Environmental Impact Assessment (EIA)

Army Institute of Physiotherapy & Rehabilitation
Dewan Idris Road, Bishmail, Savar-1344, Bangladesh.

Prepared By:

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Declaration

This Environmental Impact Assessment (EIA) report has been prepared for Army Institute of Physiotherapy & Rehabilitation by Environest Engineering. The report encompasses various management plans tailored specifically for the hospital, highlighting significant environmental impacts and outlining the necessary mitigation measures. It emphasizes the strategies to minimize, reuse, reduce, and recover different resources throughout the development process, detailing the actions required by the project proponents to address these impacts effectively.

Shamim Ur Rahman has served as the principal author of this EIA report, with comprehensive support and collaboration from the entire team at Environest Engineering. The successful completion of this report was made possible by the collective effort of our team.

We gratefully acknowledge the valuable data and information provided by the Board of Directors of Army Institute of Physiotherapy & Rehabilitation, which has been instrumental in the preparation of this report.

Shamim Ur Rahman
Chief Executive Officer
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Abbreviations

EMP	Environmental Management Plan
DOE	Department of Environment
EIA	Environmental Impact Assessment
DGHS	Directorate General of Health Services
ECR	Environment Conservation Rules
GOB	Government of Bangladesh
ETP	Effluent Treatment Plant
STP	Sewage Treatment Plant
OHSA	Occupational Health and Safety Administration
EPA	Environmental Protection Agency
WHO	World Health Organization
ECA	Environment Conservation Act
DG	Director General
ECC	Environmental Clearance Certificate
NOC	No Objection Certificate
ADB	Asian Development Bank
DPDC	Dhaka Power Development Corporation
DCC	Dhaka City Corporation
OT	Operation Theatre
EQS	Environmental Quality Standard
IEE	Initial Environmental Examination
GPS	Global Positioning System
MOEF	Ministry of Environment and Forests
NGO	Non-Government Organization
SDG	Sustainable Development Goals
TOR	Terms of Reference
UNDP	United Nations Development Program
WASA	Water And Sewer Authority
BMD	Bangladesh Meteorological Department
CEA	Comprehensive Environmental Assessment
IEE	Initial Environmental Examination
EHS	Environment, Health and Safety
ERP	Emergency Response Plan
SDG	Sustainable Development Goals
WWTP	Wastewater Treatment Plant

Physical Units

m	= Meter
he	= Hectares
km	= Kilometers
sq.m	= Square Meters
l	= Liter
sq.ft	= Square Feet
sq.km	= Square Kilometer
435.6 sq.ft	= 1 Decimal
720 sq.ft	= 1 Katha
3 Bigha	= 1 Acre
20 Katha	= 1 Bigha
100 Decimal	= 1 Acres

Executive Summary

Army Institute of Physiotherapy & Rehabilitation will be situated at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344, and will be a military hospital and diagnostic center. The project's vision is to provide the community with comprehensive and integrated diagnostic and healthcare services. Army Institute of Physiotherapy & Rehabilitation will have state-of-the-art facilities, including a modern laboratory, dialysis unit, X-ray, endoscopy, ultrasonography, outpatient department (OPD), doctor's chambers, emergency unit, operating theater, patient cabins, and wards.

The hospital will be established to deliver specialized medical care at affordable costs to patients from all the military backgrounds and others. It also aims to contribute to the training of medical professionals in the country, thereby enhancing employment opportunities for the youth. The facility is strategically located for optimal communication, environmental sustainability, and accessibility, with readily available power, gas, oxygen, and transport infrastructure, and has a capacity of 200 beds. Army Institute of Physiotherapy & Rehabilitation is designed to cater to 500 to 600 outpatients per day and has obtained all necessary approvals from the relevant municipal authorities.

The hospital is positioned within a mixed residential and commercial zone, surrounded by residential buildings, a university, a market, and other development projects. The site selection ensured that no significant ecological, cultural, or archaeological sites were impacted, and there has been no need for the relocation of existing human settlements. The area has long benefited from essential services such as gas, electricity, telecommunication, and efficient transportation networks.

While the development of the hospital may result in certain environmental impacts during both the construction and the operational phases, measures are in place to mitigate these effects. Potential sources of pollution include wastewater, solid waste, and emissions from generator exhaust. Army Institute of Physiotherapy & Rehabilitation has proactively addressed these concerns. A formal agreement has been established with a third-party organization for the collection and disposal of all solid waste, including biomedical waste.

Liquid waste generated from medical and other activities will be treated using a Sewage Treatment Plant (STP) with a combined treatment capacity of 4 cubic meters per hour. The treated wastewater will then be discharged into a nearby canal, which flows into the canal.

Army Institute of Physiotherapy & Rehabilitation is situated in an environmentally suitable location. By adhering to the proposed Environmental Management Plan (EMP) and following the outlined mitigation strategies, the hospital is expected to operate within the national environmental standards and guidelines, ensuring minimal adverse impacts on the surrounding environment.

Chapter One: Introduction

1.1 General

Health is universally recognized as a fundamental indicator of human development, serving as both a cause and a consequence of poverty, illiteracy, and ignorance. Effective human development policies not only raise income levels but also improve other quality-of-life aspects, such as life expectancy, health, literacy, knowledge, and personal agency (United Nations Development Programme, 2019). Acknowledging this, the Government of Bangladesh has prioritized healthcare services for its citizens. However, despite these efforts, the availability of medical facilities remains insufficient to meet the growing healthcare demands. The healthcare industry in Bangladesh is predominantly driven by the private sector, which has seen significant growth, particularly in tertiary hospitals and diagnostic centers. By the end of 2019, there were 255 public hospitals, 5,054 private hospitals and clinics, and 9,529 diagnostic centers registered under the Directorate General of Health Services (DGHS) (DGHS, 2020).

The proposed hospital aims to deliver essential healthcare services, create substantial employment opportunities, and contribute to the overall improvement of public health. By addressing one of the three basic human needs, this hospital will play a vital role in environmentally sustainable development, significantly contributing to environmental protection and sustainable growth in the country. Since the early 20th century, advancements in living standards have been accompanied by an increased prevalence of diseases, underscoring the need for expanded and improved healthcare facilities (World Health Organization, 2021).

Numerous national and international studies indicate that there are limited good practices for healthcare waste disposal in Bangladesh. Reports suggest that most hospitals, except for a few private facilities, dispose of healthcare waste improperly, often along roadsides, similar to the disposal methods for solid and commercial waste (World Bank, 2002; Uddin, 2007; Pescod & Saw, 1998; Amanullah & Uddin, 2008-2009). While healthcare facilities in industrialized countries adhere to stringent safety standards to minimize health risks from medical waste, Bangladesh's efforts in risk minimization are inadequate. Observations reveal that most waste handlers in Bangladesh come from lower socio-economic backgrounds, have large families, and possess limited education and awareness. These handlers often manage medical waste without using necessary protective equipment (World Bank, 2002; Uddin, 2007).

Medical waste is frequently stored within hospital premises without proper safety measures, which can lead to severe consequences for public health. The prevailing practice involves dumping hospital waste in dustbins within or outside hospital premises and on city outskirts, where it is eventually handled by municipal authorities (Hasan et al., 2008). Typically, these authorities dispose of hazardous waste alongside other waste streams on vacant land, creating significant health risks for hospital patients, staff, waste collectors, and nearby communities (Amanullah & Uddin, 2008-2009; Becher & Lichtnecker, 2002).

In Dhaka, a more structured medical waste management system has been implemented. Most private hospitals and clinics segregate medical waste using color-coded bins and dispose of it in designated landfill areas. Additionally, some facilities partner with organizations like PRISM Bangladesh Foundation for waste collection and employ methods such as incineration to manage medical waste effectively. This approach aligns with best practices in medical waste management and aims to mitigate the risks associated with improper disposal (PRISM Bangladesh Foundation, 2020).

To address these challenges, the Department of Environment introduced the Medical Waste Management Rules in 2008. Effective medical waste management is a critical aspect of healthcare services, requiring comprehensive technical, financial, managerial, administrative, and logistical support. Maintaining high standards of sanitation and hygiene in hospitals is essential to create an optimal environment for patient care and ensure overall public health (Department of Environment, Bangladesh, 2008).

Army Institute of Physiotherapy & Rehabilitation (AIPR) is being established to address the existing gaps in healthcare provision within Bangladesh, with the objective of delivering international-standard medical treatment at an affordable cost. Situated on a site of 369,729 square feet, Army Institute of Physiotherapy & Rehabilitation aims to achieve significant growth in patient flow for both diagnostic and treatment services. As a leading military medical facility, Army Institute of Physiotherapy & Rehabilitation is committed to enhancing healthcare accessibility and quality.

Medical waste management is a critical environmental concern, as improper disposal can lead to contamination of land, air, and water resources. Consequently, the establishment of Army Institute of Physiotherapy & Rehabilitation has been carefully planned to mitigate environmental impacts. Located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-

1344, the facility's design and location have been chosen to align with environmental sustainability principles.

Prior to the commencement of any development project, it is essential to conduct a thorough assessment of potential environmental impacts and implement appropriate mitigation measures. An Environmental Impact Assessment (EIA) serves as a crucial tool in this process, providing a detailed analysis of the project's environmental implications. For Army Institute of Physiotherapy & Rehabilitation, the EIA will outline necessary actions to minimize adverse environmental effects, ensuring both the protection of natural resources and the well-being of patients and staff (Glasson, Therivel, & Chadwick, 2013).

1.2 Environmental Impact Assessment (EIA) and Its Significance

An Environmental Impact Assessment (EIA) is a systematic process used to evaluate the potential environmental effects of a proposed project before its implementation. The primary objective of an EIA is to identify, assess, and mitigate any adverse environmental impacts associated with a project throughout its lifecycle, including design, construction, operation, and decommissioning (Glasson, Therivel, & Chadwick, 2013). This process ensures that potential environmental concerns are addressed early in the project planning stages, allowing for effective mitigation measures to be developed.

The EIA process consists of several key stages. Screening determines whether a full EIA is necessary based on the potential impacts of the project (Burdge, 2004). Scoping involves identifying the main environmental issues and concerns that need to be addressed (Wood, 2003). During the impact assessment phase, the potential environmental impacts are evaluated, including both positive and negative effects (Petts, 1999). Mitigation measures are then proposed to avoid, reduce, or offset adverse impacts (Morgan, 2012). The findings are documented in an Environmental Impact Statement (EIS), which is reviewed to make decisions regarding project approval and additional requirements (Glasson et al., 2013).

The significance of an EIA lies in its ability to provide a comprehensive understanding of the potential environmental consequences of a project. By integrating environmental considerations into the decision-making process, an EIA supports informed decision-making that balances development needs with environmental protection. It enables early identification of potential impacts, allowing for the development of strategies to address issues before they become significant problems (Wood, 2003). Additionally, the EIA process often includes

public consultation, which helps to address community concerns and enhance project transparency (Petts, 1999).

Conducting an EIA also ensures regulatory compliance by adhering to environmental regulations and standards, thereby reducing legal and financial risks (Morgan, 2012). Moreover, by considering environmental factors in project planning, an EIA supports the principles of sustainable development, contributing to the conservation of natural resources for future generations (Morrison-Saunders & Partidário, 2013). Overall, the EIA is a crucial tool for managing and mitigating environmental impacts, promoting sustainable development, and ensuring that projects are executed in an environmentally responsible manner.

1.3 Aims and Objectives of the EIA

The primary aim of the Environmental Impact Assessment (EIA) for Army Institute of Physiotherapy & Rehabilitation (AIPR) is to systematically identify, evaluate, and mitigate the potential environmental impacts associated with the establishment and operation of the proposed healthcare facility. This EIA report is designed to ensure that the project is developed in an environmentally responsible manner, balancing the need for advanced healthcare services with the protection and preservation of the surrounding environment.

To achieve this aim, the EIA report has several key objectives and they are as follows,

a. **Assess Environmental Impacts:** To comprehensively assess the potential environmental impacts of the proposed healthcare facility on the surrounding land, air, water, and ecosystems. This includes evaluating both direct and indirect effects related to the construction, operation, and decommissioning phases.
b. **Identify Key Environmental Issues:** To identify and analyze key environmental issues and concerns specific to the site located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344. This involves assessing potential impacts on local communities, natural resources, and infrastructure.
c. **Develop Mitigation Measures:** To propose effective strategies and measures to mitigate adverse environmental impacts identified during the assessment. This includes developing plans to address waste management, pollution control, and resource conservation.
d. **Enhance Positive Benefits:** To enhance the positive environmental and social benefits of the healthcare facility. This involves identifying opportunities for improving local environmental conditions and contributing to sustainable development goals.

e. **Ensure Regulatory Compliance:** To ensure that the project complies with all relevant environmental regulations and standards. The EIA report will outline how AIPR plans to meet legal requirements and obtain necessary permits and approvals.

f. **Facilitate Public Engagement:** To provide a transparent and inclusive process by engaging with local communities and stakeholders. This includes incorporating feedback and addressing public concerns regarding the environmental impacts of the project.

g. **Support Informed Decision-Making:** To provide decision-makers with comprehensive and accurate information to support informed decisions regarding the approval and implementation of the healthcare facility. This includes evaluating the potential trade-offs between environmental protection and project benefits.

h. **Document Findings and Recommendations:** To document the findings of the environmental assessment in a clear and structured report, including recommendations for managing environmental impacts and monitoring the effectiveness of mitigation measures.

1.4 Methodology

The methodology for the Environmental Impact Assessment (EIA) for Army Institute of Physiotherapy & Rehabilitation (AIPR) is systematically designed by Environest Engineering to meet the requirements of the Environment Conservation Rules (ECR), 2023. The process began with assembling a skilled EIA team comprised of professionals from environmental science, engineering, and social sciences. This team was tasked with overseeing the entire assessment process.

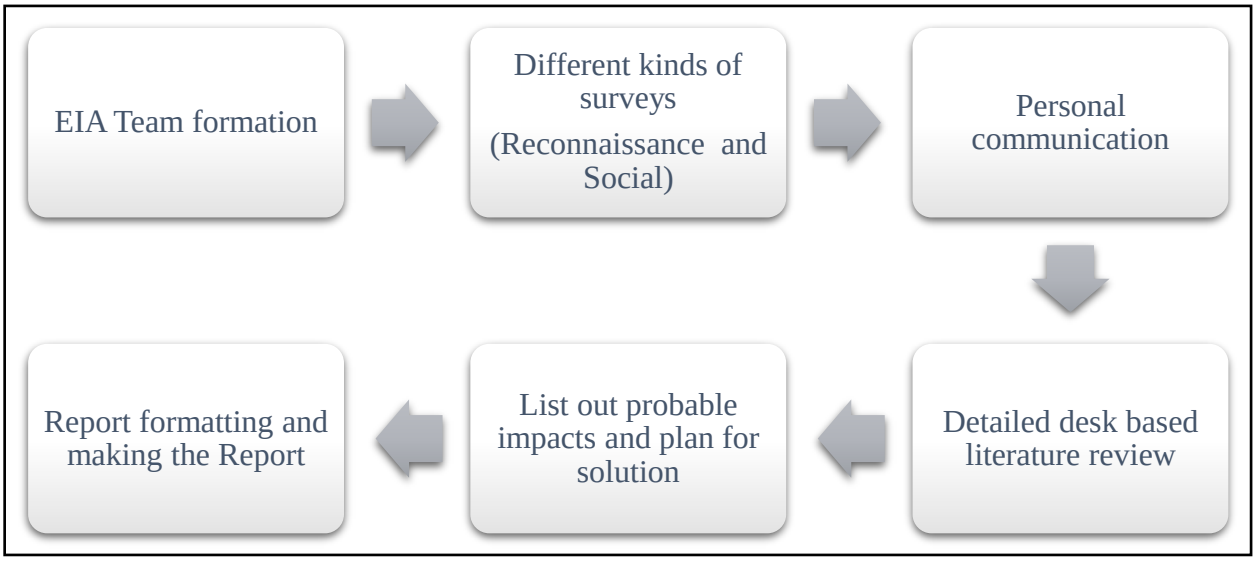


Figure 1.1: Schematic diagram of methodology

Initially, the existing environmental conditions of the project site and its surrounding areas were assessed to establish a baseline. This baseline is crucial for comparing potential environmental impacts resulting from the project's implementation. A reconnaissance survey was conducted to identify key environmental and social issues in the project area.

Data collection followed a structured approach. This included a detailed desk-based literature review to gather background information from existing studies and reports. Personal communications with stakeholders, including local community members and government officials, provided additional insights into the local context and concerns.

Social surveys helped to understand the socio-economic and cultural aspects of the community. These surveys were complemented by consultations with various government departments and agencies to ensure comprehensive data gathering.

The EIA assessed potential environmental impacts during both the construction and operational phases of the project. This involved evaluating direct and indirect effects on the environment and local communities. Based on this assessment, a comprehensive Environmental Management Plan (EMP) was developed.

The EMP includes measures to mitigate adverse impacts, enhance positive effects, and provide recommendations for monitoring throughout both construction and operational phases. Additionally, the EIA identified issues that may require further study to address any uncertainties or gaps in the assessment.

Finally, the EIA report was prepared following prescribed formats and guidelines set by the Department of Environment (DoE). This ensures that all potential environmental impacts are thoroughly assessed and managed, aligning with regulatory requirements and best practices.

In addition to the Environmental Impact Assessment (EIA) report, several specialized management plans are included to address specific project impacts. These plans encompass the Occupational Health & Safety Management Plan (OHSMP), which ensures worker safety; the Emergency Response and Fire Management Plan (EFMP), which outlines protocols for emergencies; the Hospital Waste Management Plan (SWMP), which details procedures for medical waste handling and disposal; and the Noise Management Plan (NMP), which focuses on mitigating noise pollution. All these plans are integrated into the EIA report to ensure a comprehensive approach to managing the project's environmental and operational impacts.

1.5 Organizing of the Report

This report consists of a total of twelve chapters.

- **Chapter One** provides an introduction to the report and Army Institute of Physiotherapy & Rehabilitation (AIPR), outlining the purpose and scope of the Environmental Management Plan (EMP), and the methodologies used in the report.
- **Chapter Two** covers the relevant Acts, Policies, Rules, and Regulations that govern environmental management and compliance for healthcare facilities.
- **Chapter Three** provides a detailed description of the project, including information on AIPR's location, infrastructure, and operational characteristics.
- **Chapter Four** discusses the existing environment, including aspects such as flora and fauna, air quality, water resources, land use, and noise levels in the vicinity of AIPR.
- **Chapter Five** identifies the potential environmental impacts associated with AIPR's operations and outlines mitigation measures to address these impacts.
- **Chapter Six** presents the Environmental Management Plan (EMP), detailing the strategies and actions to be implemented to manage environmental impacts during the project's lifecycle.
- **Chapter Seven** outlines the Environmental Management Policy and Monitoring Plan, specifying how AIPR will monitor and manage environmental performance and ensure compliance with environmental standards.
- **Chapter Eight** provides an analysis of alternatives, evaluating different scenarios and approaches to achieve the project’s objectives while minimizing environmental impacts.
- **Chapter Nine** describes the Decommissioning Plan, including procedures and measures to be taken when ceasing operations to ensure environmental protection and site restoration.
- **Chapter Ten** details the public consultations conducted as part of the environmental assessment process, summarizing stakeholder inputs and concerns.
- **Chapter Eleven** concludes the report, summarizing the key findings, policies, and plans that have been adopted to ensure environmental sustainability and compliance with regulatory requirements.
- **Chapter Twelve** lists all the references used throughout the report.

1.6 Performance of the Assessment

This Phase of EIA consists of the following steps

a. **Site Visit:** The member of the EIA team has visited the site to determine the possible environmental impacts of the existing project and recorded the prevailing conditions of the environment as they existed prior to the implementation of the project.
b. **Identification and Evaluation:** The adverse and beneficial effects of the existing project on the environment have been evaluated.
c. **Discussion of Alternatives:** Various possible alternatives have been discussed.
d. **Preparation of Checklist:** A checklist has been prepared to ensure complete coverage of all the possible consequences of the existing project so that it can be determined as to what administrative actions should be taken.
e. **Developed of Environmental Impact Due to The Project:** To identify the impact of the project on the environment, a checklist of environmental attributes has been developed that reflect the impact on the environment resulting from a particular action.
f. **Decommissioning Considerations:** The assessment includes planning for decommissioning the project, addressing potential environmental impacts, and ensuring proper management of waste and site restoration upon project completion.

1.7 Limitations of the Report

The Environmental Impact Assessment (EIA) report for this project relies predominantly on data provided by the client, insights gathered from discussions with hospital personnel, and observations from various surveys and investigations conducted within the project area. Throughout this study, professional judgment and subjective interpretation have been utilized. It is crucial to acknowledge that any modifications to the project's location, design, or activities could result in variations in the identified impacts. Furthermore, technological advancements during the construction and operational phases may influence the extent and severity of these impacts. As with any environmental assessment report, certain limitations must be recognized:

i. **Predictive Uncertainty:** Anticipating which potential environmental and social issues will materialize as actual problems in the future is inherently challenging. Environmental regulations and enforcement priorities are subject to frequent changes, which can affect the relevance and applicability of the findings and recommendations outlined in this report (Glasson, Therivel, & Chadwick, 2013). Consequently, unforeseen regulatory changes could necessitate revisions to the impact assessment and the proposed mitigation measures.

ii. **Estimation of Liabilities:** Estimating the liabilities associated with mitigating identified environmental and social issues is often complex and imprecise. Legal and technological standards for addressing environmental concerns are continually evolving, and liability can be significantly influenced by negotiations with regulatory agencies, which are inherently unpredictable (Wood, 2003). This variability underscores the need for adaptive management approaches to address emerging issues as they arise.

iii. **Applicability of Data and Practices:** The policies, methods, and plans included in this report are based on data and practices derived from a range of sources, which may not always be directly applicable to this specific project. The report incorporates hypothetical scenarios and predictive modeling, acknowledging that not all proposed measures may be fully effective or relevant in every situation (Canter, 1996). As a result, there is a need for continuous monitoring and adjustment of the environmental management strategies to ensure their efficacy.

iv. **Technological and Methodological Evolution:** Technological advancements and methodological innovations during the project's lifecycle may influence the environmental impacts and the effectiveness of mitigation strategies. It is essential to remain vigilant about emerging technologies and best practices that could enhance environmental performance and reduce potential impacts (Sadler, 1996).

These limitations highlight the inherent uncertainties present in environmental impact assessments. They emphasize the importance of ongoing review, monitoring, and adaptation as new information, regulations, and technologies become available. Proactive and flexible environmental management practices will be crucial in addressing these uncertainties and ensuring the project's long-term sustainability.

1.8 Scope of the Present EIA

The Environmental Impact Assessment (EIA) for Army Institute of Physiotherapy & Rehabilitation will be meticulously prepared and submitted to the Department of Environment (DoE) for review and approval to obtain Environmental Clearance. The scope of the EIA study encompasses several critical components.

Firstly, it involves a comprehensive review of relevant environmental legislation, regulatory policies, and guidelines specific to the healthcare sector, ensuring that Army Institute of

Physiotherapy & Rehabilitation adheres to legal requirements and integrates best practices for environmental management.

Secondly, the EIA will provide an in-depth description of the existing conditions at the proposed site for Army Institute of Physiotherapy & Rehabilitation, evaluating environmental characteristics and assessing the suitability of the location from an environmental perspective. This includes documenting current environmental quality and identifying any pre-existing issues that may impact the project.

The assessment will also involve a thorough evaluation of potential environmental impacts associated with the development, construction, and operational phases of Army Institute of Physiotherapy & Rehabilitation. Standard methodologies and checklists will be employed to analyze the potential effects on environmental quality parameters and identify significant impacts.

Additionally, the EIA will discuss various alternatives to determine the most environmentally sustainable options for Army Institute of Physiotherapy & Rehabilitation. This evaluation will include assessing the potential impacts of different approaches and recommending strategies for minimizing adverse effects.

The development of mitigation measures is another crucial aspect of the EIA. It will propose strategies to address identified adverse impacts and enhance positive outcomes, incorporating these measures into a detailed Environmental Management Plan (EMP). The EMP will outline monitoring programs and strategies for managing environmental performance throughout the lifecycle of Army Institute of Physiotherapy & Rehabilitation.

Lastly, the EIA will identify any areas requiring further study to address uncertainties or emerging issues that could affect the environmental performance of Army Institute of Physiotherapy & Rehabilitation. This comprehensive scope ensures that all relevant environmental aspects are thoroughly examined, contributing to the sustainable development of Army Institute of Physiotherapy & Rehabilitation.

1.9 EIA Team

The EIA report for Army Institute of Physiotherapy & Rehabilitation has been prepared by a highly qualified, knowledgeable, and dynamic team from Environest Engineering. This team comprises experts from diverse fields, including engineering, science, and sociology, ensuring

a comprehensive approach to the assessment. Throughout the preparation of the report, the team engaged in collaborative efforts, including round-table meetings, field visits, and discussions with both the client and local communities near the project site. The collective expertise and collaborative approach of the EIA team have been pivotal in developing a thorough and effective Environmental Impact Assessment. The members of the EIA team are listed as follows.

Table 1.1: EIA Team Member

S.N.	Name	Designation	Signature
1.	Shamim Ur Rahman	Manager (Environment) (Chief Author) M.Sc. in Environmental Sciences and Management Jahangirnagar University (JU) shamimurrahman.env@gmail.com Experience: 7 Years	
2.	Sudipta Sarker	Environmental Engineer BSc. in Civil Engineering, Ahsanullah University of Science & Technology (AUST), (Major: Transportational Environment)	
3.	Eimtiaz Ibne Easin	Environmental Engineer B.Sc. in Civil Engineering Ahsanullah University of Science and Technology Experience: 3 Years	
4.	Shahadat Hossain	Geologist Masters in Geological Science Jahangirnagar University Experience: 1.5 Years	
5.	Fatema Islam Lucky	Senior Executive (Green Economy) Master of Business Administration National University Experience: 2 Years	
6.	Md. Hayder Hossain	Mechanical Engineer Diploma in Mechanical Engineering Experience: 14 Years	

Numerous individuals and agencies contributed valuable data, information, and support in preparing this EIA report for Army Institute of Physiotherapy & Rehabilitation. Their cooperation and openness in discussing environmental issues were crucial to the thoroughness of the assessment. We extend our gratitude to the Department of Environment (DoE) personnel and the Dhaka Metro Office for their assistance and collaboration throughout the study.

Chapter Two: Acts, Policies, Rules & Regulations

2.1. Introduction

Development projects are governed by some legal and institutional requirements. So, considerations of relevant legal provisions, policies, strategies, and institutional issues are very important for any project proponent or developer before they actually execute a program or plan, and obviously at the operational stages of projects, no project can deny these rules which set the boundary limits for each project. The proponent has to be well aware of these requirements and comply with the provisions as applicable and necessary. The following sections review the relevant national legislation and policies along with some international laws.

2.2. Environmental Policy

Environment Conservation Act, 1995 (ECA '95) is currently one of the main legislative documents relating to environmental protection in Bangladesh. Under this act, no industrial unit or project shall be established or adopted without obtaining environmental clearance, in the manner prescribed by the rules, from the Director General. Compliance with the provision of this Act is the responsibility of the Department of Environment (DoE). A set of the relevant rules to implement the ECA'95 had been promulgated in August 1997. The rules mainly consist of:

- Categorized list (green, orange, and red) of the projects.
- Application format to take environmental clearance.
- Ambient standards about water pollution, air pollution, and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by industries.

In accordance with section 20 of The Bangladesh Environment Conservation of Act No. 1 of 1995, the Government in March 2023 passed the Bangladesh Environment Conservation Rules, 2023. This Article discussed various important provisions of the Regulation:

- Categorized list (green, yellow, orange, and red) of the projects.
- Application format to take site clearance and environmental clearance.
- Ambient standards in relation to water pollution, air pollution, and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by industries.
- Procedure for issuance of Environmental Clearance and Location Clearance Certificate.

- Services, fees, and mode of payment Services, fees, and mode of payment.

In light of the categorization made under the above ECR, '23, **Army Institute of Physiotherapy & Rehabilitation (AIPR)** falls ৬৯। হাসপাতাল (৫০ বেডের উর্ধ্বে)। under the "**Red"** category.

According to ECR'23, industries that fall under the Green and Yellow categories are not required to undertake an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA) study. Orange projects are required to undertake an IEE, while Red category projects must undertake an IEE and an EIA and or EMP.

Being committed to environmental protection, AIPR has taken positive actions from the beginning to meet ECA, '95, ECR, '23, and other environmental protection rules and regulations.

2.3. Provisions Under the Environmental Legislation

2.3.1. National Water Management Plan (NWMP), 2001 (approved in 2004)

The National Water Resources Council approved on March 31, 2004, a 25-year National Water Management Plan. The plan provides a framework within which all concerned with the development, management, and use of water resources and water services in Bangladesh can plan and implement their activities in a coordinated and integrated manner. The planned activity programs have been presented in the eight sub-sectoral clusters: i) Institutional Development, ii) Enabling Environment, iii) Main River, iv) Towns and Rural Areas, v) Major Cities; vi) Disaster Management; vii) Agriculture and Water Management, and viii) Environment and Aquatic Resources. Each cluster comprises several individual programs. WARPO was assigned to monitor the NWMP.

2.3.2. Natural Water Bodies Protection Act 2000

- According to this Act, the character of water bodies, i.e., rivers, canals, tanks, or floodplains identified as water bodies, in the master plans or the master plans formulated under the laws establishing municipalities in division and district towns shall not be changed without approval of the concerned ministry.
- Anyone disobeying this act will be subjected to a maximum of 5 years of imprisonment or a maximum 50,000-taka penalty or both.

2.3.3. National Water Policy (1999)

The National Water Policy of 1999 was passed to ensure efficient and equitable management of water resources, proper harnessing, and development of surface and groundwater, availability of water to all concerned, and institutional capacity building for water resource management. It has also addressed issues like river basin management, water rights and allocation, public and private investment, water supply and sanitation, and water needs for agriculture, industry, fisheries, wildlife, navigation, recreation, environment, preservation of wetlands, etc.

2.3.4. National Agricultural Policy, 1999

The overall objective of the National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable food security system for all. One of the specific objectives of the National Agricultural Policy is to take necessary steps to ensure environmental protection as well as environment-friendly sustainable agriculture. Through increased use of organic manure and strengthening of the integrated pest management program. The policy also suggests creating awareness so that the chemical fertilizers and pesticides used for increased crop production do not turn out to be responsible for environmental pollution. Water logging and salinity are identified as one of the serious problems in some parts of the country including the coastal areas for agricultural activities and environmental damage. The policy recommends for crop rotation and salt tolerant crop varieties.

2.4. Other Sectoral Policies/Legislation of Relevance

Any industry in the country is also required to comply with the industrial and export/import policy of the country. The industry is also required to comply with the Factories and Establishment Act and to undertake the license from concerned licensing authority.

In addition to the above National rules and regulations BTSM in its operational phase must comply with other national acts, policies, and rules, some of which are as follows:

2.4.1. Forest Policy (1994)

The National Forest Policy of 1994 is the amended and revised version of the National Forest Policy of 1977 in light of the National Forestry Master Plan. The major target of the policy is to conserve the existing forest areas and bring about 20% of the country's land area under the

forestation Program and increase the reserve forest land by 10% by the year 2015 through coordinated efforts of GO-NGOs and active participation of the people.

Amendments to the existing laws (acts, rules, and regulations) relating to the forestry sector and the creation of new laws for sectoral activities have been recognized as important conditions for achieving the policy goals and objectives. The Forestry Policy also recognizes the importance of fulfilling the responsibilities and commitments under International Conventions, Treaties, and Protocols (ICTPs).

2.4.2. National Fisheries Policy, 1999

The National Fisheries Policy, 1999 was formulated following the review and intent of the East-Bengal Protection and Conservation of Fish Act 1950, which was updated by the Protection and Conservation of Fish (Amendment) Ordinance 1982 and further refined by the Protection and Conservation of Fish (Amendment) Act 1995. These Acts and ordinances provide provisions for the protection and conservation of fish in fresh water and brackish water bodies.

The Fisheries Policy highlights the need to conserve fish breeding grounds and habitats. It intends to promote fisheries development and conservation in all water bodies. The project should consider these policies to protect the habitats, migration, and connectivity of fish and fisheries resources around the project area. Measures to reduce any potential negative impacts on local fish populations will be incorporated into all stages of the Project.

2.4.3. National Land Use Policy, 2001

The National Land Use Policy was enacted in 2001 aims at managing land use effectively to support trends in accelerated urbanization, industrialization, and diversification of development activities. The policy urges that increasing the land area of the country may be not possible through artificial land reclamation process, which is cost-effective only in the long run. The major contents of this policy are the following:

- Stopping the high conversion rate of agricultural land to non-agricultural 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 practice

2.4.4. The Embankment and Drainage Act, 1952

The East Bangle Act No. 1, 1953 was amended in 1953 and was adapted by the People's Republic of Bangladesh, by the Bangladesh Order (adaptation of Existing Laws), 1972 (President's Order No. 48 of 1972). The Act consolidates the laws relating to embankments and drainage providing provision for the construction, maintenance, management, removal, and control of embankments and water courses for the better drainage of lands and their protection from floods, erosion, or other damage by water.

The specific Sections and Articles relevant to the project are mentioned below:

- **Section 4 (1)** of the Act states that the embankment, watercourse, tow-path, earth, pathways, gates, berms, and hedges of the embankments shall vest in the Government of the Authority (BWDB).
- **Section 56 (1)** states that the person will be subject to a penalty (500 takas or imprisonment… if he erects, or causes or willfully permits to be erected, any new embankment, or any existing embankment, or obstructs of diverts, or causes or willfully permits to be obstructed or diverted, any watercourse).
- **Section 15** allows for the engineer (engineer in charge of Divisional level BWDB) for constructing new embankment or enlarging, lengthening or repairing existing embankments.
- The other sections of the Act give powers and access to the Government or Authority or Engineers to commence necessary project activities, for land acquisition (through the DC), and site clearing activities including removal of trees or houses (if necessary).

2.4.5. Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009

The GOB also prepared the BCCSAP in 2008 and revised it in 2009. This is a comprehensive strategy to address Climate Change (CC) challenges in Bangladesh. BCCSAP built on and expanded the NAPA. 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 CC 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** to further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities.

- **Infrastructure** to ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructure (cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change.
- **Research and Knowledge management** to predict the likely scale and timing of CC impacts on different sectors of the economy and socio-economic 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 govt. ministries, civil society, and the private sector to meet the challenge of CC.

2.4.6. Sound Pollution Control Rules, 2006

Table 2.1: Bangladesh Standards for Noise

SL. No.	Area Category	Standard Values (All values in dB)	
		Day	Night
1.	Silent Area	50	40
2.	Residential area	55	45
3.	Mixed area (basically residential and together used for commercial and industrial purposes)	60	50
4.	Commercial	70	60
5.	Industrial	75	70

Source: *MOEF, 2006*

Note: **1)** The time from 6 a.m. to 9 p.m. is counted as daytime.

2) The time from 9 p.m. to 6 a.m. is counted as night time

2.5. Compliance with DoE's EIA Guideline

2.5.1. The Environmental Conservation Act, 1995

The Bangladesh Environmental Conservation Act of 1995, is an umbrella legislation enacted to provide for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. The DOE was created under the Act. The provisions of the Act authorize the Director General (DG) of the Department of Environment to undertake any activity he deems fit and necessary to conserve and enhance the quality of the

environment and to control, prevent, and mitigate pollution. The main provisions of the Act have been listed in table 2.2.

Table 2.2: Various Provisions of the Bangladesh Environmental Conservation Act, 1995

Sections	Provisions
Section 3	A Department of Environment, headed by a Director General (DG), should be established by the government for carrying out the purposes of this Act.
Section 4	The powers and functions of the DG will include taking necessary measures for conservation and protection of environment and issuing directions to concerned persons, to be carried out within a specified time limit, including that of closure after sending a written notice.
Section 4(A)	The DG or any other authorized person may seek assistance from law-enforcing agencies in case of non-compliance with directions of closure. In such cases, the electricity, gas, telephone and water services for the non-compliant party can be discontinued.
Section 5	The government can declare an area ecologically critical, and issue a notice specifying the activities or processes that cannot be initiated or continued in it.
Section 6	This section specifies the restrictions regarding (a) vehicles emitting smoke injurious to environment and (b) manufacture, sale etc. of articles injurious to environment.
Section 7	The DG may seek compensation and/or corrective measures from the concerned person whose act/emission has caused direct/indirect injury to the ecosystem, failing which a civil suit and/or criminal case can be filed in a competent court.
Section 8	This section allows a person affected or likely to be affected by environmental pollution or degradation to apply to the DG for remedy.
Section 9	The person responsible and the person in charge of the place of occurrence of accidental pollution shall take measures to control or mitigate it, expenses for which are payable to the DG.
Section 10	Any person generally or specially authorized by the DG shall have the right to enter any building.
Section 11	A person authorized by the DG may, in the manner prescribed by rules, collect from any factory, premises or other place any sample of air, water, soil or other substance for analysis.
Section 12	An Environmental Clearance Certificate must be obtained from the DG for the establishment and undertaking of an industrial project.
Section 13	The government may formulate and publish environmental guidelines for conservation and improvement of environment and control and mitigation of pollution.
Section 14	This section allows a person aggrieved by a notice, order or direction issued under this Act to appeal to the appellate authority constituted by the government, within 30 days from its issuance.
Section 15	This section specifies the penalty to be paid for various offences.

Sections	Provisions
Section 16	When a company violates any provision of this Act or fails to perform its duties in accordance with a notice issued under this Act or the Rules, it will amount to a violation.
Section 17	This section introduces the grounds for taking cognizance of an offence and claim for compensation by a court.
Section 18	An action taken by the government or the DG, which caused or is likely to cause injury to any person, cannot be legally contested, if taken in good faith.
Section 19	The government may delegate its powers to the DG, who may delegate his to any other officer of the department.
Section 20	The government is vested with the power to make various rules for carrying out the purposes of this Act.

Source: *The Bangladesh Environmental Conservation Act, 1995*

2.5.2. The Environmental Conservation Rules (ECR), 1997

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. ECR'97 provides additional guidance for specific components of the Act. The rules mainly consist of:

- 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 pollution activities of the existing or proposed industries/development projects/activities
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities;
- Procedure for damage claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation.

Green: Industries/development projects/activities are considered relatively pollution-free and therefore do not require an environmental clearance certificate from the DOE and no environmental study.

Orange: Industries/development projects/activities fall into two categories. Orange "A" is less polluted and Orange "B" is moderately polluted required to submit general information, a process flow diagram, and schematic diagrams of waste treatment facilities along with their application to DoE for obtaining environmental site clearance and environmental clearance.

Red: Industries/development projects/activities which fall in RED category are those which may cause significant adverse environmental impacts and are therefore required to submit an EIA report. It should be noted that they might obtain an environmental site clearance on the basis of an IEE report, and subsequently submit an EIA report for obtaining environmental clearance along with other necessary papers.

Certain criteria and conditions have also been established by the Department of Environment (DoE) for siting an industrial plant or project. These are as follows:

- The location of the industry should be in an area that is/will be designated as an industrial zone, under the town and country planning regulations.
- While selecting sites for red and orange categories, a few considerations are to be kept in mind environmentally/ otherwise sensitive areas: nearest human settlement highway/railway boundary and high tide line (coastal regions) or natural/modified flood plain boundary.
- Forest land and prime agricultural land should be avoided as far as practicable.
- The plant should adequately provide for storage of solid wastes, treatment of wastewater, use of treated wastewater (if feasible), and a green belt around the perimeter.
- Highly polluting industrial plants should not be located in the vicinity of a recharge area /aquifer, the catchment area of a public water supply reservoir, the habitat of an endangered species, areas prone to floods/earthquakes, and areas of frequent inversions.
- Other factors also need to be considered like induced growth around the industrial site, views of the likely project-affected people, effects on availability of existing infrastructural facilities to the local population, and assimilative capacity of the receiving body of water.
- It is advisable to shortlist a few potential sites keeping in mind the above criteria, and then select a site with minimal environmental impacts.

Environmental standards in operation in Bangladesh is also Promulgated under the Environment Conservation Rules 1997. There are standards prescribed for varying water sources, ambient air, noise, odor, industrial effluent and emission discharges, vehicular Emission etc.

The Bangladesh standards intend to impose restrictions on the volume and concentrations of wastewater/solid waste/gaseous emission etc. discharged into the environment. In addition, a number of surrogate pollution parameters like Biochemical Oxygen Demand, Chemical Oxygen Demand; Total Suspended Solids, etc. are specified in terms of concentration and/or total allowable quality discharged in case of wastewater/solid waste. Additionally, specific parameters depending on the manufacturing process are specified such as phenol, cyanide, copper, zinc, chromium, etc. Air emission quality standards refer mostly to the concentration of mass emission of various types of particulates, sulfur dioxide, and oxides of nitrogen and in some cases volatile organic compounds and other substances.

The Bangladesh standards in general are less stringent compared to the developed countries. This is in view to promote and encourage industrialization in the country. The Bangladesh standards are not for any specific period of time. There is no provision for partial compliance too.

2.5.3. The Environmental Conservation Rules (ECR), 2023

The Environment Conservation Rules, 2023 are the first set of rules promulgated under the Environment Conservation Act, 2023. ECR, '23 provides additional guidance for specific components of the Act. The rules mainly consist of:

- Categorization of industries, development projects, and other activities on the basis of pollution activities of the existing or proposed industries/development projects/activities (Section-1);
- The National Environmental Quality Standards (EQS) for surface water, groundwater, drinking water, and industrial effluents (Section 2);
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities;
- Procedure for damage claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life;
- Guideline for preparing Environmental Impact Assessment (EIA) report (Section-11).

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation.

Green: Industries/development projects/activities are considered relatively pollution-free and therefore do not require an environmental clearance certificate from the DoE and no environmental study.

Yellow: Industries/development projects/activities fall in Yellow category are those which are causing medium pollution on the environment and human health. These projects/activities required to submit general information, an IEE report, application to DoE for obtaining environmental site clearance and environmental clearance.

Orange: Industries/development projects/activities fall in Orange category are moderately polluted required to submit general information, a process flow diagram and schematic diagrams of waste treatment facilities, an IEE and EMP along with their application to DOE for obtaining environmental site clearance and environmental clearance.

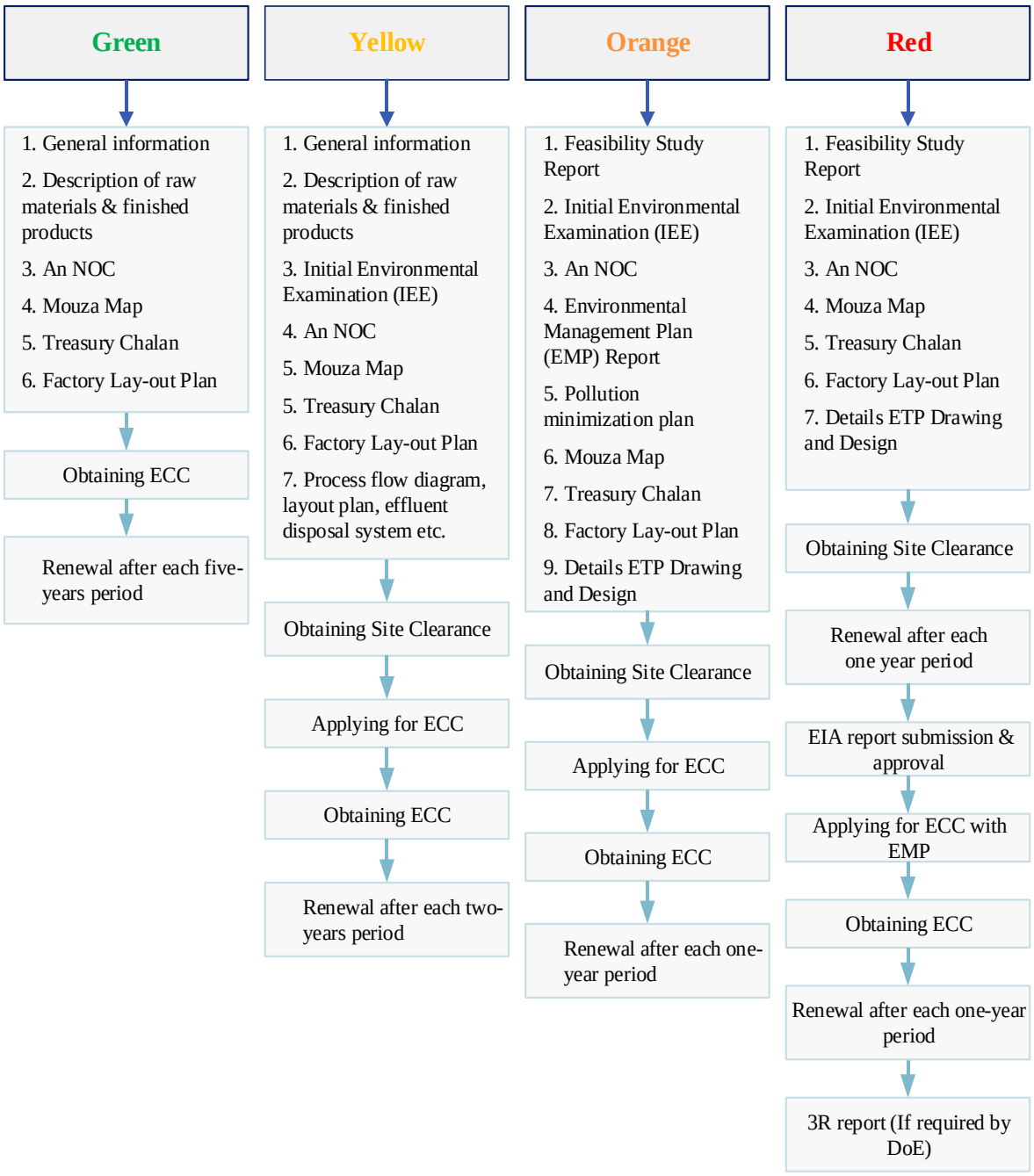
Red: Industries/development projects/activities which fall in RED category are those which may cause significant adverse environmental impacts and are therefore required to submit an EIA report. It should be noted that they might obtain an environmental site clearance on the basis of an IEE report, and subsequently submit an EIA report for obtaining environmental clearance along with other necessary papers.

2.6. Compliance with Legal Requirements

Including ECA, 1995 and the ECR, 2023, depending on applicability, the entrepreneur has to adhere to and may require approvals of other previous and existing policies, ordinances, acts, and rules.

2.6.1. Obtaining Environmental Clearance

APPLICATION TO DOE FOR ENVIRONMENT CLEARANCE CERTIFICATE



N.B. If the industry/project locates inside EPZ, then IEE is not required

Figure 2.1: Process of Getting Environmental Clearance Certificates

2.6.2. Environmental Quality Standards

Bangladesh is one of the least developed countries with a low resource base, a burgeoning population with a very low land-man ratio, often threatened by both natural & anthropogenic stresses. Like all other nations of the world, Bangladesh also acted to the global call for the protection and conservation of the natural environment & ecology. Industrial development significantly contributes towards the economic growth of a country. It brings along with it a host of environmental problems too. It is increasingly being recognized in Bangladesh as in other part of the world that for development to be meaningful & sustainable over a longer period environmental concern must be integrated into all development policies. The Ministry of Environment and Forest is the nodal ministry that supervises the implementation of environmental and forestry programs in Bangladesh. The Department of Environment (DoE) carries out policy analysis, planning and evaluation, program coordination, and monitoring and evaluation of the environmental programs. The Forest Department in the ministry deals with forestry programs.

In Bangladesh, the environmental aspects of any project are mainly governed by: The Environmental Conservation Act, of 1995, the Environmental Conservation Rules, of 1997, the Environmental Conservation Rules, of 2023, and the Forest Act, of 1927 (if forestland has been converted).

The requirement for undertaking environmental studies has been specified under the ECA, 1995, the ECR, 1997, and the ECR, 2023. Section 12 of ECA, 1995 stipulates that "No industrial unit or project shall be established or undertaken without obtaining environmental clearance from the Director General, Department of Environment (DG, DoE) in the manner prescribed by the rules".

2.6.2.1. Air Quality

Table 2.3: Ambient Air Quality Standards

Air Pollutant	Unit	Standards	Average Time
Carbon Monoxide (CO)	mg/m^3	5	8 hrs.
		20	1 hr.
Lead (Pb)	micro gm/m^3	0.25	Annual
		0.5	24 hrs.
Nitrogen di oxide (NO_2)	micro gm/m^3	40	Annual
		80	24 hrs.
Particulate Maters$_{10}$ (PM_{10})	micro gm/m^3	50	Annual
		150	24 hrs.
Particulate Maters $_{2.5}$ ($PM_{2.5}$)	micro gm/m^3	35	Annual
		65	24 hrs.
Ozone (O_3)	micro gm/m^3	180	1 hr.
		100	8 hrs.
Sulphur di oxide (SO_2)	micro gm/m^3	250	1 hr.
		80	24 hrs.
Ammonia (NH_3)	micro gm/m^3	100	Annual
		400	24 hrs.

Source: *Air Emission Control Rules, MOEF, 2022*

Note:

a. In this schedule, air quality means ambient air quality.

b. Average value shall not exceed more than once a year.

c. The target will be achieved when the annual average is within the prescribed standard.

2.6.2.2. Water Quality

Table 2.4: Standards for Inland Surface Water

Parameters													
SL. No.	**Best Practice Based Classification**	**pH**	**DO mg/L**	**BOD mg/L**	**NO_3-N mg/L**	**NH_4-N mg/L**	**PO_4-P mg/L**	**Total Cr mg/L**	**Pb mg/L**	**Hg mg/L**	**Total Coliform CFU/L**	**TDS mg/L**	**TDS mg/L**
1	Source of drinking water for supply only after disinfecting	6.5-8.5	6 or above	2 or less	7.0	0.1	0.1	0.02	0.03	0.001	100 or less	1000	10
2	Water usable for recreational activity	6.5-8.5	5 or above	3 or less	7.0	0.3	0.5	0.2	0.05	0.001	50 or less	1000	10
3	Source of drinking water for supply after conventional treatment	6-9	5 or above	5 or less	7.0	0.3	0.5	0.02	0.03	0.001	5000 or less	1000	25
4	Water usable by fisheries	6-9	5 or above	6 or less	7.0	0.3	0.5	0.05	0.1	0.004	5000 or less	1000	50
5	Water usable by various process and cooling industries	6.5-8.5	1 or above	12	-	2.7	-	0.1	0.1	0.05	-	1000	100
6	Water usable for irrigation	6.5-8.5	-	12 or less	5.0	1.5	2.0	0.1	0.1	0.002	50,000 or less	1000	100

Source: *Environmental Conservation Rules, 2023*

Notes:

a. Electrical conductivity for irrigation water – 2250 µmhoms/cm (at a temperature of 25°C); Sodium less than 26%; Boron less than 0.2%

Table 2.5: Standards for Drinking Water

Sl. No.	Parameters	Unit	Standards
1.	Fecal Coliform	CFU/100ml	0
2.	Total Coliform	“	0
3.	Free Residual Chlorine	mg/L	0.20
4.	Nitrate (NO3-)	“	45
5.	Arsenic (As)	“	0.05
6.	Turbidity	NTU	5
7.	Aluminum (Al)	“	0.20
8.	Ammonia (NH3)	“	1.50
9.	Barium (Ba)	“	0.70
10.	Benzine (C6H6)	“	0.01
11.	Boron (B)	“	1.0
12.	Cadmium (Cd)	“	0.003
13.	Calcium (Ca)	“	75
14.	Chloride (Cl)	“	250*
15.	Carbon tetra chloride	“	0.005
16.	1,1 Dichloroethane	“	0.03
17.	1,2 Dichloroethane	“	0.03
18.	Tetrachloroethane	“	0.04

Sl. No.	Parameters	Unit	Standards
19.	Trichloroethane	“	0.02
20.	Pentachlorophenol	“	0.009
21.	2,4,6 Trichlorophenol	“	0.20
22.	Chloroform	“	0.09
23.	Total Chromium	“	0.05
24.	Color	Hazen	15
25.	Copper (Cu)	mg/L	1.5
26.	Cyanide (CN)	“	0.05
27.	Fluoride	“	1.0
28.	Hardness as $CaCO_3$	“	500
29.	Ferrous (Fe)	“	0.3-1.0
30.	Total Kjeldahl Nitrogen	“	1.0
31.	Lead (Pb)	“	0.01
32.	Magnesium (Mg)	“	30-35
33.	Manganese (Mn)	“	0.4
34.	Mercury (Hg)	“	0.001
35.	Nicale (Ni)	“	0.05
36.	Nitrite (NO_2^-)	“	1.0
37.	Odor	-	Odorless
38.	Oil & Grease	mg/L	0.01
39.	pH	-	6.5-8.5
40.	Phenols	mg/L	0.002
41.	Potassium (K)	“	12
42.	Radioactive materials (gross alpha activity)	Bq/L	0.1
43.	Radioactive materials (gross beta activity)	“	1.0
44.	Selenium (Se)	mg/L	0.01
45.	Silver (Ag)	“	0.02
46.	Sodium (Na)	“	200
47.	Suspended Solid (SS)	“	10
48.	Sulfide as H2S	“	0.05
49.	Sulfate (SO_4^{2-})	“	250
50.	Total Dissolve Solids (TDS)	“	1000
51.	Temperature	0C	20-30
52.	Tin (Sn)	mg/L	2.0
53.	Zinc (Zn)	“	5.0
54.	Aldrin/Dieldrin	Micro-g/L	0.03
55.	Anionic detergents	mg/L	0.2

Source: *Environmental Conservation Rules, 2023*

Note: *1000 mg/L for Coastal Area

Table 2.6: Standards for Sewage Discharge

SL No.	Parameters	Unit	Standards
1	BOD_5	mg/l	30
2	Nitrate	,,	50
3	Phosphate	,,	15
4	Suspended solids (SS)	,,	100
5	Temperature	Degrees centigrade	30
6	Total Coliform	CFU/100 ml	1000
7	pH	mg/L	6-9
8	COD	,,	150
9	Oil & Grease	,,	10

Source: *Schedule 3, Environmental Conservation Rules, 2023*

Notes:

a. This limit shall be applicable to discharges into surface and inland water bodies.

b. Sewage shall be chlorinated before final discharge. Residual Chlorine cannot be more than 0.2 mg/L.

2.6.2.3. Noise

Table 2.7: Standards for Sound

SL. No.	Area Category	Standard Values (All values in dB)	
		Day	Night
1.	Silent Area	50	40
2.	Residential area	55	45
3.	Mixed area (basically residential and together used for commercial and industrial purposes)	60	50
4.	Commercial	70	60
5.	Industrial	75	70

Source: *Noise Control Rules, MOEF, 2006*

Note:

a. The time from 6 a.m. to 9 p.m. is counted as daytime.

b. The time from 9 p.m. to 6 a.m. is counted as night time.

2.6.3. The National Conservation Strategy

National Conservation Strategy (GoB/IUCN, 1992) was drafted in late 1991 and submitted to the Government in early 1992. For sustainable development in the industrial sector, the report offered various recommendations; some of which are as follows:

- Industries based on nonrenewable resources should be made to adopt technology that conserves raw materials, and existing industries should be given incentives to install technical fixes to reduce the wastage rate
- All industries, especially those based on imported raw materials, should be subjected to EIA and the adoption of pollution prevention/control technologies should be enforced.
- No hazardous or toxic materials/wastes should be imported for use as raw material.
- The import of appropriate and environmentally sound technology should be ensured.
- Complete dependence on imported technology & machinery for industrial development should gradually be reduced so that industrial development is sustainable with local skills and resources.

2.6.4. The National Environmental Management Plan (NEMAP), 1995

The National Environmental Management Plan (NEMAP) was developed as the framework of programs and interventions aimed at implementing NEP. Under this Plan, various program outlines were drawn up and activities incorporated. The main aims of the Plan were:

- Better management of scarce resources;
- Checking the rate of environmental degradation;
- Improving the natural and manmade environment;
- Conserving habitats and biodiversity;
- Promoting sustainable development; and
- Improving quality indicators of human life.

2.6.5. National Environmental Policy (NEP), 1992

In 1992 the National Environmental Policy (NEP) was drawn up with the aim of providing protection and sustainable management of the environment. The objectives of the Policy include:

- Maintaining ecological balance and overall development through protection and improvement of the environment;
- Identifying and regulating polluting and environmentally degrading activities;
- Ensuring environmentally sound development;
- Ensuring sustainable and environmentally sound use of all-natural resources;
- Active association with all international environmental initiatives.

2.6.6. The Environment Court Act, 2010

In 2010, a new law known as the Bangladesh Environment Court Act, 2010 was enacted, replacing the 2000 Act. The objective of the current Act is to establish Environment Courts in each district, presided over by a Joint District Judge. This Judge handles both regular cases and those falling under the jurisdiction of an Environment Court. Notably, the Act doesn't require the creation of entirely separate Environment Courts. Consequently, aside from the former three Courts and an Appellate Court, no additional Environment Courts have been set up. Similar to the prior Act, the 2010 Act also allows for the establishment of Special Magistrate Courts in each District, managed by first-class Magistrates or Metropolitan Magistrates. These courts handle cases with penalties of less than five years imprisonment or fines up to five lakh BDT. Furthermore, the Act involves Executive Magistrates who operate under the Mobile Court Act, of 2009. They can promptly address certain offenses and pass judgments based on the offender's admission of guilt. Environmental laws commonly incorporate provisions for the operation of Mobile Courts.

2.7. International Legal Obligations

2.7.1. The Convention on Biological Diversity (CBD), 1992

The Convention on Biological Diversity (CBD) is an international treaty that was adopted in 1992. The CBD has three main goals:

- Conservation of biological diversity
- Sustainable use of its components
- Fair and equitable sharing of benefits arising from genetic resources

The CBD applies to all types of biological diversity, including land-based ecosystems. Land development projects can have a significant impact on biological diversity, both positive and negative. The CBD provides a number of tools and mechanisms to help countries manage the impacts of land development projects on biological diversity. These tools include:

National Biodiversity Strategies and Action Plans (NBSAPs): NBSAPs are national plans that set out the goals and objectives for the conservation and sustainable use of biological diversity in a particular country.

The Prior Informed Consent (PIC) procedure: The PIC procedure requires countries to obtain the consent of the country providing genetic resources before using those resources in a land development project.

The Access and Benefit-sharing (ABS) regime: The ABS regime provides a framework for countries to share the benefits arising from the use of genetic resources.

The CBD is an important tool for protecting biological diversity and ensuring that land development projects are carried out in a sustainable manner. By following the CBD's guidelines and procedures, countries can minimize the negative impacts of land development projects on biological diversity and maximize the positive impacts.

2.8. Medical Waste Management Act-2008

Medical Waste Management Act, 2008 was laid down by the Ministry of Environment, Forest and Climate Change through a Gazette notification dated November 5, 2008.

চিকিৎসা-বর্জ্যের শ্রেণীগত বৈশিষ্ট্য

শ্রেণী বিভাগ	বর্জ্যের শ্রেণী	কতিপয় উদাহরণ
শ্রেণী-১	সাধারণ বর্জ্য (অক্ষতিকারক/ জীবাণুমুক্ত/ অসংক্রামিত)	ব্যবহার্য কাগজ/মোড়ক, প্লাস্টিক বা ধাতব কৌটা, ঔষধের স্ট্রিপ, খালী বাক্স ও কার্টুন, প্যাকিং বাক্স, পলিথিন ব্যাগ, মিনারেল পানির বোতল, কাঁচের খালী বোতল, বিস্কিটের মোড়ক, ইনজেকশনের খালী ভায়েল, অসংক্রামিত ব্যবহার্য স্যালাইন ব্যাগ ও সেট, অসংক্রামিত ব্যবহার্য সিরিঞ্জ, অসংক্রামিত কাপড়/গজ/তুলা, অসংক্রামিত রাবার দ্রব্য/কর্ক, ফলমূলের খোসা, উচ্ছিষ্ট খাবার, রান্না ঘরের আবর্জনা, ডিমের খোসা, ডাবের মালা, প্রেশারাইজ খালী কৌটা ইত্যাদি ।
শ্রেণী-২	এনাটমিক্যাল বর্জ্য	মানব দেহের কাটিয়া ফেলা বিভিন্ন অঙ্গ, প্রত্যঙ্গ, টিস্যু, কাটিয়া ফেলা টিউমার, গর্ভফুল, গর্ভপাত/গর্ভসংক্রান্ত বর্জ্য ইত্যাদি ।
শ্রেণী-৩	প্যাথলজিক্যাল বর্জ্য	ল্যাবরেটরি কালচার, মজুদ অথবা বিভিন্ন টিকার নমুনা, বায়োলজিক্যাল টক্সিন, পরীক্ষার জন্য দেওয়া রক্ত/কফ/মল/ সিরাম/শরীরের নিঃসরণ ইত্যাদি ।
শ্রেণী-৪	রাসায়নিক বর্জ্য	বিভিন্ন প্রকার রিএজেন্ট, ডেভলপার, ডায়ালাইসিস এ ব্যবহার্য ও রাসায়নিক দ্রব্য ইত্যাদি ।
শ্রেণী-৫	ফার্মাসিউটিক্যাল বর্জ্য	বাতিলকৃত, মেয়াদ উত্তীর্ণ, সংক্রামিত বা ব্যবহার উত্তীর্ণ ঔষধ ইত্যাদি ।
শ্রেণী-৬	সংক্রামক/জীবাণুযুক্ত বর্জ্য	রক্ত/পূজ/দেহ রস দ্বারা সংক্রামিত গজ, বেন্ডেজ, তুলা, স্পঞ্জ, সোয়াব, মব, প্লাস্টার, ক্যাথিটার, ড্রেনেজ টিউব, রক্ত সঞ্চালনের ব্যাগ/টিউব, রক্ত দ্বারা সংক্রামিত স্যালাইন সেট, জমাট বাঁধা রক্ত/দেহ রস, ডায়রিয়া রোগীর সংক্রামিত কাপড় চোপর, সংক্রামিত সিরিঞ্জ ইত্যাদি ।
শ্রেণী-৭	তেজস্ক্রিয় বর্জ্য	রেডিওএকটিভ আইসোটোপ, তেজস্ক্রিয় বস্তু দ্বারা সংক্রামিত সকল বর্জ্য, অব্যবহৃত এক্সরে মেশিনের হেড ইত্যাদি ।
শ্রেণী-৮	ধারাল বর্জ্য (সংক্রামিত ও অসংক্রামিত)	মেডিকেলে ব্যবহৃত সকল প্রকার সুই, সকল প্রকার ব্লেড, ভাঙ্গা স্লাইড, ব্যবহৃত এ্যাম্পুল, ভাঙ্গা বোতল/কাঁচ/টেস্ট টিউব/পিপেট/জার, নেইল, স্টীল এর তার, অর্থোপেডিক কাজে ব্যবহৃত স্ক্রু, স্টীল প্লেট, পিন ইত্যাদি ।
শ্রেণী-৯	পুনঃব্যবহারযোগ্য সাধারণ বর্জ্য (অক্ষতিকারক/ জীবাণমুক্ত/ অসংক্রামিত)	ব্যবহার্য কাগজ/মোড়ক, প্লাস্টিক বা ধাতব কৌটা, ঔষধের স্ট্রিপ, খালী বাক্স ও কার্টুন, প্যাকিং বাক্স, পলিথিন ব্যাগ, মিনারেল পানির বোতল, কাঁচের খালী বোতল, বিস্কিটের মোড়ক, ইনজেকশনের খালী ভায়েল, অসংক্রামিত ব্যবহার্য স্যালাইন ব্যাগ ও সেট, অসংক্রামিত ব্যবহার্য সিরিঞ্জ, অসংক্রামিত কাপড়/গজ/তুলা, অসংক্রামিত রাবার দ্রব্য/কর্ক ।

শ্রেণী বিভাগ	বর্জ্যের শ্রেণী	কতিপয় উদাহরণ
শ্রেণী-১০	তরল বর্জ্য (সংক্রামিত ও অসংক্রামিত)	ব্যবহৃত পানি, পানের পিক, বমি, কফ, সাকশন করা তরল, পূজ, দেহ রস, সিরাম, তরল রক্ত, গর্ভের পানি, তরল রাসায়নিক দ্রব্য, অব্যবহৃত তরল ঔষধ, ড্রেনেজ ব্যাগের তরল বর্জ্য ইত্যাদি ।
শ্রেণী-১১	প্রেসারাইজড বর্জ্য	প্রেসারাইজড কৌটা/ক্যান/কনটেইনার

বর্জ্যের শ্রেণী	বর্জ্যের শ্রেণীর নমুনা	পরিশোধন ও বিনষ্টকরণ
ক্যাটাগরী নং-১	সাধারণ বর্জ্য (অসংক্রামিত/ অক্ষতিকারক বর্জ্য	(ক) প্রাঙ্গন বা গণ আবর্জনা ফেলার স্থানে অপসারণ । (খ) প্লাস্টিক বর্জ্য কাটিয়া টুকরা করিয়া পুনঃব্যবহার বন্ধ নিশ্চিত করা ।
ক্যাটাগরী নং-২	এনাটমিক্যাল বর্জ্য	(ক) প্রাঙ্গন/নিরাপদ স্থানে কংক্রিটের পিট (Pit method) পদ্ধতিতে শোধন/বিনষ্টকরণ । (খ) গভীর মাটি চাপা দেওয়া (পরিমাণে অল্প হলে) (গ) বাষ্প অটোক্লেভিং/মাইক্রোওয়েভ ট্রিটমেন্ট/ ইনসাইনেরেটর এর ব্যবহার ।
ক্যাটাগরী নং-৩	প্যাথলজিক্যাল বর্জ্য	ক্যাটাগরীর নং-২ (এনাটমিক্যাল বর্জ্য) এর মত ।
ক্যাটাগরী নং-৪	রাসায়নিক বর্জ্য	(ক) মেয়াদোত্তীর্ণ রাসায়নিক বর্জ্য সরবরাহকারীকে ফেরত প্রদান (পরিমাণে বেশী হলে) । (খ) প্রচুর পরিমাণে পানি মিশাইয়া তরলীকরণের মাধ্যমে নিষ্ক্রিয় করিয়া পয়ঃনিস্কাশন প্রণালীতে অপসারণ (পরিমাণে অল্প হলে) । (গ) রাসায়নিকভাবে পরিশোধন/নিষ্ক্রিয় করিয়া সুয়ারেজ প্রণালীতে অপসারণ ।
ক্যাটাগরী নং-৫	ফার্মাসিউটিক্যাল	ক্যাটাগরী নং-৪ (রাসায়নিক বর্জ্য) এর মত
ক্যাটাগরী নং-৬	সংক্রামক/ জীবাণুযুক্ত বর্জ্য	(ক) প্রাঙ্গন/নিরাপদ স্থানে কংক্রিটের পিট (Pit method) পদ্ধতিতে শোধন/বিনষ্টকরণ । (খ) গভীর মাটি চাপা দেওয়া (পরিমাণে অল্প হলে) (গ) বাষ্প অটোক্লেভিং/মাইক্রোওয়েভ ট্রিটমেন্ট/ ইনসাইনেরেটর এর ব্যবহার ।
ক্যাটাগরী নং-৭	তেজস্ক্রিয় বর্জ্য	প্রতি কেজি বর্জ্যে তেজস্ক্রিয়তার মাত্রা ০.১ এম বি কিউ-এর বেশী হইলে উহা অবশ্যই Bangladesh Atomic Energy Comission এর বিধান অনুসারে শোধন ও বিনষ্ট করিতে হইবে ।
ক্যাটাগরী নং-৮	ধারাল বর্জ্য	(ক) প্রাঙ্গণ/নিরাপদ স্থানে কংক্রিটের পিট (Pit method) পদ্ধতিতে বিনষ্টকরণ । (খ) এনক্যাপসুলেসন (Encapsulation) (গ) গভীর মাটি চাপা দেওয়া (পরিমাণে অল্প হবে) । (ঘ) ইনসাইনেরেটর (Incinerator) এর ব্যবহার ।

বর্জ্যের শ্রেণী	বর্জ্যের শ্রেণীর নমুনা	পরিশোধন ও বিনষ্টকরণ
ক্যাটাগরী নং-৯	পুনঃব্যবহার যোগ্য সাধারণ বর্জ্য	ক) বাষ্প অটোক্লেভিং দ্বারা শোধন করে পুনঃ ব্যবহার করা ।
		খ) রাসায়নিক দ্রব্য দ্বারা শোধন করে পুনঃ ব্যবহার করা ।
ক্যাটাগরী নং-১০	তরল বর্জ্য (সংক্রামিত/অসংক্রামিত)	ক) প্রচুর পরিমাণে পানি মিশিয়ে তরলীকরণের মাধ্যমে পয়ঃনিস্কাশন প্রণালীতে অপসারণ ।
		খ) ১% সোডিয়াম হাইপোক্লোরাইড সলিউশন মিশিয়ে, রাসায়নিকভাবে শোধন করে পয়ঃ প্রণালীতে অপসারণ ।
শ্রেণী-১১	প্রেসারাইজড বর্জ্য	ক) সরবরাহকারীকে ফেরত প্রদান (পরিমাণে বেশী হলে)
		খ) পদ্ধতি সম্মত ভাবে ডিপ্রেসারাইজড করে সাধারণ/পুনঃ প্রক্রিয়াজাতকরণ যোগ্য বর্জ্যের সাথে অপসারণ (পরিমাণে অল্প হলে) ।

উপরোক্ত ঐচ্ছিক ক্ষমতা (option) প্রযুক্তির সহজলভ্যতার উপর নির্ভরশীল । দখলদার/অপারেটর অন্য কোন বিশেষ ধরণের প্রযুক্তি ব্যবহার করার ইচ্ছা পোষণ করিলে তদবিষয়ে নির্ধারিত কর্তৃপক্ষকে ক্ষমতা প্রদান মঞ্জুরের বিষয় বিবেচনা করিবার জন্য নির্ধারিত কর্তৃপক্ষের নিকট পেশ করিতে হইবে ।

ক. প্রাঙ্গনে নিরাপদ পিট পদ্ধতি/গভীর মাটিচাপা দেওয়ার জন্য সীমানাচিহ্নিত স্থানের ব্যবহার এবং গণ আর্বজনা ফেলার স্থানের ক্ষেত্রে তফসিল-৬ এ বর্ণিত মানদন্ড প্রতিপালন পূর্বক সংরক্ষিত ও নিরাপদ এলাকা ব্যবহার করিতে হইবে ।

খ. হ্যালোজেন যৌগযুক্ত, যেমন পিভিসি প্লাস্টিকস, বিশাল পরিমাণ রাসায়নিক বর্জ্য চুল্লীতে (Incinerator) পোড়ানো যাইবে না যে পর্যন্ত না শোধন সুবিধায় ধোঁয়া গ্যাস পরিষ্কারের জন্য পর্যাপ্ত যন্ত্রপাতি রহিয়াছে ।

গ. স্টীম অটোক্লেভিং (বা মাইক্রোওয়েভ ট্রিটমেন্ট) অবশ্যই তফসিল-৬ এ বর্ণিত মানদন্ড অনুযায়ী হইতে হইবে ।

ঘ. তরল রাসায়নিক বর্জ্য পয়োঃপ্রণালীতে ফেলিবার পূর্বেই তফসিল-৬ এর মানদন্ড প্রতিপালন করতঃ রাসায়নিকভাবে নিশোধন treatment করিতে হইবে ।

ঙ. ধারাল বর্জ্য অপসারণের পূর্বে রাসায়নিকভাবে নিশোধন treatment করিতে হইবে ।

চ. পুনঃ ব্যবহার রোধকল্পে রাবার/প্লাষ্টিক জাতীয় নল কাটিয়া টুকরা করিতে হইবে এবং বিভিন্ন ব্যাগ (স্যালাইন ব্যাগ, রক্ত ব্যাগ, ইউরিন ব্যাগ ইত্যাদি) ফুটা/কাটিয়া দিতে হইবে ।

চিকিৎসা-বর্জ্যের সংরক্ষণ ও অপসারণের জন্য পাত্র ও কালার কোড

কালার কোড	বর্জ্যের বিভাগ	বর্জ্যের শ্রেণী	বর্জ্যের ধরণ	পাত্র
কাল	সাধারণ বর্জ্য	শ্রেণী-১, ১১	অক্ষতিকারক, অসংক্রামিত, জীবাণুমুক্ত বর্জ্য	ছিদ্রবিহীন প্লাস্টিক বিন
হলুদ	ক্ষতিকারক বর্জ্য	শ্রেণী-২, ৩, ৪, ৫, ৬	এনাটমিক্যাল, প্যাথলজিক্যাল, সংক্রামক/জীবাণুযুক্ত, বর্জ্য	ছিদ্রবিহীন প্লাস্টিক বিন
লাল	ধারাল বর্জ্য	শ্রেণী-৮	সংক্রামিত, অসংক্রামিত, জীবাণুযুক্ত, জীবাণুমুক্ত বর্জ্য	ছিদ্রবিহীন অভেদ্য পুরু প্লাস্টিক বিন, বাক্স
নীল	তরল বর্জ্য	শ্রেণী-১০, ৪	ক্ষতিকারক, অক্ষতিকারক, সংক্রামিত, অসংক্রামিত, জীবাণুযুক্ত, জীবাণুমুক্ত, কেমিক্যাল বর্জ্য	ছিদ্রবিহীন প্লাস্টিক গামলা, বিন
সিলভার	তেজস্ক্রিয় বর্জ্য	শ্রেণী-৬	বিকিরণযোগ্য বর্জ্য	ছিদ্রবিহীন লিড বক্স
সবুজ	পুনঃ ব্যবহার যোগ্য সাধারণ বর্জ্য	শ্রেণী-৯	অক্ষতিকারক, অসংক্রামিত, জীবাণুমুক্ত বর্জ্য	ছিদ্রবিহীন প্লাস্টিক বিন

- তেজস্ক্রিয় বর্জ্য সংরক্ষণ বা পরিবহনের জন্য সিলভার রং এর ছিদ্রবিহীন লিড এর তৈরী বক্স বা বাংলাদেশ আনবিক শক্তি কমিশনের নির্দেশিত নিয়ম অনুসরণ করিতে হইবে।
- তরল ফার্মাসিউটিক্যাল বর্জ্য অল্প পরিমাণ হইলে তরল বর্জ্য রাখার নীল পাত্রে রাখা যাইতে পারে।
- ফার্মাসিউটিক্যাল বর্জ্য অল্প পরিমাণ হইলে ক্ষতিকারক বর্জ্য রাখার হলুদ পাত্রে রাখা যাইতে পারে।
- বিভিন্ন প্রকার কেমিক্যাল বর্জ্য এক সাথে এক পাত্রে রাখা যাইবে না, কারণ রাসায়নিক বিক্রিয়ার জন্য দুর্ঘটনা ঘটিতে পারে।
- পিট পদ্ধতিতে পঁচন প্রক্রিয়া তরান্বিত করার জন্য অল্প পরিমাণ রান্নাঘরের বর্জ্য হলুদ পাত্রে রাখা যাইবে।
- পুনঃ ব্যবহার্য সাধারণ বর্জ্য (শ্রেণী-৯) এর পরিমাণ অল্প হইলে, সাধারণ বর্জ্যের (শ্রেণী-৮) এর সাথে কাল পাত্রে রাখা যাইতে পারে।
- প্রতিটি বর্জ্য রাখার পাত্রে স্পষ্ট বাংলা ভাষায় রং ভেদে বর্জ্যের ধরণ লিখিতে হইবে এবং বিশ্ব স্বাস্থ্য সংস্থা অনুমোদিত সাংকেতিক চিহ্ন/ লেবেল ব্যবহার করিতে হইবে।

Chapter Three: Project Description

3.1. Project Definition

Army Institute of Physiotherapy & Rehabilitation is a specialized healthcare facility designed to provide comprehensive rehabilitative, therapeutic, and diagnostic services for patients with neurological, musculoskeletal, pediatric, geriatric, and trauma-related conditions

Army Institute of Physiotherapy & Rehabilitation (AIPR) will be a military owned, 200-bed hospital located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344. Scheduled to begin operations in 2026, AIPR aims to offer comprehensive healthcare services to patients across various medical disciplines. Strategically positioned in a mixed residential and commercial area, the hospital enjoys easy access to essential services, including gas, electricity, telecommunications, and transport networks, making it an accessible healthcare hub.

AIPR will be dedicated to delivering integrated diagnostic and healthcare services to the community, focusing on high-quality care that will be affordable for all patients. The facility will be designed to handle 500 to 600 outpatients daily and has secured all necessary approvals from relevant municipal authorities. In addition to providing top-tier medical care, AIPR aims to contribute to the training and development of medical professionals, thereby fostering employment opportunities and supporting the local healthcare workforce.

To address environmental considerations, AIPR will implement several measures to mitigate potential impacts during the construction and operational phases. The hospital has established partnerships with third-party organizations to manage solid and biomedical waste collection and disposal. Furthermore, AIPR will utilize shared Sewage Treatment Plant (STP). This facility, with a total treatment capacity of 4 cubic meters per hour, will treat liquid waste generated by institutions, ensuring safe discharge into a nearby canal that leads to the nearby canal. By adhering to a robust Environmental Management Plan (EMP), AIPR is committed to operating within national environmental standards, minimizing negative impacts, and promoting sustainability.

Advanced Technology

Army Institute of Physiotherapy & Rehabilitation (AIPR) will be at the forefront of delivering exceptional healthcare services through advanced medical technology and state-of-the-art facilities. The hospital will have a comprehensive range of modern infrastructure, including a

fully equipped laboratory, advanced X-ray and ultrasonography units, a well-organized outpatient department (OPD), specialized dental and emergency units, and sophisticated operating theaters. These facilities enable AIPR to provide accurate diagnostics, effective treatment, and high-quality patient care, reflecting its commitment to medical excellence.

AIPR will incorporate the latest medical equipment, reagents, and technologies to ensure that patients and healthcare professionals receive the best support possible. The hospital building is designed to create a healthy and sustainable environment, featuring eco-friendly design elements and a welcoming atmosphere. A dedicated recreation area for children and patient attendants further enhances the comfort and experience of those receiving care at AIPR.

Committed to providing continuous care, AIPR will operate 24/7 with a comprehensive range of emergency services. The hospital will also offer online services, facilitating easy access to medical information and care. A fully stocked on-site pharmacy ensures the availability of a wide variety of medicines and surgical supplies to meet the immediate needs of patients and healthcare providers.

AIPR will offer a reliable ambulance service around the clock to support patient transport and safety. This dedication to advanced technology and patient-centered care underscores AIPR's mission to provide superior healthcare services while adhering to the highest safety standards, quality, and environmental responsibility. Sewage Treatment Plant (STP) demonstrates AIPR's commitment to sustainable and environmentally sound healthcare operations.

3.2. Project Location and Details

Army Institute of Physiotherapy & Rehabilitation will be located at Senwalia, Bishmail-Jirabo road, Savar Cantonment, Savar-1344. The hospital intends to set on 50,167.64 sqm of land which is located at a geographical coordinate of Longitude: 23°54'16.00"N, 90°16'43.00"E & and Latitude: 23°54'16.00"N. The location map, location direction from Google map, and satellite image have been given in the following figure:

Figure 3.1: The location map of the project (Adopted from Google Maps)

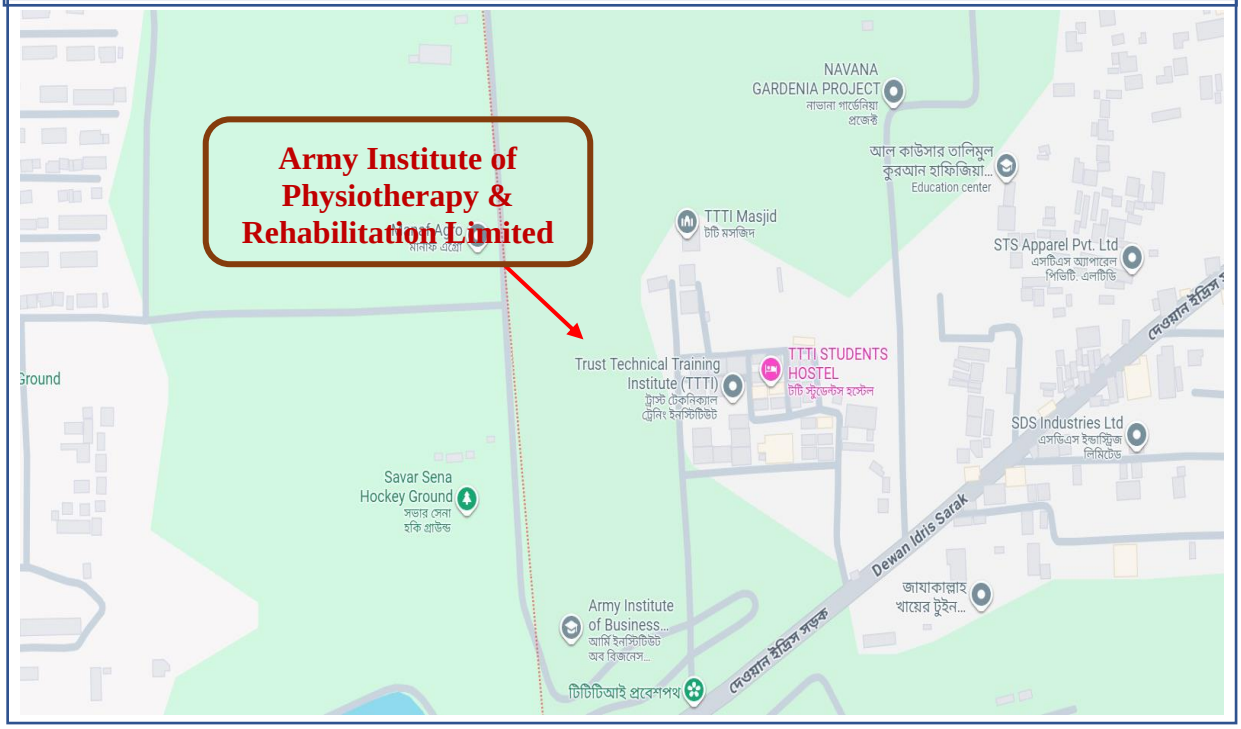


Figure 3.2: The location map of the project (Adopted from Google Maps)

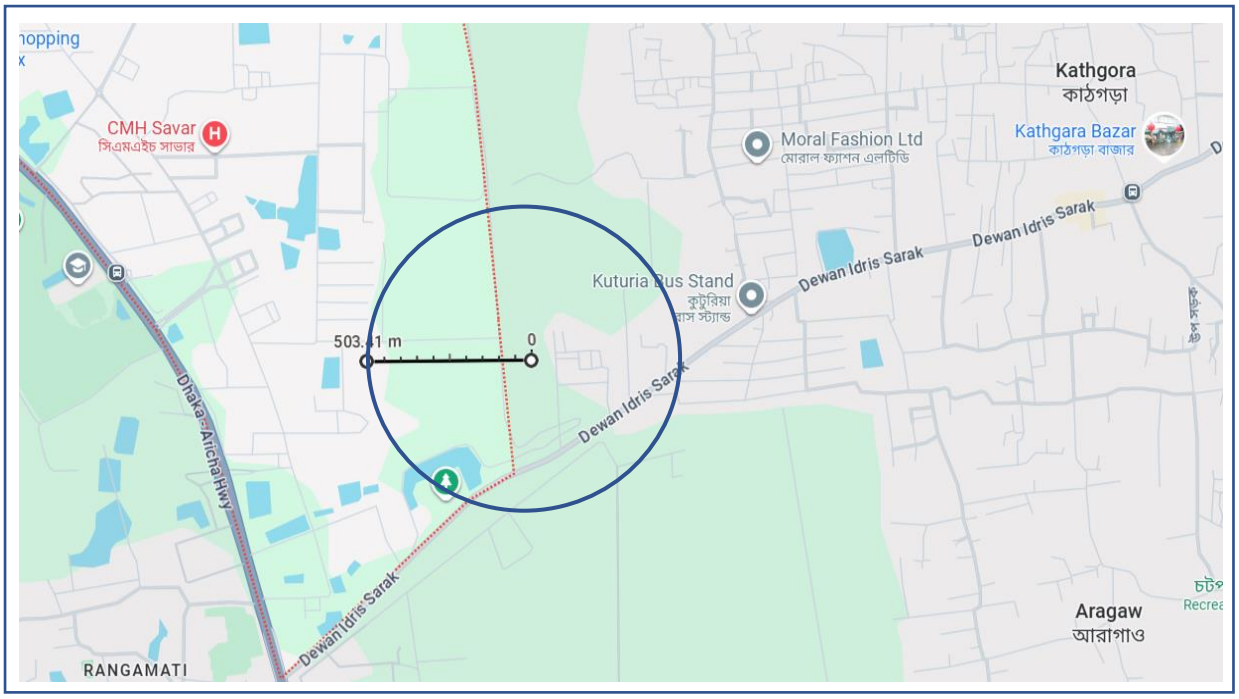


Figure 3.3: 500-meter surrounding area from project location (captured from Google Earth)

3.3. Basic Information of Project

The EIA Report for Army Institute of Physiotherapy & Rehabilitation (AIPR) primarily addresses the environmental impacts arising from the operation of the hospital facilities on the surrounding environment.

Table 3.1: Basic Information of Army Institute of Physiotherapy & Rehabilitation

Basic Information of **Army Institute of Physiotherapy & Rehabilitation**		
S.N.	**Items**	**Description**
1.	**Name of the project**	Army Institute of Physiotherapy & Rehabilitation
2.	**Type of project**	Non-Government Hospital
3.	**Patient Bed**	200
4.	**Location of the Project**	Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344.
5.	**Total Manpower**	**Doctor: 21** **Nurse: 179** **Staff:110** **Administration: 05** **Total: 315 person**
6.	**Total Area**	50167.64 m^2
7.	**Project Cost**	BDT 408 Crore 85 lakh
8.	**Facilities**	Lab, X-ray, Ultrasonography, CT scan, Dialysis, Critical Areas (OPD, Emergency Unit, OT, Doctor Chamber, Cabin, Ward, etc.
9.	**Electricity Requirement**	**Electricity-** 2.5 KW, REB **Generator-** 500 KVA (03)
10.	**Water Requirement** (For Army Institute of Physiotherapy & Rehabilitation)	• Drinking water= 2830 LPD • Personal Hygiene & sanitation = 71750 LPD • Patient Treatment & Hospital Purpose =8500 LPD
11.	**Disposal Point for Liquid Waste**	Liquid waste generated from medical activities will be treated using Sewage Treatment Plant (STP). The excess treated water will be discharged into the local drainage system, which leads to a nearby canal.
12.	**(Proposed) Medical Sewage Treatment Plant (STP)**	STP Capacity 4 m^3/hr. Operating Time 20 hr. per day.
13.	**Source of Water**	Ground Water (Deep Tube Well)
14.	**Type of Waste Generated**	Medical waste, General Solid Waste, and Liquid Waste
15.	**Solid Waste Generation (without garbage)**	Saline Bag: 180-200 nos. Syringe: 300-400 nos. Vial: 200-300 nos.

Basic Information of **Army Institute of Physiotherapy & Rehabilitation**		
S.N.	**Items**	**Description**
		Gauge, Bandage Cotton, etc. Total: ± 40-50 Kg/day
16.	**Solid Waste Disposal**	Solid waste is managed by Prism Bangladesh Foundation.

3.4. Floor Detail

Army Institute of Physiotherapy & Rehabilitation conducts its treatment activities within its own building. The building's floor details are as follows:

Table 3.2: Floor Detail of the Hospital

Floor	Floor Details
Ground Floor	OPD Block
1st Floor	Pediatrics, Pathology, Store & Procedure Room
2nd Floor	Stroke & Robotics Block
3rd Floor	Neuro & SCI Block
4th Floor	MSK & Sports Injury Block
5th Floor	Admin Block
6th Floor	Advanced Artificial Limb Centre
7th Floor	Stroke Ward
8th Floor	MSK Male Ward
9th Floor	Sports Medicine Block
10th Floor	Sports Fitness Centre with modern Gait Lab facilities

3.5. Hospital Process Flow, List of Equipment and Reagent

The hospital process flow, equipment, and reagent lists are attached in Annexure B at the end of the report.

3.6. Utilities

3.6.1. Water Requirement and Wastewater Generation

The hospital's water supply is sourced from its own deep tube well, which is utilized for various hospital utility needs, including medical purposes, daily household activities, drinking, kitchen use, and washing. Wastewater is generated from medical facilities, sanitary systems, kitchen operations, and the washing of bed sheets and pillows. The details of water consumption and wastewater generation are provided below.

Table 3.3: Wastewater Generation Calculation for STP

SL No	Purpose	Purpose Area of Use	Requirements of water	Total (LPD)
1	Drinking Purposes	Doctor, Nurse and Staff of the Hospital	315 Persons X 2 Liters per day = 630 LPD	2830
		Outdoor patient with one attendant	(600+600) Patient X 1 Liters/day = 1200 LPD	
		200 Admitted Patient Beds and One Attendant	200 X 2 X 2.5 Liters/day = 1000 LPD	
2	Personal Hygiene and Sanitation (Domestic Usage)	Doctors, Nurses, Administrative staff, and cleaning staff freshness Total manpower (315 people)	315 X 50 Liters/day = 15750 LPD	71750
		Admitted patient and one attendant	400 X 50 Liters/Day = 20000 LPD	
		Outpatient with attendant and Visitors	1200 X 30 Liters/Day = 36000 LPD	
883	Patient Treatment and Hospital Purpose	Autoclaving (Sterilization)	500 LPD (Considered)	8810
		Pathology lab Equipment and instrument wash with autoclaving etc.	Approximately 250 LPD (Considered)	
		Bed Sheet Wash 200 No's, 200 X 400 gm = 80 kg	80 kg X 65 liter = 5200 LPD	
		200 no's Pillow wash = 200 X 100 gm = 20 kg	20 kg X 65 lit = 1300 LPD	
		Doctors & Nurse Apron wash 200 No's X 120 gm = 24 kg	24 kg X 65 lit = 1560 LPD	
		Floor Wash (Hospital Only)	300 L (Considered)	

Wastewater Generation & STP Capacity Calculation	
Total Generated Wastewater	2830 + 71750 + 8810 L/Day = 83390 L/day
Total Wastewater Quantity	3.47 m^3/hr or 83.39 m^3/day
Required ETP Capacity:	3.47 m^3/hr +15% Safety = 3.92 **m^3/hour**
Constructed ETP Capacity	**80.0 m^3/day (4.0 m^3/hr). which is satisfactory.**

3.6.2. Power

Army Institute of Physiotherapy & Rehabilitation will be utilizing Electricity from two sources:

a. The BREB will supply the main grid power. The hospital's connecting load will be 2.5 MW.
b. Three standby generators, each with a capacity of 500 kVA, will be installed. On average, the generators consume 100 to 150 liters of diesel per month.

3.6.3. Safety Provision

Army Institute of Physiotherapy & Rehabilitation prioritizes fire safety with a comprehensive system that includes fire extinguishers, fire hydrants, and an advanced fire detection system to safeguard against fire-related incidents. These safety measures will be strategically placed throughout the facility to ensure prompt and effective response in case of emergencies. Detailed information on these safety protocols is provided in Chapter Six.

The hospital will be equally committed to the health and safety of its staff and visitors. Regular health screenings will be conducted for employees, who also benefit from primary healthcare services and Group Health Insurance coverage. Certified first aid personnel will be readily available in all key departments to provide immediate medical assistance. Army Institute of Physiotherapy & Rehabilitation will enforce strict safety protocols, mandating that all employees and visitors wear appropriate Personal Protective Equipment (PPE) in designated operational areas. Hazard warnings and safety instructions are clearly posted in critical locations to enhance awareness and compliance. The hospital will also conduct regular safety training sessions, facilitated by certified trainers, focusing on firefighting techniques, fall prevention, and the safe handling of heavy equipment and flammable materials.

3.6.4. Pollution Control and Waste Disposal

Army Institute of Physiotherapy & Rehabilitation will implement comprehensive measures for effective pollution control and waste disposal. The hospital will have a formal agreement with Savar Municipalities and PRISM Bangladesh Foundation to oversee the management of medical and solid waste.

A Sewage Treatment Plant (STP) are being installed to treat medical wastewater prior to its safe discharge. Furthermore, the hospital has engaged a third-party organization to ensure the proper disposal of both medical and solid waste, adhering to regulatory standards and mitigating environmental impacts.

3.7. Employment Opportunities

Army Institute of Physiotherapy & Rehabilitation (AIPR) will be a significant contributor to the local economy, generating numerous employment opportunities and fostering regional economic growth. The facility will employ approximately 315 individuals, including both skilled and unskilled positions.

Skilled roles at AIPR will encompass medical and technical professions, such as doctors, medical officers, nurses, and various specialized technicians. These professionals will play a crucial role in delivering high-quality healthcare services and maintaining operational efficiency. They receive targeted training to ensure expertise in their respective fields, which is essential for the smooth functioning of the hospital and adherence to health and safety standards.

Unskilled positions at AIPR will include administrative support, facility maintenance, and other essential support roles. These positions will provide entry-level employment opportunities, offering on-the-job training that equips employees with valuable skills. This not only aids in personal career development but also supports the hospital’s operations.

Together, the diverse workforce at AIPR will contribute to a collaborative and efficient environment. The hospital’s employment practices also positively impact the community by providing stability and economic benefits. Additionally, AIPR will be involved in community outreach and training programs to further enhance the skills and employability of its workforce.

3.8. Sewage Treatment Plants (STP)

Wastewater treatment encompasses the mechanisms and processes designed to address water contamination resulting from residential, institutional, industrial, or commercial activities prior to its release into the environment or its potential reuse. While many institutions have adopted measures to minimize or recycle wastewater, others continue to produce significant volumes.

Army Institute of Physiotherapy & Rehabilitation (AIPR) are committed to minimizing their environmental impact through the Sewage Treatment Plant. These advanced facilities are crucial for treating wastewater generated from both medical and operational activities, ensuring compliance with stringent environmental standards prior to discharge. The STP represent a key component of AIPR's commitment to effective pollution control and environmental stewardship.

Table 3.4: Basic Details of Wastewater Treatment Plants

Name of Client	**:**	**Army Institute of Physiotherapy & Rehabilitation**
Location	**:**	Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344, Bangladesh.
Type of Effluent	**:**	Hospital Wastewater
Treatment Hours	**:**	20 Hr./Day
ETP Capacity	**:**	4 m^3/Hr.
ETP Treatment Concept	**:**	Biological Oxidation Treatment Process with Activated Sludge Process (ASP)
STP Capacity	**:**	10 m^3/Hr.
STP Treatment Concept	**:**	Biological MBBR Treatment Process.

Constructing both ETP and STP systems with a combined treatment capacity of 4 m^3/hr will require a 1450 ft^2 area (approximately). STP details, drawings, and design calculations are attached in **Annexure A**.

Chapter Four: Existing Environment

4.1.General Aspects

Baseline data on the environment is crucial for understanding the physical, biological, cultural, economic, and social characteristics of the project study area. This information serves as the foundation for analyzing the potential impacts of project activities. The primary objectives of examining and defining the existing environment are:

a. To identify environmental and socioeconomic components that may be affected by project activities.
b. To recognize potential environmental impacts on these components.
c. To establish a baseline against which future environmental conditions of the project can be measured.

For this Environmental Impact Assessment (EIA) study, the focus is on key environmental factors such as water, air, and noise quality within the study area. The assessment also considers both the immediate and ancillary areas that may be impacted.

4.2.Land Use

Army Institute of Physiotherapy & Rehabilitation is located on a dedicated 50167 square meter within a fully developed area. The hospital is situated at Senwalia,Bishmail- Jirabo road, Savar Cantonment, Savar-1344. The surrounding 5-kilometer radius includes a mix of residential and a university, local pathways, roads, and various local establishments. The site benefits from comprehensive infrastructure, including access to power, labor, manpower, and efficient road and water communication systems.

To the north of the hospital lies a field area. To the south, the area features is Army Institute of Business Administration. To the west, the surroundings consist of Savar Sena Ground. To the east, the area includes the Trust Technical Training Institute (TTTI).

4.3.Water Quality

Water can be categorized into two primary types: surface water and groundwater. Surface water refers to water found in natural or artificial reservoirs on the Earth's surface, such as rivers, lakes, ponds, and canals. This water is directly exposed to the atmosphere and can be easily affected by environmental factors, including pollution and weather conditions.

Groundwater, on the other hand, is water that resides beneath the Earth's surface in soil pores and rock formations. It accumulates through the infiltration of rainwater and is typically accessed via wells or pumps. Groundwater is often used for drinking and irrigation and is less exposed to surface contaminants compared to surface water.

The area surrounding Army Institute of Physiotherapy & Rehabilitation features several small-scale surface water bodies, including ponds and canals. Additionally, the region benefits from substantial rainfall and a reliable supply of groundwater, which is utilized for drinking and domestic purposes via pumping. The hospital will source its water from its own deep tube well and is committed to reducing water consumption. The local conditions support the recharge of underground aquifers, ensuring that the water table remains stable and there are no significant complaints regarding groundwater availability in the area.

Given that the hospital is located within the Dhaka district, the baseline water quality is assessed based on the broader water quality standards for the city. This assessment includes both surface and groundwater quality. The water quality in Dhaka has recently faced challenges due to various natural and anthropogenic factors, leading to notable deterioration. The capital city of Dhaka, in particular, suffers from increased pollution, exacerbated by high rural-to-urban migration rates.

The river system in the Dhaka district includes the Buriganga, Dhaleshwari, Balu, and Ichamati rivers. These rivers are subject to significant organic pollution, primarily due to the inadequate sewerage and sanitation infrastructure in the urban areas of Dhaka.

Army Institute of Physiotherapy & Rehabilitation will treat its wastewater using a Sewage Treatment Plant (STP). The excess treated water will be discharged into the local drainage system, which leads to a nearby canal. This approach ensures that the hospital's wastewater management aligns with environmental sustainability practices and minimizes the impact on local water bodies.

Key water quality parameters for the Dhaleshwari River indicate fluctuations in pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), and other metrics, reflecting the river's vulnerability to pollution and the importance of effective wastewater management practices to protect the aquatic ecosystem.

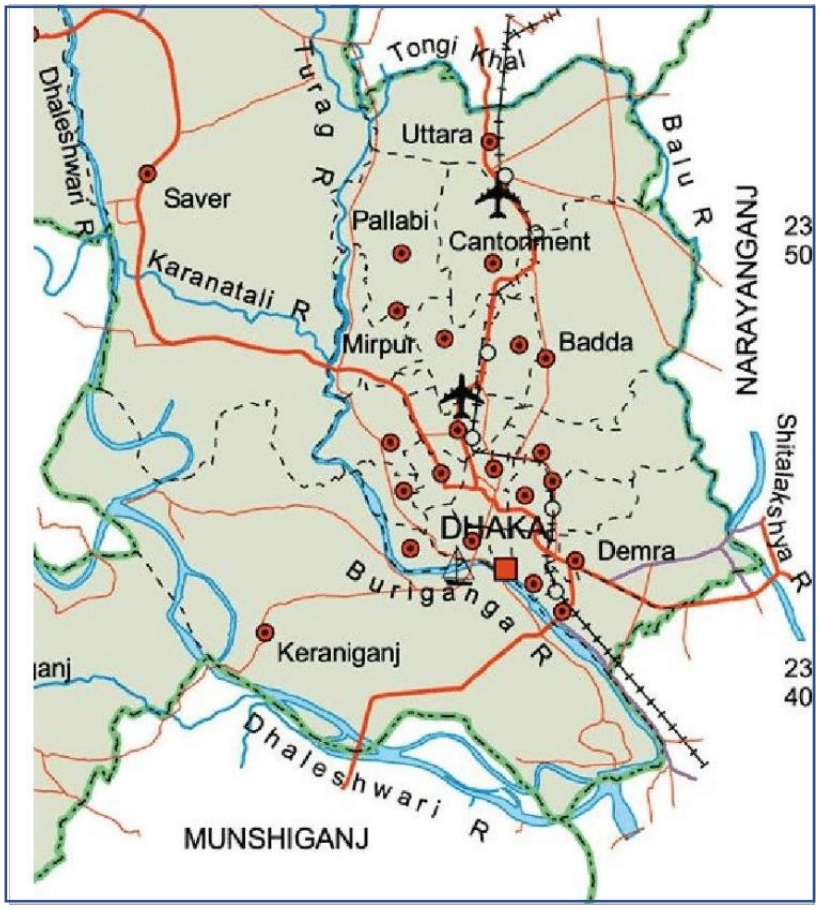


Figure 4.1: The River System in the Dhaka Zila

4.3.1. Surface Water Quality (The Dhaleshwari River)

The Dhaleshwari River primarily flows through the extensive swamps of Beel Belai and areas east of Dhaka. While the Dhaleshwari mixed with Shitalakshya and Turag river. its main role is in local drainage and providing passage for small boats (Sifatul Quader Chowdhury).

In 2023, water quality monitoring of the Dhaleshwari River involved collecting samples from two key locations: Trimohoni Bridge and Jolshiri Abason. It is important to note that data was not available for the months of April to June and September.

Water Quality Findings of the Dhaleshwari River for 2023

- **pH Levels**: The pH of the Dhaleshwari River ranged from 6.39 to 7.41, which falls within the Environmental Quality Standards (EQS) range of 6.0 to 9.0. The highest pH value recorded was 7.41 in February at Jolshiri Abason, and the lowest was 6.39 in November at Trimohoni Bridge. For comparison, in 2022, the pH levels varied between 6.50 and 7.62.

- **Dissolved Oxygen (DO)**: The DO concentration was particularly low during the dry season. The maximum DO record was 8.3 mg/l in July at Jolshiri Abason, while the minimum was 0.0 mg/l in August at Trimohoni Bridge. In 2022, the DO levels ranged between 0.0 and 8.0 mg/l.

- **Biochemical Oxygen Demand (BOD)**: The highest BOD observed was 68 mg/l in January at Trimohoni Bridge, while the lowest was 2.1 mg/l in August at Jolshiri Abason. In 2022, BOD levels ranged from 3.0 to 88.5 mg/l.

- **Chemical Oxygen Demand (COD)**: COD levels frequently exceeded the EQS threshold of ≤50 mg/l for fisheries during the dry season. The highest COD recorded was 217 mg/l in January at Trimohoni Bridge, with the lowest being 5 mg/l in August at Jolshiri Abason. COD levels in 2022 varied from 10.0 to 222 mg/l.

- **Total Dissolved Solids (TDS)**: All recorded TDS levels were below the EQS limit of 1000 mg/l for fisheries. The maximum TDS level was 487 mg/l in February at Trimohoni Bridge, and the minimum was 112 mg/l in October at Jolshiri Abason. In 2022, TDS levels fluctuated between 90 and 470 mg/l.

- **Chloride**: Chloride concentrations peaked at 99 mg/l in January at Trimohoni Bridge and reached a minimum of 13 mg/l in October at Jolshiri Abason. In 2022, chloride levels ranged from 8.0 to 102 mg/l.

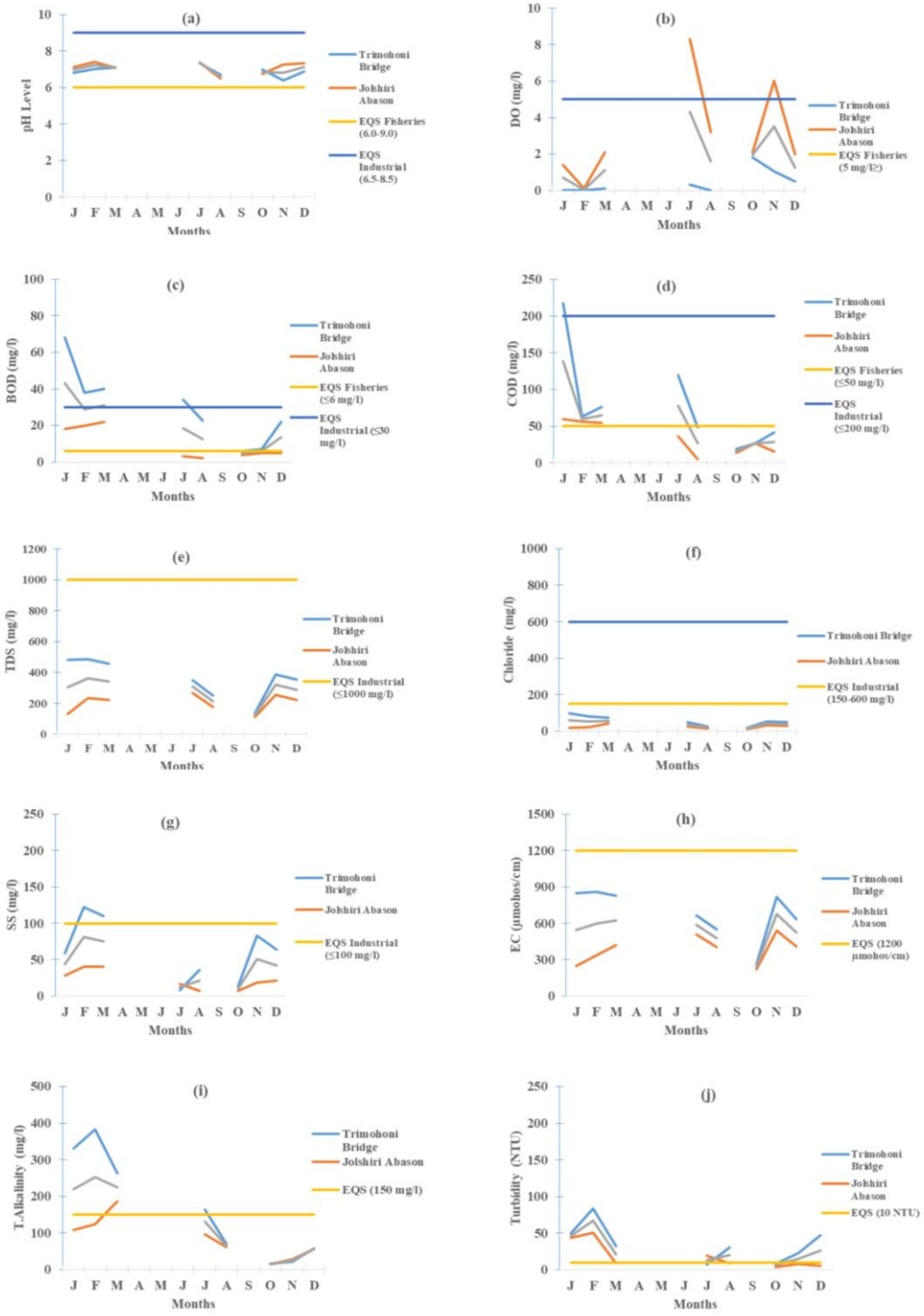


Figure 4.2: Status of pH, DO, BOD, COD, TDS, Chloride, SS, EC, T.Alkalinity and Turbidity of Dhaleshwari River

- **Suspended Solids (SS)**: The highest SS measurement was 122 mg/l in February at Trimohoni Bridge, while the lowest was 7 mg/l in both August and October at Jolshiri Abason. SS levels in 2022 ranged from 7.0 to 220 mg/l.

- **Electrical Conductivity (EC)**: The highest recorded EC was 858 µmhos/cm in February at Trimohoni Bridge, with the lowest being 219.2 µmhos/cm in October at Jolshiri Abason. In 2022, EC values varied between 154 and 842 µmhos/cm.

- **Total Alkalinity**: Total alkalinity was highest at 382 mg/l in February at Trimohoni Bridge, and the lowest value observed was 14 mg/l in October at Jolshiri Abason. In 2022, total alkalinity ranged from 32 to 370 mg/l.

- **Turbidity**: Turbidity levels peaked at 83.9 mg/l in February at Trimohoni Bridge and dropped to a minimum of 4.0 mg/l in October at Jolshiri Abason. Turbidity in 2022 ranged from 4.9 to 86.3 NTU.

These findings highlight the water quality characteristics of the Dhaleshwari River, showing seasonal fluctuations and potential implications for local ecosystems and human use. The data regarding the Dhaleshwari River's water quality is referenced from the *Surface and Ground Water Quality Report 2023*, published by the Department of Environment under the Ministry of Environment, Forest & Climate Change, Government of the People's Republic of Bangladesh.

4.3.2. Groundwater Quality

Army Institute of Physiotherapy & Rehabilitation tested the deep tubewell water. The test report results are attached in the Annexure E.

Table 4.1: Groundwater Quality Test Report

SL. No	Parameter	Units	Result	DoE (Bangladesh) Standard for Drinking Water
1.	pH	--	7.2	6.5-8.5
2.	TDS	mg/l	198	1000
3.	Iron	mg/l	0.12	0.3-1.0
4.	Alkalinity	mg/l	36	---
5.	Hardness	mg/l	43	200-500
6.	Chloride	mg/l	51	150-600
7.	Arsenic	mg/l	<0.002	0.05

Laboratory analyses were conducted to determine the specified parameters, including ion concentration, chloride, TDS, hardness, and alkalinity. A buffered, calibrated pH meter was used to measure the pH value accurately. The groundwater quality at Army Institute of

Physiotherapy & Rehabilitation was found to be satisfactory, with all parameter values falling within the water quality standards set by the Department of Environment (DoE) and EPA. This water is deemed suitable for drinking purposes.

4.4.Air Quality

Air quality is determined by the concentration of substances in the atmosphere that can cause adverse effects on human health, animal and plant life, and property. Key pollutants include gases such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and carbon dioxide (CO_2), as well as suspended particulate matter (SPM) like smoke, dust, and fumes. Elevated levels of these pollutants can have detrimental impacts on the environment and public health.

Increased vehicular traffic is a primary contributor to elevated air pollution levels. However, recent regulatory measures implemented by the Bangladesh Government through the Department of Environment (DoE) have led to improvements in air quality.

The area in front of Army Institute of Physiotherapy & Rehabilitation is subject to some pollution due to ongoing development projects and vehicular traffic. Emissions from vehicles contribute various gases, including SO_2, NO_x, CO, CO_2, as well as smoke and dust particles. Additionally, construction activities in the vicinity generate dust.

To mitigate these effects, the hospital building is designed to be fully enclosed, preventing the infiltration of contaminated air into the facility. The typical air quality of Dhaka city, including baseline measurements for the area, is depicted in the following figure.

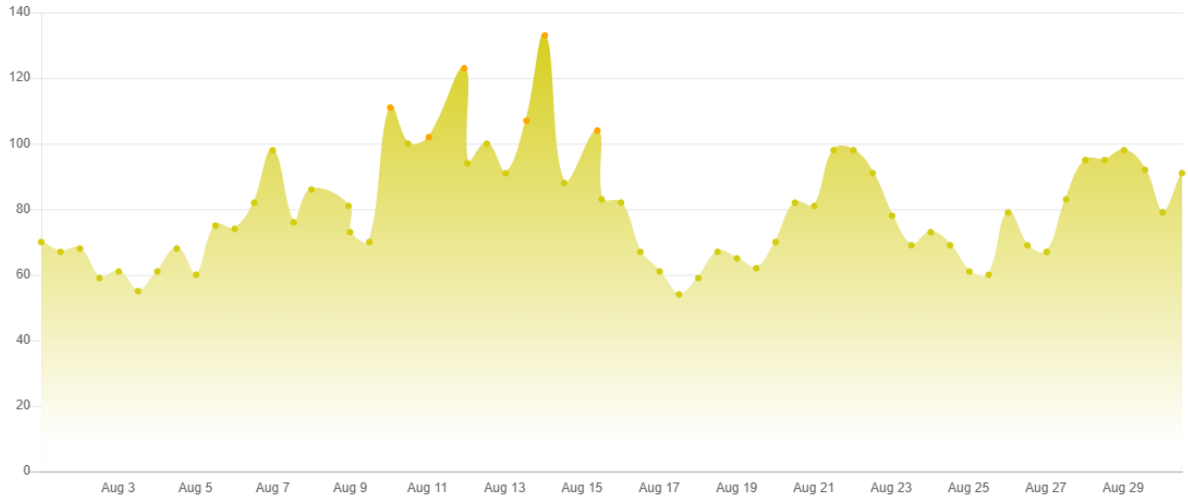


Figure 4.3: Air Quality Index of Dhaka City During August 2024 (source: https://www.aqi.in/dashboard/bangladesh/dhaka)

According to the Air Quality Index (AQI) data for Dhaka, the maximum AQI recorded in August 2024 was 54 on August 17, indicating a moderate level of air quality. The lowest air quality during the same period was observed on August 14, with an AQI of 133, which falls into the category of unhealthy for sensitive groups.

Table 4.2: Air Quality Index (AQI) specifics

AQI	Category	Color	Health implications	What should people do
0-50	Good	Green	Air quality is considered satisfactory, and air pollution poses little or no risk.	It's a great day to be active outside.
51-100	Moderate	Yellow	Air quality is acceptable; however, for some pollutants, there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.	Unusually sensitive people: Consider reducing prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easier. Everyone else: It's a good day to be active outside.
101-150	Unhealthy for Sensitive Groups	Orange	Members of sensitive groups may experience health effects. The general public is not likely to be affected.	Sensitive groups: Reduce prolonged or heavy exertion. It's OK to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. People with asthma should follow their asthma action plans and keep quick relief medicine handy. If you have heart disease: Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your health care provider.
151-200	Unhealthy	Red	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.	Sensitive groups: Avoid prolonged or heavy exertion. Move activities indoors or reschedule to a time when the air quality is better. Everyone else: Reduce prolonged or heavy exertion. Take more breaks during all outdoor activities.
201-300	Very Unhealthy	Purple	Health alert: everyone may experience more serious health effects.	Sensitive groups: Avoid all physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. Everyone else: Avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.
301-500	Hazardous	Maroon	Health warnings of emergency conditions. The entire population is more likely to be affected.	Everyone: Avoid all physical activity outdoors. Sensitive groups: Remain indoors and keep activity levels low. Follow tips for keeping particle levels low indoors.

Table 4.3: Ambient Air Quality of the Hospital

SL. No.	Sample Location	Ambient Air Pollution Concentration in microgram/cubic meter.					
		SPM	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**NO_x**	**CO**
1.	**Units**	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3
2.	**Near Hospital Main Gate**	71	21	36	5.2	7.5	0.38
3.	**Test Duration (Hours)**	8	8	8	8	8	8
4.	**Method of Analysis**	Gravimetric	Gravimetric	Gravimetric	West Gaeke	Jacob and Hochheiser	Electrochemical Sensor
Bangladesh (DoE) Standard for Ambient Air		**200**	**65**	**150**	**365**	**100**	**10,000**
IFC/WB Standard		**NF**	**75**	**150**	**125**	**200**	**NF**
Remark		**Good**	**Good**	**Good**	**Good**	**Good**	**Excellent**

Note: -

i. PM_{10} - Respirable Dust Content.
ii. $PM_{2.5}$ - Fine Particulate Matter
iii. SPM - Suspended Particulate Matter
iv. SO_2 - Sulphur dioxide.
v. NO_X - Oxides of Nitrogen.

Air samples were collected using a high-volume sampler equipped with gaseous impingers to measure the concentrations of sulfur dioxide (SO_2), nitrogen oxides (NOx), and carbon monoxide (CO). The data for these gaseous pollutants were gathered for subsequent laboratory analysis. The levels of PM_{10}, $PM_{2.5}$, and suspended particulate matter (SPM) were determined using the gravimetric method, which involves weighing the dust cup and Whatman filter paper before and after sample collection. The results of the ambient air quality parameters for Army Institute of Physiotherapy & Rehabilitation are presented in the above-mentioned table.

The concentrations of the measured ambient air quality parameters, including SPM, PM_{10}, $PM_{2.5}$, SO_2, NOx, and CO, fall within the acceptable limits set by the Department of Environment (DoE), Government of Bangladesh. Additionally, these results comply with

international standards, such as those set by the International Finance Corporation (IFC) and the World Bank. Samples were collected during sunny and dry weather conditions at the Army Institute of Physiotherapy & Rehabilitation site, with the wind direction recorded as moving from the northwest to the southeast.

4.5.Ambient Noise Level

Army Institute of Physiotherapy & Rehabilitation tested the ambient noise level at the project site. The test report results are attached in Annexure E.

Table 4.4: Ambient Noise Level Assessment Test Report

SL. No	Sample Location	Site Condition	Concentration Present (LA_{eq}) dBA	
			Day Time	Night Time
1.	Project East Side	Running Condition	44.19	35.37
2.	Project West Side	Running Condition	41.01	34.03
3.	Project North Side	Running Condition	39.8941.78	32.99
4.	Project South Side	Running Condition		34.18
Bangladesh (DoE) Standard for Industrial Area			Day Time	Night Time
Industrial Area			75	70
Commercial Area			70	60
Mixed Area			60	50
Residential Area			55	55
World Bank/ IFC Standard			Day Time	Night Time
Industrial Area			70	70
Residential; Industrial; Educational			55	45

The ambient noise level assessment for Army Institute of Physiotherapy & Rehabilitation (AIPR) presents a detailed analysis of noise levels at various project site boundaries, with findings compared against the Bangladesh Department of Environment (DoE) standards and World Bank/IFC guidelines. Measurements taken during the day ranged from 51.41 dBA on the west side to 35.4 dBA on the east side, while nighttime levels ranged from 49.11 dBA to 31.6 dBA across the exact locations. These measurements indicate compliance with the DoE standards for industrial areas, which permit up to 75 dBA during the day and 70 dBA at night. Since AIPR operates in an industrial setting, these results fall within acceptable limits, suggesting that the project's noise levels are adequately managed in line with DoE requirements.

For areas classified as commercial or mixed-use, the recorded noise levels also satisfy the DoE thresholds, which set lower limits (70 dBA daytime and 60 dBA nighttime for commercial; 60 dBA daytime and 50 dBA nighttime for mixed-use). AIPR's noise levels are consistent with these standards, indicating that the site would meet DoE requirements if situated in these zones. However, for residential standards, which allow a maximum of 55 dBA both day and night, the daytime readings on the east and south sides slightly exceed this threshold. In comparison, the nighttime levels remain compliant except for a minor exceedance on the east side at 55.34 dBA. Although these minor deviations would not affect AIPR's standing in an industrial area, they might suggest potential adjustments if residential areas are nearby.

AIPR's noise levels meet the DoE requirements for industrial zones and fall within acceptable ranges for commercial and mixed-use areas. However, given slight exceedances relative to residential standards, especially at night, it may be beneficial to implement noise reduction measures if nearby sensitive areas are impacted. This proactive approach would ensure full compliance with current DoE industrial standards and enhance compatibility with residential thresholds, providing an additional margin of environmental stewardship.

4.6.Climate and Meteorological Condition of the Project Area

Army Institute of Physiotherapy & Rehabilitation is in a tropical savanna climate characterized by a hot, wet summer season from May to September and a cooler, dry winter. The monthly average temperature can reach up to 32ºC during the pre-monsoon period. More than 85% of the total annual rainfall occurs during the wet season, with predominant wind patterns blowing from the south. However, ongoing research is needed to determine if these trends are indicative of broader climatic changes. Notably, the typical rainy monsoon period is experiencing delays, leading to shifts in agricultural patterns. This delay results in increased production costs and reduced crop yields, adversely affecting both the agriculture sector and the livelihoods of local communities.

In recent years, the region has experienced heat waves, attributed to indiscriminate deforestation and the specific geographical characteristics of the area. The highest recorded temperature in the metropolitan area is now 38ºC, while the lowest is around 12ºC. During the monsoon, the average temperature hovers around 25.0ºC. Local observations suggest that temperatures have been gradually rising over the past five years, making daily life increasingly challenging. The primary cause of these heat waves is the rising humidity levels in the atmosphere, posing significant challenges to future development efforts.

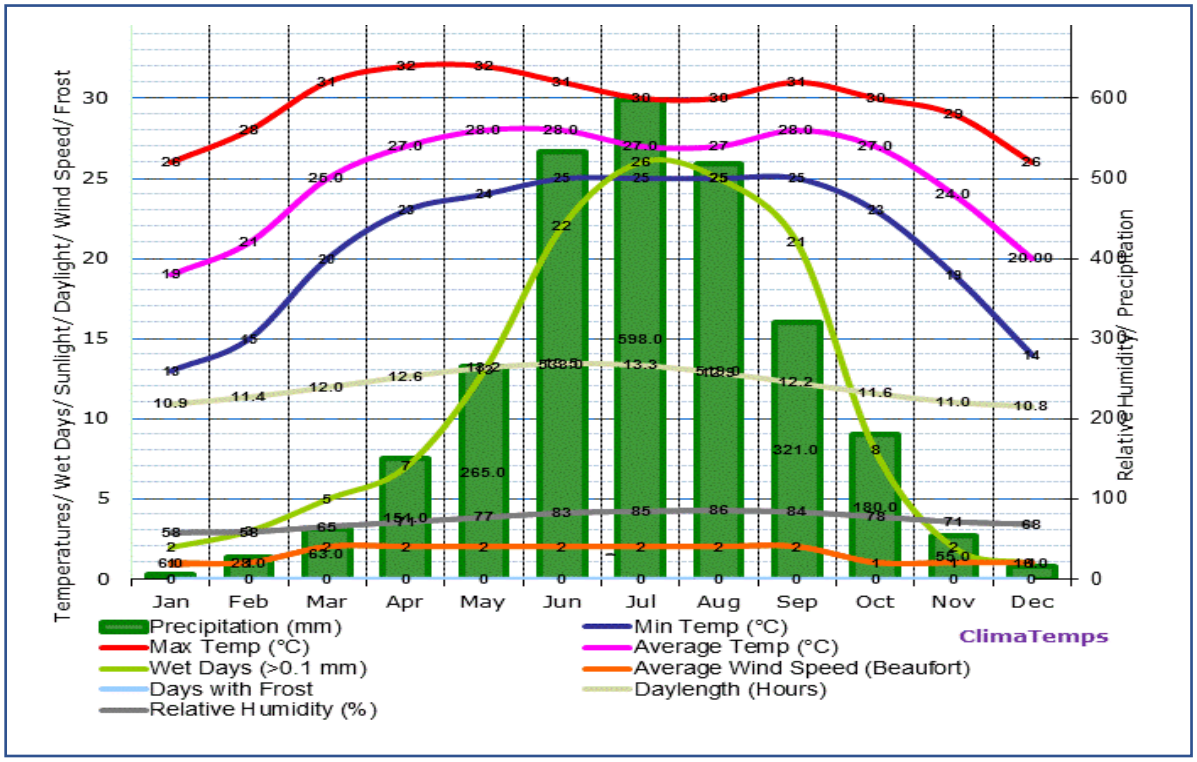


Figure 4.4: Climate graphs of Dhaka Division

To illustrate the variation in rainfall throughout the year, we present data accumulated over a sliding 31-day period centered on each day of the year. Dhaka experiences significant seasonal variation in monthly rainfall. The rainy season extends for approximately 9.5 months, from February 13 to November 30, during which the sliding 31-day rainfall consistently exceeds 0.5 inches. July is typically the wettest month, with an average rainfall of 9.7 inches.

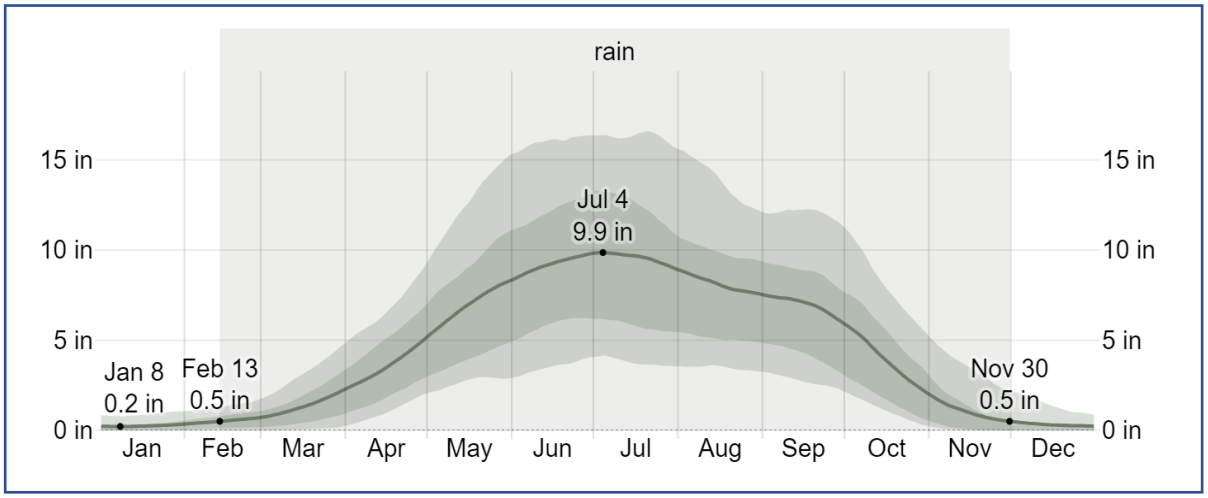


Figure 4.5: Average rainfall over the year in Dhaka

The rainless period in Dhaka lasts for approximately 2.5 months, from November 30 to February 13. January typically experiences the least rainfall, with an average of just 0.2 inches.

Humidity levels are based on the dew point, which indicates whether perspiration can evaporate from the skin to cool the body. Lower dew points feel drier, while higher dew points feel more humid. Unlike temperature, which can fluctuate significantly between day and night, dew points tend to change more gradually. Consequently, a humid day often leads to a humid night. Dhaka experiences significant seasonal variation in perceived humidity. The humid period spans about 8.8 months, from March 3 to November 28, during which conditions are muggy, oppressive, or uncomfortable at least 26% of the time. January has the fewest muggy days, with only 0.8 days falling into this category.

Statistics indicate that average humidity rises to nearly 80% between June and October, while it decreases during the remaining months. The annual average humidity levels are illustrated below:

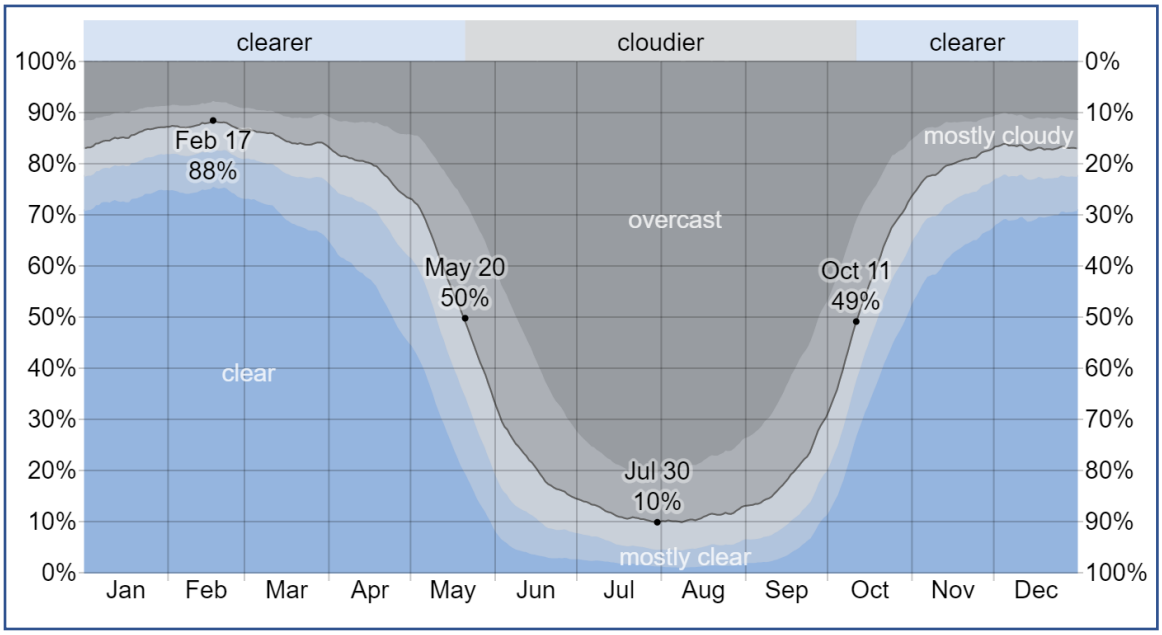


Figure 4.6: Average humidity over the year in Dhaka

This section examines the wide-area hourly average wind vector, encompassing both speed and direction, measured at 10 meters above ground level. Wind conditions at any specific location can vary significantly due to local topography and other factors, resulting in more variability in instantaneous wind speed and direction than in hourly averages.

Dhaka experiences notable seasonal variation in average hourly wind speed throughout the year. The windier period extends for approximately 5.3 months, from March 29 to September 6, during which the average wind speed exceeds 7.4 miles per hour. July is typically the windiest month, with an average hourly wind speed of 9.8 miles per hour. Conversely, the

calmer period spans about 6.7 months, from September 6 to March 29, with November being the calmest month, characterized by an average hourly wind speed of 4.6 miles per hour.

Wind direction also varies with the seasons. During the pre-monsoon and monsoon seasons, winds predominantly blow from the southwest and southeast. In contrast, during the post-monsoon and dry seasons, the winds shift to blow from the northwest and northeast. Periods of high wind velocity are typically observed between mid-April and early June, as well as between mid-September and mid-December. The average wind speed throughout the year for the project site is detailed below:

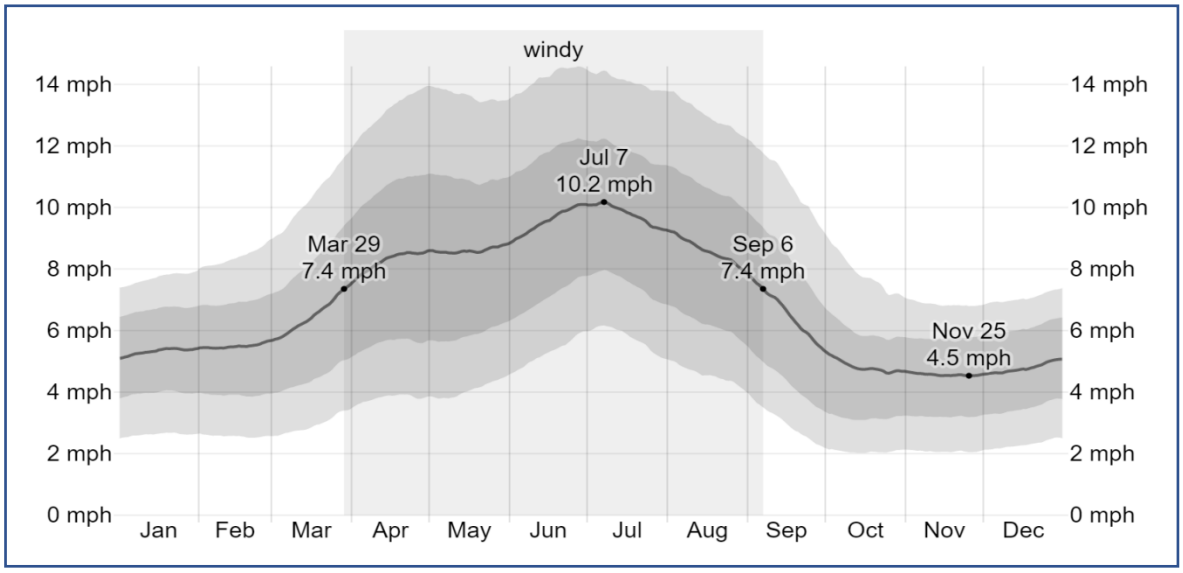


Figure 4.7: Average wind speed over the year in Dhaka

The hot season in Dhaka spans approximately 3.5 months, from March 13 to June 27, with average daily high temperatures exceeding 89°F. May is typically the hottest month of the year, featuring an average high of 92°F and a low of 78°F.

Conversely, the cool season lasts around 1.5 months, from December 14 to January 31, during which the average daily high temperature remains below 78°F. January is the coldest month, with average low temperatures of 57°F and high temperatures of 76°F.

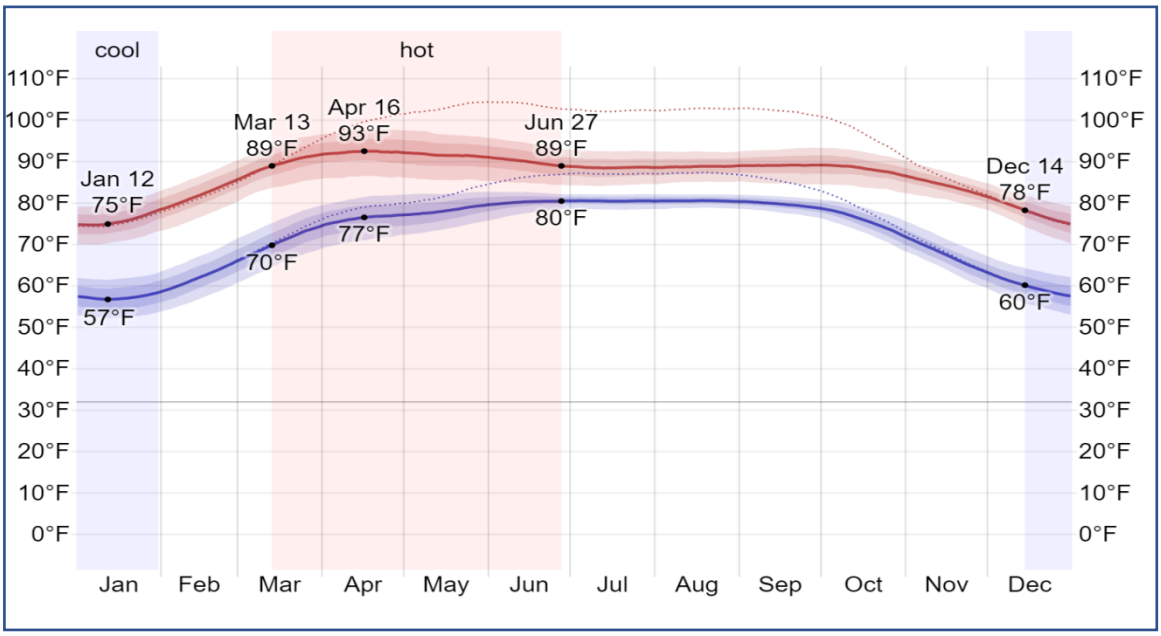


Figure 4.8: Average High and Low Temperature in Dhaka

In Dhaka, the average cloud cover shows significant seasonal variation throughout the year. The clearer period begins around October 11 and extends for approximately 7.3 months, concluding around May 20. February is typically the clearest month, with the sky being clear, mostly clear, or partly cloudy approximately 87% of the time. In contrast, the cloudier period starts around May 20 and continues for about 4.7 months, ending around October 11. August is the cloudiest month, with the sky being overcast or mostly cloudy approximately 89% of the time.

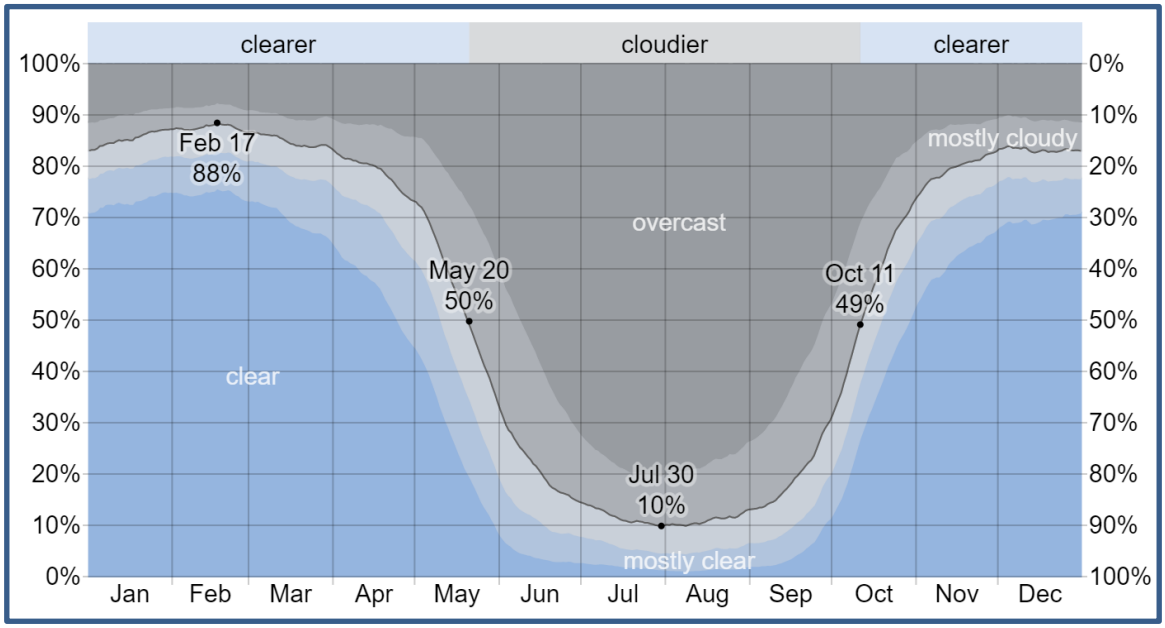


Figure 4.9: Average cloud cover in Dhaka

4.7.Archeological Heritage

There are no historical sites or structures of archaeological, paleontological, or architectural significance near the project or hospital areas.

4.8.Life Pattern

The life pattern in the vicinity of the project site and hospital area is generally positive, as the region is experiencing gradual development and increased job opportunities for the local population.

4.9.Settlement and Housing

Currently, there are limited settlements and housing in the project area. As the project progresses, the influx of workers from various sectors will necessitate additional housing, leading to rapid development of settlements around the project site. This will also result in increased socio-economic activities due to the influx of capital and the economic contributions of the newly settled workforce. Consequently, the demand for infrastructure and services, such as water supply, garbage collection, sanitation, electricity, roads, and drainage, will rise. To meet these needs, the relevant local authorities, in collaboration with the project proponents, will work to enhance and expand service facilities in the area. Therefore, the project does not require the evacuation of existing settlements or housing in the project vicinity.

4.10. Traffic and Transport

The project is strategically located adjacent to a well-maintained road network and is directly connected to Madani Avenue. Existing traffic and transport facilities are adequate to support the project's operations. However, the establishment of this hospital is expected to increase traffic and transport activities in the area, which will likely lead to a rise in socio-economic activities around the project site.

4.11. Terrestrial and Aquatic Flora and Fauna

Dhaka's climate and location are favorable for the growth and development of various tree species. Despite being a bustling city, Dhaka district still retains significant vegetation and diverse ecosystems, intersected by several rivers. The area boasts a rich array of flora and fauna, contributing to both terrestrial and aquatic ecosystems. Key ecological features include the four

major rivers, natural and social forestry initiatives, gardens, and institutions, all contributing to the ecological balance.

However, increasing industrialization and urban development pose significant threats to these ecosystems. Ecosystems provide essential goods and services crucial for human well-being and need to be managed with care (Graham, 2004). In the past, many areas in Dhaka served as sanctuaries for avifauna, wildlife, and fisheries, contributing to rich faunal biodiversity and a well-functioning ecosystem. Currently, however, extensive land, including low-lying areas and wetlands, is being encroached upon for residential and industrial development. This trend is driven by Dhaka's attractive living conditions and excellent connectivity to the rest of the city (Hossain et al., 2008).

4.11.1. Flora

The dominant flora in the area includes a variety of species such as Kochuripana (Water Hyacinth), Chechra (*Schenoplectus articulatus*), and Kolmi (*Ipomoea* sp.), alongside larger trees like Tamarind (*Tamarindus indica*), Jackfruit (*Artocarpus heterophyllus*), and Mango (*Mangifera indica*). Fruit-bearing trees commonly found in the area include jackfruit, mango, litchi, banana, coconut, and blackberry. The region also features a variety of timber trees such as mahogany, neem, rain tree, and koroi. The area is characterized by a considerable number of trees and bushes, with a diverse composition of plant species including low-growing grasses, herbs, shrubs, and trees (Source: EIA, MGSP). A detailed list of common tree species in the area is provided below.

Table 4.5: Common Trees in the Project Area

Name of Trees	Scientific Name	Name of Trees	Scientific Name
Mango	Mangifera indica	Guava	Psidium guajava
Kodbel	Feronia limonia	Dumor	Ficushispida
Sajina	Moringa oleifera	Akashmoni	Acacia auriculiformis
Atafal	Annona reticulate	Rain Tree	Samanea saman
Sobeda	Manilkara sapota	Shimul	Bombax ceiba
Date Palm	Phoenix	Supari	Areca catechu
Lichi	Lichi chinensis	Papaya	Carica Papaya
Bel	Aegle marmelos	Banana Musa	Sapientum
Shishu	Dalbergia sisoo	Bakul	Mimosas eleng
Jackfruit	Artocarpus heterophyllus	Jaw	Casuarina littorea
Mahogany	Swietenia macrophylla	Boroi	Zizyphusm auritiana
Neem	Azadirachta indica	Jambura	Citrus grandis

Name of Trees	Scientific Name	Name of Trees	Scientific Name
Babla	A. nilotica	Kamranga	Averrhoa carambola
Jarul	Lagerstroemia speciosa	Eucalyptus	Eucalyptus teritocornis
Tetul	Tamarindus indica		

4.11.2. Fauna

A study conducted by Md. Eftekhar Hossain, Mohammad Mamun Chowdhury, and Kazi Farhed Iqbal in the Savar Upazila of Dhaka District documented a diverse range of species, including 30 species of birds, 24 species of winter birds, 7 species of reptiles, 3 species of amphibians, 15 species of mammals, and 32 species of fish. The relative abundance of these species was assessed, revealing that the House Sparrow (*Passer domesticus*) was the most abundant among the bird species, while Blyth's Kingfisher (*Alcedo hercules*), Rock Eagle Owl (*Bubo bengalensis*), Hooded Pitta (*Pitta sordida*), Black-headed Oriole (*Oriolus xanthornus*), White-winged Duck (*Cairina seululala*), and the Bar-headed Goose (*Anser indicus*) were classified as rare. The relative abundance of winter birds could not be determined due to their migratory nature.

Among the reptiles, the Striped Keelback (*Amphiesma stolata*) and Common Smooth Water Snake (*Enhydris enhydris*) were observed to be common, whereas the Black Pond Turtle (*Geoclyms hamiltonii*) and Pond Tortoise (*Melanochelys trijuga*) were recorded as endangered. For amphibians, the Common Toad (*Bufo melanostictus*) was found to be abundant, while the Bullfrog (*Rana tigrina*) was rare. In the mammalian category, the Asiatic Wild Dog (*Cuon alpinus*) and House Mouse (*Mus musculus*) were abundant, while the Common Otter, Large Indian Civet, Irrawaddy River Dolphin, and Indian Hare were noted as rare.

Regarding fish species, Carp, Silver Carp, Tilapia, and Nile Tilapia (*Oreochromis niloticus*) were found to be abundant. In contrast, species such as Freshwater Garfish, One-striped Spiny Eel, and Grey Featherback were rare. The study identified several major threats to the faunal diversity of the Savar area, including landfilling, deforestation, poaching, industrial effluents, and the use of current nets (jal).

4.12. Socio-Economic Status

The area surrounding the proposed hospital site hosts limited socio-economic activities, with residents engaged in a wide range of occupations across industrial, commercial, transportation, and various other sectors. This industrial region is characterized by a diverse population from

different cultural and religious backgrounds who live, work, and worship harmoniously. The establishment of the hospital has not led to the displacement or negative impact on local residents. Instead, it will have stimulated multi-disciplinary activities and businesses, providing numerous employment opportunities. A significant number of people have become involved in the hospital's operations, supporting their livelihoods.

During both the construction and operational phases, the project is expected to employ a large workforce, including both skilled and unskilled labor. The hospital's presence has already benefited many local residents, either directly through employment opportunities or indirectly through the provision of healthcare services and related business activities.

The primary sources of income in the area are agriculture (47.89%), non-agricultural labor (2.89%), business (14.85%), transport and communication (3.85%), employment (13.28%), rent and remittance (4.57%), and other activities (12.67%). The hospital's establishment offers the local population access to improved diagnostic services, reducing the need for long commutes, which are often hindered by traffic congestion in Dhaka.

Army Institute of Physiotherapy & Rehabilitation will employ approximately 780 individuals, both skilled and unskilled, in its operational phase. This will provide significant socio-economic benefits to the community, including increased employment opportunities and the growth of ancillary businesses related to the healthcare sector. Consequently, the hospital's presence enhances local service accessibility and overall quality of life for nearby residents.

The project site is not marshy, and no aquatic life has been observed on the land throughout the year. Therefore, the hospital's establishment has not resulted in the loss of any wetland areas. The hospital has successfully integrated into the local environment, contributing positively to the socio-economic development of the area without compromising ecological integrity.

Chapter Five: Identification And Mitigation of Potential Impacts

5.1. General Consideration

In the case of most industrial or development projects, potential negative impacts are far more numerous than beneficial impacts. Several project activities during the operation of existing facilities of **Army Institute of Physiotherapy & Rehabilitation (AIPR)** or construction at the project site have been identified in chapter three of this report. This chapter identifies potential positive and negative impacts that may be generated from those project activities, which is the first step of forming this EIA report. Though regional and national economic benefits associated with implementing any development project are considered to fall outside the scope of an EIA, they are also considered here. It is recognized that the long-term benefits will ultimately contribute to improving the quality of life in the project area.

5.2. Impacts Identification and Mitigation Measures

Identification of potential impacts due to the plant location and operation has been done using Checklist. Checklists are comprehensive lists of environmental effects and impact indicators designed to stimulate the analysis to think broadly about possible consequences of contemplated actions *(Munn, 1979)*. In order to prepare the checklist and further analyze the associated Environmental impacts due to the project, a multi-disciplinary team from the consultant's side visited the existing project site and closely identified activities of the project and significant environmental components that may be affected by the project. The project officials were interviewed during each visit to assess their understanding of the interrelation of the project activities and significant environmental impacts. The visitors in the project site were also interviewed randomly to assess their level of understanding about the general responsibilities to conserve the overall environment of this recreational spot. These were done mainly to identify the significant environmental components of the project and, at the same time, stimulate thinking about the environmental conservation of all the groups associated with the project. This process identifies the water quality of the project and its surroundings as the most significant environmental components. Overall project environment, erosion, sewage and stormwater management, solid waste management, sound and air quality management, maintenance practices, and overall environmental management systems are the major environmental issues identified from the consultant's side.

However, as the project is an existing project, the environmental management of the existing facilities' operation phases has been emphasized to develop the EIA. An outline of management issues in case of any future construction and development has also been included in the management plan so that Army Institute of Physiotherapy & Rehabilitation's authority can take proactive approaches to minimize environmental and socio-economic impacts to the lowest possible extent. Table -5.1 represents the checklists developed for Army Institute of Physiotherapy & Rehabilitation. In this checklist, major activities that create the Significant Environmental Impacts (SEIs) are shown. The terms none, minor, moderate major, short-termed, and long-termed are used in checklists to classify the magnitude and duration of probable SEI.

5.2.1. Environmental Aspects Process Model

a. **Identification of Environmental Aspects:** Organizations identify and list the various activities, products, or services that interact with the environment. These are known as environmental aspects.
b. **Evaluation of Environmental Impacts:** Organizations assess the potential environmental impacts for each identified aspect. These impacts can affect air, water, soil, biodiversity, energy consumption, etc.
c. **Significance Determination:** The significance of each impact is determined based on criteria such as regulatory requirements, potential harm, frequency, and reversibility.
d. **Legal and Other Requirements:** Organizations identify applicable legal requirements and other obligations related to significant environmental aspects.
e. **Objectives and Targets:** Environmental objectives and targets are established to address the significant aspects and comply with legal requirements. These objectives are specific, measurable, achievable, relevant, and time-bound (SMART).
f. **Operational Controls:** Procedures and controls are implemented to ensure that operations are conducted in line with environmental objectives and legal requirements.
g. **Monitoring and Measurement:** Monitoring processes are established to track environmental performance and ensure compliance. This may involve regular inspections, sampling, and data analysis.
h. **Review and Continuous Improvement:** Periodic reviews are conducted to assess the effectiveness of the EMS. The findings are used to continually improve, update objectives, and enhance environmental performance.

Table 5.1 Checklist for identification of probable Environmental Impact of Army Institute of Physiotherapy & Rehabilitation (Project Location).

Project Phase	Action Affecting Environmental Resources and Values		SEIs without Mitigation Measures				Impact Type				Duration	
			None	Minor	Moderate	Major	Adverse	Beneficial	Reversible	Irreversible	Short Term	Long Term
Hospital Location	a	Loss of and displacement from homestead land	√									
	b	Overland Drainage and Impact on Surface Water		√			√			√		√
	c	Change in Landscape		√			√			√		√
	d	Loss of and displacement from agricultural land and house	√									
	e	Disruption of Earth's Surface		√			√			√		√
	f	Inadequacy of Buffer Zone		√			√		√			√

Table 5.2 Checklist for identification of probable Environmental Impact of Army Institute of Physiotherapy & Rehabilitation (Project Location).

Project Phase	Action Affecting Environmental Resources and Values		SEIs without Mitigation Measures				Impact Type				Duration	
			None	Minor	Moderate	Major	Adverse	Beneficial	Reversible	Irreversible	Short Term	Long Term
Construction	a	Air pollution		√			√			√	√	
	b	Noise Pollution and Vibration affect.		√			√			√	√	
	c	Spreading diseases		√			√			√		√
	d	Accidents		√			√			√		√

Table 5.3 Checklist for identification of probable Environmental Impact of Army Institute of Physiotherapy & Rehabilitation (Operation of the Hospital).

Project Phase	Action Affecting Environmental Resources and Values		Effect on Environment and Economy	SEIs without Mitigation Measures				Impact Type				Duration	
				None	Minor	Moderate	Major	Adverse	Beneficial	Reversible	Irreversible	Short Term	Long Term
Hospital Operation	Operation of Army Institute of Physiotherapy & Rehabilitation												
	a	Noise Pollution	Noise Generated from Electromechanical			√		√		√			√

Project Phase	Action Affecting Environmental Resources and Values		Effect on Environment and Economy	SEIs without Mitigation Measures				Impact Type				Duration	
				None	Minor	Moderate	Major	Adverse	Beneficial	Reversible	Irreversible	Short Term	Long Term
			machinery and transports										
	b	Water Pollution	Untreated liquid wastewater and sewage discharge can pollute the environment.				√	√			√		√
	c	Air pollution from the generators			√			√			√	√	
	d	Solid Wastes from daily activities as well as from routine maintenance work				√		√			√		√
	e	Accidental and Natural Hazard				√		√			√		√
	f	Employment- Recruitment of new staffs and operators					√		√				√

The checklist identifies the Impacts likely to occur in the different phases of the project. The following sections evaluate these impacts, mentioning their origin and characteristics, actual site condition implemented mitigation measures, and possible enhancement of mitigation/enhancing measures. At the end of each sub-section, the status of residual impact will also be mentioned.

5.3. Evaluation of Predicated Adverse Impacts and Mitigation

Unjustified and unplanned operations of any project can significantly impact the quality of life and the surrounding environment. Such operations may lead to increased air, noise, and water pollution, the generation of hazardous waste, and pollution from spillage or surface runoff. Additionally, they can disrupt local flora and fauna, resulting in the loss of trees due to increased access, and elevate land values, threatening agricultural activities. These environmental disturbances can have far-reaching consequences, affecting the natural ecosystem and the health and well-being of human populations.

5.4. Impact due to Operation of the Existing Project

Several environmental issues have been identified for evaluation during the operational phase of the Army Institute of Physiotherapy & Rehabilitation project. These issues, which necessitate careful monitoring and management, include:

- **Topographical Impacts**: Moderate
- **Water Consumption and Wastewater Discharge**: Significant
- **Solid Waste Generation**: Significant
- **Noise Pollution**: Moderate
- **Natural and Accidental Hazard Risks**: Uncertain

Addressing these environmental considerations is crucial to maintaining compliance with regulatory standards and ensuring the long-term sustainability of the project

5.5. Impacts on Topography

5.5.1. Disruption of Earth Surface

5.5.1.1. Impact Origin

As mentioned earlier, a part of the landfilling and cutting would be required to develop the site to provide protection against floods and create an underground basement. This landfilling and cutting will not disrupt the earth's natural surface and obstruct the area's natural drainage system.

5.5.1.2. Mitigation Measure

According to the plan, Army Institute of Physiotherapy & Rehabilitation will not create any water logging and drainage problems as the authority collects the soil to develop the area by

carrying sand to and from different places. Cross-drainage works should be constructed to bypass the surface water and other discharges.

5.5.1.3. Residual Impact

If the mitigation measures above are implemented, the residual impact will be very insignificant.

5.5.2. Change in Landscape

5.5.2.1. Impact Origin

A landscape is a subjective concept that cannot be precisely quantified. However, in general, any project that is not designed considering the local landscape creates visual intrusion to the people. The project may change the local landscape to some extent.

5.5.2.2. Mitigation Measure

Any part of the project should be designed to consider key landscape criteria like coherence, readability, hierarchy, and stability. It is understood that the project will have a modern architectural view, which does not provide any significant visual intrusion. A straightforward way the altered green area can be turned into its original visual quality is to plant trees around the project area.

5.5.2.3. Residual Impact

Provided the mitigation measures above are fully implemented, the residual impact will be very insignificant.

5.6. Impact on Climate

5.6.1. Impact Origin

The potential climate impact associated with the operations of Army Institute of Physiotherapy & Rehabilitation Hospital can be attributed to several key sources:

- **Greenhouse Gas Emissions:** The hospital's operations generate greenhouse gas emissions, contributing to the overall carbon footprint.
- **Combustion of Fossil Fuels:** The use of natural gas and other fossil fuels for heating, electricity, and backup power supply systems contributes to carbon dioxide and other greenhouse gas emissions.
- **Energy Consumption:** Hospital operations, including medical equipment, lighting, HVAC systems, and IT infrastructure, require high energy consumption, which results

in substantial greenhouse gas emissions if the energy is sourced from non-renewable resources.

- **Intensive Water Use:** Water consumption for hospital activities, including sanitation, cleaning, and cooling systems, can indirectly impact climate change if water management is inefficient, leading to energy-intensive water supply and treatment processes.
- **Solid Waste Generation:** The generation of medical and general waste, if not appropriately managed, can lead to methane emissions from waste decomposition in landfills.
- **Transportation:** The transportation of medical supplies, staff, patients, and waste, which uses fuel-powered vehicles, contributes to carbon emissions.
- **Use of Chemicals:** Chemicals utilized in cleaning, disinfection, and medical treatments can have indirect environmental impacts, potentially contributing to climate change if not handled and disposed of properly

5.6.2. Mitigation Measure

- **Transition to Renewable Energy Sources:** Hospitals can utilize solar panels (in the future) or other renewable energy technologies to power operations, reducing their reliance on fossil fuels.
- **Promote Sustainable Resource Use:** Support responsible sourcing practices for all materials, including medical supplies, and engage in local afforestation projects to offset carbon emissions.
- **Water Management and Conservation:** Implement water recycling and rainwater harvesting systems (in the future) to reduce water usage and minimize the energy footprint associated with water supply and wastewater treatment.
- **Invest in Energy Efficiency:** Upgrade to energy-efficient equipment and appliances, conduct regular energy audits, and promote conservation practices among staff to reduce overall energy consumption.
- **Waste Management Strategies:** Develop comprehensive waste reduction, recycling, and disposal plans, focusing on minimizing medical and general waste and exploring options for the circular economy. Also, dispose of solid waste through the Prism Medical Waste Management Program.
- **Optimize Transportation and Logistics:** Use fuel-efficient and low-emission vehicles for hospital operations and consider regional sourcing to minimize transportation distances and associated emissions.

- **Environmentally Friendly Chemical Use:** Substitute harmful chemicals with eco-friendly alternatives, implement best practices in chemical handling, and adopt closed-loop systems to prevent chemical runoff and contamination.

5.6.3. Residual Impacts

- **Minimal Residual Impacts:** Implementing these measures will significantly reduce the hospital's carbon footprint, contributing to lower greenhouse gas emissions.
- **Reduced Impact on Biodiversity and Ecosystems:** Responsible sourcing and afforestation efforts will help protect local biodiversity and maintain healthy ecosystems.
- **Reduced Water Stress and Pollution:** Water recycling and conservation measures will decrease the hospital's water usage, lowering stress on local water resources and minimizing pollution.
- **Lower Energy Consumption:** Investing in energy-efficient technologies will decrease overall energy demand, reducing greenhouse gas emissions.
- **Minimized Landfill Contribution:** Effective waste management will reduce the amount of waste sent to landfills, promoting resource conservation.
- **Reduced Carbon Footprint in the Supply Chain:** Optimizing logistics and adopting eco-friendly transport modes will lower the hospital's supply chain emissions.
- **Minimized Chemical-Related Environmental Harm:** Using eco-friendly chemicals and closed-loop systems will reduce the environmental impact of hazardous substances.

5.7. Impact on Water Use & Wastewater Discharge on Environment

5.7.1. Impact Origin

Army Institute of Physiotherapy & Rehabilitation will utilize approximately 83 m^3 of water daily. This water is distributed among various hospital operations, including utility services and other hospital-related purposes. The total volume of liquid wastewater generated by AIPR is around 80 m^3 per day, with the biochemical oxygen demand (BOD) and chemical oxygen demand (COD) levels expected to be relatively low. To manage this, Sewage Treatment Plant (STP) with capacity of 4 m^3 per hour have been constructed to treat all the wastewater produced by hospitals and medical colleges.

Untreated hospital wastewater can have several adverse effects on agricultural land, including:

- **Soil Contamination:** The presence of hazardous chemicals, heavy metals, and pharmaceutical residues in untreated wastewater can contaminate the soil, making it toxic for plant growth and leading to the accumulation of harmful substances in the food chain.
- **Water Pollution:** When untreated wastewater enters agricultural water sources, it can pollute irrigation water, spreading contaminants across fields and negatively affecting crop health and yield.
- **Nutrient Imbalance:** Hospital wastewater often contains high levels of nitrogen and phosphorus, leading to nutrient imbalances in the soil. This may cause excessive algal growth in nearby water bodies, leading to eutrophication and oxygen depletion.
- **Pathogen Spread:** Untreated wastewater may carry pathogens, including bacteria, viruses, and parasites, which can contaminate crops and soil and pose health risks to humans and animals consuming these crops.
- **Soil Salinity:** Certain chemicals in untreated wastewater can increase soil salinity, adversely affecting plant health, reducing soil fertility, and leading to poor crop yields.
- **Plant Toxicity:** Exposure to certain chemicals and pharmaceuticals present in hospital wastewater can cause direct toxicity to plants, leading to stunted growth, poor development, or even plant death.
- **Reduction in Soil Microbial Activity:** Toxic substances in untreated wastewater can harm beneficial soil microorganisms, reducing soil fertility and its ability to support healthy plant growth.
- **Impact on Groundwater Quality:** Percolation of untreated wastewater into the soil can contaminate groundwater reserves, affecting agricultural activities and drinking water sources.

5.7.2. Mitigating Measure

Water quality issues are significant for hospitals and industries due to the generation of liquid and solid wastes, especially in hospitals dealing with patients and various pathogens. At Army Institute of Physiotherapy & Rehabilitation, wastewater will be treated using a Sewage Treatment Plant (STP). Cooling water will be used in a closed-loop system, and treated water will be utilized for gardening, with any excess being safely discharged. Makeup water will be added to the system as needed.

The project includes a planned drainage system to manage surface runoff. The surface drainage network will be connected to an interceptor before discharge into natural water bodies. This interceptor will capture any oily substances present in the water. While liquid waste disposal poses a significant challenge, particularly in industrial contexts like paper production, the current measures ensure that wastewater from the hospital, estimated at around 83 m^3 per day, is effectively managed to minimize environmental impact.

5.7.3. Residual Impact

It is clear from the above study that hospital wastewater needs proper treatment before discharging into the environment, and accordingly, the project proponent has adopted necessary treatment options suitable to their needs, meeting the national standards and at the same time, which is cost-effective, easy to maintain, and operation. Adaptation of measures set out above may not provide total mitigation. So, in this case, to maintain national standards, Army Institute of Physiotherapy & Rehabilitation will discharge some residual pollutants, which can affect the environment in the long run. So, this situation can be overcome by determining the exact level of treatment and proper monitoring, which is required to maintain the normal water quality of the receiving body.

5.8. Impact Due to Solid Waste Generation

5.8.1. Impact Origin

At Army Institute of Physiotherapy & Rehabilitation, solid waste generation arises from a variety of operational activities, which can be categorized as follows:

- **Medical Waste:** This includes infectious and biohazardous materials such as used bandages, gloves, syringes, disposable medical supplies, and pathological waste from surgeries or autopsies. If not handled and disposed of properly, these materials pose significant health risks.
- **Non-Medical Waste:** Comprising food waste from hospital kitchens, cafeterias, and patient areas, as well as general office waste such as paper, cardboard, packaging materials, and other non-hazardous items.
- **Sludge from STP:** STP process hospital wastewater, producing sludge that contains organic and inorganic substances and requires appropriate disposal methods to prevent environmental contamination.

- **Hazardous Waste:** Includes pharmaceutical waste, laboratory chemicals, and expired or unused medications. These substances must be managed carefully to prevent environmental pollution and potential health hazards.
- **Sharps Waste:** Encompasses needles, scalpels, and other sharp instruments. These pose risks of injury and contamination and thus require specialized handling and disposal protocols.
- **E-waste and Equipment:** This includes outdated or broken electronic devices and medical equipment, such as computers, monitors, and diagnostic machines. To prevent environmental harm, these items must be disposed of in compliance with e-waste regulations.
- **Miscellaneous Waste:** Waste from maintenance activities, such as used air filters and cleaning rags, as well as minor amounts of domestic waste generated by staff and visitors

5.8.2. Mitigation Measures

Sludge To effectively manage the solid waste generated at Army Institute of Physiotherapy & Rehabilitation and minimize its environmental impact, the following mitigation measures will be implemented:

- **Segregation of Waste:** Implement a comprehensive waste segregation system to separate medical, hazardous, and non-hazardous waste at the point of generation. Clearly labeled bins and color-coded bags will be provided to ensure proper disposal practices are followed.
- **Safe Disposal of Medical Waste:** Establish protocols for safely handling, storing, and disposing medical and biohazardous waste. This includes using autoclaves for sterilization and incineration or partnering with licensed medical waste disposal services to prevent contamination and infection risks.
- **ETP and STP Sludge Management:** Treat sludge generated from the STP to reduce its volume and toxicity. Utilize dewatering techniques and, if feasible, explore options for sludge recycling or safe landfilling by environmental regulations.
- **Hazardous Waste Management:** Establish secure storage areas for hazardous waste, such as pharmaceuticals and chemicals, and work with certified hazardous waste disposal contractors to ensure safe and compliant disposal.

- **Sharps Waste Protocols:** Use sharps containers to dispose of needles, scalpels, and other sharp objects. These containers will be puncture-resistant, clearly marked, and safely disposed of through specialized medical waste services.
- **E-Waste Recycling:** Partner with certified e-waste recycling facilities to responsibly dispose of outdated or broken electronic equipment and medical devices, ensuring compliance with e-waste regulations and minimizing environmental impact.
- **Training and Awareness:** Regularly training hospital staff on waste management practices, emphasizing the importance of proper waste segregation, handling, and disposal procedures to maintain a safe and sustainable environment.
- **Monitoring and Auditing:** Establish a waste management monitoring and auditing system to track waste generation, handling, and disposal processes. Regular audits will ensure compliance with regulatory standards and identify opportunities for improvement.
- **Community Awareness Programs:** Engage with the surrounding community to raise awareness about hospital waste management practices and maintaining environmental health and safety standards.

5.8.3. Residual Impact

If the mitigation measure above is implemented, the residual impact will be very insignificant.

5.9. Impact on Air Quality

5.9.1. Impact Origin

The operation of Army Institute of Physiotherapy & Rehabilitation may influence air quality through various sources and activities associated with hospital operations. The primary origins of air quality impact include:

- **Combustion Processes:** Backup generators and boilers powered by fossil fuels can release combustion by-products, such as nitrogen oxides (NOx), sulfur oxides (SOx), carbon monoxide (CO), particulate matter (PM), and volatile organic compounds (VOCs), into the atmosphere, contributing to air pollution.
- **Medical Waste Incineration:** If on-site medical waste incineration is practiced, it can release pollutants such as dioxins, furans, heavy metals, and particulate matter, which harm human health and the environment.
- **HVAC Systems:** Heating, ventilation, and air conditioning (HVAC) systems may contribute to the release of chlorofluorocarbons (CFCs) and other refrigerants,

especially if equipment is not maintained properly. This could potentially deplete the ozone layer and contribute to greenhouse gas emissions.

- **Use of Anesthetic Gases:** The release of anesthetic gases, such as nitrous oxide and halogenated anesthetics, can contribute to greenhouse gas emissions and have a localized impact on air quality within and around the hospital.
- **Chemical Usage:** Disinfectants, cleaning agents, and sterilization chemicals can release VOCs into the air, potentially affecting indoor air quality and posing respiratory risks to hospital staff and patients.
- **Vehicle Emissions:** The operation of hospital transport vehicles, ambulances, and patient and staff vehicles contribute to air emissions, including CO_2, NO_x, PM, and VOCs, which can impact the air quality in and around the hospital premises.
- **Construction Activities:** During any construction or renovation activities, dust generation and emissions from construction equipment and machinery can contribute

5.9.2. Mitigation Measure

To address and mitigate the impact on air quality from Army Institute of Physiotherapy & Rehabilitation, the following measures will be implemented:

- **Adoption of Clean Energy Sources:** Transition to cleaner energy sources, such as natural gas or renewable energy (e.g., solar, wind), for backup generators to reduce NOx, SOx, CO, and PM emissions.
- **Improved Waste Management Practices:** If medical waste must be incinerated, use advanced and properly maintained incineration technologies designed to minimize the emission of harmful pollutants. Alternatively, explore options for waste segregation and off-site treatment to reduce on-site emissions.
- **HVAC System Maintenance:** Regularly maintain and service HVAC systems to ensure efficient operation and minimize the release of refrigerants. Consider upgrading to environmentally friendly refrigerants with low ozone depletion potential (ODP) and global warming potential (GWP).
- **Control of Anesthetic Gas Emissions:** Implement proper ventilation and capture systems in operating rooms to control the release of anesthetic gases. Use low-emission anesthetic agents when possible and ensure all equipment is calibrated correctly and maintained.
- **Use of Low-VOC Products:** Choose cleaning agents, disinfectants, and other chemicals with low volatile organic compound (VOC) content to minimize indoor air

pollution. Ensure proper storage and handling of chemicals to prevent accidental releases.

- **Fleet Management:** Optimize the use of hospital transport vehicles by implementing regular maintenance schedules and adopting fuel-efficient or electric vehicles to reduce emissions. Implement carpooling and shuttle services to decrease the number of individual vehicles used by staff and patients.
- **Dust Control Measures:** During construction or renovation activities, employ dust control measures such as water spraying and dust suppressants to minimize particulate matter emissions. Ensure that construction equipment is properly maintained to reduce exhaust emissions.

5.9.3. Residual Impact

After the implementation of the proposed mitigation measures, the residual impacts on air quality at Army Institute of Physiotherapy & Rehabilitation are expected to be:

- **Reduced Emission Levels:** The adoption of clean energy sources and advanced waste management practices will significantly lower emissions of nitrogen oxides (NOx), sulfur oxides (SOx), carbon monoxide (CO), particulate matter (PM), and volatile organic compounds (VOCs). This will lead to improved air quality both inside the hospital and in the surrounding community.
- **Minimized Air Pollutants:** Regular maintenance of HVAC systems, the use of low-VOC products, and proper handling of anesthetic gases will reduce indoor air pollutants, contributing to a healthier indoor environment for patients and staff.
- **Lower Environmental Impact:** Efficient fleet management and dust control measures will decrease emissions from hospital transport and construction activities, thereby reducing the hospital's overall environmental footprint.

5.10. Impacts on Acoustic Environment

5.10.1. Impacts and Origin

The operation of Army Institute of Physiotherapy & Rehabilitation may impact the acoustic environment through the following sources:

- **Hospital Equipment:** Medical and diagnostic equipment such as MRI machines, ultrasound devices, and ventilation systems can generate continuous noise, which may affect nearby residents and hospital staff.

- **HVAC Systems:** Heating, ventilation, and air conditioning (HVAC) systems, including air handling units and chillers, contribute to ambient noise levels within and around the hospital premises.
- **Construction Activities:** During the construction phase, noise from machinery, excavation, and building activities can temporarily disrupt the surrounding area. This includes noise from construction equipment, drilling, and transportation of construction materials.
- **Emergency Vehicles:** Frequent use of sirens by emergency vehicles arriving or departing from the hospital can contribute to elevated noise levels in the vicinity.
- **Waste Management:** Noise generated from waste collection and disposal activities, including the operation of waste compactors and vehicles, can also affect the acoustic environment.
- **Staff and Patient Activity:** General noise from hospital staff, patient interactions, and public areas within the hospital can contribute to the overall acoustic environment.

5.10.2. Mitigation Measures

To address and minimize the impacts on the acoustic environment at Army Institute of Physiotherapy & Rehabilitation, the following mitigation measures will be implemented:

- **Soundproofing and Noise Insulation:** Install soundproofing materials and noise insulation in areas with high noise levels, such as medical equipment rooms, HVAC systems, and emergency vehicle bays. This will help reduce noise transmission within the hospital and surrounding areas.
- **Noise Control for Equipment:** Ensure that all medical and diagnostic equipment is maintained to operate within acceptable noise limits. Implement regular maintenance schedules to minimize noise from malfunctioning or outdated equipment.
- **Construction Noise Management:** Develop and enforce a construction noise management plan, including limiting construction activities to designated hours, using quieter machinery, and employing noise barriers or enclosures around high-noise equipment.
- **Emergency Vehicle Protocols:** Implement protocols to minimize the use of sirens within the vicinity of the hospital whenever possible. Ensure that emergency vehicle operations are conducted in a manner that reduces noise disturbance.

- **Waste Management Procedures:** Optimize waste collection and disposal schedules to avoid peak noise. Utilize quieter waste collection equipment and vehicles and implement noise reduction measures during waste handling.
- **Staff Training:** Train hospital staff on noise management practices and maintaining a quiet environment, particularly in sensitive patient rooms and recovery areas.

5.10.3. Residual Impact

Following the implementation of the proposed mitigation measures, the residual impacts on the acoustic environment at Army Institute of Physiotherapy & Rehabilitation are expected to be:

- **Minimized Noise Pollution:** The measures will significantly reduce noise levels from hospital operations and construction activities, ensuring that any remaining noise is within acceptable limits and does not adversely affect the surrounding community.
- **Reduced Disruption:** The impact on nearby residential and commercial areas will be minimized, with noise levels managed to prevent significant disturbance. Regular monitoring and adjustment of noise control practices will help maintain a low level of acoustic disruption.
- **Improved Acoustic Comfort:** Enhanced soundproofing and noise management within the hospital will provide a more comfortable environment for patients and staff, promoting better overall health and well-being.

5.11. Impact on Health and Safety, Natural and Accidental Incidents

5.11.1. Health and Safety

5.11.1.1. Impact Origin

The operation of Army Institute of Physiotherapy & Rehabilitation may present various health and safety impacts, originating from:

- **Medical Waste Management:** If not managed properly, the handling, storage, and disposal of medical waste pose risks of infection and contamination. This includes the potential for staff, patients, and the surrounding community to be exposed to hazardous materials.
- **Chemical Use:** Chemicals used in cleaning, disinfection, and laboratory processes can lead to potential health hazards if there are spills, leaks, or improper handling. Exposure to these chemicals may pose risks to the health of hospital staff and patients.
- **Infection Control:** Hospital environments are prone to the spread of infectious diseases. Ineffective infection control measures can result in cross-contamination and nosocomial infections, affecting patient and staff health.
- **Occupational Hazards:** Healthcare facilities involve various occupational health risks, such as repetitive strain injuries, ergonomic issues, and exposure to physical and biological hazards.
- **Emergency Response:** Effective emergency response protocols are critical. Potential fires, chemical spills, or natural disasters require preparedness to minimize health and safety impacts.
- **Construction and Maintenance Activities:** During the construction and maintenance phases, there are risks associated with heavy machinery, construction materials, and site activities that could pose safety hazards to workers and nearby residents

5.11.1.2. Mitigation Measures

To address health and safety impacts at Army Institute of Physiotherapy & Rehabilitation, the following mitigation measures will be implemented:

- **Medical Waste Management:**
    - **Segregation and Safe Disposal:** Implement strict protocols for segregating, storing, and disposing medical waste to minimize risks of infection and contamination. Use color-coded bins and ensure waste is handled according to regulatory standards.

- **Training and PPE:** Provide comprehensive training for staff on medical waste management practices and ensure using personal protective equipment (PPE) to protect against exposure.

- **Chemical Use:**
  - **Proper Storage and Handling:** Store chemicals in designated, well-ventilated areas and properly label them. Implement safety data sheets (SDS) and follow handling guidelines to prevent spills and leaks.
  - **Spill Response Procedures:** Develop and train staff on spill response procedures, including using spill kits and emergency protocols.
- **Infection Control:**
  - **Enhanced Hygiene Practices:** Establish and enforce strict hygiene and sanitation protocols, including regular cleaning and disinfecting surfaces and equipment.
  - **Infection Control Training:** Provide ongoing training for healthcare staff on infection control practices and protocols to minimize the risk of nosocomial infections.
- **Occupational Health and Safety:**
  - **Ergonomic Assessments:** Conduct ergonomic assessments to minimize risks of repetitive strain injuries and provide appropriate ergonomic equipment and adjustments.
  - **Safety Training:** Offer regular occupational health and safety training, including topics on manual handling, safe work practices, and emergency procedures.
- **Emergency Response:**
  - **Emergency Preparedness Plans:** Develop and regularly update comprehensive emergency response plans for various scenarios, including fires, chemical spills, and natural disasters.
  - **Drills and Training:** Conduct regular emergency drills and training exercises for staff to ensure emergency preparedness and effective response.
- **Construction and Maintenance Activities:**
  - **Safety Protocols:** Implement strict safety protocols for construction and maintenance activities, including safety barriers, personal protective equipment (PPE), and adherence to construction safety regulations.

- **Regular Inspections:** Conduct regular inspections and audits of construction sites and maintenance activities to ensure compliance with safety standards and address potential hazards promptly

5.11.1.3. Residual Impact

After implementing the mitigation measures for health and safety at Army Institute of Physiotherapy & Rehabilitation, the residual impacts are expected to be:

- **Minimized Risk of Infection and Contamination:**
  - Effective medical waste management and infection control practices will significantly reduce the risk of healthcare-associated infections and contamination, ensuring a safer environment for both patients and staff.
- **Reduced Chemical Exposure:**
  - Proper storage, handling, and spill response protocols will minimize the risk of chemical exposure and associated health hazards, protecting employees and patients from potential harm.
- **Improved Occupational Health:**
  - Ergonomic improvements and comprehensive safety training will decrease the likelihood of occupational injuries and strain-related disorders, enhancing overall staff well-being.
- **Enhanced Emergency Preparedness:**
  - Well-developed emergency response plans and regular training will ensure that staff are prepared for emergencies, thereby reducing the impact of such incidents on health and safety.
- **Controlled Environmental Risks:**
  - Adherence to construction and maintenance safety protocols will mitigate risks associated with these activities, minimizing potential hazards and ensuring a safer working environment.

5.11.2. Natural and Accidental Incidents

5.11.2.1. Impact Origin

The potential impacts of natural and accidental incidents at Army Institute of Physiotherapy & Rehabilitation can originate from the following sources:

- **Natural Disasters:**
  - **Flooding:** Heavy rains or natural flooding events could affect hospital operations, disrupt services, and damage infrastructure.
  - **Earthquakes:** Seismic activity could compromise the structural integrity of the hospital building, leading to safety risks and potential damage to equipment and facilities.
  - **Cyclones and Storms:** High winds and severe weather conditions could cause physical damage to the hospital structure and impact the availability of essential services.
- **Accidental Incidents:**
  - **Fire:** Potential sources include electrical faults, flammable materials, and chemical storage, which could lead to fire hazards affecting patient safety and hospital operations.
  - **Chemical Spills:** Accidental spills of hazardous substances used in medical or operational processes could threaten health, safety, and the environment.
  - **Equipment Failure:** Malfunctions or breakdowns in critical hospital equipment could disrupt medical services and impact patient care.
  - **Human Error:** Mistakes or lapses in following safety protocols by staff could lead to accidents, affecting personnel and patients.
- **Construction Phase Accidents:**
  - **Site Safety Hazards:** During the construction phase, risks such as falls from heights, accidents involving heavy machinery, and exposure to hazardous materials can pose serious safety threats to construction workers and nearby residents.
  - **Structural Failures:** Inadequate construction practices or failure to adhere to safety standards could result in structural collapses or accidents, impacting ongoing construction activities and future hospital operations.
  - **Traffic and Equipment Accidents:** Increased vehicle traffic and construction equipment operation could lead to accidents, posing risks to workers and the general public in and around the construction site.

- **Material Handling:** Improper handling and storage of construction materials could lead to accidents or injuries, affecting the safety of construction workers and nearby individuals.

5.11.2.2. Mitigation Measures

To manage impacts from natural and accidental incidents, including those during construction, the following measures will be implemented:

Natural Disasters

- **Flooding:** Utilize flood-resistant design and effective drainage systems and update flood management plans.
- **Earthquakes:** Follow seismic design standards and conduct regular structural inspections.
- **Cyclones and Storms:** Design for weather resilience and develop cyclone response plans.

Accidental Incidents

- **Fire:** Install fire safety systems, conduct regular drills, and ensure proper storage of flammable materials.
- **Chemical Spills:** Implement safe handling protocols and spill response plans and maintain containment equipment.
- **Equipment Failure:** Maintain and inspect critical equipment regularly and use backup systems.
- **Human Error:** Provide safety training and foster a strong safety culture.

Construction Phase Accidents

- **Site Safety Hazards:** Ensure safety training, PPE usage, and regular site inspections.
- **Structural Failures:** Enforce quality control and structural monitoring practices.
- **Traffic and Equipment Accidents:** Implement traffic management plans and ensure operator training.
- **Material Handling:** Establish safe handling procedures and conduct regular audits.

5.12. Socio-Economic Impacts

5.12.1. Positive Impacts

- **Employment Opportunities:** The hospital's operation will create many jobs, both skilled and unskilled, in various roles such as healthcare professionals, administrative staff, and support services.

- **Economic Growth:** Hospital operations will increase local spending and create business opportunities, benefiting local suppliers, contractors, and service providers.
- **Healthcare Access:** Enhanced medical services and diagnostic facilities will improve the community's overall health outcomes, reducing the need for travel to distant healthcare providers.
- **Infrastructure Development:** The project will improve local infrastructure, including roads, utilities, and public services, which will benefit residents.

5.12.2. Potential Negative Impacts

- **Increased Cost of Living:** The influx of hospital staff and related economic activity may lead to higher demand for housing and services, potentially increasing living costs in the area.
- **Traffic Congestion:** The hospital's operation may lead to increased traffic, which could impact local transportation and cause congestion.
- **Cultural and Social Changes:** Rapid development and increased population density might alter the area's social and cultural dynamics.

5.12.3. Mitigation Measures

- **Community Engagement:** Maintain open communication with residents to address concerns and incorporate their feedback into project planning.
- **Traffic Management:** Develop and implement plans to minimize congestion and ensure smooth transportation.
- **Affordable Housing:** Explore partnerships to provide affordable housing options and manage any potential increases in living costs.
- **Cultural Sensitivity:** Promote cultural awareness and inclusivity in hospital policies and community interactions to preserve local traditions and social harmony.

5.13. Overland Drainage and Impact on Surface Water

5.13.1. Impact Origin

- **Altered Drainage Patterns:** Construction and operation of the hospital can change natural drainage patterns, potentially leading to increased runoff and localized flooding.
- **Surface Water Pollution:** Increased runoff from the site, including pollutants such as oils, chemicals, and sediments, can contaminate nearby surface water bodies.
- **Erosion:** Construction activities and disturbed land can lead to soil erosion and sedimentation in local water sources.

- **Reduced Natural Absorption:** Impervious surfaces, such as pavements and building foundations, reduce natural water infiltration, increasing the volume and velocity of surface runoff.

5.13.2. Proposed Mitigation Measures

- **Stormwater Management Plan:** Implement a comprehensive stormwater management plan that includes the design of detention basins, retention ponds, and permeable surfaces to manage runoff and reduce peak flow rates.
- **Erosion Control:** Use erosion control measures, such as silt fences, sediment basins, and vegetation cover, to minimize soil erosion and sedimentation during and after construction.
- **Pollutant Management:** Implement best management practices (BMPs) to control and treat pollutants in runoff, including oil-water separators and regular maintenance of drainage systems.
- **Regular Monitoring:** Monitor surface water quality regularly to ensure that runoff and discharges comply with environmental regulations and do not adversely impact nearby water bodies.

5.13.3. Residual Impact

- **Managed Runoff:** Proper stormwater management and erosion control measures will minimize the residual impact on surface water quality and flooding.
- **Reduced Pollution:** Effective BMPs will reduce the potential for surface water contamination and maintain compliance with environmental standards.
- **Minimal Erosion:** Continued use of erosion control practices will limit soil erosion and sedimentation, preserving the health of local water bodies

5.14. Increase in Vehicular Traffic in The Area

5.14.1. Impact Origin

- **Increased Traffic Volume:** The establishment and operation of the hospital will likely result in a significant increase in vehicular traffic due to patient visits, staff commuting, and supply deliveries.
- **Congestion:** The influx of vehicles may lead to traffic congestion, particularly during peak hours, affecting local roadways and transportation efficiency.
- **Increased Emissions:** Higher traffic volumes can contribute to elevated levels of air pollutants, including particulate matter and greenhouse gases.

- **Parking Demand:** The increased number of vehicles will raise the demand for parking spaces, potentially leading to inadequate parking facilities and increased roadside parking.

5.14.2. Mitigation Measures

- **Traffic Management Plan:** Develop and implement a traffic management plan that includes strategies for managing peak traffic times, optimizing traffic flow, and reducing congestion around the hospital.
- **Public Transport Options:** Encourage the use of public transportation and provide information on available transit options to reduce the number of private vehicles.
- **Parking Solutions:** Design and provide sufficient on-site parking facilities to accommodate the needs of patients, staff, and visitors, minimizing the need for roadside parking.
- **Emission Controls:** Promote the use of low-emission vehicles and consider implementing vehicle emission control measures to reduce the impact on air quality.

5.14.3. Residual Impact

- **Managed Traffic Flow:** With effective traffic management and parking solutions, congestion and traffic-related issues can be minimized.
- **Reduced Emissions:** Emission controls and promotion of public transport will help mitigate the impact on air quality.
- **Improved Accessibility:** Adequate parking and efficient traffic management will enhance accessibility to the hospital while reducing potential negative effects on the local transportation network.

5.15. Impacts During Construction

5.15.1. Disruption of Earth Surface-Site Preparation and Clearing and Earthworks

5.15.1.1. Impact Origin

- **Land Disturbance:** Site preparation and clearing activities involve removing vegetation, topsoil, and altering the land surface, which can lead to soil erosion and sedimentation.
- **Soil Compaction:** Heavy machinery used for earthworks can compact the soil, affecting its permeability and potentially impacting groundwater recharge and soil fertility.

- **Erosion and Sedimentation:** Disturbance of the earth's surface increases the risk of erosion and sediment runoff into nearby water bodies, which can degrade water quality and harm aquatic habitats.
- **Habitat Destruction:** Clearing land for construction may destroy natural habitats and affect local flora and fauna, leading to potential biodiversity loss.

5.15.1.2. Mitigation Measures

- **Erosion Control Measures:** Implement erosion control practices such as silt fences, sediment basins, and vegetation cover to prevent soil erosion and manage sediment runoff.
- **Minimize Land Disturbance:** Limit the area of land disturbed at any one time and avoid unnecessary clearing of vegetation to reduce environmental impact.
- **Soil Management:** Use soil management techniques to reduce compaction, such as employing lighter machinery and maintaining soil quality through proper handling and storage practices.
- **Habitat Preservation:** Conduct pre-construction environmental assessments to identify and protect sensitive habitats and species. Implement measures to minimize habitat destruction and ensure the preservation of biodiversity.

5.15.1.3. Residual Impact

- **Controlled Erosion:** Erosion control measures will significantly reduce soil erosion and sedimentation, maintaining water quality and protecting aquatic ecosystems.
- **Managed Soil Quality:** Soil management practices will mitigate compaction effects, supporting groundwater recharge and maintaining soil health.
- **Minimized Habitat Impact:** By preserving critical habitats and minimizing land disturbance, the impacts on local flora and fauna will be reduced, supporting biodiversity conservation.

5.15.2. Impacts on Air Environment

5.15.2.1. Impact Origin

- **Dust Generation:** Construction activities such as excavation, grading, and demolition produce dust, which can lead to increased particulate matter in the air. This can impact air quality and cause respiratory issues for nearby residents.
- **Vehicle Emissions:** Construction vehicles and machinery, including trucks, bulldozers, and cranes, emit exhaust gases like nitrogen oxides (NOx), carbon monoxide (CO), and

particulate matter (PM). These emissions contribute to air pollution and can degrade air quality in the surrounding area.

- **Machinery Emissions:** The operation of construction equipment, such as generators and compressors, releases pollutants and particulate matter, further impacting air quality.
- **Material Handling:** The transportation and handling of construction materials, such as sand, gravel, and cement, generate dust and particulate matter, contributing to airborne pollution.
- **Site Preparation:** Activities such as land clearing and soil disturbance can release dust and particulate matter into the atmosphere, affecting local air quality.

5.15.2.2. Mitigation measures

To address the impacts on the air environment during construction, the following mitigation measures should be implemented:

- **Dust Suppression:** Regularly apply water or dust suppressants to construction sites and unpaved roads to minimize airborne dust. Use soil stabilizers where appropriate to reduce dust emissions.
- **Road Maintenance:** Maintain construction and access roads in good condition by filling potholes and smoothing surfaces to prevent dust and reduce vehicle emissions.
- **Vehicle Management:** Enforce speed limits on construction and access roads to reduce dust generation. Ensure that construction vehicles are well-maintained and equipped with proper emission control devices.
- **Erosion Control:** Implement erosion control measures, such as silt fences and sediment barriers, to prevent soil erosion and reduce dust and particulate matter release.
- **Air Quality Monitoring:** Conduct regular air quality monitoring to assess dust and kemission levels. Adjust mitigation strategies as necessary based on monitoring results.
- **Public Communication:** Keep local communities informed about construction activities, dust control measures, and any potential impacts on air quality to manage expectations and address concerns.

5.15.2.3. Residual Impact

Even with the implementation of mitigation measures, some residual impacts on the air environment may remain. These include:

- **Minor Dust Emissions:** Despite dust suppression efforts, there may still be occasional dust emissions from construction activities and unpaved surfaces.
- **Increased Vehicle Emissions:** Construction vehicles and machinery may continue to contribute to localized air pollution, though maintained and well-regulated vehicles will minimize this effect.
- **Temporary Air Quality Degradation:** Short-term increases in particulate matter and other pollutants may occur, particularly during peak construction periods or adverse weather conditions.

Overall, while mitigation measures will significantly reduce air quality impacts, occasional residual effects are expected. Regular monitoring and prompt adjustments to mitigation strategies will help manage and minimize these residual impacts

5.15.3. Gains to The Economy

5.15.3.1. During Operation Phase

i. Impact Origin

The operation phase of the Army Institute of Physiotherapy & Rehabilitation hospital will bring several economic benefits, including:

- **Job Creation:** The hospital will provide employment opportunities for a range of professionals, including medical staff, administrative personnel, maintenance workers, and support staff. This will reduce local unemployment and contribute to household incomes.
- **Boost to Local Economy:** Increased employment and hospital operations will stimulate local businesses, including suppliers, vendors, and service providers. This can lead to the growth of ancillary businesses such as pharmacies, food outlets, and transport services, boosting the overall economic activity in the area.
- **Healthcare Services:** By providing accessible and high-quality healthcare services, the hospital will improve the productivity and well-being of the local population, contributing to the broader economic stability of the community.
- **Training and Development:** The hospital will offer opportunities for training and skill development for healthcare professionals and other staff, enhancing the local workforce's expertise and increasing their employability.

- **Increased Property Values:** The establishment of a major healthcare facility can lead to an increase in property values in the surrounding area, as improved healthcare services and job opportunities make the area more attractive to residents and businesses

ii. Benefit Enhancement Measure

To amplify economic gains during the operation phase of the Army Institute of Physiotherapy & Rehabilitation hospital, the following benefit enhancement measures will be implemented:

- **Local Employment:** Prioritize hiring local residents to fill both skilled and unskilled positions. This will provide job opportunities for the community, reduce unemployment, and support local economic growth.
- **Local Procurement:** Source materials, supplies, and services locally whenever possible. This approach will support local businesses, stimulate the local economy, and reduce supply chain disruptions.
- **Staff Training and Development:** Invest in regular training and professional development for hospital staff. Enhanced skills will lead to better service quality, job satisfaction, and retention, while also contributing to the overall professionalism of the healthcare sector in the area.
- **Community Engagement Programs:** Establish initiatives that involve the community, such as health education programs, wellness workshops, and preventive health check-ups. These initiatives will improve public health awareness and create goodwill within the community.
- **Collaborative Partnerships:** Form partnerships with local educational institutions to provide internships, training, and research opportunities. This will not only enhance educational outcomes but also create a pipeline of qualified healthcare professionals for the hospital.
- **Infrastructure Support:** Contribute to the development of local infrastructure, such as roads, public transport access, and utility services, which will benefit both the hospital and the local community, improving accessibility and quality of life.

5.15.3.2. During Construction

i. Impact Origin

During the construction phase of the Army Institute of Physiotherapy & Rehabilitation hospital, several economic benefits are anticipated, which include:

- **Job Creation:** The construction activities will generate direct employment opportunities for local workers, including engineers, architects, construction laborers,

and support staff. This influx of employment will provide a boost to the local job market.

- **Local Business Opportunities:** The demand for construction materials, equipment, and services will benefit local suppliers and vendors, stimulating business for local hardware stores, equipment rental companies, and other service providers.
- **Increased Demand for Services:** Construction workers will require food, accommodation, and other amenities, leading to increased business for local restaurants, grocery stores, hotels, and transport services.
- **Skill Development:** The construction project will provide training and experience for local laborers and contractors, enhancing their skills and employability for future projects.
- **Boost to Local Economy:** The overall increase in economic activity due to the construction process will contribute to higher spending and circulation of money within the local economy, supporting overall economic growth and stability.

ii. Benefit Enhancement Measure

To maximize the economic gains during the construction phase of the Army Institute of Physiotherapy & Rehabilitation hospital, the following benefit enhancement measures should be implemented:

- **Prioritize Local Hiring:** Establish policies that prioritize the hiring of local workers and contractors. This approach ensures that employment opportunities directly benefit the local community, boosting the local economy and fostering community support.
- **Support Local Businesses:** Encourage procurement of construction materials, equipment, and services from local suppliers and vendors. This not only stimulates the local market but also reduces transportation costs and the environmental footprint associated with sourcing materials from distant locations.
- **Provide Training Programs:** Implement training programs for local workers to improve their skills in construction and related fields. This initiative will enhance the employability of the workforce, ensuring they gain valuable skills and experience that can be applied to future projects.
- **Engage with Community Stakeholders:** Maintain open communication with community leaders and stakeholders to understand their needs and concerns. By involving the community in the planning process, the project can be better aligned with local economic development goals, and any issues can be promptly addressed.

- **Encourage Local Entrepreneurship:** Support initiatives that promote local entrepreneurship, such as small business grants or partnerships with local startups, to provide services and products needed during construction. This can help build a more diverse and resilient local economy.
- **Monitor Economic Impact:** Regularly monitor and assess the economic impacts of the construction project to ensure that the benefits are being realized and to make adjustments as needed. This may involve conducting surveys or working with local economic development agencies to track economic indicators.

5.15.4. Job Opportunities

5.15.4.1. Impact Origin

The construction and operation phases of the Army Institute of Physiotherapy & Rehabilitation hospital will create a significant number of job opportunities, contributing positively to local employment levels. During the construction phase, a wide range of positions will be available, including those for skilled labor, such as engineers, architects, and project managers, as well as unskilled labor for tasks such as site preparation, materials handling, and general construction work.

Once operational, the hospital will provide employment opportunities for medical professionals, including doctors, nurses, and technicians, as well as administrative, maintenance, and support staff. The increased demand for healthcare services will also likely spur the growth of related industries, such as pharmaceuticals, medical equipment, and local service providers, further enhancing job creation.

5.15.4.2. Benefit Enhancement Measures

To maximize the job opportunities created by the project, the following measures should be implemented:

- **Local Employment Policies:** Develop and enforce policies that prioritize the hiring of local residents for both construction and operational roles. This approach will help ensure that the economic benefits of job creation remain within the local community.
- **Skills Training Programs:** Offer training and apprenticeship programs to equip local residents with the necessary skills for employment during both the construction and operational phases. This will enhance the employability of the local workforce and ensure a steady supply of qualified personnel.

- **Partnerships with Educational Institutions:** Collaborate with local colleges, universities, and vocational training centers to develop programs tailored to the specific needs of the hospital. This can help prepare students and job seekers for roles in healthcare and construction.
- **Career Development Opportunities:** Provide ongoing career development and training opportunities for employees to advance within the organization. This can improve job satisfaction and retention rates while building a more skilled and capable workforce.
- **Fair Wage and Labor Practices:** Ensure that all employees, whether directly hired or contracted, receive fair wages and benefits. Adhering to ethical labor practices will foster a positive work environment and enhance the hospital's reputation as an employer of choice.
- **Monitoring and Evaluation:** Regularly monitor employment levels and the effectiveness of training and development programs. Adjust strategies as needed to address gaps and optimize job creation and employee development.

Chapter Six: Environmental Management Plan (EMP)

6.1. General

The Environmental Management Plan (EMP) for the Army Institute of Physiotherapy & Rehabilitation hospital project is a comprehensive framework designed to mitigate adverse environmental impacts and enhance beneficial outcomes throughout the project's implementation and operational phases. The EMP aims to ensure that all environmental measures comply with the Environmental Quality Standards (EQS) of Bangladesh, thereby safeguarding the project's long-term sustainability.

1. **Mitigation Plan:** This component focuses on identifying and implementing measures to minimize or offset the potential adverse environmental impacts associated with the project. By adhering to strict mitigation strategies, the project can reduce its environmental footprint to acceptable levels as per Bangladesh's regulatory standards.
2. **Enhancement Plan:** The enhancement plan aims to maximize the positive environmental and social benefits of the project. This includes promoting green practices, improving community health outcomes, and supporting local economic development through job creation and resource optimization.
3. **Monitoring Plan:** Continuous monitoring is essential to ensure that the environmental management measures are effective and that the project remains in compliance with environmental regulations. The monitoring plan outlines the procedures for regular assessment and reporting, enabling timely adjustments to the EMP as needed.

The project proponent has proactively implemented several policies and measures to prevent environmental degradation. The project authority is dedicated to environmental stewardship, ensuring that every sector of pollution—whether it be water, soil, air, or noise—is addressed through the EMP. The following specific management plans are integral to the overall EMP and are either already in place or will be activated during the project:

- **Occupational Health & Safety Management Plan (OHSMP):** Ensures the safety and well-being of all employees and stakeholders by adhering to best practices in occupational health and safety.
- **Emergency Response and Fire Management Plan (EFMP):** Prepares the hospital to effectively manage emergencies, including fires, by establishing clear protocols and training programs.

- **Hospital Waste Management Plan (HWMP):** Focuses on the proper disposal and treatment of medical and general waste generated by the hospital to prevent environmental contamination.
- **Air Management Plan (AMP):** Aims to control and reduce air emissions from the hospital, ensuring that air quality remains within acceptable limits.
- **Noise Management Plan (NMP):** Addresses noise pollution by implementing measures to minimize noise levels and their impact on the surrounding environment.

By implementing the EMP, the project will be able to reduce its environmental impact to levels that are acceptable under Bangladesh government regulations. Additionally, the EMP will enhance the project's positive effects, contributing to the overall well-being of the environment and the community. The proactive approach taken by Army Institute of Physiotherapy & Rehabilitation in developing and executing the EMP reflects its commitment to environmental responsibility and sustainability.

6.2. Occupational Health and Safety Management Plan

Occupational health and safety are a worldwide concern. Every organization should give the highest importance to health safety. The worth of life cannot be measured by price. According to the World Health Organization (WHO), "Occupational health deals with all aspects of health and safety in the workplace and strongly focuses on primary prevention of hazards." It is the multi-disciplinary field of safety, health, and welfare. Sometimes, health service centers like hospitals or diagnostic centers face emergencies like fire, natural calamities, accidents, etc. A hazardous environment might be created on the hospital's premises. Fire can be another emergency hazard that will be horrible in a moment. All these situations are risks to health and safety. The project has already applied and will be applied the following measures to ensure health and safety in the hospital for all.

6.2.1. Present Scenario and Future Implementation

Army Institute of Physiotherapy & Rehabilitation has implemented several health and safety measures to protect its employees. These measures include the availability of first aid kits, deployment of trained medical technologists, and regular health check-ups of the workers.

For future improvements, the hospital management plans to implement additional measures to enhance the safety and well-being of all stakeholders. These measures include:

- **Formation of a Health and Safety Committee**: A dedicated committee will be established in compliance with the *Bangladesh Labor Act (Amendment) 2013*. This committee will oversee, execute, and plan health and safety protocols for patients, doctors, nurses, and all staff members.
- **Pre-job Risk Assessment**: A risk assessment will be conducted before assigning new or hazardous tasks. This will be followed by issuing work permits that outline specific risks and management strategies and designate individuals responsible for taking corrective actions.
- **Provision of Personal Protective Equipment (PPE)**: Adequate PPE, such as gloves, safety goggles, masks, and helmets, will be supplied to all doctors, nurses, and staff engaged in potentially risky activities within the hospital.
- **Training Programs**: Employees will receive training to increase their awareness about the hazardous nature of chemicals and other risks associated with their roles. This will help minimize exposure and ensure safe handling practices.
- **Job Rotation**: To prevent prolonged exposure to high noise levels, workers will be rotated through different tasks, reducing the duration of exposure and mitigating potential health risks.
- **Regular Medical Examinations**: All staff members will receive periodic health check-ups. If any significant occupational health issues are identified, management will take the necessary corrective measures.
- **Implementation of Management Procedures**: Comprehensive management procedures will be implemented, including process safety protocols, ongoing training, management of change procedures, incident investigation processes, employee participation in safety initiatives, and contractor training and oversight.
- **Incident Reporting and Investigation**: All incidents will be promptly reported and investigated using root cause analysis. This will enable the development of action plans for continuous improvement, ongoing monitoring, and periodic review to ensure safety standards are upheld.

These proactive measures will help Army Institute of Physiotherapy & Rehabilitation maintain a safe and healthy environment for its patients and staff, ensuring compliance with local regulations and international best practices.

6.3. Emergency Response and Fire Management Plan (ERFMP)

6.3.1. General

In the event of a fire at Army Institute of Physiotherapy & Rehabilitation, the following guidelines should be adhered to:

- If a small fire cannot be controlled using a portable extinguisher or fixed extinguishing system, or if the smoke poses a risk to the operator, the area should be evacuated immediately.
- The fire department must be notified without delay. Personnel should then move to a designated safe area and wait for the fire department to arrive.
- Attempting to extinguish a fire is a voluntary action. Only individuals who have received proper training and feel confident in using a portable extinguisher should consider attempting to extinguish the fire.
- It is crucial to recognize that improper use of portable extinguishers can result in severe injury or fatality. Safety should always be the priority, and untrained personnel should focus on evacuation and alerting emergency services.

These procedures aim to protect the safety of all personnel and ensure a coordinated response to fire incidents.

6.3.2. Types of Fire

There are five types of fire such as

Class A – Ordinary combustibles (wood, paper, plastics, etc.)
Class B – Combustible liquids (oils, gas, cooking oil, etc.)
Class C – Electrical (energized equipment – appliances, wiring, etc.)
Class D – Combustible metals (aluminum, magnesium, zinc, etc.)
Class E – Commercial cooking equipment (Cooking oils, Animal fats, Vegetable fats)

It is extremely important to choose the properly rated fire extinguisher for the class of fire that is burning.

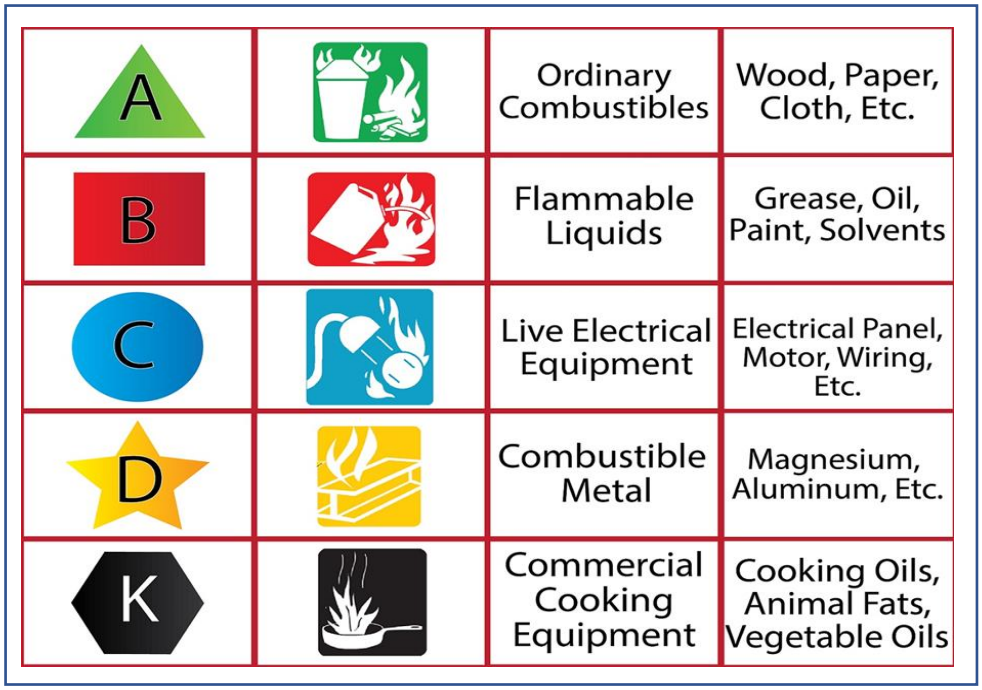


Figure 6.1: Pictorial view of different types of fire

6.3.3. Fire Safety Risk Assessment

A fire safety risk assessment is an organized and methodical look at the premises, the activities within the premises, the potential for a fire to occur, and the harm it could cause to the people in and around the premises. The prescribed process is available for inside or indoor fire risk assessment. The following fire risk assessment process can be followed and executed twice in a year.

Table 6.1: Fire Safety Risk Assessment

	FIRE RISK ASSESSMENT
1	Identify fire hazards Identify: Sources of Ignition Sources of Fuel Sources of Oxygen
2	Identify People at Risk Identify: People in and around the premises People especially at Risk
3	Evaluate, Remove, Reduce, and Protect from Risk Evaluate the risk to people from fire Remove or Reduce the Risks to people Detection and warning Fire-fighting

	Escape routes Lighting Signs and notices Maintenance
4	Record, Plan, Inform, Instruct and Train Record significant findings and action taken Prepare an emergency plan Inform and instruct relevant people co-operate and co-ordinate with others Provide training
5	Review Keep assessment under review Revise where necessary

Source: Project Paper, IDM, KUET

Beyond the above measures, the project also has full provision for firefighting equipment in each area and first aid medical services. Though there might not be a serious threat of fire in the hospital, the possibility still exists. Adequate precautionary measures should be taken to prevent that and also to combat a situation of fire need to be taken. The project is equipped with firefighting equipment such as a water sprayer, fire extinguisher, sand etc. Adequate first aid medical facilities should be provided in the project too.

6.3.4. Measures for Emergency Response and Fire Management

Army Institute of Physiotherapy & Rehabilitation will implement several measures to ensure fire safety and effective emergency response at the hospital. Comprehensive firefighting systems will be installed, including fire lines and hose pipes. Regular health and safety training sessions will be conducted to educate staff on emergency procedures. Adequate first aid facilities will be made available throughout the premises. The use of personal protective equipment (PPE), such as masks, aprons, ear plugs, and ear muffs, will be mandated when necessary. Separate restrooms will be provided for men and women to enhance convenience and hygiene. The hospital will hold a valid fire license and will develop an emergency evacuation plan, as well as a waste management plan. The building will be equipped with a designated emergency staircase to facilitate safe evacuation during critical situations.

6.3.5. Proposed Future Measures

To further enhance fire safety and emergency preparedness at Army Institute of Physiotherapy & Rehabilitation, the following measures will be implemented:

- Common evacuation paths will be clearly marked and located near stairwells for easy access.
- All floors and staircases will have safety markings to guide occupants during an evacuation.
- The emergency evacuation paths will be kept free from any obstacles at all times to ensure unobstructed movement.
- Doors will be equipped to open from both the inside and outside to facilitate quick and easy exit during emergencies.
- Regular fire and evacuation drills will be conducted to ensure all staff and patients are familiar with the emergency procedures.
- Sufficient lighting will be installed along evacuation routes to ensure visibility during power outages or low-light situations.
- Drinking water quality will be tested at least twice a year to ensure it meets safety standards.
- Adequate numbers of toilets with necessary supplies such as soap and water will be provided, ensuring proper hygiene and accessibility.
- Electrical wires, cables, and connections will undergo monthly inspections to identify and rectify potential fire hazards.
- A more advanced fire detection system, including alarms or whistles, will be installed to provide early warning in the event of a fire.

6.4. Hospital Waste Management Plan

According to the US EPA, "Medical waste is a subset of wastes generated at healthcare facilities, such as hospitals, physicians' offices, dental practices, blood banks, veterinary hospitals/clinics, as well as medical research facilities and laboratories." Medical waste is typically categorized as hazardous or toxic, making it potentially harmful. At Army Institute of Physiotherapy & Rehabilitation, the different types of medical waste include:

- Blood and other bodily fluids
- Blood-soaked bandages, compresses, and similar materials
- Tissues, such as organs or biopsy samples
- Used and unused hypodermic needles from the injection of insulin or other prescribed medications
- Tattoo and body piercing needles
- Home kidney dialysis filters, bags, and associated equipment

- Automatic lancets used for blood sampling
- Contaminated gloves and other protective materials
- Culture materials and swabs

The categorization of medical waste at Army Institute of Physiotherapy & Rehabilitation aligns with the guidelines set out in the Medical Waste Management Act of 2008, Bangladesh, as detailed in the following table.

Table 6.2: Category and Treatment Facilities of Medical Waste
(According to the "Medical Waste Management Act-2008")

Category of Waste	Category of Waste Sample	Treatment and Destroy
Category No-1	General Waste (Infected / Harmful Waste)	(a) Remove premises or public landfill. (b) Ensure that plastic waste is cut off and reused.
Category No-2	Anatomical waste	(a) Purification/destruction of concrete pit method in premises / safe place. (b) Deep soil cover (the amount is small) (c) Use of steam autoclaving / microwave treatment / incinerator.
Category No-3	Pathological waste	Category No. II (Anatomical waste) like.
Category No-4	Chemical waste	(a) Return to expired chemical waste supplier (if quantity is high). (b) Disposal of sewage by diluting it with a large quantity of water (if the quantity is small) (c) Chemically purified / inactivated in sewage system.
Category No-5	Pharmaceutical	Category No. -4 chemical waste) like.

Category of Waste	Category of Waste Sample	Treatment and Destroy
Category No-6	Infectious / bacterial waste	(a) Purification / destruction of concrete pit method in premises / safe place. (b) Deep soil cover (the amount is small) (c) Use of steam autoclaving / microwave treatment / incinerator.
Category No-7	Radioactive waste	(a) If the level of radioactivity per kg of waste exceeds 0.1 MB Q, it must be treated and disposed of in accordance with the provisions of Bangladesh Atomic Energy Commission.
Category No. 8	Sharp waste	(a) Purification / destruction of concrete pit method in premises / safe place. (b) Encapsulation (c) Deep soil cover (the amount is small) (d) Use of steam autoclaving / microwave treatment / incinerator.
	Reusable General Waste	(a) Purification and reuse by steam autoclaving. (b) Chemical treatment and reuse.
Category No-9	Liquid waste (Infected/Non-infected)	(a) Removal in drainage system by diluting with plenty of water. (b) Removal to the sewer by chemically purifying mixed with 1% sodium hypochlorite solution.
Category No-11	Pressurized waste	(a) Refund to supplier (in excess)

Category of Waste	Category of Waste Sample	Treatment and Destroy
		(b) Methodically depressurized removal with normal/recyclable waste (in small quantities)

6.4.1. Waste Treatment and Disposal Plan for Solid & Liquid Waste

Setting up individual treatment and disposal units for each medical center will be challenging and costly. However, the project will have its waste management plan. Dhaka City Corporation and a third party will be responsible for managing the solid medical waste. The medical waste treatment process will involve several stages. First, waste will be generated from various hospital activities and collected in separately marked bins. Color-coded bins, following medical waste management guidelines, will be provided on different floors.

From these collection bins, the waste will accumulate. The solid waste will then be collected by a third party responsible for solid medical waste management. The hospital will have a secondary waste storage area, used for temporarily storing waste. Medical waste from different floors and facilities will accumulate in this area. The waste will be separated (where necessary) and stored in this room. A waste collection vehicle will then collect all medical waste, except liquid waste, from these secondary storage facilities.

Liquid medical waste will be managed by a designated Sewage Treatment Plant (STP) capacity of 4 m^3/hr. Detailed specifications of the wastewater treatment plant will be provided in the Annexure. These facilities will treat all wastewater generated by the hospital, ensuring that treated water is suitable for reuse within the hospital. Any excess treated water will be discharged into the local drainage system, which will ultimately flow into a nearby canal.

The total management plan of hospital waste is given in the following schematic diagram.

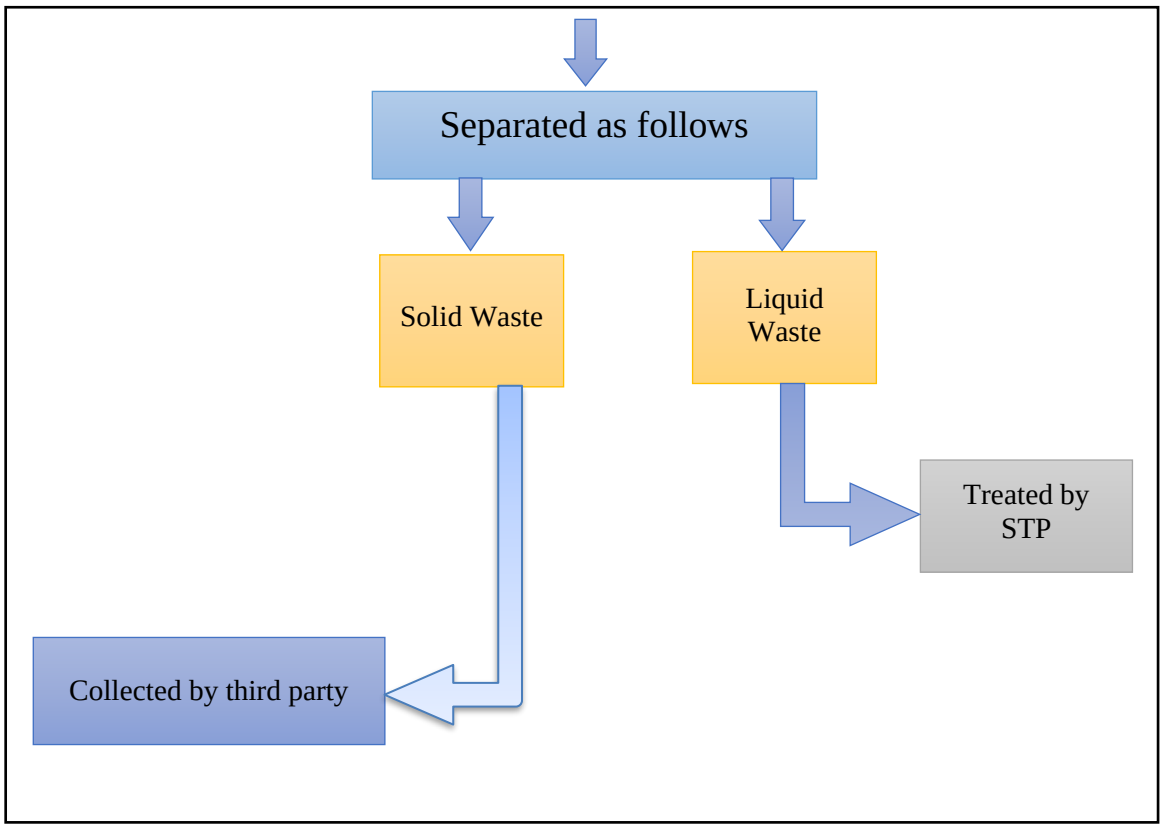


Figure 6.4: The proposed Medical Waste Management plan of the Hospital

The following table gives a summary of the total hospital waste management system.

Table 6.2: Medical Waste Management Plan of Army Institute of Physiotherapy & Rehabilitation.

S.N	Types of Hospital Waste	Management Plan
1	Medical waste (solid in form)	Carried out by Prism Bangladesh Foundation.
2	Medical Liquid Waste	Treatment by STP
3	Gray Water	Treated by STP.
4	Black Water	Treated by Sewage Treatment Plant (STP).
5	General Solid Waste	Carried out and managed by a third-party company.

6.4.2. Air Pollution Management Plan

Army Institute of Physiotherapy & Rehabilitation will have minimal air pollution impact from its operations. The use of gas burners in the canteen and kitchen, as well as generators for power backup, will be the primary sources of emissions. However, these sources emit limited amounts of pollutants, which are not expected to have significant adverse effects on air quality. The center complies with the Environmental Conservation Rules (ECR), 2023, and will not

show any negative impact on ambient air quality. To further ensure minimal air pollution, Army Institute of Physiotherapy & Rehabilitation implements the following measures:

1. **Use of Low-Emission Gas Burners**: The canteen and kitchen will utilize gas burners, which are known for their low emissions compared to other types of fuel. Regular maintenance of these burners ensures efficient combustion and minimal emission of harmful gases.
2. **Generator Emission Control**: Generators used for power backup will be fitted with proper exhaust systems to minimize smoke emissions. Regular maintenance and timely servicing of generators help to ensure they operate efficiently, thereby reducing their impact on air quality.
3. **Regular Cleaning and Maintenance**:
    - Floors and common areas will regularly be washed and cleaned to reduce the spread of odors and minimize dust accumulation.
    - This practice will help to maintain a clean environment and reduce potential air quality issues caused by dust and debris.
4. **Vehicle Management**: Efficient management of transportation facilities will be in place to minimize emissions from vehicles. This will include the regular maintenance of hospital vehicles to ensure they comply with emission standards, thereby reducing their impact on air quality.
5. **Greenery and Vegetation**: The hospital premises will feature greenery and vegetation that help absorb dust particles and reduce the amount of airborne dust. This natural barrier will play a significant role in maintaining clean air within the facility.
6. **Regular Water Sprinkling**: To further reduce dust levels, water sprinkling is conducted regularly around the premises. This practice helps to settle dust on surfaces and prevents it from becoming airborne, contributing to improved air quality.
7. **Odor Control Measures**: Proper waste management and ventilation systems will be in place to prevent the accumulation and spread of odors, particularly in areas like the canteen and kitchen.

By implementing these measures, Army Institute of Physiotherapy & Rehabilitation ensures compliance with air quality standards and minimizes the potential for air pollution, thereby safeguarding the health and well-being of its patients, staff, and visitors

6.5. Noise Management Plan

At Army Institute of Physiotherapy & Rehabilitation, the noise levels will be monitored to ensure they comply with the Environmental Conservation Rules (ECR), 2023, and are currently around 60 dBA. The following Noise Management Plan outlines the strategies to manage and minimize noise pollution effectively.

Sources of Possible Noise Pollution:

1. **Generators**: Used for power backup and can emit significant noise.
2. **Kitchen and Canteen Areas**: Equipment such as exhaust fans, dishwashers, and cooking appliances generate noise.
3. **Transportation Facilities**: Vehicles and transportation equipment contribute to noise levels.
4. **General Hospital Operations**: Includes medical equipment, staff activities, and patient interactions.

Mitigation Measures:

1. **Generator Management**
    - **Enclosure**: The generator room will be fully enclosed to contain and reduce noise emissions.
    - **Protective Gear**: Staff working in the generator room will be provided with earplugs as necessary.
    - **Low-Noise Equipment**: Utilization of a modern generator designed to produce minimal noise.
2. **Kitchen and Canteen Areas**
    - **Regular Maintenance**: Ensure all kitchen equipment will be well-maintained to reduce noise.
    - **Noise Barriers**: Install noise-absorbing materials around high-noise equipment.
3. **Transportation Facilities**
    - **Vehicle Management**: Implement schedules and maintenance checks to ensure vehicles operate quietly.
    - **Parking Area**: Designate areas for vehicle idling and loading/unloading to minimize noise impact on sensitive areas.

4. **General Hospital Operations**
    - **Noise Protection**: Use noise protection materials in areas prone to high noise levels.
    - **Door and Window Management**: Keep doors and windows closed when not in use to prevent external noise from entering.
5. **Additional Measures**
    - **Regular Monitoring**: Conduct periodic noise level assessments to ensure compliance with ECR standards.
    - **Staff Training**: Educate staff about noise reduction practices and the importance of maintaining a quiet environment.

By implementing these measures, Army Institute of Physiotherapy & Rehabilitation aims to effectively manage and reduce noise pollution, thereby enhancing the comfort and well-being of both staff and patients.

6.6. Other Environmental Management Plan

6.6.1. Disaster Management Plan

To ensure comprehensive emergency preparedness and response, Army Institute of Physiotherapy & Rehabilitation has established a Disaster Management Program. This program encompasses training for staff and volunteers, installation and maintenance of emergency equipment, and the establishment of a command center. The following sections outline the strategies and measures in place to mitigate disaster risks.

6.6.1.1. Objectives

- **Enhance Preparedness**: Equip staff and volunteers with the skills and knowledge needed for effective emergency response.
- **Reduce Risk**: Implement measures to minimize risks associated with potential disasters.
- **Ensure Continuity**: Maintain hospital operations and safety during and after emergencies.
- **Promote Awareness**: Foster a culture of safety and preparedness among staff and the community.

6.6.1.2. Current Measures to Reduce Disaster Risk

1. **Building Design and Infrastructure**
    - **Structural Integrity**: The hospital's well-designed building reduces the risk of collapse.
    - **Land Improvement**: Measures have been taken to reduce water logging and flooding in the hospital area.
    - **Electrical Safety**: Good electrical wiring practices have minimized the risk of electrical incidents.
    - **Engineering Expertise**: Recruitment of qualified engineers contributes to reducing disaster risks.
    - **Firefighting Measures**: Installed firefighting equipment supports the mitigation of fire risks.

6.6.1.3. Future Measures to Further Reduce Disaster Risk

1. **Fire Risk Assessment**
    - **Regular Assessments**: Conduct a comprehensive fire risk assessment annually, following the guidelines in Table 6.1.
2. **Fire Drills and Training**
    - **Drills**: Execute at least two fire drills annually involving firefighters, security personnel, the compliance team, and support from the district fire service and civil defense.
    - **Training**: Provide disaster risk reduction training for campus staff and students.
3. **Disaster Management Team**
    - **Formation**: Establish a dedicated disaster management team responsible for overseeing preparedness and response efforts.
4. **Seasonal Monitoring**
    - **Seasonal Vigilance**: Monitor weather conditions closely during the monsoon and cyclone seasons, and prepare for potential impacts.
5. **Awareness and Education**
    - **Community Awareness**: Implement awareness programs for students and staff to increase understanding of disaster risks and preparedness strategies.
    - **Training Programs**: Conduct disaster risk reduction training sessions for all campus members.

6.6.1.4. Implementation and Review

- **Training and Equipment**: Ensure ongoing training for all staff and volunteers, and regularly inspect and maintain emergency equipment.
- **Command Center**: Operate a command center to coordinate emergency response activities effectively.
- **Plan Review**: Regularly review and update the Disaster Management Plan based on new risks, lessons learned from drills, and feedback from staff.

Army Institute of Physiotherapy & Rehabilitation is committed to maintaining a robust Disaster Management Plan to safeguard the well-being of patients, staff, and visitors while ensuring the continuity of hospital operations during emergencies.

6.7. Sequential Elements of Environmental Management Plan

The Environmental Management Plan (EMP) for Army Institute of Physiotherapy & Rehabilitation follows a structured approach to ensure effective management of environmental impacts throughout the project lifecycle. The EMP process comprises three sequential elements:

1. **Identification of Impacts**
    - **Positive and Negative Impacts**: Identify all potential impacts, both positive and negative, on the natural and human environment resulting from the hospital's operations and infrastructure. This includes impacts on air quality, water resources, noise levels, solid waste, and community health.
2. **Evaluation and Assessment of Impacts**
    - **Quantification and Analysis**: Evaluate and quantify the identified impacts to understand their significance. This includes assessing impacts relative to baseline conditions and understanding how they affect various aspects of the environment and community. The assessment helps in understanding the extent of impacts and the need for mitigation.
3. **Preparation and Implementation of Management Plans**
    - **Mitigation and Protection Measures**: Develop and implement management plans designed to reduce or offset the potentially significant negative impacts of the hospital operations to acceptable levels. These plans may include modifications to project design, implementation of specific environmental

protection measures, and adoption of project alternatives that minimize adverse effects.

Monitoring and Review

- **Monitoring Plan**: Include a monitoring plan to track the effectiveness of the mitigation measures. Regular monitoring ensures that the environmental protection measures are functioning as intended and allows for adjustments as needed based on observed performance and environmental changes.
- **Review Process**: Periodically review the EMP to address any new environmental concerns or changes in project operations. This ongoing review helps in maintaining compliance with environmental standards and adapting to evolving environmental conditions.

Army Institute of Physiotherapy & Rehabilitation is committed to integrating these sequential elements into its Environmental Management Plan to promote environmental sustainability, ensure regulatory compliance, and enhance the overall impact of the hospital's operations on the community and environment

Table 6.3: Environmental Management Action Plan for Operation Phases

Environmental Impact	Mitigation Measures	Time Frame	Location	Responsibility
Air pollution	➢ Provide adequate ventilation and exhaust fan in the workplace; ➢ Maintain open air exhaust for generator and set catalytic converter and faulty engine would be repaired as soon as possible; ➢ Plant tree near the boundary line or in the green area; ➢ Monitoring Air every 06 Months;	Throughout Operation phase	Project site	Representative of project proponent
Water pollution	➢ Per day, 80 cubic meters of wastewater are generated during hospital operations, and Waste water is treated by Sewage Treatment Plant. After treatment, the water is reused, and excess treated water is discharged through the drainage system.	Throughout Operation phase	Project site	Representative of project proponent
Solid waste	➢ Apply the 3R method for waste management of the project (per day waste produces around 40-50 KG); ➢ Trained employees on waste control and disposal procedures; ➢ Segregates wastes at source and stores in demarcated places and disposes of them by **Prism Bangladesh Foundation**.	Throughout Operation phase	Project site	Representative of project proponent

Environmental Impact	Mitigation Measures	Time Frame	Location	Responsibility
Noise and Vibration	➢ Air plugs will be provided to workers while near to noise generating equipment or working in noise areas; ➢ Procure and use low noise generating machinery; ➢ Conduct periodic maintenance of equipment, replace warn-out parts, lubricate rotating parts; ➢ Will procure noise monitoring device and monitor noise conditions in and outside the project premises; ➢ Monitoring noise condition every 06 months;	Throughout Operation phase	Project site	Representative of project proponent
Impact on soil or land	➢ Maintain Cleanliness of the Hospital and store Medical Waste in waste collection bin; ➢ Green belt development for enhancing the natural aesthetic of the site;	Throughout Operation phase	Project site	Representative of project proponent
Impact on traffic volume	➢ Control vehicle movement in an organized way and follow local traffic instructions;	Throughout Operation phase	Project site	Representative of project proponent
Fire/Explosion	➢ Explosion does not apply to the said project; ➢ Establish own firefighting system and maintain collaboration with government firefighting and civil defense departments locally; ➢ Organize fire drills and training for construction staff;	Throughout Operation phase	Project site	Representative of project proponent

Environmental Impact	Mitigation Measures	Time Frame	Location	Responsibility
Occupational health and safety risk	➢ Conduct job safety analysis; ➢ Use of personal protective equipment such as hard helmet, musk, boot, general glass, etc.; ➢ Aware and train employees on using safety devices;	Throughout Operation phase	Project site	Representative of project proponent
Statutory requirements	➢ Meet all statutory requirements with DoE within the time frame;	Throughout Operation phase	Project site	Representative of project proponent

Table 6.4: Environmental Management Action Plan

Issue/Concern	Potential Negative Environmental Impacts	Mitigation Measures	Environmental Monitoring	Responsible Actors	Time Frame
Water Pollution	- Surface and groundwater pollution -Occupational illness	- Wastewater is treated by Sewage Treatment Plant. - Water recycling	-Monitoring of water quality	-Authority & workers - Health and safety officer	- monitoring half-yearly
Solid waste	- Air, water, and soil pollution -Poorly disposed waste may block drainage	- Proper solid waste management system - Medical Solid waste collection, storage, and transportation system - Awareness and training campaign	- Regular monitoring of the solid waste management facilities	-Authority & workers - Health and safety officer - Prism Bangladesh Foundation	-Must be kept daily register for solid waste - Quarterly reporting

Issue/Concern	Potential Negative Environmental Impacts	Mitigation Measures	Environmental Monitoring	Responsible Actors	Time Frame
Air Pollution	- Deterioration of indoor air quality -Occupational illness/health impact	- Proper stack height for the generator -Regular maintenance of Generators -Use of PPE	-Negligible amount of gaseous from generator (500 **kVA)** -Monitoring of Air Quality	-Authority & workers - Health and safety officer	- monitoring half-yearly
Noise Pollution	- Hearing loss -Reduced productivity and efficiency -Fatigue, headache, nervousness, irritability, and high pretension resulting in accidents at the workplace	- Implementation of an effective noise control and hearing conservation program -Noise measurement -Providing suitable hearing protection to all workers -Training of workers	-Determine Noise levels from time to time -Negligible sound produced by generator	-Authority & workers - Health and safety officer - Neighbors and - The General Public	- Half yearly Noise level monitoring

Issue/Concern	Potential Negative Environmental Impacts	Mitigation Measures	Environmental Monitoring	Responsible Actors	Time Frame
Occupational hazards	- Injury to employees on site -Injury to visitors - Reduced productivity - Plant and equipment damage -Negative corporate image	- Good and sound housekeeping practices -Provision of appropriate working tools and equipment -Use of PPE -Timely repair and maintenance of equipment -Employee training -Use appropriate elevators and other machinery	-Accident and incident records -Record of employee training	-Authority & workers - Health and safety officer	- The mitigation measures proposed should be put in alongside project implementation and daily operations, continuously improved on and sustained throughout the operation life of the hospital.

Chapter Seven: Environmental Management Policy & Monitoring Plan

7.1.Issues of Environmental Management Policy

7.1.1. Issues of Environmental Management Policy

Army Institute of Physiotherapy & Rehabilitation is committed to implementing a robust environmental policy for its facilities. This policy will be periodically reviewed and enhanced to ensure that all operations adhere to high standards of environmental responsibility and sustainable resource utilization. The policy will address the following key areas:

- **Compliance with Legislation**: Ensure all activities comply with relevant national environmental regulations and standards.
- **Continuous Improvement**: Promote ongoing environmental enhancement and superior performance through rigorous monitoring and evaluation of hospital operations.
- **Resource Utilization**: Optimize the use of natural resources while implementing measures for conservation and preservation to ensure their availability for future generations.
- **Balanced Approach**: Achieve a harmonious balance between natural resource use, environmental conservation, and economic development.

To support these goals, the environmental stewardship program will entail both management responsibilities and individual employee obligations. To achieve the program's objectives, the following actions will be implemented:

- **EHSMS Maintenance**: Continuously maintain and improve the organization's Environment, Health, and Safety Management System (EHSMS).
- **Employee Training**: Provide appropriate training to all employees to fulfill their environmental responsibilities within the EHSMS framework.
- **Objectives and Targets**: Establish annual environmental objectives and targets and implement programs to meet them.
- **Legal Compliance**: Ensure compliance with relevant legal and other environmental requirements.
- **Resource Allocation**: Ensure Army Institute of Physiotherapy & Rehabilitation has the necessary resources and skills to meet its environmental commitments.

- **Performance Appraisal**: Incorporate environmental performance into the annual appraisal of employees and contractors and provide recognition accordingly.
- **Monitoring and Reporting**: Conduct formal monitoring, auditing, and review of environmental performance and EHSMS requirements, and report annually on progress against defined objectives.

7.1.2. Occupational Health and Safety Policy

Army Institute of Physiotherapy & Rehabilitation is dedicated to establishing a comprehensive Occupational Health and Safety (OHS) Policy as part of its broader environmental policy framework. This policy will be regularly reviewed and updated as necessary to ensure it addresses the health, safety, and welfare of all employees and meets the local community's health needs. The policy will encompass the following key areas:

- **Safety Measures**: Implement and maintain safety protocols for all machinery and equipment used within the facility.
- **Emergency Procedures**: Develop and enforce emergency procedures and actions to minimize risks and manage accidental damage to employees, the community, and the environment.
- **Training and Maintenance**: Ensure proper machinery maintenance and provide proficiency training for operators to address safety concerns effectively.
- **Personal Protective Equipment (PPE)**: Ensure appropriate PPE is available and used for all doctors, nurses, and staff members.

To promote best practices in health and safety management, the following actions will be undertaken:

- **EHSMS Improvement**: Continuously maintain and enhance the organization's Environment, Health, and Safety Management System (EHSMS).
- **Health and Safety Focus**: Balance efforts between managing health and well-being, personnel, and process safety.
- **Hazard Identification**: Actively identify hazards and manage risks as low as reasonably practicable.
- **Employee Engagement**: Encourage active participation and consultation with employees regarding their own and others' health, well-being, and safety.

- **Resource Allocation**: Provide the necessary resources to support a systematic approach to health, safety, and process management, ensuring continuous performance improvement.
- **Performance Measures**: Establish performance metrics, set improvement targets, and measure and report performance at all organizational levels.
- **Legal Compliance**: Ensure compliance with all relevant legal and regulatory requirements.
- **Safety Culture**: Foster a culture where employees remain vigilant about safety hazards and integrate health and safety performance into employee appraisals, recognizing and rewarding adherence to safety practices.

7.1.3. Local Community Policy

Army Institute of Physiotherapy & Rehabilitation is committed to fostering strong relationships with both its employees and the local community based on mutual respect and active partnership. The Local Community Policy will focus on:

- **Collaboration:** Working closely with local communities, government departments, and relevant agencies to support sustainable community development.
- **Communication:** Enhancing the flow of information between management, employees, and the community to ensure transparency and effective engagement.
- **Capacity Building:** Actively involving the local community in hospital activities and decision-making processes to build community capacity and engagement.

7.1.4. Pollution Control Policy

Army Institute of Physiotherapy & Rehabilitation's Pollution Control Policy is derived from the comprehensive Environmental Management Plan (EMP) and is designed to prevent and manage pollution effectively. The policy includes:

- **Pollution Prevention:** Ensuring that hospital operations do not result in pollution of the premises or surrounding areas.
- **Waste Management:** Implementing proper measures for pollution control, including:
    - **Liquid Waste:** Treating liquid waste using a properly designed sewage treatment plant.
    - **Gaseous Effluents:** Managing incinerator emissions by passing them through water, with subsequent treatment of this water.

- **Solid Waste:** Preventing open dumping and ensuring safe disposal.
- **Sharp Waste:** Storing sharp waste in a reinforced concrete container (RCC tank).

- **Environmental Safety:** Taking all necessary steps to ensure a safe and clean environment in accordance with the policy.

7.2.Environmental Monitoring Plan

Monitoring is an essential part of EMP. Monitoring makes it easy to understand whether the recommended mitigation/enhancement measures are working well or not. Under this monitoring plan, different types of monitoring works, such as Water Pollution, Air Pollution, Noise pollution, etc., will be monitored periodically to measure the pollution level of specified locations within the project and the surrounding area.

7.2.1. Monitoring Parameters and Frequency

According to the monitoring data, improvements and further mitigation measures may be needed for more effective maintenance and control of pollution levels within the government-recommended level. The monitoring will be conducted as per the following table.

Table 7.1 Monitoring Parameters and Frequency

Issue	Location of Monitoring	Parameters	Monitoring Frequency	Duty Unit /Persons
Solid waste Generation	Every Floor/OT/Premises etc.	-	Daily	Based on discussion and the Management department
Medical wastewater discharge	METP inlet & outlet, OT, Drain.	pH, BOD, COD, Temp., TSS, etc.	Every Three Months	
Stack Emissions & Ambient air quality	Air pollutant emission points like generator room, Incinerator, and Around the Hospital site.	Not mandatory	Not mandatory	
Generation of Hazardous waste	Production area, chemical storeroom, X-Ray Room and OT	Chemicals sample, igneous, X-Ray Films, Sharp metal, etc.	Daily	

Issue	Location of Monitoring	Parameters	Monitoring Frequency	Duty Unit /Persons
Workplace Environment	Hospital Premises	Light, Air, Sound, Temperature, Moisture content, etc.	Once in every three months	
Noise Level	Hospital Premises	Noise at different locations day and night	Once in every three months	
Drinking water Quality	Drinking water outlet	pH, Total Alkalinity Total Hardness TDS, As, Fe, Chloride (Cl-), Fecal & Total Coliform	Once in six months	

Chapter Eight: Analysis of Alternatives

This section examines various alternatives to the proposed hospital project by Army Institute of Physiotherapy & Rehabilitation, considering environmental, social, and economic factors. Each alternative is assessed to determine its implications on healthcare provision, community impact, and environmental sustainability.

8.1.Do Nothing

Description: This alternative involves not proceeding with the proposed hospital project and continuing to rely on the existing healthcare infrastructure in the area.

Implications:

- **Healthcare Access:** The existing facilities may continue to face challenges in meeting the healthcare needs of the growing population in Madani Avenue and surrounding areas. This could exacerbate current deficiencies and limit access to quality medical care.
- **Community Impact:** The community might experience ongoing limitations in healthcare services, leading to potential health disparities and increased pressure on existing facilities.
- **Environmental Impact:** By not proceeding with the project, there would be no new construction-related environmental impacts. This alternative avoids any immediate environmental disturbances associated with building and operating a new facility.
- **Costs and Benefits:** While avoiding the costs associated with construction and operation, this alternative forgoes the potential benefits of improved healthcare access, regional development, and enhanced local infrastructure.

8.2.Alternative Land Use

Description: This alternative involves repurposing the designated site for a different use rather than constructing a healthcare facility. Potential alternative uses include community development projects, such as parks, educational institutions, or commercial establishments.

Implications:

- **Community Development:** Alternative land uses could provide significant benefits to the local community, such as enhanced public spaces, educational opportunities, or economic development through commercial ventures.
- **Healthcare Needs:** While this approach might benefit the community in various ways, it would not address the critical healthcare needs of the region. The absence of a new healthcare facility would mean that existing gaps in healthcare services would remain unaddressed.
- **Environmental Impact:** Depending on the alternative use, there could be varying environmental impacts. For example, developing a park might offer environmental benefits, while commercial establishments could introduce new pollution sources.
- **Costs and Benefits:** This alternative might offer immediate economic and community benefits but fails to provide the long-term health benefits associated with improved healthcare infrastructure.

8.3.Alternative Land Site

Description: This alternative involves relocating the proposed hospital to a different site within Dhaka or the surrounding area. The new site would be selected based on factors such as accessibility, environmental impact, and suitability for construction.

Implications:

- **Accessibility:** A new site might offer better accessibility for the target population, potentially improving the effectiveness of the healthcare facility in serving the community.
- **Environmental Impact:** Relocating the project could reduce environmental impacts if the new site is better suited for construction and minimizes disturbances to the surrounding environment. However, this would require a thorough environmental assessment of the alternative site.
- **Costs and Benefits:** Identifying and developing a new site could involve additional costs and delays. The benefits would include potentially addressing any concerns related to the original site, such as environmental or logistical issues. The new location would need to be carefully evaluated to ensure it meets the project's goals and effectively serves the target population.

- **Community Impact:** The success of this alternative depends on the suitability of the new site in addressing community healthcare needs and providing the intended benefits of improved healthcare access.

8.4.Conclusion

Each alternative presents distinct advantages and challenges:

- **Do Nothing:** Avoids construction and environmental impacts but fails to address existing healthcare deficiencies.
- **Alternative Land Use:** Offers community and economic benefits but does not address healthcare needs.
- **Alternative Land Site:** Provides potential for better site-specific benefits but involves additional costs and delays.

After evaluating the alternatives for the proposed hospital project, it is concluded that proceeding with the current site is the most suitable option for Army Institute of Physiotherapy & Rehabilitation. This site offers several advantages that align with the project's objectives and the needs of the surrounding community.

a. **Serving the Surrounding Area:** The current location is strategically positioned to effectively serve the Madani Avenue area and its surrounding neighborhoods. It provides a central and accessible site for residents, ensuring that the healthcare facility can address the medical needs of a significant population base. This proximity will enhance the facility's ability to deliver timely and efficient care, which is crucial for improving overall health outcomes in the region.
b. **Economic Growth:** Developing the hospital at this location will contribute to local economic growth by creating jobs, stimulating local business, and enhancing the infrastructure of the area. The presence of a healthcare facility can attract additional investments and foster economic development, benefiting both the immediate community and the broader region.
c. **Cost Efficiency:** Utilizing the existing land owned by Army Institute of Physiotherapy & Rehabilitation significantly reduces costs associated with land acquisition, which can be substantial when seeking new sites. This advantage minimizes additional financial burdens and allows the organization to allocate resources more effectively toward the development and operation of the healthcare facility.

d. **Environmental Considerations:** Selecting a new land site would involve additional environmental assessments and potential disruptions associated with land acquisition and development. These activities could introduce new environmental challenges and delays, contrary to the current site, which has already been evaluated and is prepared for development. By proceeding with the existing site, Army Institute of Physiotherapy & Rehabilitation avoids the environmental impacts and complexities associated with new site development.
e. **Addressing Healthcare Needs:** The proposed site is well-positioned to meet the growing healthcare demands of the local population. It ensures that the hospital can provide essential medical services without the added delays and complications of finding and developing a new location.

In summary, the current site is optimal for Army Institute of Physiotherapy & Rehabilitation's hospital project. It effectively meets the healthcare needs of the military people, supports local economic growth, and provides a cost-effective solution by leveraging existing land. This approach avoids the additional environmental and financial impacts of acquiring a new site and aligns with the organization's goals of delivering high-quality healthcare services while promoting sustainable development.

Chapter Nine: Decommissioning Plan

The decommissioning plan for Army Institute of Physiotherapy & Rehabilitation outlines a comprehensive strategy to safely dismantle the project site, minimize environmental impacts, and restore the area for future use. Each component of the plan is elaborated below:

9.1.Project Closure Notification

- **Notification Process:**
    - **Regulatory Bodies:** Notify relevant government agencies, including environmental authorities, about the decommissioning activities. This might include the Department of Environment and local municipal authorities.
    - **Stakeholders:** Inform key stakeholders such as employees, contractors, suppliers, and local community members about the project's closure and decommissioning plans. This helps to manage expectations and address any concerns.
    - **Public Communication:** Use local media and community meetings to keep the public informed about the decommissioning schedule and potential impacts. This transparency helps to build trust and facilitates smooth communication.
- **Documentation:**
    - **Decommissioning Plan Documentation:** Prepare comprehensive documentation outlining the decommissioning schedule, procedures, safety measures, and contact information for project managers.
    - **Regulatory Compliance Records:** Ensure that all regulatory compliance documents, including permits and approvals, are up-to-date and accessible.

9.2.Site Assessment

- **Pre-Demolition Assessment:**
    - **Site Survey:** Conduct a detailed survey of the site to assess current conditions, including structural integrity, environmental quality, and the presence of hazardous materials.
    - **Review Historical Data:** Analyze historical records and reports related to site operations, maintenance, and previous environmental assessments to identify potential issues.

- **Hazard Identification:**
    - **Hazardous Materials:** Identify and catalog hazardous materials such as asbestos, lead, or chemical residues. Use specialized services to assess the presence and concentration of these materials.
    - **Risk Assessment:** Evaluate the risks associated with these hazards, including potential health impacts on workers and environmental contamination.

9.3.Dismantling and Removal

- **Dismantling Procedures:**
    - **Detailed Plan:** Develop a detailed dismantling plan that outlines the steps for safely decommissioning the hospital's structures and systems. This plan should include methods for deconstructing buildings, removing equipment, and managing debris.
    - **Safety Measures:** Implement safety protocols to protect workers and the public, including barricades, signage, and emergency response plans.
- **Equipment Removal:**
    - **Decommissioning Equipment:** Safely decommission and remove medical and operational equipment, ensuring that any hazardous components are handled appropriately.
    - **Special Handling:** For equipment containing hazardous materials (e.g., batteries, electronic waste), follow specific disposal procedures.
- **Structural Demolition:**
    - **Demolition Methods:** Use appropriate demolition methods for different types of structures. This may include mechanical demolition, dismantling by hand, or using controlled explosives.
    - **Debris Management:** Manage demolition debris by sorting materials for recycling, disposal, or reuse. Ensure that debris is transported and disposed of according to regulations.

9.4.Waste Management

- **Waste Categorization:**
    - **Types of Waste:** Classify waste into categories such as hazardous, non-hazardous, recyclable, and general waste.
    - **Waste Tracking:** Implement a waste tracking system to monitor the types and quantities of waste generated and their disposal methods.

- **Disposal Procedures:**
    - **Licensed Contractors:** Work with licensed waste disposal contractors to handle and dispose of hazardous and non-hazardous waste.
    - **Compliance:** Ensure that all waste disposal activities comply with local, national, and international regulations.
- **Recycling and Reuse:**
    - **Recycling Programs:** Establish recycling programs for materials such as metals, wood, and concrete. Partner with recycling facilities to process these materials.
    - **Reuse Opportunities:** Identify opportunities to repurpose or reuse materials in other projects or for charitable purposes.

9.5.Soil and Water Remediation

- **Soil Testing:**
    - **Sampling and Analysis:** Conduct soil sampling and laboratory analysis to detect contamination from hazardous materials or chemicals used during hospital operations.
    - **Contamination Mapping:** Map areas of contamination to target remediation efforts effectively.
- **Remediation Measures:**
    - **Treatment Methods:** Apply appropriate soil remediation techniques such as excavation, soil washing, or bioremediation to clean contaminated soil.
    - **Regulatory Compliance:** Follow guidelines and regulations for soil remediation to ensure effectiveness and safety.
- **Water Quality Monitoring:**
    - **Testing:** Regularly test surface and groundwater for contaminants, especially if there were storage tanks or waste disposal areas on-site.
    - **Treatment:** Implement water treatment solutions if contamination is detected, ensuring that treated water meets regulatory standards before discharge or reuse.

9.6.Site Restoration

- **Restoration Plan:**
    - **Land Regrading:** Regrade and contour the land to restore it to its natural state or prepare it for new uses. This may involve filling in excavations or leveling uneven areas.

- **Vegetation:** Plant vegetation and grasses to stabilize the soil, prevent erosion, and enhance the aesthetic appeal of the site.

- **Final Inspection:**
  - **Inspection Checklist:** Conduct a final inspection to verify that all decommissioning and restoration activities have been completed according to the plan.
  - **Regulatory Approval:** Obtain any necessary approvals from regulatory authorities to confirm that the site meets all required standards for restoration.

9.7.Monitoring and Reporting

- **Ongoing Monitoring:**
  - **Environmental Monitoring:** Implement a monitoring program to track environmental conditions, such as soil quality and water quality, after decommissioning. This helps to detect any residual contamination or impacts.
  - **Periodic Reviews:** Conduct periodic reviews to assess the effectiveness of remediation and restoration efforts.
- **Reporting:**
  - **Final Report:** Prepare a comprehensive final report detailing the decommissioning activities, waste management practices, remediation efforts, and site restoration outcomes.
  - **Stakeholder Communication:** Share the final report with stakeholders, including regulatory bodies, local communities, and internal management.

9.8.Health and Safety

- **Health and Safety Plan:**
  - **Risk Assessment:** Conduct a risk assessment to identify potential health and safety hazards associated with decommissioning activities.
  - **Safety Measures:** Develop and enforce safety measures, including the use of personal protective equipment (PPE), training for workers, and emergency response procedures.
- **Risk Management:**
  - **Accident Prevention:** Implement procedures to prevent accidents and injuries, including regular safety audits and inspections.

- **Emergency Response:** Establish an emergency response plan to address potential incidents, such as chemical spills or equipment failures, during decommissioning.

By addressing each of these components, Army Institute of Physiotherapy & Rehabilitation ensures a thorough and responsible approach to decommissioning. This plan aims to protect the environment, safeguard public health, and prepare the site for future use in a sustainable manner.

Chapter Ten: Public Consultations

10.1. Introduction

The public consultation for the proposed healthcare facility project by Army Institute of Physiotherapy & Rehabilitation, located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344, was conducted to gather input on the project's potential environmental and socio-economic impacts. This consultation aimed to facilitate open and transparent communication between the project developers and the local community. Through various engagement activities, including public meetings and interviews, community members and stakeholders were invited to share their concerns, suggestions, and expectations regarding the project's environmental footprint, socio-economic effects, and proposed mitigation strategies. The feedback gathered from these consultations was instrumental in shaping the Environmental Impact Assessment (EIA) report, ensuring that the project aligns with community interests and promotes sustainable development in the area.

10.2. Objectives of Public Consultation and Disclosure Meeting

The objectives of the public consultation for the proposed healthcare facility project by Army Institute of Physiotherapy & Rehabilitation at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344, are outlined below:

- **Engagement and Inclusion:** To actively engage the local community, stakeholders, and relevant authorities in the decision-making process, ensuring their opinions, concerns, and feedback are collected and considered.
- **Information Sharing:** To provide clear and comprehensive information about the project’s objectives, scope, location, potential impacts, and proposed mitigation strategies, thereby fostering transparency and understanding among all participants.
- **Addressing Concerns:** To offer a platform for participants to express their concerns, ask questions, and share perspectives on potential environmental, socio-economic, and community impacts associated with the healthcare facility.
- **Gathering Feedback and Suggestions:** To solicit valuable feedback and suggestions from participants on how to minimize negative impacts, enhance positive outcomes, and incorporate sustainable development practices throughout the project's lifecycle.

- **Promoting Collaboration:** To promote collaboration and partnership between project developers, local community members, stakeholders, and relevant authorities, aiming to achieve a shared understanding and alignment on the project's vision and objectives.
- **Influencing Decision-Making:** To ensure that the input gathered during the public consultation process significantly influences the decision-making process, project design, and the development of the Environmental Impact Assessment (EIA) report.
- **Building Trust:** To build trust and credibility between Army Institute of Physiotherapy & Rehabilitation and the local community by actively listening to concerns, responding to inquiries, and integrating meaningful feedback into the project's planning, implementation, and monitoring phases.

10.3. Approach and Methodology of Public Consultation and Disclosure Meeting

The approach and methodology for the public consultation and disclosure meeting for Army Institute of Physiotherapy & Rehabilitation's proposed healthcare facility project at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344, aim to ensure effective communication, meaningful engagement, and transparency. The following steps outline the suggested approach and methodology for the public consultation:

10.3.1. Preparing for the Consultation:

- **Identify Key Stakeholders:** Engage with relevant stakeholders, including local community members, government authorities, non-governmental organizations (NGOs), healthcare professionals, and environmental experts, who may have an interest in or be impacted by the project.
- **Define Objectives and Scope:** Clearly outline the objectives of the consultation, the key topics for discussion, and the scope of the process to provide clear guidance for the meeting.
- **Develop an Engagement Plan:** Prepare a comprehensive engagement plan that details the activities, timeline, and resources required to conduct the consultation process effectively.
- **Information Preparation:** Gather all relevant project information, such as project plans, Environmental Impact Assessment (EIA) findings, and proposed mitigation measures, to be shared with participants to facilitate informed discussions.

10.3.2. Communication and Outreach:

- **Publicize the Meeting:** Use a variety of communication channels, including local newspapers, radio stations, community notice boards, social media platforms, and direct invitations, to inform the community about the consultation meeting and invite their participation.
- **Multilingual Support:** Provide translation services or materials in local languages to ensure all participants, regardless of language barriers, can engage effectively in the consultation.
- **Engage Local Leaders and Influencers:** Collaborate with local community leaders, respected elders, and influencers to spread the word about the meeting and encourage widespread participation.

10.3.3. Consultation Meeting:

- **Facilitate Open Discussion:** Create a welcoming and inclusive environment that encourages open dialogue. Facilitators should ensure that all attendees have the opportunity to voice their opinions, ask questions, and share their concerns without fear of bias or intimidation.
- **Present Project Information:** Begin the meeting with a clear and concise presentation of the project's overview, its purpose, potential environmental and socio-economic impacts, and the proposed mitigation measures. Use visual aids and straightforward language to enhance understanding.
- **Q&A and Interactive Sessions:** Allocate ample time for participants to ask questions, seek clarifications, and provide feedback. Foster interactive discussions that allow for diverse perspectives and ideas to be shared.
- **Workgroup Activities:** Organize smaller workgroup activities or breakout sessions focused on specific issues or concerns. This approach ensures deeper engagement and allows participants to discuss topics more thoroughly.

10.3.4. Disclosure of Information:

- **Transparent Information Sharing:** Provide all participants with access to relevant project documents, reports, and studies, ensuring complete transparency in the disclosure of project-related information.

- **Written Submissions:** Encourage participants to submit written feedback or complete feedback forms to capture their concerns, suggestions, and recommendations in a structured and organized manner.
- **Follow-Up Communication:** Commit to sharing a comprehensive summary of the meeting, including key points discussed, concerns raised, and proposed actions, to keep all participants informed and maintain transparency.

10.3.5. Evaluation and Incorporation:

- **Evaluate Feedback:** Carefully analyze the feedback and input received during the consultation process to identify recurring themes, concerns, and valuable suggestions.
- **Incorporate Feedback:** Utilize the feedback to refine project plans, adjust mitigation measures, and address community concerns to the greatest extent possible, demonstrating a commitment to responsive and responsible project planning.
- **Communication of Outcomes:** Clearly communicate the outcomes of the consultation process, highlighting how the input received has influenced decision-making, and detailing any modifications made to the project based on the feedback provided by participants.

10.4. Public Consultation Meeting (PCMs)

Public consultation was initiated with the explicit objective of ensuring community participation from the planning stage of the project. The aim was to enhance the study by incorporating opinions and concerns from residents of the impacted area. During the household survey, conducted through a semi-structured questionnaire, knowledgeable individuals, community leaders, and local chairpersons and members were identified and approached for their input.

Army Institute of Physiotherapy & Rehabilitation organized a public consultation meeting on 14 August 2024 at the project site located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344. The meeting was attended by approximately 40 participants, including local residents, community leaders, and other interested individuals from various parts of the community.

The consultation provided a platform for open dialogue, allowing stakeholders to express their views, ask questions, and raise concerns about the proposed healthcare facility. This inclusive

approach helped to gather valuable insights and foster a sense of collaboration and transparency between the project developers and the local community.

10.5. Public Disclosure Meetings (PDMs)

The local response to the proposed project by Army Institute of Physiotherapy & Rehabilitation has been generally positive. Most residents living close to the project site have expressed no objections to establishing the healthcare facility at the chosen location. During interviews, many individuals were unaware of potential environmental hazards and did not perceive the project as threatening their well-being.

Historically, a top-down approach has been common in similar projects, where public involvement in the planning stages is minimal. This approach was also observed in the case of Army Institute of Physiotherapy & Rehabilitation. It contrasts with a bottom-up approach, which would involve local community input throughout the project design and planning phases.

Despite this, the community appears optimistic about the project, primarily due to the anticipated employment opportunities and the potential for improved healthcare services. Public participation is limited to engaging residents in construction and related activities, with indirect benefits from associated economic activities.

Key outcomes from the Public Disclosure Meeting include:

- **Quality of Life Improvements**: Local residents believe that the project's implementation will enhance their quality of life. There are no significant concerns regarding disruptions to daily activities, and the community is positive about the job opportunities that the new facility will provide.
- **Environmental Concerns and Recommendations**: Stakeholders have voiced concerns about potential environmental impacts. They recommended that Army Institute of Physiotherapy & Rehabilitation adopt sustainable waste reduction, reuse, and recycling practices.
- **Waste Management**: A comprehensive waste management plan is in place. The healthcare facility will have dedicated systems for managing medical and other waste, ensuring proper disposal and recycling where feasible.
- **Water Management**: The project includes measures for water management, with plans to maximize water reuse. Initially, a significant percentage of water will be recycled, with the remainder treated before discharge.

- **Consultancy Commitment**: The consultancy firm Environest Engineering (EE) has committed to incorporating recommendations such as waste reduction strategies into the Environmental Impact Assessment (EIA) report. They will work closely with Army Institute of Physiotherapy & Rehabilitation to ensure these measures are effectively implemented and monitored.

The Public Disclosure Meeting has been instrumental in addressing community concerns and ensuring transparency in the planning and implementation of the healthcare facility.

- **Additional documents for Public Consultation are added in Annexure E.**

Chapter Eleven: Conclusion

The proposed site for Army Institute of Physiotherapy & Rehabilitation is located at Senwalia, Bishmail- Jirabo road, Savar Cantonment, Savar-1344. This location has been selected for its strategic advantages, including excellent road connectivity, reliable electricity supply, and access to essential services. Furthermore, the availability of adequate groundwater resources supports the operational needs of the healthcare facility.

The current Environmental Impact Assessment (EIA) report thoroughly evaluates the potential environmental and socio-economic impacts associated with the project. The study highlights the importance of implementing comprehensive mitigation measures to manage these impacts effectively. Key measures include proper handling of medical waste, ensuring water reuse and treatment, and adhering to stringent environmental controls to minimize pollution.

The project's success hinges on adhering to the Environmental Management Plan (EMP) outlined in this report. By following the recommended practices, Army Institute of Physiotherapy & Rehabilitation will ensure a safe and healthy environment for both patients and staff. The facility is committed to maintaining high standards of environmental protection and sustainability.

The hospital's management has demonstrated a proactive approach to addressing environmental challenges. Initial measures have already been implemented, and the remaining actions outlined in the EMP will be executed promptly. This commitment will enable Army Institute of Physiotherapy & Rehabilitation to not only meet but exceed regulatory requirements and environmental standards.

Overall, the project is set to become a leading healthcare facility in Dhaka, renowned for its advanced medical services and commitment to environmental stewardship. With the ongoing support and dedication of the management and staff, Army Institute of Physiotherapy & Rehabilitation is poised to make a significant positive impact on the community and the healthcare sector in Bangladesh.

Chapter Twelve: Reference

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Annexure

Annexure A: Wastewater Treatment Plants (STP) Detail, Calculation, Design and Drawings

Annexure B: Hospital Process Flow Diagram and Machinery List

Annexure C: Location Maps

Annexure D: Hospital Legal Documents

Annexure E: Test Reports

Annexure F: Public Consultation

Army Institute of Physiotherapy & Rehabilitation

2025

Environmental Impact Assessment

Prepared By - EnviroNest ENGINEERING