ENVIRONMENTAL ASSESSMENT REPORT

CONSTRUCTION OF POURA BUS TERMINAL WITH RENOVATION OF TERMINAL BUILDING

Municipal Governance and Services Project (MGSP)

Bangladesh Municipal Development Fund (BMDF)

June 2018

NOAKHALI POURASHAVA, NOAKHALI

EXECUTIVE SUMMARY

Introduction: Noakhali Pourashava is a Class "A" Pourashava having an area of 17.11 sq km. The total area of the Pourashava is divided into nine administrative wards with a total population of 107654 (Pourashava data, 2018). Recently, the Pourashava has prepared its Capital Investment Plan (CIP) for its infrastructural development following a participatory approach with the technical assistance from Bangladesh Municipal Development Fund (BMDF) and identified "Construction of Poura Bus Terminal with renovation work of terminal building" as one of the priority works (CIP No. 102) for ensuring smooth and easy communication of all people who are living within the Pourashava and in different parts of the Noakhali region and regularly travelling to the main town of the Noakhali district as well as different parts of the Country for trade, business, administrative services and daily necessities.

Location of the subproject: The proposed Bus Terminal is located at Sonapur area under Ward number 7 of the Pourashava. It is surrounded by residential areas of Ward Number 8 at the south, vacant land and rice mills at the north, a large ditch and Poura Bazar at the east, and Sonapur-Charjabbar road, a branch of Noakhali khal and residential areas under Ward # 8 at the west. The coordinate of the location of the bus terminal is the coordinate of the bus terminal is $22^0 49^/ 27.2^{//}$ N and $91^0 5^/ 54.1^{//}$ E.

Justification of selecting the subproject: The transportation system of Noakhali Pourashava is mainly dependent on road and railway system. Transportation through water system is not available within this Pourashava area. The road system is the main communication system of the Pourashava by which the Pourashava is connected with different sub-districts and districts of greater Noakhali. Noakhali Pourashava is the head quarter as well as the main center of trade and business of Noakhali district. It also serves as the main town of administrative work and other public services and facilities of the people. The proposed subproject named Sonapur Poura Bus Terminal is the central bus terminal of the Pourashava as well as the key terminal through which inter and intra district buses moves at different parts of the district and the country. It is situated at the south side of the Pourashava Bhavan as well as near the Zero Point of Sonapur where the Dhaka-Noakhali national highway and regional highways are intersects with each other. The Sonapur Bus Terminal is located on the Sonapur-Char Jabbar regional highway and near the Zero Point which is connected with all other routes passess through the Pourashava. Four major inter-district routes through which the buses move to different districts include Noakhali-Comilla-Dhaka, Noakhali-Feni, Noakhali-Laxmipur and Noakhali-Chittagong. The local buses move from Sonapur Poura Bus Terminal to different routes which include Sonapur to Char Alekgendra of Laxmipur, Sonapur to Ramgoti of Laxmipur, Sonapur to Chairmanghat of Hatiya through CharJabbar, Sonapur to Chairmanghat of Hatiya through Noakhali Science and Technology University, and Sonapur to Akhtarmiyar hat.

there are about 321 inter-districts buses, 117 intra-district buses, 200 trucks, 500 pick-ups, 150 dump trucks, 1000 private cars, 20 raiders, 5000 CNG driven auto rickshaws, 1000 easy bike or auto rickshaws, 5000 motor cycles, 2000 motorized rickshaws, 200 man-driven vans and 200 vans

engaged in providing transportation services to the people of the Pourashava and surrounding areas. It is expected that it will serve the increasing demand of future increased population and around 20000 people per day will travel through this bus terminal after its completion.

Further, the Pourashava is the owner of the land and presently using the bus terminal with old and damaged infrastructure and facilities. In fact, after completion of the sub-project, a well-designed structure will facilitate a modern user friendly bus terminal where all the essential facilities for both bus operators as well as passengers (male, female and disabled) will be available. Thus a passenger or a bus operator who will come for travel will enjoy modern facilities and traffic congestion free movement. Moreover, it will create an employment opportunity through jobs and business facilities in the bus terminal areas and within the Pourashava. The Pourashava will also get huge revenue from the proposed bus terminal. Hence, considering the overall benefits, the construction of the proposed bus terminal is justified and will be one of the key income generating establishments for Noakhali Pourashava.

Objective of the study: The general objective of the study is to determine the major environmental impacts that might be happened due to the implementation of the subproject and to recommend possible mitigation measures to avoid or reduce identified adverse environmental impacts and to enhance positive impacts. The specific objectives include:

- Identifying existing environment condition at the sub-project areas for environmental components viz. air, noise, water, land, soil, biological and socio-economic aspects;
- Prediction and evaluation of positive and negative impacts that may result from the proposed sub-project;
- Undertaking public consultation and disclosure of project-related information;
- Formulation of an environmental management plan (EMP) to eliminate or minimize the adverse impacts of the project on the surrounding environment and affected communities;
- Preparing occupational health and safety to minimize any accident or emergency situation;
- Proposing plans for the post project monitoring, ongoing consultation and disclosure, EMP implementation, and institutional arrangement/organizational arrangement; and
- Suggestion and recommendation for abatement/mitigation/management measures to ensure environmental, biological, health and social compatibilities and also to comply with the National Environmental legal requirements and national Environmental Quality standards.

Methodology of the study: This is a qualitative study. However, both quantitative and qualitative data are collected and analyzed to achieve the objective of the study and show the baseline information of the study areas. Quantitative data are collected from secondary sources and qualitative data are collected from primary sources using different qualitative approach and methods. The approach and methods those are applied during the assessment include: (i) Consultation with stakeholders and community people; (ii) Focus Group Discussion; and (iii) Field visit and observation.

Findings of environmental impact assessment: The **environmental screening, field observation** and **community consultation** have identified that the proposed bus terminal has an insignificant ecological impact as few trees to be felled down and no vegetation need to be cleared and impact on aquatic environment at the surrounding areas might be moderate as leakage of oils, grease and fuels may washed out to the nearby water bodies. However, the impact will be minimized by constructing storm drain all around the bus terminal which will be connected with main drainage system of the Pourashava.

The bus terminal may have temporary and localized negative impact on physicochemical environment during construction and operational phases due to dismantling of existing structures, movement of vehicles and using of different machines for piling, welding and drilling. It is anticipated that the air pollution and water logging will be insignificant due to taking necessary measures and existing drainage system. However, the noise pollution, water pollution, solid waste pollution and construction waste might have moderate level of impact on the environment due to use of heavy machines, spillage of oil and lubricant to nearby water bodies due to washing and cleaning of buses, generation of waste due to scrap, spare parts, tires and tube, battery and filter replacement, residuals of food packaging materials and debris from dismantling of damaged structures etc during construction and operational phases. The subproject might have negative socio-economic impact due to traffic congestion and health and safety issues of workers and labors during construction phase. However, it will create employment opportunity. There is no archaeological and historical place within the subproject influence areas.

In addition, the bus terminal has a positive impact on the community people by creating employment opportunity during construction and operational phase. It will create employment opportunity by engaging as labor, and shop owner and shop keepers in shops to be operated within the bus terminal. In addition, local people may install different types of shops at the surrounding areas of the bus terminal to meet the demand of the passengers travelling through the bus terminal. The bus terminal will ease the transportation facilities for the community people who will have to move different sub-districts and main town for service, trade and business and others daily needs.

Conclusion and recommendations: On the basis of the overall environmental analysis, it may be concluded that the attitude of the community people towards the construction of the Sonapur Poura Bus Terminal is positive and the subproject stands environmentally sound and sustainable when the recommended mitigation measure and environmental management processes are adopted properly. The adverse environmental impacts from the project will mostly take place during the construction stage. The benefits of the subproject will be significant by creating employment and business opportunities during the construction and operational phases. There is no significant cumulative adverse impact during operation that is identifiable at this stage. However, following key recommendations are made for smooth construction and successful operation of the bus terminal**:**

- All general components of a bus terminal mentioned in the report should be considered at the design stage to ensure maximum facilities and services at the terminal area.

- A well-defined solid waste collection and disposal system should be in place at the bus terminal.
- All waste water should be discharged to the municipal sewer system. In the absence of such system in the vicinity of the terminal the septic tanks should be constructed.
- No servicing of vehicles and refueling should be allowed inside the premises of the terminal. For any emergency repair, special bays should be provided.
- An oil and fuel spill contingency plan should be prepared.
- Fire prevention and fighting equipment should be provided and maintained as well as terminal staff should be trained in fire prevention and fighting.
- Vehicles should not be allowed to park with their engines are running.
- The entire area of the bus terminal, driveways and parking lots should be paved.
- Landscaping and plantation should be undertaken to improve the aesthetic quality of the bus terminal.
- Encroachment of outside terminals should be prevented to ease the pressure on traffic.
- Bus terminal should have facilities for washing, prayer, toilet, waiting, shopping, meals and snacks.
- Contractor will ensure availability of the PPEs and first-aid box, water supply and sanitation facilities to the workers.
- The surrounding people should be informed about the construction and operation of the bus terminal.
- Above all, the EMP should be followed and mitigation measures should be monitored as per EMP and monitoring plan.

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ABBREVIATION

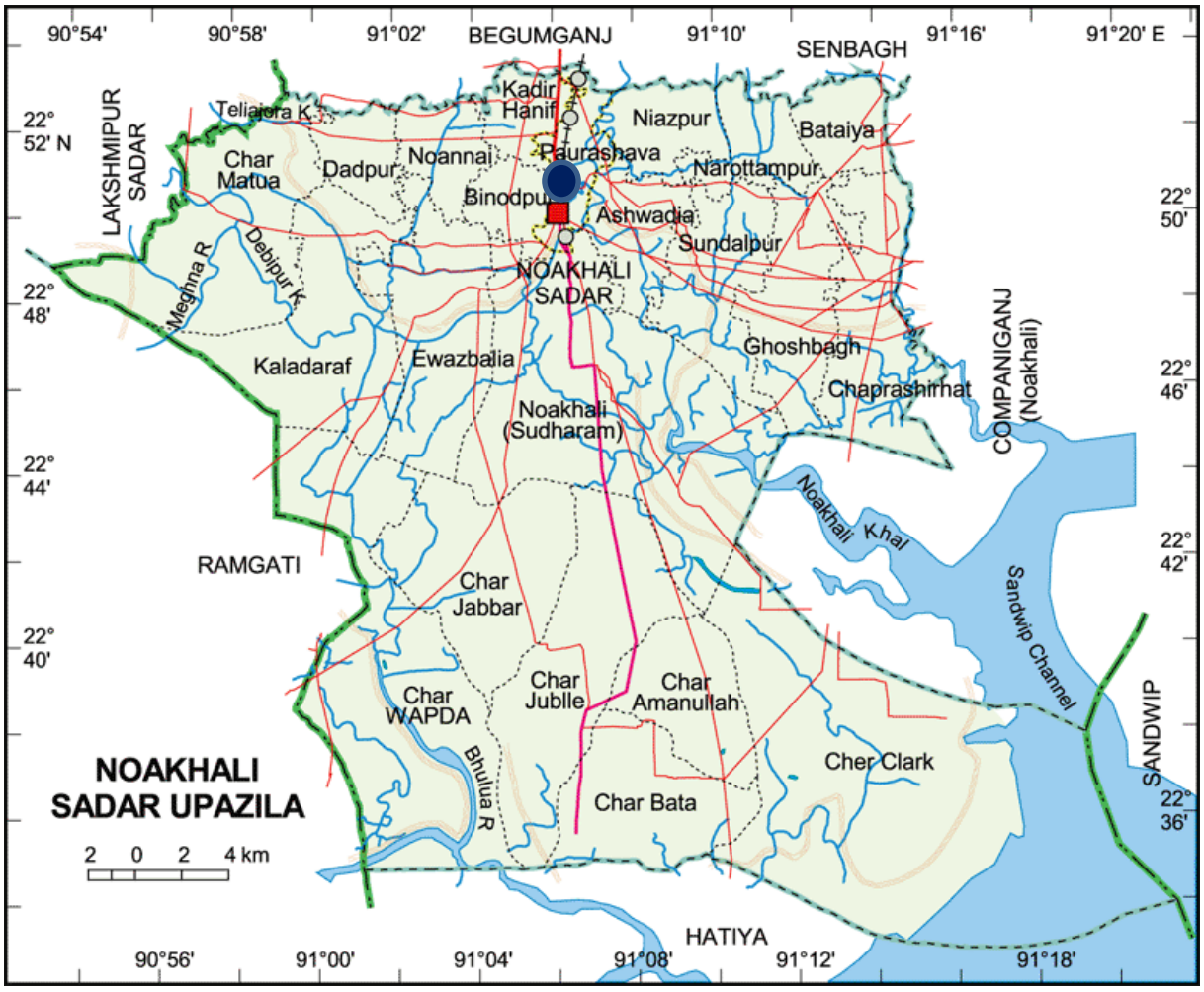
AP	Affected People
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BMDF	Bangladesh Municipal Development Fund
BOQ	Bill of Quantity
CIP	Capital Investment Plan
DOE	Department of Environment
ECA	Environmental Conservation Act
ECoP	Environmental Code of Practice
ECR	Environmental Conservation Rules
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ES	Environmental Screening
FGD	Focus Group Discussion
GOB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GW	Ground Water
HBB	Herringbone Bond
IUCN	International Union for Conservation of Nature
MD	Managing Director
MGSP	Municipal Governance and Services Project
NGO	Non-Governmental Organization
OP	Operational Policy
PIU	Project Implementation Unit
PMU	Project Management Unit
PPE	Personal Protective Equipment
RCC	Reinforced Concrete Cement
SPW	Supply Water

ULB	Urban Local Body
WB	World Bank

1. INTRODUCTION

1.1 Background of the Pourashava and the Sub-project

The Noakali Pourashava is situated within the Noakhali Sadar Upazilla under Noakhali district and at the southern part of Bangladesh. It is 187 km far from the Capital city if Bangladesh. It lies on 23º17′ north latitude and between 89º55′ and 90º06′ east longitude. The total area of the Pourashava is 17.11 kilo meters (km). The Pourashava is divided into nine Wards and 36 Mahallas. It is surrounded by Begumganj and Senbagh Upazillas at the north, Hatia Upazilla at the south, Companyganj and Sandip Upazillas at the east, and Ramgoti Upazilla of Laxmipur district at the west. It was established in 1876 and declared as "A" class Pourashava in 1989. The ancient name of Noakhali was Bhulua.



Map 1: Geographical location of Noakhali Pourashava

According to the sources of the Pourashava, the total population of this Pourashava is 107654 with a population density of 6292 per square kilometre (sq. km). The male and female ratio of the Pourashava is 100:99. The average size of the household is 5.

As a "Category A" Pourashava as well as the main town of the Noakhali Sadar Upazilla as well as Noakhali district, the Noakhali Pourashava has been improving its infrastructural development for ensuring the necessary services to its inhabitants and taking new initiatives to meet the growing demand of the people. Recently, the Pourashava has prepared its Capital Investment Plan (CIP) for its infrastructural development following a participatory approach with the technical assistance from Bangladesh Municipal Development Fund (BMDF) and identified the "Construction of Poura Bus Terminal with Renovation Work of Terminal Building" as a one of the priority works (CIP No.102) for ensuring smooth and easy communication of all people who are living in different parts of the Pourashava as well as the people of greater Noakhali using the Bus Terminal as a transit point. The proposed Bus Terminal is situated at the south side of the Pourashava and 7 km far from the Pourashava Bhavan.

The Pourashava has already submitted an application for sub-credit to BMDF seeking financial support in constructing the Poura Bus Terminal. The significant features of the subproject are given in **Table 1-1** as below:

Table 1-1: The significant features of the proposed subproject	
Name of the Sub-Project	Construction of Poura Bus Terminal with Renovation Work of Terminal Building
Name of District	Noakhali
Name of ULB	Noakhali Pourashava
Location of the Bus Terminal	Sonapur under Ward # 08 of the Pourashava.
Service Areas	Primarily, the total Pourashava and Upazilla area, But, ultimately, different Upazillas of Noakhali, Feni and Laxmipur districts.
Types of Vehicles	321 inter-district buses, 117 intra-district buses, 200 trucks, 150 dump trucks, 500 pick-ups, 20 raiders, 5000 CNG driven auto rickshaws, 1000 easy bikes, 1000 micro-bus/private cars and 2000 motorized rickshaws move through this bus terminal. (Source: KII and Traffic survey 2018)
Structural Design Option	RCC frame structure design.
Total Land Area	3.4 acres
Land Acquisition	Noakhali Pourashava is the legal owner of the land.
Estimated Cost	BDT 100 millions

Subproject duration	15 months
Tentative Starting date	October 2018
Tentative Completion date	December 2019

1.2 Justification of Selecting the Subproject

The transportation system of Noakhali Pourashava is mainly dependent on road and railway system. Transportation through water system is not available within this Pourashava area. The road system is the main communication system of the Pourashava by which the Pourashava is connected with different sub-districts and districts of greater Noakhali. Noakhali Pourashava is the head quarter as well as the main center of trade and business of Noakhali district. It also serves as the main town of administrative work and other public services and facilities of the people. The proposed subproject named Sonapur Poura Bus Terminal is the central bus terminal of the Pourashava as well as the key terminal through which inter and intra district buses moves at different parts of the district and the country. It is situated at the south side of the Pourashava Bhavan as well as near the Zero Point of Sonapur where the Dhaka-Noakhali national highway and regional highways are intersects with each other. The Sonapur Bus Terminal is located on the Sonapur-Char Jabbar regional highway and near the Zero Point which is connected with all other routes passess through the Pourashava. Four major inter-district routes through which the buses move to different districts include Noakhali-Comilla-Dhaka, Noakhali-Feni, Noakhali-Laxmipur and Noakhali-Chittagong. The local buses move from Sonapur Poura Bus Terminal to different routes which include Sonapur to Char Alekgendra of Laxmipur, Sonapur to Ramgoti of Laxmipur, Sonapur to Chairmanghat of Hatiya through CharJabbar, Sonapur to Chairmanghat of Hatiya through Noakhali Science and Technology University, and Sonapur to Akhtarmiyar hat.

There are about 321 inter-districts buses, 117 intra-district buses, 200 trucks, 500 pick-ups, 150 dump trucks, 1000 private cars, 20 raiders, 5000 CNG driven auto rickshaws, 1000 easy bike or auto rickshaws, 5000 motor cycles, 2000 motorized rickshaws, 200 man-driven vans and 200 vans engaged in providing transportation services to the people of the Pourashava and surrounding areas. It is expected that it will serve the increasing demand of future increased population and around 20000 people per day will travel through this bus terminal after its completion.

Further, the Pourashava is the owner of the land and presently using the bus terminal with old and damaged infrastructure and facilities. In fact, after completion of the sub-project, a well-designed structure will facilitate a modern user friendly bus terminal where all the essential facilities for both bus operators as well as passengers (male, female and disabled) will be available. Thus a passenger or a bus operator who will come for travel will enjoy modern facilities and traffic congestion free movement. Moreover, it will create an employment opportunity through jobs and business facilities in the bus terminal areas and within the Pourashava. The Pourashava will also get huge revenue from the proposed bus terminal.

Hence, considering the overall benefits, the construction of the proposed bus terminal is justified and will be one of the key income generating establishments for Noakhali Pourashava.

1.3 Policy Legal and Administrative Framework

There are some environmental laws and regulations under the environmental legal framework of Bangladesh for environmental protection and natural resources conservation. In addition, there are also some safeguard policies of World Bank to prevent and mitigate undue harm to people and their environment in the development process. All the subprojects to be prepared and implemented under the BMDF should be in compliance with these environmental laws and policies of Bangladesh and World Bank. The proposed subproject will also be prepared and implemented in compliance with these laws and policies. The environmental laws and regulations of Bangladesh and the safeguard policies those are applicable to this subproject are given as below:

National Environmental Laws and Regulations:

- National Environmental Policy 1992
- Bangladesh Environmental Conservation Act (ECA) 1995 amended 2002
- Environmental Conservation Rules (ECR) 1997 amended 2003
- National Land-use Policy 2001
- Bangladesh Labor Action 2006
- Bangladesh National Building Code

World Bank Safeguard Policies:

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitats
- OP/BP 4.11 Physical Cultural Resources

Now, as per the environmental management framework of BMDF, it is required to conduct an environmental impact assessment of the proposed bus terminal in accordance with the legal regulatory framework of the Government of Bangladesh and World Bank policies. Therefore, the Noakhali Pourashava has deployed an individual consultant to carry out the environmental impact assessment of the proposed bus terminal as a subproject.

2. OBJECTIVE AND METHODOLOGY

2.1. Objective of the Study

The general objective of the study is to determine the major environmental impacts that might be happened due to the implementation of the subproject and to recommend possible mitigation measures to avoid or reduce identified adverse environmental impacts and to enhance positive impacts. The specific objectives include:

- a detailed portrayal of the existing environment condition at the sub-project areas for environmental components viz. air, noise, water, land, soil, biological and socio-economic aspects;
- prediction and evaluation of positive and negative impacts that may result from the proposed sub-project;
- consideration of alternatives;
- undertaking public consultation and disclosure of project-related information;
- grievance redress mechanism;
- formulation of an environmental management plan (EMP) to eliminate or minimize the adverse impacts of the project on the surrounding environment and affected communities;
- preparing occupational health and safety to minimize any accident or emergency situation;
- proposing plans for the post project monitoring, ongoing consultation and disclosure, EMP implementation, and institutional arrangement/organizational arrangement;
- Obtaining approval from the World Bank and DOE; and
- Suggestion and recommendation for abatement/mitigation/management measures to ensure environmental, biological, health and social compatibilities and also to comply with the National Environmental legal requirements and national Environmental Quality standards.

2.2. Scope and Methodology of the Study

2.2.1. Scope of the study

This study includes different dimensions of environmental issues those need to be considered at different stages of selecting, implementing, and operating the subproject following the environmental policies of Government of Bangladesh and World Bank. Addressing the environmental issues in this subproject includes a series of tasks to be carried out by the study. The scope and methods of this Environmental Assessment includes:

- Baseline Survey data acquisition of the baseline both environmental and social to carry out the Environmental Assessment;
- Understanding the technical aspects of the proposed sub-project through gathering and analyzing primary and secondary data;

- Explore the present environment condition of subproject influence areas through reconnaissance survey and in consultation with community people;
- Identification of potential environmental impacts and evaluating the consequences through using given environmental screening format;
- Categorize the pollutions that may come out during pre-construction, construction and operation phases at subproject site and surrounding areas through key informant interview and field observation;
- Discuss with the people living in the sub-project area about the mitigation measures suggested to avert the negative environmental impacts and to enhance the positive environmental impacts through stakeholders' consultations and general public consultation; and
- Assess the institutional aspects, and develop Environmental Management and Monitoring Plan for the subproject in consultation with Mayor and other PIU members , and based on the findings of the study.

2.2.2. Methods of the study

The study is qualitative in nature and different qualitative methods are used to gather information. Both primary and secondary information are collected, analyzed and used to fulfill the requirements of the study. The primary information is collected following qualitative technique as given below:

- Consultation with stakeholders and community people;
- Key Informant Interview;
- Focus Group Discussion; and
- Field visit and observation.

Consultation with stakeholders and community people: Consultative meeting with different stakeholders such as Ward Councilors, representatives of Bus Owners' Association, representatives of Workers' Association, civil society members, representatives of business men surrounding the bus terminal, community leaders and representative of community people is done to exercise the environmental screening using prescribed form of BMDF and filled in the screening form as per their information and opinion. Before starting the screening exercise, the participants are informed about the details of the project information and the way of implementing the subproject.

Key Informant Interview: In-depth interviews are done with Line Man of the bus terminal and Ward Councilor of the respective Ward where the bus terminal is situated and with the Mayor to know about the rationale of selecting the site, types of vehicles hauling through the bus terminal, numbers of travel agencies have been getting services from the bus terminal and numbers of

different types of vehicles of the travelling agencies are deployed for carrying passengers through this bus terminal.

Focus group discussion: Two focus group discussions (FGD) are organized separately with male community participants and female community participants, mainly the people who are residing adjacent to the proposed subproject to know their attitudes towards the proposed subproject, its potential impact and their feedback, and suggestions on mitigating the potential negative impacts and enhancing the positive impacts of the subproject.

Field visit and observation: Field visit and observation of different environmental features are done by the consultant to understand the overall environmental situation of the subproject areas and the potential impacts of the subproject on it during pre-construction, construction and operational stages.

In addition, some quantitative information is collected from secondary sources to complement the qualitative information. The secondary information is collected by reviewing national, district and Pourashava level document and different websites.

3. SUBPROJECT DESCRIPTION

3.1. Name of the Subproject

The name of the subproject is "Construction of Sonapur Poura Bus Terminal with Renovation Work of Terminal Building".

3.2. Brief Description of the Subproject

The proposed subproject named "Construction of Sonapur Poura Bus Terminal with Renovation Work of Terminal Building" is situated at Sonapur area under the Ward No. 08 of Noakhali Pourashava and at the southern side of the Pourashava. It is located near the Zero Point where the Noakhali-Dhaka national highway and regional highways such as Sonapur-Hatiya, Sonapur-Kabirhat-Basurhat-Companyganj and Sonapur-Char Jabbar-Ramgati crossed with each other. It is surrounded by residential areas of Ward Number 8 at the south, vacant land and rice mills at the north, a large ditch and Poura Bazar at the east, and Sonapur-Charjabbar road, a branch of Noakhali khal and residential areas under Ward # 8 at the west. The coordinate of the location of the bus terminal is $22^0 49' 27.2''$ N and $91^0 5' 54.1''$ E.

The total area of the proposed bus terminal is 13800.24 square meters or 3.4 acres. There would be two exit ways and two entry ways for smooth movement of the vehicles and passengers. In addition, at the middle of the terminal, there will be a passengers' drop way. The terminal area will consist of renovated terminal building; 10 ticket counters; space for vehicle movement; dropping area for passengers by rickshaw or other local vehicles; separate parking area for buses, CNG or other auto rickshaw and private car; connecting roads; footpath, street lights and drains; public toilets with separate space for both male (10 toilets, 10 urinal and 10 washing basins) and female (6 toilet with 6 washing basins); 8 shops at two sides of the terminal; 2 restaurants; one workshop and 10 shops for supporting services; solid waste management system; car washing area with waste water treatment facilities; and beautification works.

The proposed subproject will renovate a two-storied bus terminal building having 278.82 square meters each floor size. The floor wise detail of the terminal building is given as below:

Ground floor: The ground floor of the terminal building will include:

- One office room for staff;
- One waiting room and lobby for passengers;
- One cleaners' room;
- One pharmacy;
- Two rooms for association of bus owners and association of labors;
- One Police control room;
- One CCTV control room;
- Electro-mechanical room;
- ATM Booth;
- Firefighting system; and

- Separate two toilets for both male and female with washing basins;

The design of the ground floor is attached as **Annexure 1**.

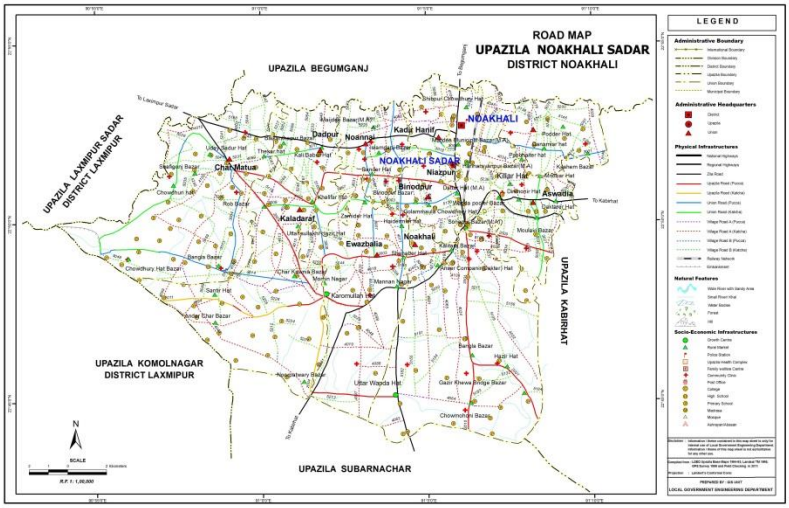
First floor: The first floor of the terminal building will include:

- One hall room for meeting;
- Eight shops including food shop and one tea stall;
- One prayer room for male and another for female;
- Two separate toilets with basin for both male and female;
- One rest room for drivers; and
- Water tank and solar system (5%) at the top of the first floor.

The design of the first floor is attached as **Annexure 2.**

3.3. Location of the Subproject

The proposed Bus Terminal is located at Sonapur area under Ward # 07 of the Pourashava. It is surrounded by residential areas of Ward Number 8 at the south, vacant land and rice mills at the north, a large ditch and Poura Bazar at the east, and Sonapur-Charjabbar road, a branch of Noakhali khal and residential areas under Ward # 8 at the west. The coordinate of the location of the bus terminal is the coordinate of the bus terminal is $22^0 49' 27.2''$ N and $91^0 5' 54.1''$ E.



Map 2: Location map of proposed Poura Bus Terminal

The location map of the proposed bus terminal is given as above.

3.4. Layout of the Subproject

The layout plan of the proposed Bus Terminal is not yet finalized. The layout plan as well as overall design of the Bus Terminal will be developed by the Pourashava in consultation with Design Engineer.

3.5. Ownership of the Subproject Land

The Noakhali Pourashava is the legal owner of the proposed land where the proposed bus terminal will be constructed. No land acquisition is required for constructing the bus terminal.

3.6. Present Condition of the Proposed Subproject's Site

The present condition of the existing bus terminal where the proposed subproject will be implemented is very bad. The bus terminal is situated at the plain land with the same level of the surrounding areas. There is small and non-functional RCC drain at the east side and a small khal owned by the PWDB at the west side of the bus terminal. This khal is also non-functional. Thus, water logging and muddy situation are prevailing all over the bus terminal. The driveways, parking lots and pavement within the bus terminal are made up with herringbone bond and brick bolt, and are out of service due to this water logging and muddy situation. **Picture 1** and **Picture 2** show the condition of the pavement and parking lot.

Picture 1: Present condition of overall pavement

Picture 2: Present condition of parking lots

There is a terminal building at the middle-west side of the bus terminal and there are 46 shops including workshops, wheel shops, spare parts' shops, color shops, tea stalls etc at the end of south side, 16 shops including workshops, wheel shops, hotel, tea stalls at the end of west side, and 6 closed shops at the end of north side of the bus terminal. The **Picture 3** and **Picture 4** show the terminal building and shops within the terminal area.

Picture 3: Existing terminal building

Picture 4: A part of existing shops

There are also 14 trees including coconut, acasia, jhaw, kadam and boroi with the bus terminal. Although the terminal building is moderately good but the septic tank of the toilet, at the east side of the bus terminal is damaged. The **Picture 5** and **Picture 6** depict the exiting condition of the toilet and septic tank. There is a boundary wall at north side of the bus terminal. However, there is no boundary wall at other sides of the bus terminal. Sporadic solid wastes and spillage of oils are found all over the bus terminal areas. Buses are parking here and there within the bus terminal. There is facility for washing the buses at the northern side of the terminal.

Picture 5: Condition of toilet

Picture 6: Condition of septic tank

There are five entry and exit ways at the north-east, north, north-west, west and south-west sides of the bus terminal for the movement of vehicles and passengers.

There is a regional highway named Sonapur-Char Jabbar highway at the west side of the bus terminal through which different vehicles moves to carry passengers and goods. According to a traffic survey conducted for this study shows that at present, on an average, 488 buses, 224 trucks, 302 pick-ups, 149 private cars, 107 lorrys, 853 CNG driven auto rickshaws, 580 motorized rickshaws, 54 raiders, 652 easy bikes, 377 man-driven rickshaw and 261 vans move per day through the road for carrying passengers and goods. This figure is significantly low than the actual number of vehicles moves through the Pourashava and this less movement of vehicles has happened due to the damaged condition of the bus terminal. Again, due to the unsuitable condition of the bus terminal, no vehicles except local buses entered into the bus terminal.

3.7. Key Components of the Subproject

The proposed Bus Terminal design should include the following components:

- Existing capacity and future demand estimation: In addition to operational requirements, terminal planning and designing should also factor in the estimates for existing capacity and future (horizon year) demand. The considerations for redressal of potential short-term and long-term capacity constraints, and future expansion on the basis of estimated horizon year demand should be incorporated early in the planning stage;
- Wide station platform (5 to 6 meter wide) and open air to allow good air circulation;

- Multiple stopping bays (up to 4 buses can stop at the same time);
- Passing Lane to allow overtaking at stations;
- A special gate to allow wheelchair to enter into bus terminal;
- Tactile ground surface indicator/paving for visually impaired users;
- Lane separator with guard-rail;
- Real time passenger information system;
- A large area for parking buses;
- Good pavement quality;
- Sufficient space for bus marking and maneuver area;
- Re-fueling facility;
- Vehicle cleaning and washing system;
- Maintenance and repair area (workshop);
- Administrative office for operators, and employee facilities;
- Ensuring planned and streamlined traffic circulation, and provision of amenities for passengers, rest areas, and other facilities for bus drivers, as well as workshop and workshop space for operators;
- Integrating multi-modal accessibility and feeder infrastructure: Integrating provisions for feeder modes—like cycle rickshaws, auto rickshaws, buses, private vehicles etc.—in the facility design, ensures improved accessibility and conflict free circulation. Planned allocation of space for such modes helps reduce delays, and improves level of service for passengers. The aim is to facilitate seamless transfers, in order to create the impression that the journey is continuous (and without breaks).

Primary elements to be considered with regard to a bus terminal's infrastructure development can be classified for three different user types. These include passengers, terminal staff and bus staff. The elements under each class are given as below:

A. Passenger areas

- Ticketing and queuing;
- Passenger waiting areas;
- Prayer room;
- Passenger conveniences (drinking water facilities and toilets);
- Passenger circulation;
- Boarding/Departing areas;
- Facility entry;
- Tourist information;
- Security, including CCTV cameras and security guards;
- Dormitories and lodging (if required);
- Toilets (Male and Female);
- Concourse;
- Free Wi-Fi facility in waiting area;

- Eateries;
- Baggage trolleys.

B. Areas for terminal staff

- Revenue office;
- Security and information;
- Ticketing booths;
- Resting rooms;
- Staff conveniences (drinking water facilities and toilets);
- Canteen;
- Maintenance staff (chairs and lockers);
- Control room (CCTV surveillance).

C. Areas for bus staff

- Canteen;
- Resting areas;
- Lodging areas (if required);
- Bus staff conveniences (drinking water facilities and toilets).

Bus maintenance Facilities: This relates to the bus maintenance infrastructure at the terminal, and can be classified into two broad categories:

- On site - Maintenance/breakdown facilities are provided inside the terminal boundary. Provisions include reserved parking bays for breakdown vehicles, space for a mini workshop, room for tools etc.
- Off Site – Maintenance/breakdown facilities are not provided inside the terminal boundary but sourced off site, usually to local, privately operated repair workshops in the terminal's vicinity.

3.8. Major Activities of the Subproject

The construction of proposed bus terminal involves a series of activities at different phases such as pre-construction phase, construction phase and operational phase. The key activities to be carried out at different phases are given as below:

3.8.1. Major Activities during Pre-Construction Phase

As the proposed subproject will be implemented at the place of existing bus terminal and there are some damaged structures those need to be removed, so some pre-construction activities will be carried out for preparing the site ready for proposed construction activities. The major pre-construction activities to be carried out are as below:

- Dismantling of existing damaged structures;
- Removal of debris and salvaged materials;
- Removal of existing electric and water supply lines;
- Providing temporary boundary/fencing;
- Providing temporary electric and water supply lines;

- Construction of temporary separate labor sheds for male and female laborers;
- Construction of separate toilet facilities for male and femal laborers and
- Construction of temporary office for supervision of construction activities.

3.8.2. Major Activities during Construction Phase

During the construction phase, following major subproject activities to be carried out:

- Layout of the site;
- Earthwork and excavation;
- Renovation of terminal building with associated civil works;
- Construction of separate toilets for male and female outside of main building;
- Construction of road pavement for passengers;
- Construction of water tank, septic tank and soakage well;
- Construction of solar energy facilities;
- Electricity connection and other ancillary works; and
- Provision for workers' health and safety.

3.8.3. Major Activities during Operational Phase

The major activities to be considered during operational phase are as below:

- Collection and disposal of solid waste;
- Management of waste water and its treatment;
- Maintenance of drainage system;
- Traffic control; and
- Safety and security mechanism.

3.9. Category of the subproject

Environmental Screening (ES) for the Poura Bus Terminal has been conducted with the purpose of fulfilling the requirements of Government of Bangladesh (GOB) and the World Bank (WB). Environmental Screening ensures that environmental issues are properly identified in terms of extent of negative and positive impacts. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework (EMF) of the MGSP, was administered for identifying the impacts and their extents.

- According to ECR 1997: Green □ Orange A □ **Orange B** □ √ Red □ Not Listed □
- According to WB classification: **Category B** □ √ Category C □

The name of Bus Terminal is not mentioned in any category in the ECR 1997 of DoE. Considering the environmental impacts, the construction of Poura Bus Terminal can be considered as Orange B as per ECR-97*(Multistoried Commercial Building)*. According to the WB classification, it is of Category B.

3.10. Analysis of alternatives

The analysis of alternative of the subproject is done from three main perspectives such as location, design and technology or method of construction. The analysis of alternative of the subproject is given as below:

(a) Analysis of alternative location

Table 3-1: Analysis of alternative location

Location	Advantage	Disadvantage
Alternative 1: Poura Bus Terminal, Maijdee.	▪ Situated at the middle of the Pourashava area. ▪ Capacity of holding 20-30 buses.	▪ The land of the bus terminal is not owned by the Pourashava. ▪ Inadequate space for holding required vehicles. ▪ Heavy traffic congestion will happen. ▪ There is a chance of acquiring the land of the bus terminal during the construction of proposed 4-laned road. ▪ Land acquisition will be required, if want to extend the area but the Pourashava has no capacity of compensate the affected people.
Alternative 2: Poura Bus Terminal, Sonapur	▪ Located at the northern side of the main town. ▪ Has been using as existing central bus terminal. ▪ Have adequate size of land for vehicle movement and other necessary facilities. ▪ Capacity of holding 400-500 buses. ▪ No need to move the vehicles through main town which will reduce traffic congestion. ▪ No land acquisition is required.	▪ Inhabitants of the main town of the Pourashava have to travel by local vehicles to go to the bus terminal.

- No need to construct any bypass to avoid traffic congestion at the main town.
- No replacement is required.
- The land is owned by the Pourashava.

Selected location: Considering the above situation, the Pourashava Authority has selected the Alternative 2.

(b) Analysis of alternative design: A user-friendly design is required for the constructing of bus terminal at any locations of the Noakhali Pourashava. The proposed mixed RCC frame structure and herringbone bond (HBB) pavement design will cover all the expected facilities as desired by Noakhali Pourashava.

(c) Analysis of alternative technology or method of construction: Reinforced Concrete Cement **(**RCC) construction costs are higher than herringbone bond (HBB). On the other hand, during repairing of RCC work at bus terminal premises will take longer time than the HBB option. HBB terminal will have low cost and will take less time for repairing than RCC. However, the proposed bus terminal will have a multi-storied terminal building and pavements, so mixed structure (RCC and HBB) is prepared.

(d) No subproject scenario: If subproject like proposed POura Bus terminal is not implemented, the existing traffic congestion in the bus terminal area will further aggravated with time. The proposed bus terminal, locating at the northern side of the Pourashava and adjacent to the Sonapur-Char Jabbar regional higway, will serve as key transportation point of all parts of the Pourashava, Noakhali Sadar Upazzilla, and Noakhali and surrounding districts. The absence of suitable bus terminal is severely affecting the transportation of people and goods within the Pourashava as well as the other Upazilas / Districts from all other parts of the region.

(e) Conclusion: The Poura Bus Terminal at the end of the northern side of the Noakhali Pourashava is then finally selected by the Noakhali Pourashava authority.

3.11. Estimated cost of the subproject

The estimated cost of the proposed Poura Bus Terminal is BDT 100 million.

3.12. Schedule of implementation

The proposed subproject will be started on October 2018 and will be completed by the end of December 2019. Therefore, the subproject will be implemented within a period of 15 months.

4. BASELINE ANALYSIS OF ENVIRONMENTAL CONDITION

4.1. Physicochemical Environment

4.1.1.Important environmental features

Important environmental features in influence areas (1 km around the subproject site) were observed through field observation. Detail observation and assessment were made on identified key environmental features like drainage congestion, waste water discharge, solid waste disposal and management, water contamination, air pollution, soil degradation, odor spreading around and traffic movement etc. in and around the catchment or influenced areas of the sub project. Moreover, land use pattern of the influence areas were also observed and found human settlement, offices, commercial establishments, health care facilities, educational institutions, landfill, ponds and agricultural lands as depicted **Table 4-1** as given bellow. As an essential ingredient, an engineering and topographical survey was done which might require minor adjustment during the construction phase.

Table 4-1: Land use and important environmental features around the proposed Bus Terminal

Sides/Direction	Important Environmental and Infrastructural Features
North	Sonapur Degree College and Pond of the college; Bus Depot of BRTC; Sonapur Islamia Madrasa, Mosque and Pond; Sonapur Public Library; Sonapur Police Lines; Sonapur Karamotia Madrasa; Office of Jilla Parishad; Guest House of Jilla Parishad (Dakbanglo); Sonapur Collegiate School; Residential Areas; Jilla Parishad Khal; Sonapur Ahmadia School; Maijdee-Sonapur Main Road; Ponds; and Agricultural lands.
West	Sonapur Petrol Pump; Residential areas; Second Diversion Road; Kalitara Bazar; Nuria School; Nuria Mardasha; Brother Andra High School; Katholic Milon Church; Kalitara Muslim Girls School; Residence of Christian people; and Agricultural lands.
South	Sand field and residential areas; Mohabbatpur Jamme Mosjid; Khal adjacent to Embankment; Sonapur-Char Jabbar Road; D. Afroz Sweater Factory; Kalijaba-Bhabaniganj Road and adjacent Khal; Animal Hospital; Old Mayor Quarter Road; Royal Hospital; Prone Hatchery; Pool of Income Chowdhury; and Agricultural lands.
East	Sonapur-Science&Technology University Road; Sonapur-Kabirhat Road; Sonapur Poultry Farm; Sonapur Railway Station; Residential Areas; Sonapur Embankment; Madhyam Karimpur Government Primary School; Sonapur Ohab Calony; Sonapur-Banglabazar Road and Adjacent Khal;

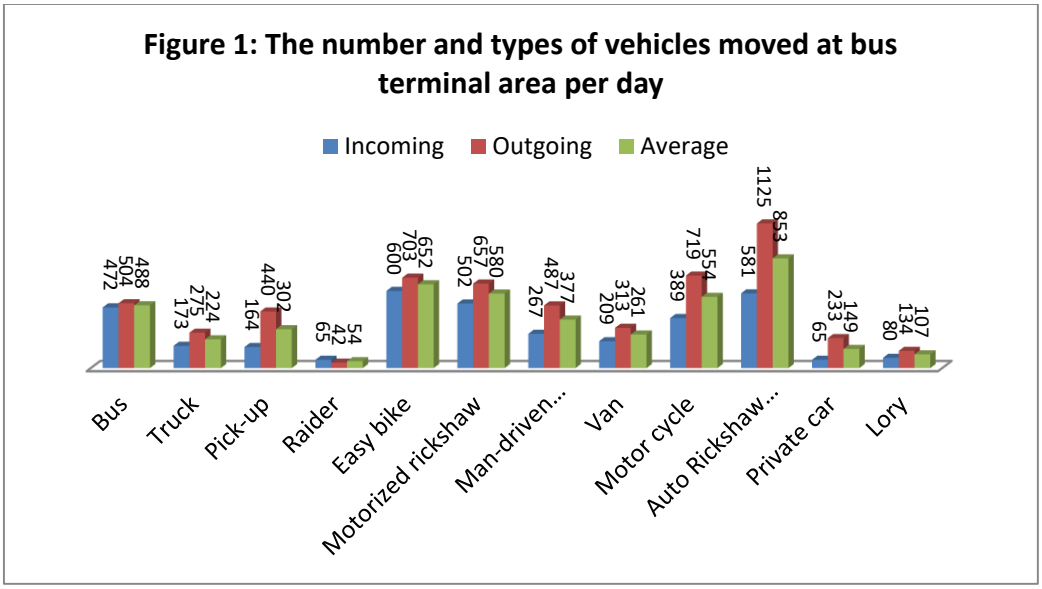
Sonapur-Kabirhat-Companyganj Road; Ponds; Agricultural Lands; Madarasas; and Mosques.

4.1.2. Transportation facilities, road network and traffic volume

According to the Master Plan and Pourashava sources, the Noakhali Pourashava contains all possible traffic routes except airway. The railway and water way traffic have their unique nature and distribution. There is one rail station, named maijdee Court, at the north-western side of the Pourashava and about one kilometer (km) far from the Pourashava Office. Another railway station is situated at Sonapur. There is 6 km railway line within the Pourashava that passes from north-south direction of the Pourashava. The water way has mainly connected Noakhali Pourashava with Hatiya and Sandip through Chairmanghat area. There are two bus terminals within the Pourashava areas named Noakhali Bus Terminal and Sonapur Poura Bus Terminal as well as the central bus terminal of the Pourashava. The Noakhali Bus Terminal is situated on the Dhaka-Noakhali Highway and passes through the main town. This national highway is bifurcated and one of the routes goes to Maijdee and another goes to Sonapur. On the other hand, the Sonapur Bus Terminal is located on the Sonapur-Char Jabbar regional highway and near the Zero Point which is connected with all other routes passess through the Pourashava. Four major inter-district routes through which the buses move to different districts include Noakhali-Comilla-Dhaka, Noakhali-Feni, Noakhali-Laxmipur and Noakhali-Chittagong. The local buses move from Sonapur Poura Bus Terminal to different routes which include Sonapur to Char Alekgendra of Laxmipur, Sonapur to Ramgoti of Laxmipur, Sonapur to Chairmanghat of Hatiya through CharJabbar, Sonapur to Chairmanghat of Hatiya through Noakhali Science and Technology University, and Sonapur to Akhtarmiyar hat.

According to the Pourashava sources, the length of the total road of the Pourashava is 196 km amongst which 60 km is bituminous carpeting road, 40 km is cement concrete road, 3 km is herringbone bond road and 93 km earthen road. Besides, the Pourashava has 6 km footpath, 3 bridges and 95 culverts.

Both motorized and non-motorized vehicles are operated in all the roads of the Pourashava. According to key informant interviews (KII) and Pourashava sources, both motorized and non-motorized vehicles carries passengers and goods within and out of Pourashava, and there are about 321 inter-districts buses, 117 intra-district buses, 200 trucks, 500 pick-ups, 150 dump trucks, 1000 private cars, 20 raiders, 5000 CNG driven auto rickshaws, 1000 easy bike or auto rickshaws, 5000 motor cycles, 2000 motorized rickshaws, 200 man-driven vans and 200 vans engaged in providing transportation services to the people of the Pourashava and surrounding areas. **Figure 1**, given as below shows the information of traffic survey at a glance:



4.1.3. Climate

The climate of the Noakhali Pourashava is represented by the climate of Noakhali district. Noakhali has pronounced tropical climate and it has significant rainfall at most months, with a short dry season. In Noakhali, the average annual temperature is 25.6 °C and the average annual rain fall is about 3,302 mm. With an average of 40.6 °C, May is the warmest month. At 19.5 °C on average, January is the coldest month of the year. The driest month is January with 8 mm of precipitation. In July, the rainfall reaches its peak, with an average of 671 mm. (Source: https://en.wikipedia.org/wiki/Noakhali_District#Climate, dated on 15 June 2018)

4.1.4. Topography and drainage

The Noakhali Pourashava is mainly medium highland excepting some low lying strips including canals. Generally much of the Pourashava area is under agricultural area characterized by crop production. However, a significant portion of it is urbanized with scattered clusters. Here, the road level is not very high than the surrounding areas except national and regional highways passing through the heart of Noakhali Pourashava. The height of the road varies from 1 meter to 3 meters compared to the adjacent lands. Land level survey shows that almost all areas of the Pourashava has an average RL of 3.75 mPWD. These areas are free from normal flood. The lowest spot height is +1.81 mPWD and the highest spot height is +9.45 mPWD in Noakhali Pourashava. Average land height of the Pourashava is +3.75 mPWD.

The drainage network system of the Pourashava can be classified into three tiers such as primary drain, secondary drain and tertiary drain. The primary drainage system comprises the natural khals, and regional and major rivers. The Meghna and the Dakatia rivers along with natural khals mainly Noakhali khal (east side of the Pourashava), Gabua khal (north side of the Pourashava), Chagalmara khal(middle part of the Pourashava), Fakirpur khal and Islamia khal (west side of the Pourashava) and WAPDA Khai (south side of the Pourashava) are assumed as primary drainage

network of the Pourashava. The secondary drainage system consists of large open bricks or RCC drains, storm sewers,, small canals and other structures which operate as intermediate mechanisms to deliver storm water from the tertiary drainage systems to the primary drainage system. The number of secondary drains in Noakhali Pourashava is very few. These drains don't serve the purpose of secondary drains. The size and length are insufficient to carry storm water of Noakhali Pourashava. The tertiary drain carry run-off or storm water from different areas of the Pourashava. These drains are constructed and maintained directly by the Pourashava. The Noakhali Pourashava has 63.62 km drainage network to discharge the run-off or storm water to natural drainage system. (Source: Master Plan 2013 and Pourashava Data, 2018)

4.1.5. Geology and soil

The Tripura Hills of India that spurs project into the east of the Noakhali district are of upper primary (Pleistocene) formation and generally of dull reddish color. Unconsolidated sediments underlie the rest of the district. They are mainly recent and sub recent in age. The major part of the new flood plain sediment was deposited by the old Brahmaputra River that charged its course to the west of the Madhupur Tract some 200 years ago. The rest of the sediments were laid down principally by the Meghna River and by minor rivers draining from the Tripura Hills. Silt and clay sized particles predominate in most sediment. The Noakhali Pourashava has recent tidal sediments that are mainly silty in nature.

Almost all soils have young alluvial sediments of recent origin. The soil consists admixture of sand and clay in varying proportions. They occupy very gently undulating topography consisting of broad low flood plain ridges and shallow basins. Most ridge soils are silty which occur clays in the basins. The soils are seasonally flooded, mainly by rain water, but all, except a few basins, soils become dry during the summer. The range from olive to dark grey in color and most are finely mottled, but mainly become acid when dry. Lower layers are mainly neutral to moderately alkaline in reaction with young tidal sediments and soils in the south and south-west are slightly calcareous and some are saline to vary degree. All soils appear to be rich in weather able minerals.

4.1.6. Hydrology and water resources

There are a numbers of small khals within the Noakhali Pourashava that drains out the storm and other water generated from households and commercial establishments. The khals are Noakhali khal, WAPDA khal, Gabua khal, Chagalmara khal, Fakirpur khal and Islamia khal which act as the natural drainage of the Pourashava. These khals are linked with Bay of Bengal through Dakatia and Meghna rivers. Most of the portions of the khals have lost their navigability due to sedimentation and narrowing by unauthorized encroachments. (Source: Master Plan of Noakhali Pourashava, 2013)

4.1.7. Air quality and dust

The Noakhali Pourashava is the main town of Noakhali district and many activities are performed inside the Poura areas. It remains very busy all the time of the day. The bazar and the market places

remain over crowded in most of the time of the day. The profile of the Pourashava is mainly urban area, which has mix of semi-densely settlements and commercial areas. The major sources of air pollution noted within the area include normal vehicular pollution in roads as well as commercial activities, and domestic emissions. In some areas, poultry and livestock farming is observed that causes air pollution. Further, brick field is found in these areas. Energy supplies are not good in the area, and therefore, diesel-fired small power generating sets are common in the urban areas of the study area. The catalytic converter should be used in buses, trucks and others. CNG should be used instead of Petrol and other fossil fuels.

4.1.8. Noise level

Noakhali Pourasshava is a mixed area of residential, administrative and commercial establishments. Although, there are many sources of noise which include industries, construction works and indiscriminate use of loud speakers, motorized traffic is the principal source of creating noise in urban areas. With the increase in the number of motorized vehicles in the city, the hazard of noise pollution has increased and exceeded the level of tolerance. The more noisy areas are Sonapur bus terminal, Noakhali bus terminal, bazar areas, rail stations, and DC office morh. In these locations, traffic congestion is very high which creates noise pollution in the town. As a part of the baseline study, noise level measurement was done at different locations inside and around the proposed Sonapur Poura Bus Terminal areas. The purpose of ambient noise level measurement is to determine sound intensity at the subproject locations. Noise level measurement was performed during daytime with a sound level meter. The 2-minute continuous noise level measurements were carried out at the selected locations in 'A' weighting and slow response mode with 1 sec interval, and the average noise levels (L_{ave}) as well as the maximum noise levels (L_{max}) were determined. **Table 4-2** and **Table 4-3** show the summary of noise level measurements carried out in different locations in and around the study area during daytime and nighttime respectively. The tables also show the Bangladesh noise level standards for mixed areas during daytime and nighttime.

Table 4-2 : Noise level measurements during daytime at the selected locations of the bus terminal

Noise level measurement locations	GPS Co-ordinate	Day-time		Bangladesh standard for mixed areas (dBA),L_{max}
		Average Noise level (dBA),L_{ave}	Maximum Noise level (dBA),L_{max}	
Outside of Bus Terminal (North)	$22^0 49' 27.2''$ N $91^0 5' 54.4''$ E	59.95	74.9	60
Outside of Bus Terminal (South)	$22^0 49' 26.4''$ N $91^0 5' 56.6''$ E	49.5	64	60
Outside of Bus Terminal (East)	$22^0 49' 33.2''$ N $91^0 5' 56.6''$ E	52.75	67.5	60
Outside of Bus Terminal (West)	$22^0 49' 26''$ N $91^0 5' 54.3''$ E	66.85	85.7	60
Inside the Bus Terminal	$22^0 49' 27.2''$ N $91^0 5' 54.1''$ E	63.45	73.9	60

Source: Field Survey, June 2018

Table 4-3 : Noise level measurements during night time at selected locations of the bus terminal

Noise level measurement locations	GPS Co-ordinate	Night-time		Bangladesh standard for mixed areas (dBA), L_{max}
		Average Noise level (dBA), L_{eq}	Maximum Noise level (dBA), L_{max}	
Outside of Bus Terminal (North)	$22^0 49' 27.2''$ N $91^0 5' 54.4''$ E	47.95	58.9	50
Outside of Bus Terminal (South)	$22^0 49' 26.4''$ N $91^0 5' 56.6''$ E	47.45	59.9	50
Outside of Bus Terminal (East)	$22^0 49' 33.2''$ N $91^0 5' 56.6''$ E	42.25	51.5	50
Outside of Bus Terminal (West)	$22^0 49' 26''$ N $91^0 5' 54.3''$ E	65.65	85.3	50
Inside the Bus Terminal	$22^0 49' 27.2''$ N $91^0 5' 54.1''$ E	47.25	57.5	50

Source: Field Survey, June 2018

4.1.9. Water Quality

The surface water of pond and khals in the Pourashava is free from salinity. The present pollution level of the Pourashava areas is found to be low except coliform bacteria. The main causes of surface water pollution are waste water, sanitary sewage and solid waste dumping. Due to the present development trend of the Pourashava, the surface water pollution level of the areas may further increase for high volume of discharge of waste water, sanitary sewage, over spoils of pit and septic tanks, industrial effluents, surface run-off of katcha bazars, and indiscriminate dumping of solid and medical wastes.

The ground water level is found between 40 ft to 50 ft during dry season and 30 ft to 35 ft during wet season. The ground water contains excessive of Iron and Arsenic. It is reported that nearly 60% of the tube wells are arsenic contaminated and the provision of tube well is not possible because of the presence of salinity in the ground water at the power level. (Source: DPHE, 2009).

The result of recent water quality parameters of both surface water and ground water is given in **Table 4-4** as below:

Table 4-4: The results of water quality parameters of both surface water and ground water at Sonapur area

Sl #	Water quality parameters	Bangladesh Standard	Concentration present		Unit	Analysis method	LOQ
			SPW	GW			
01	Arsenic (As)	0.05	<LOQ	<LOQ	mg/L	AAS	0.0001
02	Chloride	150-600	290	2650	mg/L	Titrimetric	0.5

03	Coliform (Faecal)	0	100	12	N/100ml	MFM	0
04	Hardness	200-500	180	600	mg/L	Titrimetric	0.5
05	Iron (Fe)	0.3-1	0.50	1.15	mg/L	UVS	0.1
06	Manganese (Mn)	0.1	<LOQ	0.03	mg/L	AAS	0.01
07	pH	6.5-8.5	7.72	7.51	-	pH Meter	-

Source: DPHE, 2018

The urban dwellers of the Pourashava mainly depend on Ground Water. The ground water extracts by the Pourashava by deep production well and supplied by pipe water supply system after treatment in Water Treatment Plants. In some cases people install shallow hand tube well for fulfilling their domestic requirements.

4.1.10. Traffic situation at the proposed bus terminal areas

Based on the interview with the leaders of Bus Owners Association, Truck Owners Association and other vehicles Operators Association, it is found that there are about 321 inter-districts buses, 117 intra-district buses, 200 trucks, 500 pick-ups, 150 dump trucks, 1000 private cars, 20 raiders, 5000 CNG driven auto rickshaws, 1000 easy bike or auto rickshaws, 5000 motor cycles, 2000 motorized rickshaws, 200 man-driven vans and 200 vans engaged in providing transportation services to the people of the Pourashava and surrounding areas.

In addition, a day-long, from 6:00am to 9:00pm, traffic survey was conducted for this study at Sonapur Poura Bus Terminal area and it is reported that on an average, 488 buses, 224 trucks, 302 pick-ups, 149 private cars, 107 lorrys, 853 CNG driven auto rickshaws, 580 motorized rickshaws, 54 raiders, 652 easy bikes, 377 man-driven rickshaw and 261 vans move per day through the road for carrying passengers and goods. This figure is significantly low than the actual number of vehicles moves through the Pourashava and this less movement of vehicles has happened due to the damaged condition of the bus terminal. Again, due to the unsuitable condition of the bus terminal, no vehicles except local buses entered into the bus terminal.

4.2. Biological Environment

4.2.1. Floral habitat and diversity (terrestrial and aquatic)

The plant life is confined generally to variations belonging to the lower gangetic plane and of other districts in the southern region of the country. There is no organized forestry in the Noakhali district. However, all homesteads are usually covered by dense and lush green foliage of wide variety of trees. In the farmlands varieties of crops namely local Hybrid and HYV rice, jute, vegetables, spices, pulses, oilseeds, etc. are produced.

Most of the trees grown in homestead forests are fruits bearing. Mangoes, although poor in quality, grow in abundance. Almond or badam (Arachis hypogea) grow in unusually. Other common trees

are gab (*Dioaspyros precatorius*), jack fruit *(Artocarpus heterophyllus),* black berry *(Syzygium cumini),* tamarind *(Tamarindus indica),* jalpai (*Elaeocarpus tectorius*), bel (*aegle marmelos*), chalta (*Dillenia indica*), boroi, guava (Psidiumguagava), etc. banana (Banana musa sapientum) is seen almost everywhere but their quality is rather poor. Litchi (Litchi chinensis), Kamranga (Averrho karmbola), ata, haritaki (Terminalia chebula), amloki (Phyllanthus emblica), etc. grow abundantly. Indigenous timber trees include koroi, sheel koroi *(Albizia procera*). garjan(*Dipterocarpus turbinatus),* jarul (*Iegerstroemia speciosa*), shimul (Bombax ceiba), etc. however, various exotic trees like teak, mahagoni(Swietenia macrophylla), sissu (Dalbergia sissoo), etc. have been in produced as wayside trees as well as farm forestry.

The luxuriant growth of palms is the most characteristic feature of the vegetation. Supari (Areca catechu) plantations are more and more abundant towards the north and the west of the district and grows almost in forest. Cocoanuts are grown abundantly throughout the district. Toddy palms or tal *(Borassus flabellifer)* and date palms or khejur are also very common.

Shady trees include banyan or bat *(Ficus benghalensis),* pipal *(Ficus religiosa)* and nim *(Azadirachta indica).* There are several varieties of cane, a good deal of bamboo of different varieties and thatching grass or chhan although their plantations are gradually decreasing steadily.

4.2.2. Faunal habitat and diversity (terrestrial and aquatic)

Owing to the absence of organized forest and other natural conditions, any kind of large or medium carnivores are no longer seen in the district. However, the following mammals are still seen the district although their number is gradually decreasing: jackel *(Canis aureus), f*ox *(Vulpes bengalensis),* large Indian civet or bagdas *(Viverra zibetha),* ottar or ud *(Lutra lutra),* lrrawaddy, kat biral *(Callosciurus pygerythrus),* bengal mongoose or beji *(herpestes edwards),* different kind of rats and several species of bats.

Almost all varieties of birds that are seen all over Bangladesh are also commonly seen in Noakhali. Many kinds of clourful and singing birds are seen in the district. These include the national bird robin magpie *(Copsychus saularis), k*okil *(Cuculus microplerus),* halde pakhi *(Oriolus xanthornus),* kingcrow or finga *(Dicrurns adsimilis),* myna *(Sturnus malabarica),* shalik *(Acridotheres tristis)),* redvented bulbul *(Pycnotus cafer),* tuntuni *(Orthotomus sutorious),* shama *(Copsyehus malabaricus),* sparrow *(Passer domesticus),* flowerpecker *(Dicacum erythrochynchos),* babui(Plocus phillippinus) *famous for artistic nest building on the* several species of pheasants quails (Eudynamis scolopscea), pigeons and doves.

The reptiles include different species of snakes, lizards and tortoises. The snakes include different varieties of cobra, urgabora, dughadabora, kuchiabora and jinlabora, all poisonous. The lizards include gecko, calotis, wall lizard and monitor lizard. There are amphibnians like toad, frogs and tree frogs.

There are many species of sea and fresh water fish available in the district. The list of the varieties is too long to find place in this volume. The popular varieties include the carp tribe *(Cyprinidoes),*

ruhi *(Labeo rohita),* katla *(Catla catla),* mrigel *(Cirrhinus mrigala)* and kalabaush *(labeo* calbasu). airh (Mystusaor), tengra (Mystus vittatus) of several types, magur (Clarias batrschus), singi (Saccobranchus *fossilis)* and koi *(Mystus vittatus)* are considered to be delicious, shoul *(Channa striatus),* boal *(Wallago attu), g*azar *(Channa marulius)* and pabda (Ompok pabda) are available in abundance. Prawn, cry fish *(icha)* and crabs are also found muralla, punti, khoksha, bain and chela are small fish and are found all over the district in abundance.

Exotic fishes like grass carp *(Cteopharyngoden idellus),* silver carp *(Hypophthal micthys molitrix),* telapia *(Oreochromis mossambicus),* nilotica *(Oreochromis niloticus),* etc. have also been introduced for commercial pisciculture in ponds and tanks.

4.3. Socioeconomic Environment

4.3.1. Status of land use pattern, housing and built-up infrastructure

According to the Master Plan of the Pourashava, the major land use of the Noakhali Pourashava goes to residential purpose and it is 49.1% of the total land. The second highest land use is water bodies and occupying 19.2% of the total areas. Agriculture occupies 10.6% of the total land and 2.8% is vacant land. Transportation is also dominant here and covers 4.9% of the total land uses. The land use under commercial activities, and educational and research institutions are 0.5% and 1.6% respectively, while only 0.3% of land is under industrial and manufacturing establishments.

According to the Population and Housing Census 2011, the highest percentage of general households by types of structures of the Pourashava is katcha (39.2%). The percentage of other general households by the types of structures of the Pourashava include 28.1% percent semi-pucca households, 32% pucca households and only 0.7% jhupri households.

In addition, the average household size of the Pourashava is 5.0. The percentage of tenancy of households in the Pourashava area shows that 64.0% people live in own house, 33.6% people live in rented house and 2.4% people live in rent free house.

There are also markets, bazars, shops, educational institutes, private and government offices, business establishments, industries etc in the influence areas of the subproject.

4.3.2. Beneficiary population

All the people living in Noakhali Pourashava will be benefited by the bus terminal. Therefore, a total of 107654 people of the Pourashava will be benefited just after the construction of the bus terminal (Pourashava Data, 2018). Considering the current average growth rate of population in Noakhali Pourashava as 3.22 percent per year, the estimated number of the people of the Pourashava will be 223151 in 2031. All these people will be benefitted from the proposed bus terminal. In addition, a significant number of people who will be travelling from the different parts of greater Noakhali through this bus terminal to different parts of the country will also be benefitted.

4.3.3. Educational status

As per the Population and Housing Census 2011, the literacy rate among the both sex aged 7 years and above of Noakhali Pourashava is 75.3. The literacy rate among the male is higher than the female. The literacy rate among the male is 77.4 whereas it is 73.2 among the female.

There are one University, five colleges, one teachers' training college, 14 high schools, 22 primary schools, one Homio college, 26 kindergartens, one public library, one shilpokala academy and a law college in Pourashava areas which are providing educational supports and services to the inhabitants in Pourashava areas.

4.3.4. Livelihood and economic situation

According to the wealth ranking of people in Noakhali Pourashava, there are mainly four economic categories of people such as 15% people are under poor class, 29.5% are under lower middle class, 45.7% are under middle class and 9.8% are under rich. Further, only 5% people are engaged in agriculture and agri-based activities, 10% people in fishing and pisci-culture, 25% in businesses, 10% in industries, 20% in industrial labor, 10% in day labors, 10% in small businesses and 10% in others. (Source: Pourashava data, 2018)

Although, the economy of Noakhali district is predominately agriculture, but the economy of the Pourashava is dominated by the business which contributes 40% of the economy here. The second highest contribution is from remittance which is 30%. In addition, the contribution of agriculture, industries and others in economy of the Pourashava is 15%, 10% and 5% respectively. (Source: Pourashava data, 2018)

The commercial activities of the Pourashava are dominated by both wholesale and retail business. There are 10 retail markets, 2 wholesale markets, 10 small and cottage industries, 5 small and medium industries and 3 large industries here. One of the large wholesale markets of Hilsa fish of the Country is in Sonapur area of this Pourashava. The major part of trade and commerce of the Pourashava is conducted through hat/bazar where agricultural produces, consumer items, merchandise for household and other farm and non-farm items are traded. The market/bazar performs significant role in the economy of the Pourashava. In addition, there are two bus terminals and 4 railway stations here that support the economic activities of the area. (Source: Pourashava data, 2018)

4.3.5. Land acquisition and resettlement

The land of the subproject site is legally owned by Noakhali Pourashava. Hence, land acquisition is not required. However, there is an existing Bus Terminal which will be improved keeping the terminal building untouched and demolishing some semi-pucca structures. There are 68 shops including workshops, shops of spare parts, color shops, wheel shops, tea stalls, hotels etc found with in Terminal areas owned by the Pourashava during field survey by the Consultant. The Pourashava Authority has already shared with shop keepers about potential temporary replacement of their shops during construction works. The Pourashava will arrange temporary place for them

to continue their business and will allocate shops giving them the highest priority after completion of the construction work of the bus terminal.

4.3.6. Tribal communities

There is no indigenous or tribal people settlement in the subproject area. Therefore, there is no measure needed for indigenous peoples' safeguard.

4.3.7. Cultural heritage and protected areas

Within the influence area of the subproject, there is no protected area and no important historical sites identified during the field visit.

5. ENVIRONMENTAL SCREENING

5.1. Potential Environmental Impact during Construction Phase

(A) Ecological Impacts:

- Felling of trees : Significant □ Moderate □**Minor** □√
  Number of trees : 14
- Clearing of vegetation : significant□ Moderate □**Minor** □√
- Potential impact on aquatic species environment : Significant □ **Moderate** □√Minor □

The proposed bus terminal will be constructed at the place where there is an existing bus terminal. There are 9 small trees and 5 medium sized trees in the terminal areas those need to be felled down and the potential impact will be minor. There is no vegetation to be cleared. There is a water body adjacent to the proposed bus terminal which might be moderately polluted by the dust and spills of oils of vehicles.

(B) Physico-Chemical Impacts:

- Noise pollution : Significant □**Moderate** √□Insignificant□
- Air pollution : Significant □Moderate □**Insignificant**□√
- Drainage congestion : Very likely □**Likely**□√Unlikely □
- Water pollution : Significant □**Moderate**□√Insignificant □
- Solid waste pollution :Significant □**Moderate** □√Insignificant □
- Construction wastes : Significant □**Moderate**□√Insignificant □
- Water logging : Significant □Moderate □ **insignificant** □√

The subproject will have temporary and localized negative impact on physico-chemical environment during construction and operational phases due to the dismantling of existing structures, movement of vehicles for carrying construction materials and equipment, and using of

welding and drilling machine, pile rig, winch machine, concrete mixer and vibrator machine etc. The anticipated impact on noise is considered as moderate as there are some residential houses. Construction activities such as transportation of sand, stones, brick cheeps, debris etc will generate dust that may cause air pollution and anticipated impact of it is considered as minor. Construction activities will also generate solid wastes due to removing of existing semi-pucca and pucca structures that have temporary and localized impacts on drainage system if not properly re-used and or disposed-off. Since the mostly HBB construction work for constructing pavements, drive ways and parking lots will be covered in the dry season, hence the probable drainage congestion and water logging that can occur during earth work for HBB and excavated for toilet building from erratic rainfall is minor. In addition, there is no well-constructed and functional drain around the proposed site which will cause the chance of water logging and contamination of adjacent water bodies. Primarily, the subproject will have no adverse impact on the other physicochemical components. Moreover, proper silencer and muffler are to be used in all categories of machineries to be used during construction period to avoid uneven sounds.

(C) Socio-Economic Impacts:

- Traffic congestion **: Likely** □√ Unlikely □
- Health and safety : Significant □ **Moderate** □√ Insignificant □
- Impact on archaeological : Significant □ Moderate □**Insignificant** □√
- Impact on historical : Significant □ Moderate □ **Insignificant** □√
- Employment generation : Significant □ **Moderate** □√ Insignificant □

Due to transportation of the construction materials and equipment as well as debris to be produced during pre-construction and construction phases, the subproject will have likely temporary negative impact in traffic congestion. So proper traffic management is required during pre-construction and construction phases. However, it is anticipated that the subproject activities will have moderate impact on the local traffic system. Demolition of the toilet, cast-in-situ pile etc work will be performed with the conventional equipment and skilled labor. Hence, anticipated impact on health and safety is considered as moderate. However, in case of any accident such as falling from the height during brick work, plastering work, painting work, glass fitting work etc. may cause severe impact on health and safety. So, personal protection equipment use will minimize the impact. There is no archaeological and historical site within the influence area. Further, it has moderate positive impact by generating employment opportunity for the local people as labors for construction of works will be hired locally and there is a chance of installing different kind of shops, restaurants etc around the subproject site .

5.2. Potential Environmental Impact during Operational Phase

(A) Ecological Impacts:

- Potential impact on species of aquatic : Significant □ Moderate □**Minor** □√

During operational phase, the subproject activities do not have any likely impacts on the surrounding ecological environment. There will be a well-constructed drainage system surrounding the subproject site and to be connected with a khal through which the waste water to be generated at bus terminal will be discharged into running river. It will reduce the impact on aquatic species.

(B) Physico-Chemical Impacts:

- Potential air quality & noise level : Improvement □√**No-improvement**□ Deterioration □
- Drainage congestion : **Improvement** □√ Minor Improvement □ No Impact □
- Risk of water pollution : Significant □√**Moderate**□ Minor □
- Pollution from solid waste : Improvement □√ **No-improvement**□ Deterioration □

During operational phase, there is no such possibility to improve the air quality, noise pollution due to public gathering and use of hydraulic horn in vehicles which may create moderate noise nuisance to the passengers and pedestrians. As there will be a provision of managing solid waste to be generated at the bus terminal in design and there will be a well-constructed RCC drain around the bus terminal, so drainage congestion will be improved. However, proper management of solid waste using waste bins, collecting waste from bins and disposal of waste at landfill, and maintenance of drainage system to be ensured during operational phase. If the waste bins are not used properly and wastes are thrown here and there may pollute the surrounding environment. In addition, as the waste water with oil and lubricants to be generated from washing of vehicles will be discharged at running river through storm drain may pollute water. However, measures should be taken so that no waste water can be discharged into the nearby water bodies.

(C) Socio-Economic Impacts:

- Traffic **: Improvement** □√ No-improvement □ Adverse□
- Safety : **Improvement** □ √ No-improvement□ Adverse □
- Employment generation : **Significant** □√ Moderate □ Minor □

The bus terminal will have a provision of proper traffic management in place which will have significant positive impact on reducing traffic congestion at the bus terminal as well as surrounding areas. However, it may create traffic congestion due to improper parking of the vehicles and ignoring of the traffic rules. So, proper traffic management plan is required during operational phase. In addition, the bus terminal should have a provision of proper security system with CCTV camera in and around the terminal and will have residential facilities for the passengers travelling to distance place which will improve the security and safety of passengers. However, during operational phase, possible accidents and social risks due to causalities at terminal, fire hazard, short-circuit and other vulnerability may also have negative socio-economic impacts. The bus terminal will have significant positive impact by providing job and business facilities and resource mobility. There is a provision of establishing different types of shops at the terminal building for

the passengers and different types of supporting services for vehicles all around the border of the terminal areas in order to meet the demand of huge numbers of passengers to be travelled through this bus terminal and vehicles to move from this terminal.

5.3. Summary of Possible Environmental Impacts of the Subproject

The ecological impact is not significant due to the construction activities but there will be some impacts on the physico-chemical parameter of environment during construction period. Cutting of few trees may have minor impact in ecological system of the bus terminal. Generation of solid waste during construction works may temporarily pollute the surrounding environment and may create localized hazards. The anticipated impact on physicochemical components is mainly site specific and will be within the bus terminal boundary. Also, during construction phase, any failure of mechanical equipment may cause severe accidents to the workers. The generated waste (from any means) shall be managed in proper way. There may be some problems, like use of hydraulic horn by drivers during Operation Phase.

Wastes generation from leakage of fuel, scrap and used tires & tubes from vehicles at terminal are significant issues which should be handled and disposed-off properly by placing waste bins inside the bus terminal, seepage of fuel, lubricants can be collected in a particular container and transfer those for reusing in the factories. This subproject has positive impacts in terms of the generation of the employment opportunities due to construction activities, supplying of the materials at construction phase and by providing transport facilities and support services at operation phase. On the other hand, some landscaping and tree plantation works will enhance the ecological condition of the terminal area.

6. ASSESSMENT OF IMPACTS AND ITS MITIGATION & ENHANCEMENT MEASURES

6.1. Potential Significant Environmental Impacts and Its Mitigation & Enhancement Measures during Pre-Construction Phase

6.1.1. Impact due to demolished works

The proposed subproject is the rehabilitation of existing bus terminal with some damaged pucca and semi-pucca structures. The existing old and almost damaged toilet will have to be dismantled, existing terminal building will have to be renovated and the newly designed bus terminal will have to be constructed at the same place. The demolition works need simple procedure and manual equipment like; hammer, mechanical drill machine, steel cutter etc. Though the demolition work is not massive, thus the impact will not be severe, but the demolition materials shall be managed properly. The materials like bricks, shutter, reinforcement, wooden doors, windows etc. are to be reused, and the wastes and debris shall be disposed-off properly. During the demolition of structures, the creation of dust and noise will be there and will have an impact on workers and community people living at adjacent areas.

To avoid or reduce the environmental impacts of the demolition works, following measures should be taken:

- Site should be fenced to protect from strong winds and to contain dust;
- Electric power and services shall be cut off before the starting of demolition works;
- Demolition work is to be started from roof and then side brick wall;
- No demolition works should be done at night to avoid noise pollution;
- No wastes materials and debris shall be burned on the site;
- No encroachment of adjacent road and private property by the debris;
- Water will be sprayed to control the dust to be generated during demolition;
- Ensure re-use of the materials and disposal of the wastes to landfill area;
- Demolished waste material should be transported through truck covered by tarpaulin; and
- Proper safety measures should be taken by the worker to avoid unwanted accidents.

6.1.2. Impact due to demolition of septic tank and transportation of fecal sludge

There are existing toilets and a damaged septic tank those need to be demolished. The demolition of toilets may have negative impact on environment by creating, bad smell, noise and dust as well as opening of fecal sludge during demolition and transportation may create air pollution. It is anticipated that proper measures should be taken by the authority to minimize its impacts on people and environment. Following measures should be taken to avoid or reduce the environmental impacts:

- Fecal sludge need to be collected by using the mechanical suction pipe;

- The collected fecal sludge must be transferred to selected hole with proper treatment to avoid bad odor by using a vacuum truck;
- During the entire processes personal protective equipment (PPEs) must be used who is associates with this work.

6.2. Potential Significant Environmental Impacts and Its Mitigation & Enhancement Measures during Construction Phase

6.2.1. Pollution from the construction materials and equipment

A wide variety of construction materials and equipment will be used during construction of the bus terminal which required to be dumped at the site. Dumping of the construction spoils such as accidental leakage of the oil, grease, and fuel in equipment yards might have a significant hazard. Surface water and soil quality might be polluted from these contaminants. Dumping of construction material such as sand, brick chips, cement etc might have a significant impact on air quality. The people to be engaged for the construction activities may also impede the physical and human habitats of the area. Following measures should be taken to avoid or minimize the potential impacts:

- Safe transport, storage, and disposal of the construction materials, and the equipment have to be carried out in order to avoid the accidental spillage and loss;
- Raised platform (brick soling with neat cement finishing to keep the materials) shall be constructed prior to start working (to be included with environmental safeguard items in the bidding document).
- Leakage fuel and lubricants from equipment will be collected by separate container for reuse or safe disposal. So that it cannot be spread and pollute adjacent areas.

6.2.2. Impact due to waste disposal

Solid waste will be generated during construction works and in the labor shade and kitchen. A huge quantity of bore whole waste such as slurry, the mixture of sand, clay and water will come out. The improper solid waste management activities during construction period may damage both the construction site, labor shared areas and local environment. Following measures should be taken to avoid or minimize the potential impacts:

- Within the construction site, a number of waste bins will have to be provided by the contractor,
- The Contractor will be responsible to deposit the daily generated waste in a safe place and that will be carried by conservancy unit of the Pourashava to the dumping yard or landfill site.
- Contactor will carry out the pile slurry to a safe place and that safe place shall be selected earlier (before pile diving).

6.2.3. Impact due to labor camp and its sanitary latrine

Two separate labor camps, one for male and another for female will be constructed at the site before starting the construction activities. If the labor camps are not constructed with minimum raised platform and not cleaned properly, that will create health hazard to the laborers. Improper sanitary facilities may cause health hazards to the laborers and that may reduce the work efficiency. Following measures should be taken to avoid or minimize the health hazard:

- Two labor camps with raised platform should be constructed at the separate sides of the site with separate toilet facilities to ensure the safety and security of female workers.
- The contractor will install separate sanitary latrines for male and female workers. The latrines should have washing facilities (availability of water and soap).
- The labor shed shall be with the facilities like; mosquito nets, cooking arrangement, water supply, waste bins, lighting etc.
- A temporary drain for the kitchen waste water is to be provided and rain water drainage around the camp site is to be provided for easy surface runoff.

6.2.4. Impact due to inadequate drinking water supply

Safe drinking water supply is important for the construction workers such as labors, engineers, supervisors during construction work. If sufficient drinking water is not supplied during construction, it may cause health damage to them. Following measures should be taken to ensure safe drinking water at place:

- The contractor will install tube well as considered in the BOQ (environmental safeguard component) prior to starting the construction works;
- The water quality will have to be tested for its quality judgment in a regular interval.

6.2.5. Planning for transportation before starting works

During construction phase, some additional traffic will be accumulated for bringing the construction material and equipment. This traffic may cause temporary congestion on the roads nearby subproject areas. It is anticipated that the subproject activities will not create any severe impact on the local traffic system, because movement of the vehicles and equipment will be only for a short time and as per requirement. The on-site subproject activities do not have any impact on the local traffic system during construction phase, because the works will be done in a confined area. However, during operation phase, improper and roadside parking may create localized traffic congestion. Following measures should be taken to avoid or reduce the impacts:

- Any materials required for construction should be transported at night time (within 10.00 pm – 6.00 am) to avoid local traffic congestion;
- Proper vehicle movement schedule should be maintained in consultation with local people;
- Unloading of materials should be done inside project areas;

- Traffic control manpower will be deputed during construction and operation period;
- Control sign should be provided to regulate traffic movement;
- Safety arrangement should be inserted in the safeguard cost in BOQ.

6.2.6. Impact due to earth work

The proposed bus terminal construction work consists of earth cutting, earth filling, land dressing and removal of unsuitable or any hazardous and unwanted materials. Some areas have to excavate for pile cap, basement floor and septic tank construction. In addition, some areas need to be filled with soil. These works lead dust blowing, noise and vibration which may cause air pollution, noise pollution and discomfort to adjacent residential areas including pedestrians. All those including the excavation and trenching are hazardous nature of construction activities that involve soil removal. If proper measures are not taken it may cause damage to construction site road and other underground utilities. Following measures should be taken to avoid or reduce the impacts:

- Earthwork activities should be done in dry season;
- Contactor should use proper sheet pile or shore pile during earth cutting or earth excavation works and that is to be included in the structural design;
- The contract should not be allowed to collect top soil from surrounding areas to raise the ground level of the bus terminal. Local sand should be collected to fill in the lowland of the bus terminal;
- Water spray should be continued during work or day time to control dust spreading;
- Inspection of the trenches should be done at the start of each shift;
- Adequate safety barriers should be provided with clear visible signs to alert both drivers and pedestrians;
- Adequate light should be provided to the barriers and signs to make them clearly visible at night from a distance sufficient to respond;
- Temporary arrangement should be in place for pedestrian and vehicular traffic at site; and
- Excavated earth should be retained in safer places so that pedestrians can walk smoothly.

6.2.7. Clogging of water inside the construction site

During pile work storm water may clog inside the construction site. During foundation, basement etc. construction work, earth excavation is essential. This earth work may lead the chances of stagnation of storm water into the excavated pit resulting it as the mosquito breeding in the subproject area. Following measures should be taken to avoid or reduce the impacts:

- Earthworks should be done during dry season; and
- During pile, foundation, basement floor etc. work, temporary drainage system will have to be provided and should be connected with existing drainage system to run out the storm water. If necessary, a submergible pump should be there to pump out the water inside the pit.

6.2.8. Clogging of local drain water

There is a possibility to clog the local drain with construction materials kept at the subproject site as well as by the debris to be produced during demolition work and solid waste to be produced at labor camps. Following measures should be taken to avoid or reduce the impacts:

- Construction materials should be kept within a corner of construction area; and
- Contractor will ensure proper disposal of construction wastes and that should not be disposed to the local drains.

6.2.9. Impact on air quality due to dust and emission of carbon dioxide

Different construction activities such as pile diving & casting, machinery movement, handling of construction materials (stone/brick chips, sand, cement), rod fabrication, movement of trucks with construction materials etc. may generate dust and damage the air quality. The air quality in the area can be affected by emission of carbon dioxide of the construction trucks and other equipment that uses gasoline and the unpleasant smell of paint and thinners that will be use during painting. This might affect the health of the people passing by or living and working within the area. Following measures should be taken to avoid or reduce the impacts:

- Water should be sprayed to control the dust at day time;
- The trimming activity using odorless paints should be minimized;
- The condition of combustion-engine powered machine should be maintained.
- Low-sulfur fuels should be employed; and
- Construction material should be transported through truck covered by tarpaulin.

6.2.10. Impact on noise level

Different activities during construction work such as movement of vehicles, concrete mixer machine, vibrator machine and crushing bricks at site may generate a significant level of noise. Pile diving, concrete casting, cutting of steel for reinforcement etc. may also cause noise hazard. Following measures should be taken to avoid or reduce the impacts:

- Construction materials should be transported with scheduled time;
- All powered mechanical equipment and machinery should be fitted with noise abating gear such as mufflers for effective sound reducing device;
- The use of personal protective equipment like helmet, goggles, ear plug, gloves, safety boot etc. should be ensured;
- The crushing of bricks/ stones should not be allowed at the project site. Broken brick or stone chips should be collected from distanced source to the subproject site for construction purpose; and
- Separate batch plant might be used for concreting work (Ready Mix Concrete if available).

6.2.11. Impact on surface water quality

There is no water body adjacent to the subproject site. However, dust to be produced during demolition, the small debris during excavation, slight amount of cement that will flow with the air, construction waste, pile waste, effluent from work camps, food wastes etc. can affect the quality of surface water of the nearby water sources. Improper storage of different construction supplies such as steel bars, fine sand, considerable gravel and alike will affect the quality of the run-off water that will run down on drainage areas. Following measures should be taken to avoid or reduce the impacts:

- Water should be sprayed to control the dust;
- Waste material in any form should not be thrown in water body or unspecified places;
- Proper construction management including waste management, training of operators and workers will be provided to avoid pollution of water bodies or nearby habitants; and
- Waste bins are to be provided at different location of working and living places.

6.2.12. Contingency planning for any uneven situation

There are so many unwanted happenings may occur during construction periods. Proper contingency planning is required for overcoming any unwanted situation, otherwise, that will hamper the progress of works. As a precaution, proper contingency planning is essential for smooth progress. Following measures should be taken to avoid or reduce the impacts:

- All the emergency telephone numbers of all the departments like Police station, fire service and civil defense, truck and bus stands, hospitals, clinics, etc. should be available at site;
- There should be standby transport facilities to deal any accidental case;
- There should be a provision for fast-aid box and emergency on-call physician; and
- The storage of the construction materials should be done in such a way that it might not create obstacle for movement of vehicles and pedestrians.

6.2.13. Occupational health and safety

The occupational health and safety is an important issue for any construction activities. It primarily focuses on work equipment and protective gears to avoid or minimize the risks. The Contractor should give especial attention on workers' health and safety during construction work. The most important risks associated with the construction activities are listed below:

- Risks of using of the machineries in motion such as steel cutter, glass cutter etc.;
- Risk of falling from the height during chipping, plastering work, painting work etc.;
- Risk from drop down of the materials from the height during chipping, plastering work, painting work etc.;
- Risk from mechanical failure of the equipment such as pile rig and winch machine;

- Risk from the traffic collision or accidents during operation of the equipment such as hydraulic excavator, steel cutter, pile rig, winch machine, welding machine, and vehicles movement for the transportation activities of the subproject;
- Risks from head loads for carrying soil, construction materials and construction equipment;
- Risk associated to the sudden bad weather working conditions such as storm, thunder storm and earth quake etc.
- Exposure to the sunlight- workers are being exposed to the sun for long hours;
- Exposure to the high temperature, and humidity for a long time resulting in dehydration; and
- Contact with the hazardous substances and wastes pose risks of the infections and diseases.

General requirements for the workers' health and safety

The key salient features of the general requirements for the workers' health and safety are presented in **Table 6-1**.

Table 6-1: Issues and requirements for the workers' health and safety

Issues	Requirements
Health and Hygiene	• Protection against dust and furnace by using of the nose masks and covering of the head and body; • Laborers will use proper safety belts during work at high altitude • Ensure availability and using proper PPE (helmet, gloves, safety glass, safety shoes etc.) of all workers during work. • Provide construction workers with basic information on infectious diseases including HIV/AIDS • Proper scaffolding should be made available during construction • Proper disposal of the wastes and effluents; • Introduce waste bins for the solid waste management system.
Safety and Fast Aid Box	• Using of the personal protective equipment (helmet, gloves, goggles, nose mask, safety boots); • Precautions during work on or near machineries in motion; • Head loads are prohibited; • First aid facilities should be provided and maintained; • The first aid kit should include adhesive bandages, regular strength pain medication, gauze, and low grade disinfectant.
Compensation for Accidents at Work	• Contractors will bear medical treatment costs. If any sever accidents such as loss of hands, legs or loss of working ability or any case of death needs compensation-(the amount of the compensation should be fixed considering the type of accidents).

Issues	Requirements
Dust and Fumes	• For any dust, fumes, or other impurities likely to be injurious to the workers, effective measures shall be taken to prevent their accumulation and its inhalation by the workers.
Over-crowding	• No labor room should be over-crowded, the labor camp should be provide 15 ft x 30 for male and 12 ft x 15 ft for female workers.

6.2.14. Impact on local community

The construction of bus terminal can cause air pollution and noise pollution during construction phase due to blow of dust during demolition work, emission of gases during vehicle movement, generation of high sound during using equipment for piling, mixing etc that may affect community people living surrounding the construction site. In addition, there might be a conflict with community people in any uncertain events. Following measures should be taken to avoid or minimize the impacts:

- Community people should be oriented to use masks during their movement near construction site;
- Construction equipment and machineries should not be used at night;
- Orientation and training will be provided to the contractors, supervisors and workers, on health, safety and environment including sexual diseases control (as of BOQ);
- Liaison with the communities will be maintained throughout the construction phase;
- Grievance redress mechanism has been established at the sub-project site; and
- A detail disclosure on sub-project to be hanged at the visible side where community can see and read.

6.2.15. Labor influx and anticipated impacts

The bus terminal has a positive impact on labor engagement since it will attract employment of local labor. The labor influx will be minimum, because of the most of the works will be done by the local laborers and there is very limited chance of engagement of outside laborers. So, the labor influx issue will minimum in the construction of sub-project. There is a chance to avoid female workers from poor households to be employed in construction activities. Following measures should be taken to avoid or minimize the impacts:

- Laborers from the local community should be employed in construction activities; and
- Female laborers from poor households should be given highest priority to employ in construction activities.

6.3. Potential Significant Environmental Impact and Its Mitigation & Enhancement

Measures during Operational Phase

In general, there are some maintenance activities involved that causes adverse environmental impacts during operational phase. Following activities are involved in bus maintenance in a bus terminal:

- Painting and paint removal;
- Washing and cleaning;
- Parts cleaning;
- Fueling and fuel storage;
- Changing of oil;
- Battery replacement;
- Tire replacement; and
- Filter replacements.

Painting and paint removal: Painting and paint removal operations include bus painting, paint removal, and touchup operations. The types and quantities of waste generated by these operations depend on the painting and paint removal methods and materials used. Wastes generated from painting include leftover paints and paint wastes.

Following three practices should be existed to reduce wastes and to minimize the impacts from painting operations:

- Minimizing overspray using high-transfer-efficiency equipment,
- Using alternative coatings,
- Maintaining rigid inventory control ,

Washing and cleaning: Wastes can be generated by bus and engine washing and cleaning operations include hazardous and nonhazardous wastewater and sludge. The Waste water can contains a significant amount of oil. Wastes generated from aqueous (potassium permanganate) cleaning include detergent-bearing wastewater and waste sludge. Following measures should be taken to avoid or minimize the impacts:

- A separation tank or an oil/water separator can be used to separate the oil from the wash water. Separated oily water can be processed offsite by waste oil reclaimed. The sludge from the washing operation can be dewatered (dried) to reduce its volume.
- Sludge from bus washing operations is disposed to garbage first and then to the Municipal landfills.

Battery replacement: On a weight basis, used batteries are one of the largest categories of hazardous waste generated from vehicles. Usually, lead acid batteries contain lead and sulfuric acid. The Bus Operators change, repair and inject acid water in the battery within the bus terminal where every possibility of leakage of hazardous water on the surface of the bus terminal. Following measures should be taken to avoid or minimize the impacts:

- Strong monitoring system should be developed by Pourashava for safer replacement of batteries.
- A designated corner should be marked in the bus terminal for replacing, acid water injection etc.
- Full restriction on disposing any damaged battery inside the bus terminal premises.

Oil change: Bus maintenance requires changing of oil. Used oil includes many related substances such as used motor oil, transmission fluid, lubricating oil, and others. Many of the bus operators do these types of work inside the bus terminal. Following measures should be taken to avoid or minimize the impacts:

- Changing of motor oil should be done in an off-site.
- The used oil is stored and sold to an oil recycler or reclaimer to be used as a fuel.
- Disposing of used oil and transmission fluid by installing a used oil furnace.

Tire Replacement: Usually Bus operators dispose old, used and torned tires in the bus terminal which create environmental hazards. Retreading is the most common form of tire recycling. Tires that are in poor condition are used for asphalt paving, brake lining, bumpers, boiler fuel, and new tires. Many landfills do not allow tire disposal because tires never decompose; they collect gases released by decomposing garbage, and then gradually float up to the surface of the landfill. Following measures should be taken to avoid or minimize the impacts:

- Tires should be "stockpiled" as part of solid waste management;
- Burning of tire can release toxic chemicals; and
- Tire recycling, as is practiced can alleviate the stockpiling issue.

Filter replacements: Bus maintenance requires changing air, fuel, and oil filters. Most Bus Operators observed that drain, crush, and drum their used air filters and dispose of them nearby places or drainage system of the terminal. The oil filters should be crushed to achieve maximum oil release prior to disposal and to reduce waste volume. Drained oil filters typically are stored in bins for recycling.

6.3.1. Air quality degradation

The emission of carbon dioxide of buses, dust created from the movement of buses and unpleasant smell of paints and thinners that will be used during painting, and bad odor from the wastes materials can affect the air quality. This might affect the health of the passengers, living in the adjacent areas and working within the area. Following measures should be taken to minimize the impacts:

- Avoid maximum speed movements in the site since this will make the dust go in the air;
- Odorless and lead free paints available in the bus terminal should be used;
- The condition of combustion-engine powered machine should be maintained.
- Low-sulfur fuels should be used
- Control any likely bad odor generated from the waste materials; and

- Ensure effective solid waste management facilities.

6.3.2. Noise pollution

Use of hydraulic horns by the buses and other vehicles can create noise pollution. Use of loud speaker and overcrowded people during peak-hours can create noise nuisance to the passengers and pedestrians. Following measures should be taken to minimize the impacts:

- The traffic control authority should control the use of hydraulic horn in buses and minimize the traffic congestion at peak-hours; and
- Use of loud- speaker should be minimized.

6.3.3. Solid wastes generation and disposal

Solid wastes such as leftover food, foils, bottle and plastic from food and drink can be generated at bus terminal by passengers and the workers. If these generated solid wastes are not disposed properly, it will create unhygienic environment at the bus terminal and passengers will feel discomfort. Following measures should be taken to minimize the impacts:

- Sufficient numbers of waste bins should be in place at bus terminal; and
- Solid wastes to be generated at bus terminal should be collected and disposed in selected landfill.

6.3.4. Traffic congestion

There is a possibility of traffic congestion at the front side of the bus terminal. The proposed bus terminal will be the main bus terminal of the town and it will play as key transit point of all buses coming from different parts of greater Noakhali as well as the people of the Pourashava. As a result, people will use auto-rickshaw, easy-bike, non-motorized rickshaw, van etc for local transportation from and to the bus terminal and can use the road side for loading and unloading passengers. It may cause traffic congestion. Further, buses carrying the passengers may stop at the road side for loading and unloading the passengers that may also cause traffic congestion. In addition, trucks those carrying goods to and from the town will also use the main route for transportation and can use the bus terminal side for interim stop and can cause traffic congestion. Following measures should be taken to minimize the impacts:

- Loading and unloading of passengers should be done at the entrance gate bus terminal and within the bus terminal; and
- Proper traffic control mechanism should be in place.

6.3.5. Accident due to fire hazard and electric short circuit

Fire hazard is a common threat to any establishments. Firing may occur due to negligence and poor understanding of safety systems. Fire hazard may come from short circuit or open burning of waste material in the bus terminal. Following measures should be taken to minimize the impacts:

- Fire extinguisher should be used and be placed at the stair-case site in every floor;
- Touching electrical appliances with wet hands should be prohibited with properly visible danger sign;
- Faulty or malfunctioning electrical products should not be used;
- Training should be provided to use firefighting equipment when necessary; and
- Regularly checking and maintenance the electrical line of the bus terminal should be done.

6.3.6. Waste water disposal

The washing of vehicles within the bus terminal can produce waste water mixed with oils and lubricants. Leakage of vehicles can also leave oil and lubricants at the bus terminal that needs to be washed out for maintaining cleanliness of the bus terminal. This waste water can be linked with local drain and decrease the water quality of outfall. Following measures should be taken to minimize the impacts:

- Separate sewer lines should be in place for waste water to be generated at bus terminal;
- Provision of soak pit is to be provided for disposal of waste water to be generated. On the bottom of soak pit 1.5 m depth filter bed (Sylhet Sand and brick chips, 1:1 proportion) is preferable;
- The waste water, after filtration through the soak pit, will not be harmful either to ground water or to the nearby drains/ surface water; and
- The soak pit will have to be cleaned in a regular interval (at least in every three months).

6.3.7. Fecal sludge management

Fecal sludge will be generated from toilets of the bus terminal. It will be managed through on-site sanitation system i.e. by constructing septic tank and soak pit. If the septic tank is not cleaned in regular interval or broken, it can be overflowed or exposed and cause environmental pollution. Following measures should be taken to minimize the impacts:

- The Pourashava's conservancy unit will clean the septic tanks in regular interval; and
- The collected fecal sludge must be transported to fecal sludge treatment plant by using a vacuum truck.

6.3.8. Impact on local community

The bus terminal has a positive impact on the community people by creating employment opportunity during operational phase. The community people will get the chance to work with buses and other vehicles. It will also create employment opportunity by engaging in shops to be operated within the bus terminal. In addition, local people may install different types of shops at the surrounding areas of the bus terminal to meet the demand of the passengers travelling through the bus terminal. It is expected that employment for more than 500 people will be created after the completion of the construction and improvement of the bus terminal. The bus terminal will ease

the transportation facilities for the community people who will have to move different sub-districts and main town for service, trade and business and others daily needs.

7. ENVIRONMENTAL MANAGEMENT PLAN

The objective of the environmental management plan (EMP) is to record environmental impacts resulting from the sub-project activities and to ensure implementation of the identified "mitigation measures", in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operational phases of the sub-projects. The recorded environmental impacts and its mitigation and enhancement measures are given in a matrix as below:

7.1. Environmental Management Plan (EMP) Matrix

The anticipated environmental impacts and corresponding mitigation and enhancement measures have been outlined in **Table 7-1.**

Table 7-1: EMP matrix of the proposed Bus Terminal

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Pre-construction phase					
Environmental clause in the contract	• Include environmental clauses in bid and contract document.	At the Noakhali Pourashava	Before bidding or contract	PIU of Noakhali Pourashava	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Construction vehicles and machinery	• Trial run of vehicles and machinery to be used to confirm that their conditions, level of emissions of pollutants and noise level will not cause serious damages to the surrounding environment.	At the construction site, or vehicle depot	Before the commencement of construction	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Impact due to demolition work	• Site should be fenced to protect from strong winds and to contain dust; • Electric power and services shall be cut off before the starting of demolition works; • Demolition work is to be started from roof and then side brick wall; • No demolition works should be done at night to avoid noise pollution; • No wastes materials and debris shall be burned on the site;	At the Construction site	During site preparation	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
	• No encroachment of adjacent road and private property by the debris; • Water will be sprayed to control the dust to be generated during demolition; • Ensure re-use of the materials and disposal of the wastes to landfill area; • Demolished waste material should be transported through truck covered by tarpaulin; • Proper safety measures should be taken by the worker to avoid unwanted accidents.				
Demolition of septic tank and transportation of fecal sludge	• Fecal sludge need to be collected by using the mechanical suction pipe; • The collected fecal sludge must be transferred to selected hole with proper treatment to avoid bad odor by using a vacuum truck; • During the entire processes personal protective equipment (PPEs) must be used who is associates with this work.	At the Construction site	During site preparation	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Felled down of trees	• A total of 14 trees need to be cut for Bus terminal. Therefore, to maintain the ecological condition of the area, at least 42 trees should be planted. Noakhali Pourashava has a plan to plant 100 trees at the boundary of the proposed subproject site.	At the Noakhali Pourashava areas	During Design	PIU of Noakhali Pourashava	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Air, Water and Noise Quality Laboratory Test	• The base line condition of Air, Water and Noise quality of proposed bus terminal should be tested in laboratory.	Proposed site	Pre-construction	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Construction phase					
Pollution from the construction materials and equipment	• Safe transport, storage, and disposal of the construction materials, and the equipment have to be carried out in order to avoid the accidental spillage and loss; • Raised platform (brick soling with neat cement finishing to keep the materials) shall be constructed prior to start working (to be included with environmental safeguard items in the bidding document). • Leakage fuel and lubricants from equipment will be collected by separate container for reuse or safe disposal. So that it cannot be spread and pollute adjacent areas.	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Waste disposal	• Within the construction site, a number of waste bins will have to be provided by the contractor, • The Contractor will be responsible to deposit the every generated waste in a safe place and that will be	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
	carried by conservancy unit of the Pourashava to the dumping yard or landfill site. • Contactor will carry out the pile slurry to a safe place and that safe place shall be selected earlier (before pile diving).				
Labor camp and its Sanitary latrine	• Two labor camps with raised platform should be constructed at the separate sides of the site with separate toilet facilities to ensure the safety and security of female workers. • The contractor will install separate sanitary latrines for male and female workers. The latrines should have washing facilities (availability of water and soap). • The labor shed shall be with the facilities like; mosquito nets, cooking arrangement, water supply, waste bins, lighting etc. • A temporary drain for easy surface runoff of the kitchen waste water and rain water around the camp site is to be provided.	At the Labor camp and construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Inadequate drinking water supply	• The contractor will install tube well as considered in the BOQ (environmental safeguard component) prior to starting the construction works; • The water quality will have to be tested for its quality judgment in a regular interval.	At the Labor camp and construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
Transportation before starting works	• Any materials required for construction should be transported at night time (within 10.00 pm – 6.00 am) to avoid local traffic congestion; • Proper vehicle movement schedule should be maintained in consultation with local people; • Unloading of materials should be done inside project areas; • Traffic control manpower will be deputed during construction and operation period; • Control sign should be provided to regulate traffic movement; • Safety arrangement should be inserted in the safeguard cost in BOQ.	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Earth work	• Earthwork activities should be done in dry season; • Contactor should use proper sheet pile or shore pile during earth cutting or earth excavation works and that is to be included in the structural design; • Water spray should be continued during work or day time to control dust spreading; • Inspection of the trenches should be done at the start of each shift; • Adequate safety barriers should be provided with clear visible signs to alert both drivers and pedestrians;	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Issues/ Environmental impact	Mitigation and enhancement measures to be taken	Location	Timing	Responsible organization	
				Implementation	Supervision/ Monitoring
	• Adequate light should be provided to the barriers and signs to make them clearly visible at night from a distance sufficient to respond; • Temporary arrangement should be in place for pedestrian and vehicular traffic at site; • Excavated earth should be retained in safer places so that pedestrian can walk smoothly.				
Clogging of water inside the construction site	• Earthworks should be done during dry season; • During pile, foundation, basement floor etc. work, temporary drainage system will have to be provided and should be connected with existing drainage system to run out the storm water. If necessary, a submergible pump should be there to pump out the water inside the pit.	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Clogging of local drain water	• Construction materials should be kept within a corner of construction area; • Contractor will ensure proper disposal of construction wastes and that should not be disposed to the local drains.	At the Construction site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

Air quality due to dust and emission of carbon dioxide	• Water should be sprayed to control the dust at day time; • The trimming activity using odorless paints should be minimized; • The condition of combustion-engine powered machine should be maintained. • Low-sulfur fuels should be employed; • Construction material should be transported through truck covered by tarpaulin. • The construction period condition of Air, Water and Noise quality of proposed bus terminal should be tested in laboratory	At the Construction site and surrounding areas	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Noise level	• Construction materials should be transported with scheduled time; • All powered mechanical equipment and machinery should be fitted with noise abating gear such as mufflers for effective sound reducing device; • The use of personal protective equipment like helmet, goggles, ear plug, gloves, safety boot etc. should be ensured; • The crushing of bricks/ stones should not be allowed at the project site. Broken brick or stone chips should be collected from distanced source to the subproject site for construction purpose. • Separate batch plant might be used for concreting work (Ready Mix Concrete if available).	At the Construction site and surrounding areas	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Surface water quality	• Water should be sprayed to control the dust; • Waste material in any form should not be thrown in water body or unspecified places;	At the Construction site and	During construction period	Contractor	PIU of Noakhali Pourashava and

	• Proper construction management including waste management, training of operators and workers will be provided to avoid pollution of water bodies or nearby habitants. • Waste bins are to be provided at different location of working and living places.	surrounding areas			PMU of MGSP under BMDF
Uneven situation	• All the emergency telephone numbers of all the departments like Police station, fire service and civil defense, truck and bus stands, hospitals, clinics, etc. should be available at site; • There should be standby transport facilities to deal any accidental case; • There should be a provision for fast-aid box and emergency on-call physician. • The storage of the construction materials should be done in such a way that it might not create obstacle for movement of vehicles and pedestrians.	At the Construction site and surrounding areas	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Occupational health and safety	• Protection against dust and furnace by using of the nose masks and covering of the head and body; • Labors will use proper safety belts during work at high altitude • Ensure availability and using proper PPE (helmet, gloves, safety glass, safety shoes etc.) of all workers during work. • Provide construction workers with basic information on infectious diseases including HIV/AIDS • Proper scaffolding should be made available during construction	At the Construction site and surrounding areas	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

	• Proper disposal of the wastes and effluents; • Introduce waste bins for the solid waste management system. • Using of the personal protective equipment (helmet, gloves, goggles, nose mask, safety boots); • Precautions during work on or near machineries in motion; • Head loads are prohibited; • First aid facilities should be provided and maintained; • The first aid kit should include adhesive bandages, regular strength pain medication, gauze, and low grade disinfectant. • Contractors will bear medical treatment costs. If any sever accidents such as loss of hands, legs or loss of working ability or any case of death needs compensation-(the amount of the compensation should be fixed considering the type of accidents). • For any dust, fumes, or other impurities likely to be injurious to the workers, effective measures shall be taken to prevent their accumulation and its inhalation by the workers. • No labor room should be over-crowded, the labor camp should be provide 15 ft x 30 for male and 12 ft x 15 ft for female workers.				
Impact on local community	▪ Community people should be oriented to use masks during their movement near construction site; ▪ Construction equipment and machineries should not be used at night. ▪ Orientation and training will be provided to the contractors, supervisors and workers, on health, safety and environment including sexual diseases control (as of BOQ),	At the Construction site and surrounding areas	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF

	▪ Liaison with the communities will be maintained throughout the construction phase. ▪ Grievance redress mechanism has been established at the sub-project site.				
Labor influx	• Laborers from the local community should be employed in construction activities. • Female laborers from poor households should be given highest priority to employ in construction activities.	At the Constructio n site	During construction period	Contractor	PIU of Noakhali Pourashava and PMU of MGSP under BMDF
Operation phase					
Air quality degradation	• Avoid maximum speed movements in the site since this will make the dust go in the air; • Odorless paints available in the bus terminal should be used; • The condition of combustion-engine powered machine should be maintained. • Low-sulfur fuels should be employed; • Avoid any likely bad odor generated from the waste materials; • Ensure effective solid waste management facilities. • The operational phase condition of Air, Water and Noise quality of proposed bus terminal should be tested in laboratory	At the bus terminal	During operational period	Bus Owners' Association and Workers' Association	PIU of Noakhali Pourashava
Noise pollution	• The traffic control authority should control the use of hydraulic horn in buses and minimize the traffic congestion at peak-hours. • Use of loud- speaker should be minimized.	At the bus terminal	During operational period	Bus Owners' Association and	PIU of Noakhali Pourashava

				Workers' Association	
Solid wastes generation and disposal	• Sufficient numbers of waste bins should be in place at bus terminal. • Solid wastes to be generated at bus terminal should be collected and disposed in selected landfill.	At the bus terminal	During operational period	Bus Owners' Association	PIU of Noakhali Pourashava
Traffic congestion	• Loading and unloading of passengers should be done at the entrance gate bus terminal and within the bus terminal; • Proper traffic control mechanism should be in place.	At the bus terminal	During operational period	Bus Owners' Association and Workers' Association	PIU of Noakhali Pourashava
Accident due to fire hazard and electric short circuit	• Fire extinguisher should be used and be placed at the stair-case site in every floor. • Touching electrical appliances with wet hands should be prohibited with properly visible danger sign. • Faulty or malfunctioning electrical products should not be used. • Training should be provided to use firefighting equipment when necessary. • Regularly checking and maintenance the electrical line of the bus terminal should be done.	At the bus terminal	During operational period	Bus Owners' Association and Workers' Association	PIU of Noakhali Pourashava
Waste water disposal	• Separate sewer lines should be in place for waste water to be generated at bus terminal; • Provision of soak pit is to be provided for disposal of waste water to be generated. On the bottom of soak pit 1.5 m depth filter bed (Sylhet Sand and brick chips, 1:1 proportion) is preferable;	At the bus terminal	During operational period	Bus Owners' Association and Workers' Association	PIU of Noakhali Pourashava

	• The waste water, after filtration through the soak pit, will not be harmful either to ground water or to the nearby drains/ surface water. • The soak pit will have to be cleaned in a regular interval (at least in every three months).				
Fecal sludge management	• The Pourashava's conservancy unit will clean the septic tanks in regular interval; • The collected fecal sludge must be transported to fecal sludge treatment plant by using a vacuum truck.	At the bus terminal	During operational period	Conservancy Unit of the Pourashava	PIU of Noakhali Pourashava

7.2. Environmental Monitoring Plan

The Environmental Monitoring is important to record environmental impacts resulting from the subproject activities and to ensure implementation of the mitigation measures identified earlier in order to reduce adverse impacts and enhance positive impacts from the subproject activities. The environmental monitoring should be done at both constructional and operational phases.

Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality.**Table 7-2** and **7-4** summarizes the potentially significant environmental impacts needs to be monitored during the constructional and operational phases.

The following environmental monitoring plan should be adopted to monitor the activities mentioned in the environmental management plan.

7.2.1. Monitoring during construction phase

The mitigation or enhancement measures outlines in EMP should be monitoring during construction period with regular interval in order to ensure its effective implementation to avoid the adverse effect of subproject activities and to gain the positive impacts resulting for the activities. The environmental monitoring plan during the construction period is given in **Table 7-2** as below:

Table 7-2: Environmental Monitoring Plan during construction phase (Visual observation)

Monitored Parameter/ Issues	Monitoring Method/ Key Aspects	Location of Monitoring	Frequency of Monitoring
Safety orientation and training of workers	Frequency of training & orientation of workers for safety	Subproject site	• Once in a month • Reporting: Once in a month
Personal Protective Equipment	Ensure every single person involved in the activities wear and use safety equipment	Subproject site	• Daily • Reporting: Once in a month
Worker's health	Monitoring process of worker's health	Subproject site	• Daily • Reporting: Once in a month
Sanitation & drinking water facility to the workers	Availability of safe drinking water and sanitation to the workers	Subproject site	• Daily • Reporting: Once in a month
Incident record and reporting	Documented record of all incident, accident, its remedial process	Subproject site	• Daily • Reporting: Once in a month
Site security/ Fencing at the site	Isolation of site from general access by fencing, restriction of the un-authorized entry in the site.	Subproject site	• Daily • Reporting: Once in a month

Bulletin/ announcement boards/ prohibition signs	Visible in good condition or not	Subproject site	• Daily • Reporting: Once in a month
Equipment /vehicles	-Switched-off diesel engines when not in use; -Search any possible leakage; -Fuelling.	Subproject site	• Daily • Reporting: Once in a month
Dust	Dust is visible or not	Subproject site	• Daily • Reporting: Once in a month
Oily waste generation and disposal	Quantity of oily waste, storage and disposal	Subproject site	• Daily • Reporting: Once in a week
Solid waste generation	Quantity of solid wastes and disposal	Subproject site	• Daily • Reporting: Once in a month
Gender equity	Direct survey in the field by interviews with the women in order to ensure that there is no any gaps between man and women	Subproject site	• Daily • Reporting: Once in a month
Child labor	No child will be engaged in the activities	Subproject site	• Daily • Reporting: Once in a month
Handling of hazardous materials	Fuelling, storage, operation	Subproject site	• Daily • Reporting: Once in a month

Environmental parameters to be monitored during construction phase are given in **Table 7-3** as below:

Table 7-3: Environmental parameters need to be monitored (during construction phase)

Monitored Parameter / Issues	Monitoring Method/Key Aspects	Location of Monitoring	Period & Monitoring Frequency
Air quality (SPM, PM_{10}, and $PM_{2.5}$)	• Visually-black smoke; • Sampling; • Analysis at laboratory; • analysis of merits determination by using quality standards; • Through digital instruments.	Subproject site	• Two times during construction period; • Reporting: Immediately after analysis and once in a month as a regular basis

Noise level	• Through digital noise level meter	Subproject site	• Two times during construction period; • Reporting: Immediately after measurement and once in a month as a regular basis.
Water Quality	• Visually-black smoke; • Sampling; • Analysis at laboratory; • analysis of merits determination by using quality standards; • Through digital instruments	Subproject site	• Two times during construction period; • Reporting: Immediately after measurement and once in a month as a regular basis.

7.2.2. Monitoring during operational phase

Environmental monitoring during operational phase is limited to a number of impact parameters to see the actual performance of the subproject. Monitoring of some issues might be necessary during the operational period as given in **Table 7-4**.

Table 7-4: Environmental Monitoring plan during operational phase (Visual observation)

SL No	Issue	Key aspects	Monitoring frequency per year
1	Complain from local people	Any significant complain from local people and it's remedial procedure	4
2	Local drainage system	Maintaining proper drainage	4
3	Solid Waste Management	Proper management of solid wastes	4

Environmental parameters to be monitored during operational phase are given in **Table 7-5** as below:

Table 7-5: Environmental parameters need to be monitored (during operational phase)

Parameter	Location	Monitoring frequency per year
Air quality (SPM, PM_{10}, and $PM_{2.5}$)	At the Bus Terminal	2
Water quality (BOD, pH, DO, TDS, Turbidity, NH_3)	At the nearby, surface water, ground water and drain water	2
Noise and Vibration	At the Bus Terminal	2

7.3. Grievance Redress Mechanism

The project-specific Grievance Redress Mechanism (GRM) will be established by the PIU of Noakhali Pourashava to receive, evaluate, and facilitate the solution of affected people's (Aps) concerns, complaints and grievances concerning the social and environmental performance of the subproject. The GRM is aimed to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject.

The grievance mechanism is related to resolve the risks and adverse impacts of the subproject. It addresses APs' concerns and complaints promptly, using an understandable and transparent process that is also gender responsive, and culturally appropriate. It is readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

BMDF has its own Grievance Redress Procedure (GRP) and they operate it to address any dissatisfaction and complaints by the local people regarding its activities. This procedure is being applied to address any complaints or grievances through negotiations with the community leaders and representatives of the APs during implementation of the MGSP.

7.3.1. Grievance redress committee (GRC)

Noakhali Pourashava has formed a Grievance Redress Committee (GRC) headed by The Mayor. With the facilitation of Consultant, the Mayor nominated the GRC members and included representative from the Government Agencies, local NGO, and Civil Society. The GRC will nominate a focal person. Complaints will be received through drop box, by post, email and website of the Pourashava. The grievance box will be set up at construction site to received complaints. The grievance response focal point will be available at the Pourashava for recording the complaints and necessary response to an aggrieved person. It will receive complaints or suggestions, and produce them to the GRC for hearing and resolution. If any complaint is not resolved at Pourashava level then the complaint will be produced to MD-BMDF. If it is not resolved by the MD-BMDF, then the subproject will be dropped.

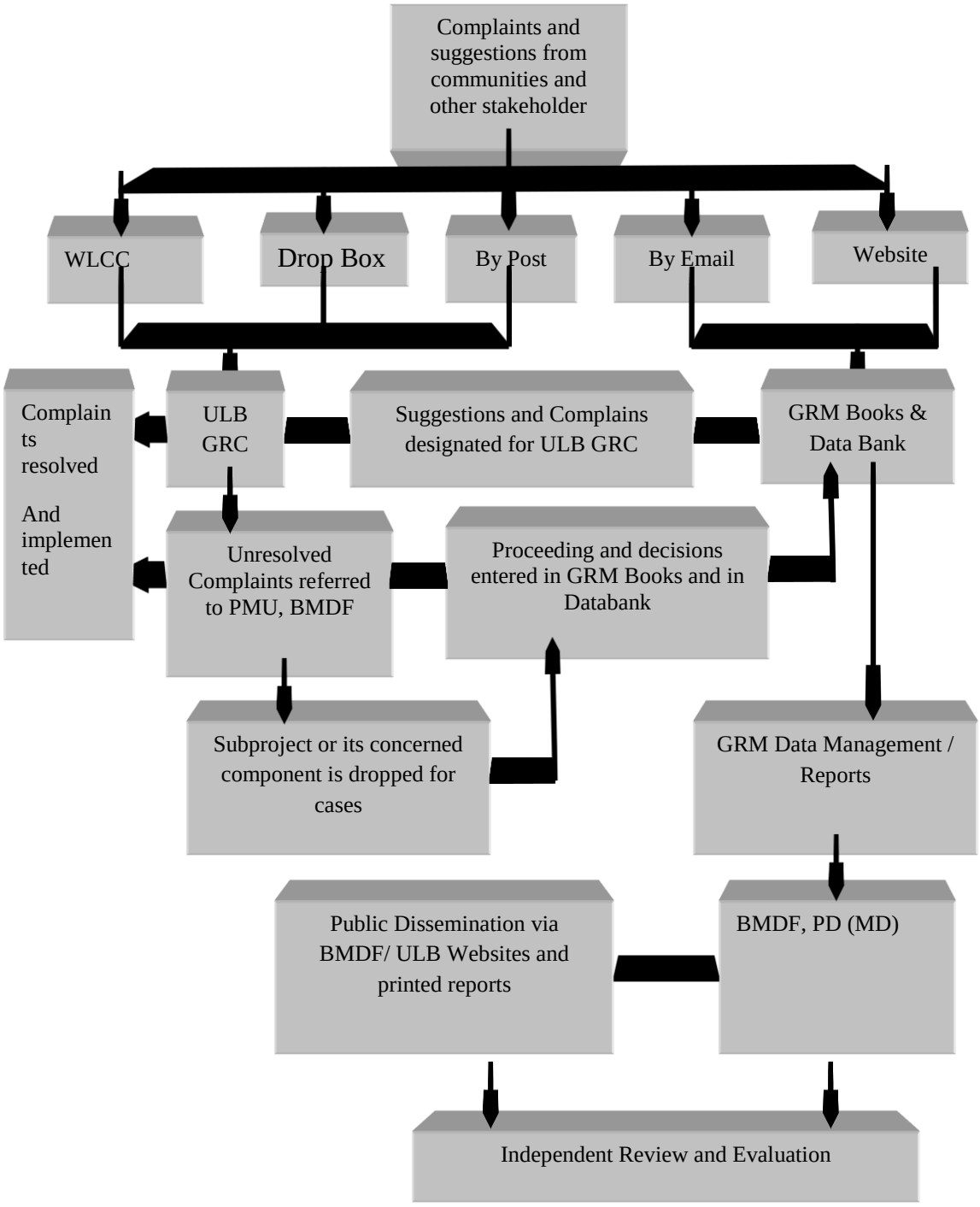
The structure of the GRC and membership are given as below:

Chairman	: ULB Mayor
Member-Secretary	: Head of the Engineering Section of ULB
Member	: Representative from local administration
	: Teacher from a local educational institution
	: Representative of a local NGO
	: Representative of civil society
	: Female ward councilor (of respective area)

The list of GRC members along with the notification from the Mayor is attached in **Annexure 7**

7.3.2. Grievance resolution process

The grievance resolution process that is given in flow chart as below will be followed for this subproject.



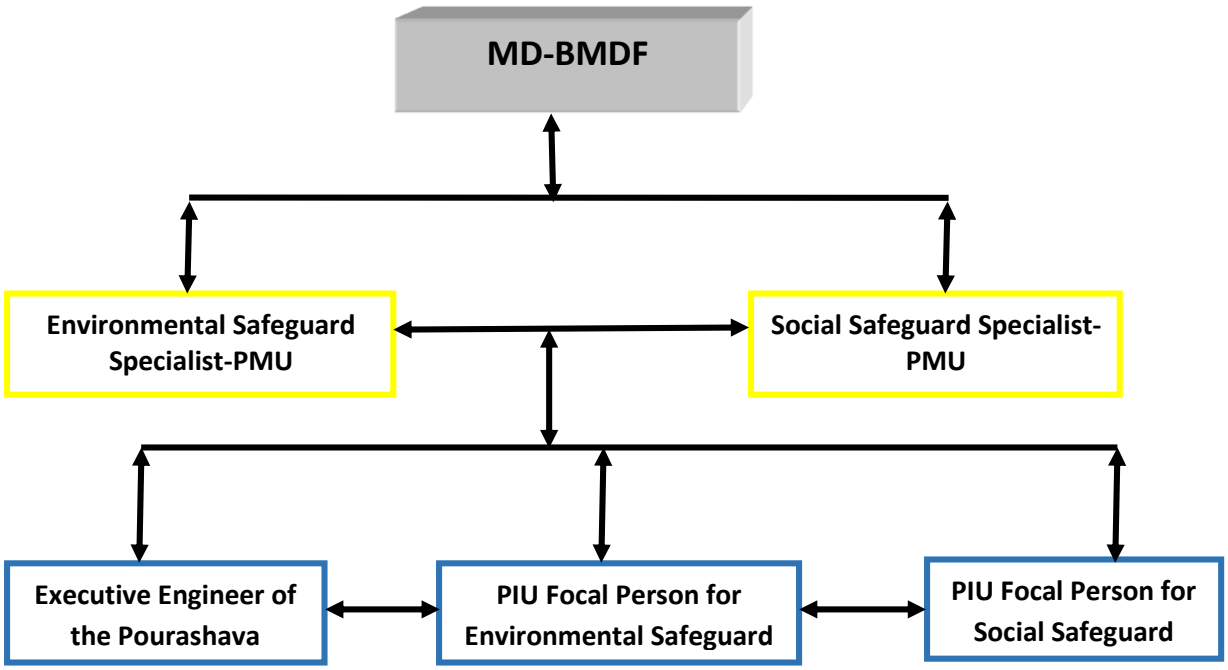
Flow diagram 7-1: Grievance resolution process

Note: If the appellant is still not satisfied, he or she has the right to take the case to the public courts. Noakhali Pourashava should also publish the outcome of the cases on the public notice boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by the Noakhali Pourashava. The Pourashava authority will try to resolve the issues (in most of the cases, in amicable settlement) within shortest possible time. However, the public court system is always open to resolve the issues.

7.4. Institutional Arrangement for Implementation of EMP

The Environmental Safeguard Compliance issues are directly vested the Pourashava Officials; especially the Executive Engineer will be responsible for supporting the construction supervision with the facilitation of BMDF. The civil works contractors will implement the environmental mitigation measures.

The BMDF, with the help of Environmental Safeguard Specialist will submit the monthly monitoring reports on Environmental Compliances to the World Bank.



Flow diagram 7-2: Institutional arrangement for implementation of EMP

7.5. Capacity Building

A two-day long training program, from 6 June 2018 to 7 June 2018, in participation of PIU members of Noakhali Pourashava was organized by the PMU of BMDF to build the capability of PIU of Noakhali Pourashava. The Consultant, hired by the Noakhali Pourashava also participated in the training program. The PMU of BMDF organized this training program in order to enhance

their capacity to conduct Environmental Assessment and Social Impact Assessment to be done for any proposed subproject. A series of sessions were conducted by the Specialists of the PMU of BMDF. The major sessions includes: (i) Environmental Screening, (ii) EMP Implementation, including environmental monitoring requirements related to mitigation measures; and (iii) taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of the implementation. The PIU of Noakhali Pourashava will organized an orientation of contractor, workers and other support staff on environmental issues to be considered and mitigation measures to be taken during pre-construction, construction and operational phases before deploying to the work sites in order to achieve the expected standards.

7.6. Estimation of Environmental Safeguard Cost of EMP

Considering the environmental impacts and their mitigation measures for the subproject, several items are included in the BOQ for the environmental management. **Table 7-6** presents the estimated cost during construction phase and **Table 7-7** presents the estimated cost during operation phase for the environmental management. Cost during construction phase will be included in BOQ but Cost during operation phase will be bearded by Noakhali Pourashava or Bus Owners' Association.

Table 7-6: Environmental Management Budget during construction phase

Item No.	Description of the Items	Costs (in BDT)
1	Establishment of labor camp (male shed - 15 ft x 30 ft and female shed 12 ft x 15 ft1) with living arrangement, drinking water facilities, cooking arrangement, mosquito net, waste bin etc.	200,000.00
2	Masonry pucca platform (at least 100 sft size), providing brick soling and net cement finishing for keeping fuel and lubricants for machineries.	15,000.00
3	Arrangement of temporary/ earthen drainage to drain out extra water logging due to rain and during construction works. All the temporary drains shall be filled up properly either at the end of event or at the end of works	50,000.00
4	Dust suppression measures by water spraying throughout the construction period in and around the subproject site, uncovered aggregates and loose materials such as stockpiles of the sands, excavated earth etc.	90,000.00
5	Air quality (SPM, PM_{10}, and $PM_{2.5}$) measurement- it can be measured from the recognized environmental survey company, public institute/ university one time before starting construction, three times during construction phase	120,000.00
6	Noise level measurement- it can be measured from the recognized environmental survey company, public institute/ university three times during construction phase and one time after construction	30,000.00

7	Water quality (pH, DO, TDS, BOD, Turbidity, NH_3)of bus terminal side drain and underground water measurement- it can be measured from the recognized environmental survey company, public institute/ university one time before starting the construction and three times during construction phase	40,000
8	Wastes disposal facility during the construction period; collection, transportation, and dumping of the wastes at landfill site and providing sufficient bins; at least 6 bins (500 litre size) to be provided.	90,000.00
9	Water supply facilities (for the labor shed and work site):1 no. of tube well (depending on the site condition the contractor will select the option)	60,000.00
10	Sanitation facilities (at the labor shed): 2 nos. of the toilets preferably portable toilets (1 no. for women and 1 no. for men)	50,000.00
11	Providing PPE like hand gloves, spectacles for eye protection, helmets, masks, visible jacket, ear plug, safety boots for at least 30 person (25 for workers and 5 for visitor) and one Fast Aid Box with necessary medicine	100,000.00
12	Tree plantation for beautification work- preferably local fruits, flowers, medicinal and ornamental trees- (including protection and conservation during project defect liability period)- tree plantation detailed as per drawing- 100 nos. of the trees @ of BDT 500.00	50,000.00
13	8 Cautionary signs @ BDT 1875.00	15000.00
	Total	**910,000.00**

Table 7-7: Environmental Management Budget during operation phase (Annual)

Item No.	Description of the Items	Costs (in BDT)
1	Air quality (SPM, PM_{10}, and PM $_{2.5}$) measurement- it can be measured from the recognized environmental survey company, public institute/ university two times per year at operation	60,000.00
2	Noise level measurement- it can be measured from the recognized environmental survey company, public institute/ university two times per year at operation	20,000.00
3	Water quality (pH, DO, TDS, BOD, Turbidity, NH_3) measurement. It can be measured from the pre-approved public institute/ university during operation period for waste water at underground water, drain and outfall @Tk. 10,000.00 per sample (2*3*5,000.00 BDT).	30,000.00

Note: The environmental safeguard compliance issues and cost (Like solid waste management, water supply, traffic monitoring, drain cleaning, test of environment parameter etc.) are to be done by Bus Owners' Association and that is to be supervised by Noakhali Pourashava.

8. COMPLIANCE WITH ENVIRONMENTAL CODE OF PRACTICES

The environmental code of practices (ECoPs) provides guidelines for environment management of the subprojects to be implemented in different urban local bodies (ULBs) under MGSP. The main objective of the ECoP is to manage construction operations in harmony with the environment in an effort to contribute to the well-being of the community and the environment by (i) minimizing pollution, (ii) sustaining eco-systems, (iii) conserving cultural heritage, and (iv) enhancing amenity. In compliance with ECoP, following issues associated with the proposed subproject are addressed during environmental assessment:

- Planning and design of the subproject;
- Site preparation;
- Construction camps;
- Borrow areas;
- Topsoil salvage, storage and replacement;
- Waste management;
- Water bodies;
- Water quality;
- Drainage;
- Public health and safety;
- Material storage, transport and handling;
- Vegetation management; and
- Natural habitat.

In this assessment, it is found that some of the issues are not relevant to this subproject. The issues those are found as relevant are addressed properly in this report.

9. PUBLIC CONSULTATION AND ACCESS TO INFORMATION

9.1. Introduction

Pubic Consultation is an effective tool for maintaining communication among the Pourashava authority, BMDF as funding authority, different stakeholders of the subproject and community people where the subproject will be implemented. It helps to facilitate and streamline decision making as well as fosters an atmosphere of common understanding among individuals, group and organizations that could be affected or be affected by the subproject. It also ensures the transparency of the subproject at all levels of planning, design, construction and operation. It is a continuous process by which opinion from public is sought on matters affecting them. Hence, as a part of IEE/EIA, an effective public consultation and access to information is important.

9.2. Objectives

The main objectives of the public consultation and access to information under this subproject are: (i) to generate public awareness by providing information about the subproject to all stakeholders, particularly the subproject affected persons (PAPs) in a timely manner, and (ii) to provide opportunity to the stakeholders to raise their opinions and concerns on different aspects of the subproject.

9.3. Methodology

Public consultation about the planning, design, implementation and operation is done at different stages following different participatory methods. The methods followed in public consultation are: (1) consultative meeting with different stakeholders, (ii) Focus group discussion with community people through the participation of male participants, and (iii) Focus group discussion with community people through the participation of female participants, girls and boys, and disable people.

One consultative meeting was organized at community level through the participation of concern Councilors of Noakhali Pourashava, representatives of Bus Owners' Association, representatives of Workers' Association, local leaders, community elites and representatives of business men surrounding the bus terminal. The participants were informed about the detail design and activities of subproject going to be implemented. Environmental screening of the subproject was also done in this meeting using the prescribed form mentioned in EMF of BMDF. They were asked to share their opinion, feedback and suggestions on environmental and social impacts of the

Picture 7: Consultative meeting with stakeholders

subprojects as well as the mitigation measures to avoid or reduce the potential impacts. The list of participants of the consultative meeting with stakeholders is attached as **Annexure 3.**

One focus group discussion was organized with male community participants from different professions residing surrounding the subproject site. The participants were informed about the detail design and activities of subproject going to be implemented and asked about their opinion, feedback and suggestions on environmental and social impacts of the subprojects as well as the mitigation measures to avoid or reduce the potential impacts. The list of participants of the FGD with male community participants is attached as **Annexure 4.**

Picture 8: FGD with male group

Another focus group discussion was organized with female community participants living around the subproject site. The participants were also informed about the detail design and activities of subproject going to be implemented and asked about their opinion, feedback and suggestions on environmental and social impacts of the subprojects as well as the mitigation measures to avoid or reduce the potential impacts on women's point of view. In this session, boy and girls, and disable people were also present. The list of participants of the FGD with female community participants is attached as **Annexure 5.**

Picture 9: FGD with female group

Special efforts were made to include the elderly, women, and vulnerable groups and to allow them to express their views regarding the subproject implementation. In all cases, the impression of stakeholders and general mass regarding sub-project implementation was positive.

9.4. Issues Raised by the Participants

Following issues were raised during community consultation:

- Noise pollution due the construction activities;

- Air pollution due to blowing of dust, sand, cement and gravel sacks;
- Traffic congestion;
- Separate toilet facility;
- Waiting and prayer rooms;
- Solid waste management; and
- Security at the terminal area.

9.5. Feedback, Suggestions and Recommendations of the Participants

Local people, workers and operators of vehicles, traders and businessmen are very much interested and felt encouragement about the construction of a well-designed bus terminal with all facilities for the passengers and to create employment opportunity by keeping scope of shops within the bus terminal area. They are encouraged and ready to provide necessary social supports in constructing the bus terminal at the selected site. They suggested making the bus terminal environment friendly considering and addressing all assumed adverse effects related to abovementioned issues with the implementation of potential mitigation and enhancement measures during both pre-construction, construction and operational phases. Participants requested the Pourashava authority to maintain the quality of the construction work. Adjacent community peoples of the proposed site requested the Pourashava authority to keep the noise level low and keep the construction work stopped at night, restrict the workers to visit adjacent community, use quality construction materials, ensure proper traffic management and restrict the vehicles to stand at road side, ensure proper solid waste management to be produced by the passengers, ensure toilet, waiting room, prayer room and canteen facilities at the terminal building, ensure security of the passengers especially women by installing CCTV camera and deploying security guards, take necessary administrative action to restrict inhaling and drinking illegal drugs, wine and others, honor the communities' comfort and reduce over tranquility of the environment.

9.6. Access to Information

The environmental assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned personnel responsible for subproject implementation. It will also be made available to the public. The final assessment report (both English and Bangla) will also be uploaded in the Noakhali Pourashava website, BMDF website and the World Bank website after approval.

10. CONCLUSION AND RECOMMENDATIONS

10.1. Conclusion

On the basis of the analysis, it may be concluded that the project stands environmentally sound and sustainable when the recommended mitigation measure and environmental management processes are adopted properly. The adverse environmental impacts from the project will mostly take place during the construction stage. The benefits of the subproject will be significant by creating employment and business opportunities during the construction and operational phases. There is no significant cumulative adverse impact during operation that is identifiable at this stage. The construction impacts should be very predictable and manageable, and with appropriate mitigation measures. The subproject is expected to have a small "environmental footprint". No endangered or protected species of flora or fauna are reported at the subproject site. The proposed project activities have no significant adverse environmental impact so far as a time bound execution program with application of advanced construction technology is ensured. The mitigation measures are well within such codes and practices of construction and operation of the proposed project.

10.2. Recommendation

The attitude of the community people towards the construction of Poura Bus Terminal is positive as well as they have some recommendations to minimize the social impacts of the bus terminal during its construction and operation. The Government of Bangladesh and World Bank have some legal and social safeguard compliances issues those are applicable during constructing and operating the proposed bus terminal. Considering the above-mentioned issues and findings of the study, following key recommendations are made for smooth construction and successful operation of the bus terminal:

- All general components of a bus terminal should be considered at the design stage.
- A well-defined solid waste collection and disposal system should be in place at the bus terminal.
- All waste water should be discharged to the Municipal sewer system. In the absence of such system in the vicinity of the terminal the septic tanks should be constructed.
- No service of vehicles and refueling should be allowed inside the premises of the terminal. For any emergency repair, special bays should be provided.
- An oil and fuel spill contingency plan should be prepared.
- Fire prevention and fighting equipment should be provided and maintained as well as terminal staff should be trained in fire prevention and fighting.
- Vehicles should not be allowed to park with their engines are running.
- The entire area of the bus terminal, driveways and parking lots should be paved.
- Landscaping and plantation should be undertaken to improve the aesthetic quality of the bus terminal.
- Encroachment of outside terminals should be prevented to ease the pressure on traffic.

- Bus terminal should have facilities for washing, prayer, toilet, waiting, shopping, meals and snacks.
- Contractor will ensure availability of the PPEs and first-aid box, water supply and sanitation facilities to the workers.
- The surrounding people should be informed about the construction and operation of the bus terminal.
- Above all, the EMP should be followed and mitigation measures should be monitored as per EMP.

11. REFERENCES

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