicative land requirement for a single engineered landfill would be approximately 400–500 acres to ensure long-term serviceability in compliance with national rules. Based on widely applied planning norms and international best practices adapted to South Asian conditions, the indicative landfill land requirement by population size is summarized in **Table 4-7**

Table 4-7: Rule of Thumb for Landfill Land Requirement

Population Served	Indicative Land Requirement	Typical Landfill Height	Service Life
10,000	~2 acres	4–5 m	20–25 years
100,000	8–10 acres	12–15 m	20–25 years
1,000,000	80–100 acres	12–15 m	20–25 years
5,000,000 (CCC)	400–500 acres	12–15 m	20–25 years

4.6.3 Assessment of Landfill Site Location

In order to ensure environmentally sound and long-term solid waste disposal for Chattogram City Corporation (CCC), one potential site for the development of a sanitary landfill has been identified to the southern, western, eastern, and northern parts of the city. The sites were preliminarily assessed based on key physical, environmental, and accessibility-related factors, including land area, elevation above mean sea level (MSL), proximity to major transport corridors, and surrounding environmental conditions.

The potential landfill sites and their salient characteristics are presented in **Table 4-8**

Table 4-8: Possible Landfill Sites for CCC

SI	Location	Approx. Land Area (Acres)	Elevation	Accessibility	Key Observations
1	South of the city (South Haliashahar, Ward-39), near CEPZ – Approx. 1500 m from BRAC Primary School	~80 acres	Low land, ~2.5 m above MSL	Good	This land is kept in DAP as landfill site. Satisfies most of the controlling criteria. Near char land (Shoal)
2	West of the city (Uttor Kattali, Ward-11 & North Kattali, Ward-10), Approx. 100m from the Port Link Road	~55 acres	Low land, ~2.5 m above MSL	Good	Satisfies most of the controlling criteria. Several types of water bodies were found scattered in this area
3	East of the city (Mohra, Ward-5)	~40 acres	Low land, ~2.5 m above MSL	Good	Satisfies most of the controlling criteria. Safe distance away from the river.
4	North of the city (North Pahartali, Ward-9)	~80 acres	Moderately high, ~5 m above MSL	Good	Satisfies all controlling criteria. Situated in hilly region and Slums are existing. Will be very difficult to implement due to tension between the residence and government over land ownership disputes
5	North of the City (near Chattogram University)	~80 acres	Moderately high, ~5 m above MSL	Good	Satisfies all controlling criteria. Situated in hilly region. CCC is currently working to establish a landfill in this area.

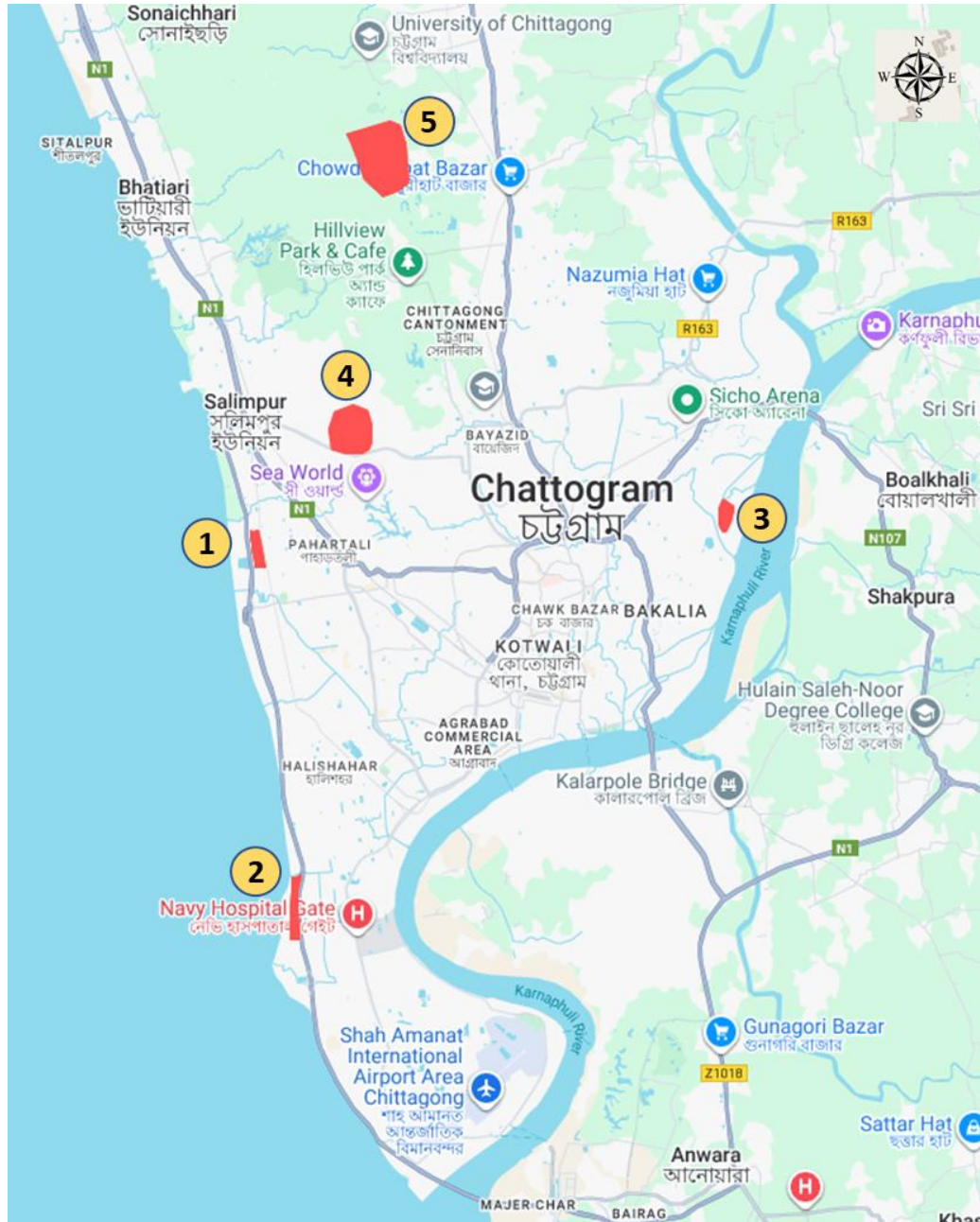


Figure 4-3: Possible Landfill Sites

4.6.4 Assessment Outcome

None of the identified sites meet the minimum land requirement for a full-scale engineered landfill for CCC, even if the system is divided into two landfill facilities.

Prescribed Option: Hybrid Waste Management System (Most Practical)

Given the absence of sufficiently large land parcels within or near CCC, the most practical and implementable option is a Hybrid Solid Waste Management System, rather than reliance on a single large landfill.

Key Features of the Hybrid System

- Development of two small controlled landfill sites (80–100 acres each) for residual waste only

- Introduction of waste diversion measures, including:
 - Composting of organic waste
 - Recycling and material recovery
 - Possible RDF or co-processing options
- Phase-wise landfill cell development, extending operational life despite limited land

Concluding Statement

Considering the extreme limitation of available land within Chattogram City Corporation, development of a single large engineered landfill is not feasible under existing conditions. Based on the rule of thumb for landfill land requirement and site suitability assessment, a hybrid solid waste management system—combining waste reduction, composting, recycling, transfer stations, and small controlled landfill facilities for residual waste is the most practical and compliant solution for CCC.

4.7 Integration of Informal Waste Workers into Formal Waste Management

4.7.1 Background

In both Chattogram City Corporation (CCC) and the Paurashavas under CDA, a significant portion of recyclable waste is collected and processed by informal waste workers, including waste pickers, itinerant buyers, and small-scale recyclers. These workers provide essential services in waste recovery, yet they often operate without recognition, social protection, or access to safe working conditions.

Recognizing their role is crucial for achieving inclusive, efficient, and sustainable solid waste management. Formal integration of these workers into municipal waste systems not only enhances recycling rates and reduces landfill pressure but also contributes to social equity and economic resilience.

4.7.2 Proposed Actions

Activity	Lead Agency	Supporting Agencies	Timeline
Mapping and registration of informal waste workers	CCC/Paurashava	NGOs, Local Elected Representatives/ Ward Councillors	6–12 months
Capacity building and training programs	CCC/Paurashava	Vocational Training Institutes, NGOs, DoE	12–24 months
Provision of safety equipment and health services	Ministry of Health	CCC/Paurashava, NGOs	12–36 months
Establishment of cooperative or cluster models	CCC/Paurashava	NGOs, Microfinance Institutions, Informal Worker Associations	12–36 months
Inclusion in municipal waste collection contracts	CCC/Paurashava	DoE, Local Elected Representatives/ Ward Councillors	12–24 months
Monitoring and evaluation of integration efforts	DoE	NGOs, Academic Institutions	Biannually

4.7.3 Expected Outcomes

- **Improved Waste Management Efficiency:** Harnessing the existing networks of informal workers can boost collection and recycling rates.
- **Better Livelihoods:** Formal engagement leads to more stable incomes, access to health and safety services, and recognition.
- **Environmental Gains:** Higher recycling and reduced open dumping result in cleaner urban environments.
- **Social Inclusion:** Empowers marginalized workers by integrating them into formal systems, promoting equity and dignity.

4.7.4 Application in CCC and Paurashava Contexts

In CCC, informal waste workers can be engaged through Public-Private Partnership (PPP) contracts. They may be allocated to specific zones under the oversight of the Waste Management Department, with NGOs supporting training and coordination.

In Paurashavas, integration may follow a Community-Based Organization (CBO) model. Informal workers may be organized into cooperatives or registered associations to participate in door-to-door collection, dry waste sorting, and recycling activities. These efforts will be linked to ongoing PPP/CBO frameworks and municipal performance monitoring systems.

This section is intended to stand independently within the EMP and aligns with the Solid Waste Management Rules, 2021, supporting inclusive, community-driven urban environmental management.

4.8 Enforcement Mechanisms and Penalties for Non-Compliance

To ensure effective implementation of the Environmental Management Plan (EMP), robust enforcement and compliance framework is essential. This includes legal backing, systematic monitoring, graduated penalties, and institutional capacity.

4.8.1 Legal and Regulatory Framework

The EMP aligns with applicable national laws such as the Environment Conservation Act (1995), Air Pollution Control Rules (2022), Solid Waste Management Rules (2021), and the Environment Court Act (2010), providing legal authority to penalize violators.

4.8.2 Monitoring and Inspection Systems

- **Regular Inspections:** Scheduled and surprise visits to assess compliance.
- **Continuous Monitoring:** Use of real-time systems (e.g., CEMS, noise meters) in critical locations.

4.8.3 Penalty Structures

- **Minor Violations:** Warnings and required corrective action.

- **Moderate Violations:** Monetary fines proportional to damage.
- **Severe/Repeated Violations:** License cancellation, prosecution, or environmental court action.

4.8.4 Incentives for Compliance

- **Recognition Programs:** Publicly acknowledge environmentally compliant entities (e.g., wards, industries, institutions) through awards and certifications.
- **Technical Support:** Training and advisory support for improvement.

4.8.5 Institutional Strengthening

- **Capacity Building:** Training for CCC, DoE, and Paurashava staff on enforcement.
- **Coordination Mechanisms:** Establish inter-agency task forces and integrate data sharing.

This section reinforces the EMP's goal of creating a culture of compliance and accountability, promoting proactive behavior among stakeholders.

CHAPTER FIVE

CONCLUSION

5 CONCLUSION

This Environmental Management Plan (EMP) has been prepared based on detailed environmental assessments to equip the Chattogram Development Authority (CDA), Chittagong City Corporation (CCC), Paurashavas, and all relevant stakeholders with sufficient environmental information for the Preparation of the Chattogram Metropolitan Master Plan (Period: 2020–2041) project.

The EMP provides a structured framework for systematically managing environmental risk, strengthening urban services such as solid waste management, promoting air quality improvement, and enhancing citizens' quality of life, while ensuring compliance with national and international environmental standards.

Although the project is associated with certain environmental impacts, these impacts are neither long-term, cumulative, nor significant. With the implementation of the proposed mitigation measures, these impacts can be effectively controlled to avoid adverse effects on communities and ecosystems.

The project is expected to deliver substantial economic, social, and environmental benefits, contributing not only to the sustainable development of the project area but also to national objectives.

The CDA remains committed to continuous environmental improvement through regular monitoring, public disclosure, active community participation, and strict enforcement of environmental safeguards.