



Design Planning & Management Consultant Ltd.



Low Income Community Housing Support Project

Environmental Management Plan (EMP) Report Rahamatganj Millgate Settlement, Sirajganj Pourashava

Community Mobilization, Design and Supervision Consultant

Prepared for



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To
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National Housing Authority
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Subject: Submission of Environmental Management Plan – Rahamatganj Millgate

Dear Mr. Kabir,

We are submitting two copies of the Environmental Management Plan (EMP) Report – Rahamatganj Millgate Settlement, Sirajganj Pourashava for your kind consideration.

Sincerely yours,



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Team Leader
Community Mobilization, Design & Supervision Consultancy (CMD&S)
Low Income Community Housing Support Project (LICHSP)

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National Housing Authority

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Table of Contents

1.	Subproject Description	1
1.1	Subproject Background.....	1
1.2	Location and Setting of the Subproject Site.....	1
1.3	Subproject Scope.....	6
1.4	Justification of Selection of the Subproject	6
1.5	Current Situation, Proposed Intervention and Need for the Rahamatganj Millgate Settlement	8
1.5.1	Housing:.....	8
1.5.2	Drainage System:.....	8
1.5.3	Toilet/Community Toilet:	8
1.5.4	Improvement of Tube Well Yard:	8
1.5.5	Solid Waste Management.....	8
1.5.6	Connecting Road.....	9
1.5.7	Pathways/ Internal Road.....	9
1.5.8	Street Lighting Facilities	9
1.6	Proposed Intervention for the Rahamatganj Millgate Settlement	9
1.7	Major Subproject Activities:.....	12
1.8	Schedule of implementation :.....	12
2.	SURROUNDING FEATURES	13
3.	ENVIRONMENTAL SCREENING	14
4.	IMPACT ASSESSMENT & MITIGATION MEASURES	17
4.1	General.....	17
4.2	Impact during Pre-construction for Site Preparation.....	17
4.2.1	Disposal of Demolished Toilet Waste	17
4.2.2	Clearing of Vegetation and Cutting of Trees.....	17
4.3	Impact during Construction Phase.....	17
4.3.1	Management of Site (Labor-shed, Material & Waste storage)	17
4.3.2	Construction of 01 Multi-purpose Center	18
4.3.3	Air Quality and Dust	19
4.3.4	Noise and Vibration.....	20
4.3.5	Interruption of Pedestrians Movement	20
4.3.6	Momentary interference to neighbouring settlements.....	20
4.4	Impact during Operation Phase	21
4.4.1	Waste Management (Toilet& Septic Tank)	21
4.4.2	Solid Waste Management:.....	21
4.4.3	Waste Water Management:	21
5.	Environmental Management Plan (EMP).....	27

5.1	General.....	27
5.2	Institutional Arrangement for Safeguard Compliance	27
5.3	Public Consultation and Participants and Final Design Feedback	28
5.4	Grievance Redress Mechanism (GRM)	29
5.5	Environmental Management Plan (EMP).....	29
5.6	Environmental Monitoring Plan	37
5.6.1	Compliance Monitoring	37
5.6.2	Monthly Environmental Monitoring Report.....	38
5.6.3	Community Level Monitoring	38
5.6.4	Effects monitoring	39
5.7	Environmental Safeguard Cost during Construction Phase	42
5.8	Subproject Specific Environmental Compliance Clauses for Tender Document.....	43
5.8.1	Environmental Management Plan (EMP).....	43
5.8.2	Temporary Works.....	43
5.8.3	Health and Safety.....	43
5.8.4	Waste Disposal and Pollution	43
5.8.5	Earthworks	44
5.8.6	Third Party Monitoring.....	44
6.	CONCLUSIONS AND RECOMMENDATIONS	45
	Annex	46
	Annex 1: Photograph of Public Consultation	46
	Annex 2: List of the Participants	47

List of Figure:

Figure 1-1:	Topographical location of proposed subproject.....	2
Figure 1-2:	Rahamatganj Millgate Settlement Location within Pourashava map	3
Figure 1-3:	Base map of Rahamatganj Millgate settlement	4
Figure 1-4:	Lay out plan of proposed interventions at Rahamatganj Millgate settlement.....	5
Figure 1-5:	Selection Approach of Low income community Settlement	7
Figure 1-6:	Current Situation of the Settlement: Poor Infrastructural Facilities	11
Figure 4-1:	Layout plan of proposed road, toilet & washrooms, tube well platform retention tank and drainage network.....	23
Figure 4-2 :	Downstream discharge point; slope and x-section of drainage network	25
Figure 4-3:	Layout plan of septic tank with soak pit and cross section.....	26
Figure 5-1:	Institutional Arrangement for Environmental Safeguard	28

List of Table:

Table 2-1: Major Surrounding Features13

Table 5-1: Environmental Management Plan (EMP)30

Table 5-2: Compliance Monitoring Checklist during Construction and Operation Phase.....37

Table 5-3: Community Monitoring at Operation Phase.....39

Table 5-4: Effect Monitoring for the environmental Management.....40

Table 5-5: Effect monitoring for Analytical analysis41

Table 5-6: Environmental Safeguard Cost.....42

Table 5-7: Environmental Enchantment Budget42

Table 5-8: Environmental Monitoring Budget.....42

ABBREVIATIONS

BOQ	Bill of Quantity
CDC	Community Development Committee
CSC	Community Support Center
EA	Environment Assessment
ECA	Environment Conservation Act
ECoP's	Environmental Code of Practices
ECR	Environment Conservation Rules
EIA	Environment Impact Assessment
EMF	Environmental Management Framework
EMP	Environment Management Plan
EPA	Environmental Protected Areas
GoB	Government of Bangladesh
GRM	Grievance Redress Mechanism
GRO	Grievance Redress Officer
LICHSP	Low Income Community Housing Supporting Project
MoHPW	Ministry of Housing and Public Works
NHA	National Housing Authority
OP	Operational Policy
PAP	Project Affected Person
PMU	Project Management Unit
Sqm	Square meter
TRC	Technical Review Committee
UPPR	Urban Partnership for Poverty Reduction
CSC	Community Support Center
CDC	Community Development Committee
WB	The World Bank

1. SUBPROJECT DESCRIPTION

1.1 Subproject Background

National Housing Authority (NHA), through its project, 'Low Income Community Housing Support Project' (LICHSP), is in the process of implementing subproject interventions, with the financial assistance from World Bank, to reduce vulnerability of selected designated urban poor communities in five Pourashavas of Bangladesh, including Sirajganj Pourashava.

Sirajganj Pourashava lies just at the West side of the Brahmaputra River and beside the Jamuna River, about 70 miles (110 km) northwest of Dhaka. It has an area of 28.69 sq. km. There are 15 Wards and 50 Mahallas. Accordingly, to the census of 2011, the total population of Sirajganj Pourashava is 158,913, out of which 80,241 male and 78,672 females. The literacy rate, among town residents, is 63.2%.

A total of 654 low-income settlements were identified in Sirajganj Municipality. These settlements consist of 38,941 houses and 51,977 households. The land area of the low-income settlements is 1,577.2 acres (about 43.8% of Sirajganj Municipality's total area of 3,602.8 acres). Out of 654 settlements, 142 settlements are categorized as "Very Poor", 494 settlements as "Poor" and 18 settlements as "Not Poor" with respect to land entitlement, infrastructure, utility services, community facilities, employment, income and vulnerability. Among all these settlements, nine settlements have been selected for immediate development, including Rahamatganj Millgate, which has 348 houses.

The living environment of this low-income community in Rahamatganj Millgate is unhygienic, with rainwater drainage, internal sanitation and solid waste management systems being inadequate and substandard. During the rainy season, water-logging is a common problem for the settlement. Hence, to improve the living condition of the Rahamatganj Millgate low income community, LICHSP, with the financial assistance from the World Bank, will finance a multi-sectoral package of infrastructure and service improvements. This includes upgrading works includes improved drainage, vehicular access road, internal roads, sanitation services, tube well platform improvement, one multi-purpose center, garbage bin & street light improvement in line with the demands of the Rahamatganj Millgate community.

To meet the WB regulatory requirements and guidelines, this **Environmental Management Plan** (EMP) is prepared for this subproject, which details the projected impacts and subsequent mitigation measures to be considered during the subproject implementation and post implementation stages.

1.2 Location and Setting of the Subproject Site

The proposed Rahamatganj Millgate settlement /subproject site is located within the jurisdiction of Ward no 4 under Sirajganj Pourashava. The settlement occupies an area of 144237 sq. meters. The geographic coordinates of the proposed low-income community are 24°27'57.43"N and 89°41'7.84"E. The base map and layout plan of Rahamatganj Millgate settlement are shown in **Figures 1.1, 1.2, 1.3 and 1.4.**

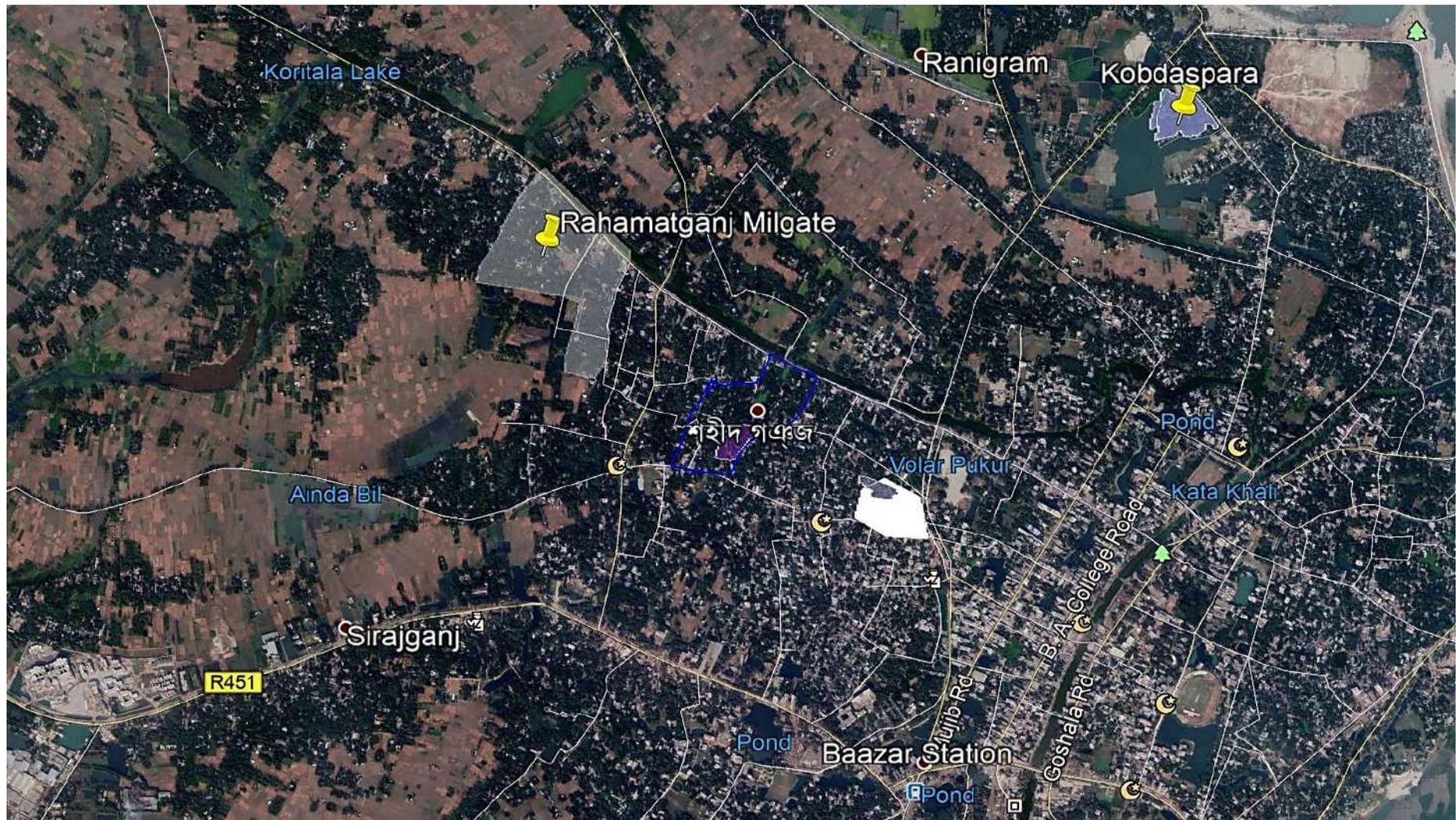


Figure 1-1: Topographical location of proposed subproject

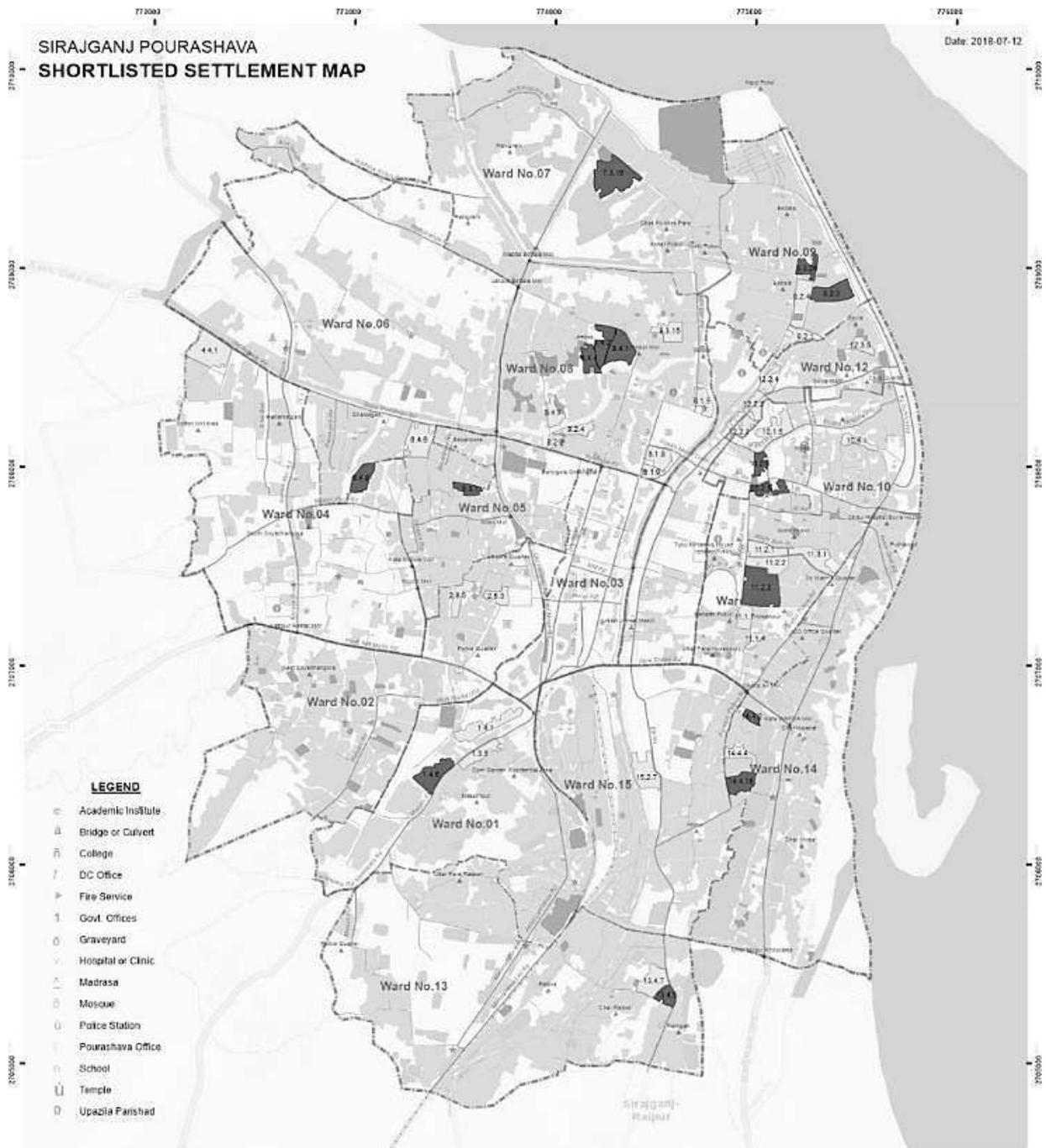


Figure 1-2: Rahamatganj Millgate Settlement Location within Pourashava map

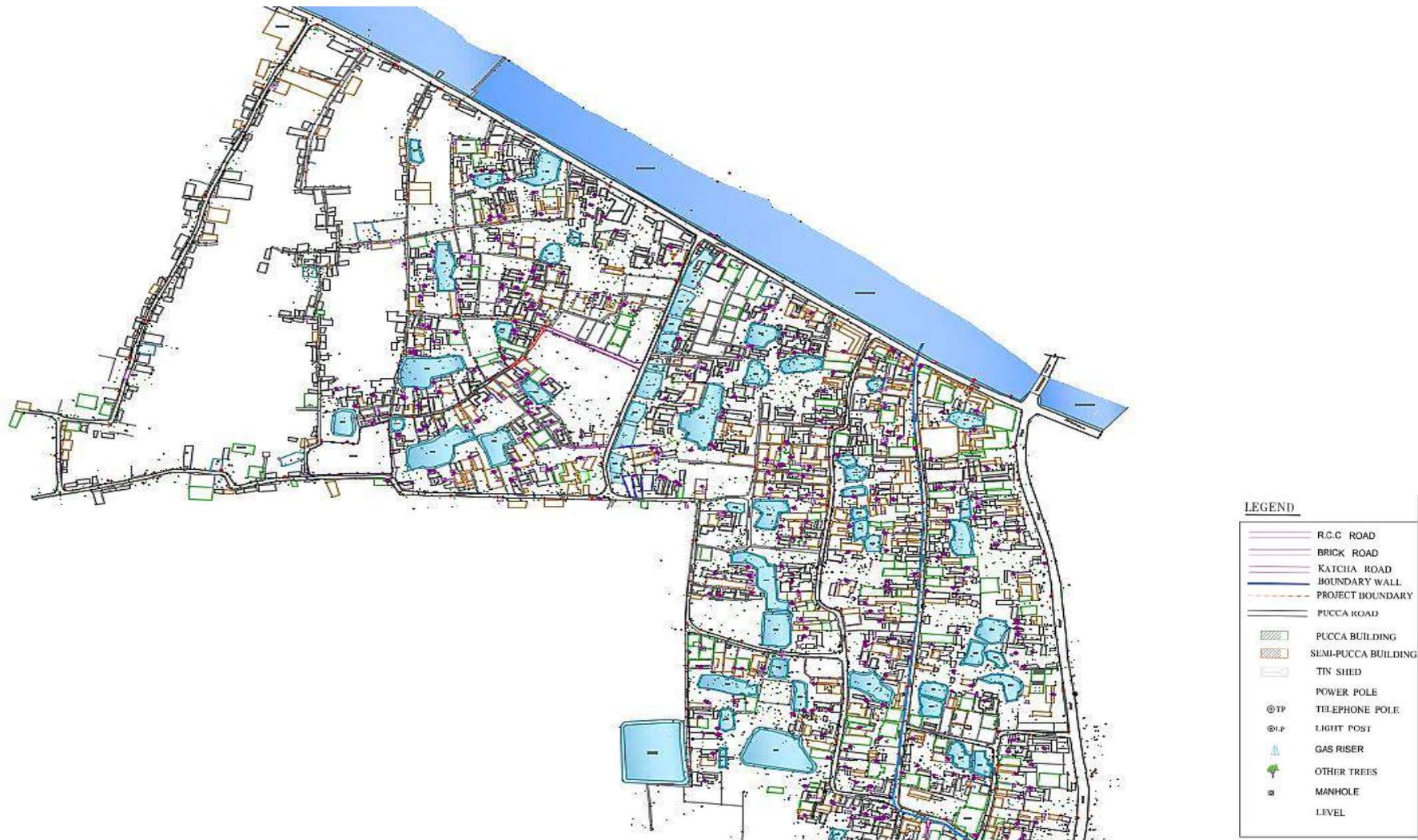


Figure 1-3: Base map of Rahamatganj Millgate settlement

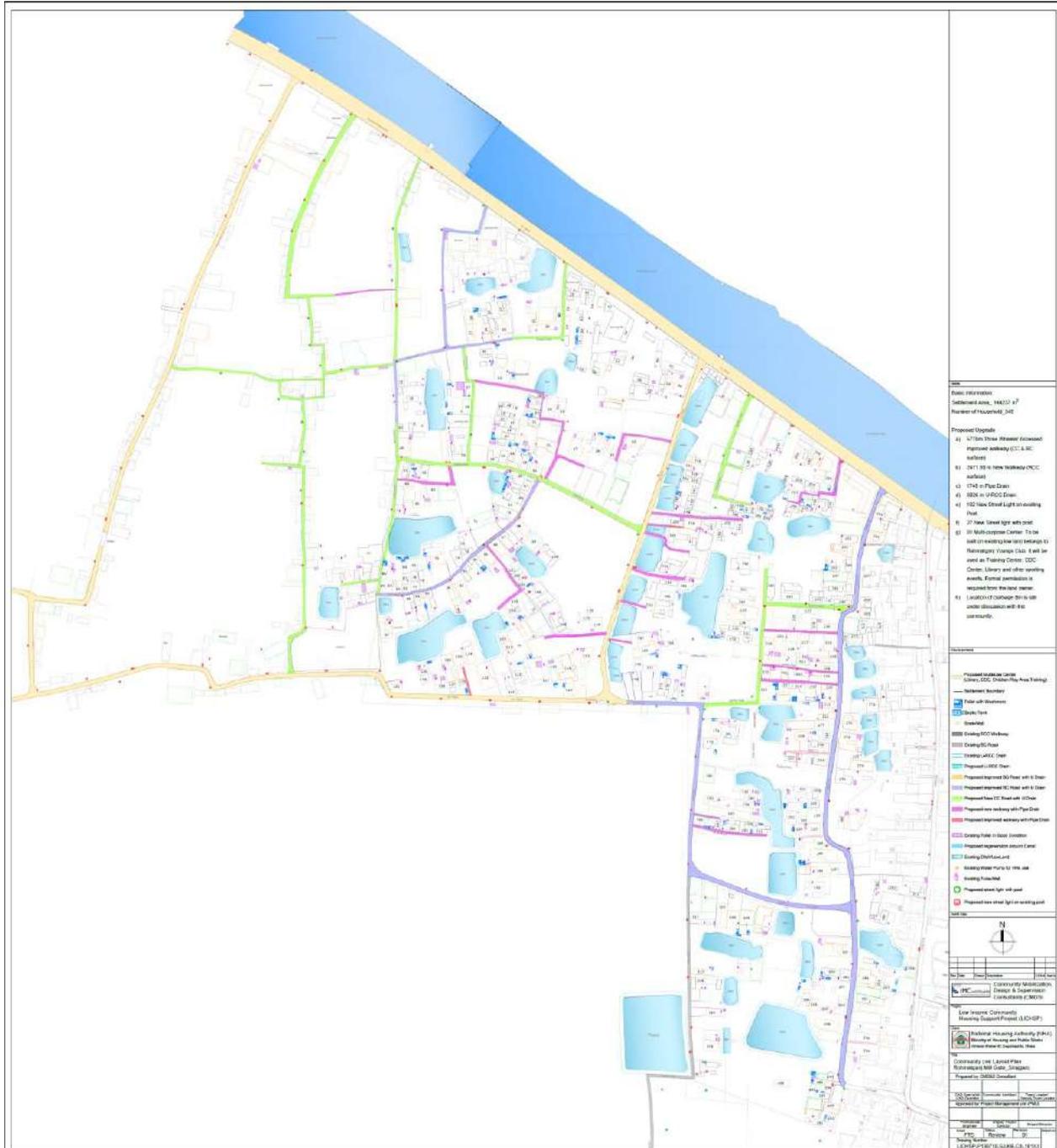


Figure 1-4: Lay out plan of proposed interventions at Rahamatganj Millgate settlement

1.3 Subproject Scope

LICHSP is targeting to implement particular components to cover three key factors of i) shelter improvement i.e. land, ii) infrastructure, and iii) housing. Implementation of the project will include a strong focus on monitoring and evaluation component, to better understand the impacts and potential for future scaling-up.

Under this settlement upgrading program, a multi-sectoral component has been included. This includes:

- i) 1348 m Three-Wheeler Accessed improved walkway (CC & BC surface)
- ii) 1397 m New Walkway (RCC surface)
- iii) 116 m Pipe Drain
- iv) 3491 m U-RCC Drain.
- v) 69 New Street Light on existing Post.
- vi) 23 New Street light with post.
- vii) 01 Multi-purpose Center. To be built on existing low land belongs to Rahamatganj Youngs Club. It will be used as Training Center, CDC Center, Library and other sporting events. Formal permission is required from the landowner.
- viii) Garbage Bin
- ix) 85 Toilet & wash, 08 washroom, 1 Toilet, 62 Septic Tank
- x) 17 Tube-well Platform

1.4 Justification of Selection of the Subproject

NHA has selected the long and short list of settlement, for the implementation of LICHSP, with the assistance of data sources of LGED, Sirajganj Municipality, Urban Partnership for Poverty Reduction (UPPR) officials and open sources. The following flow chart, shown in figure 1-5, was considered during the selection process.

Based on the overall selected list of low-income community, NHA has prepared a short list on a priority basis, whereby PMU and Consultant team visited the site as a part of the reconnaissance survey. After site inspection, it was observed that the anticipated impacts due to the implementation of this pilot scale project, for low income community upgrading intervention, will not be severe, since it is considered as. Hence, considering the low environmental and social impacts due to this low-income community upgrading, this subproject has been selected.

The low-income community settlement is mostly located at the existing right of way. After completion of the project, the living conditions, of the selected Rahamatganj Millgate community, will be improved. Hence, considering the benefit that will be derived after construction, this settlement has been selected.

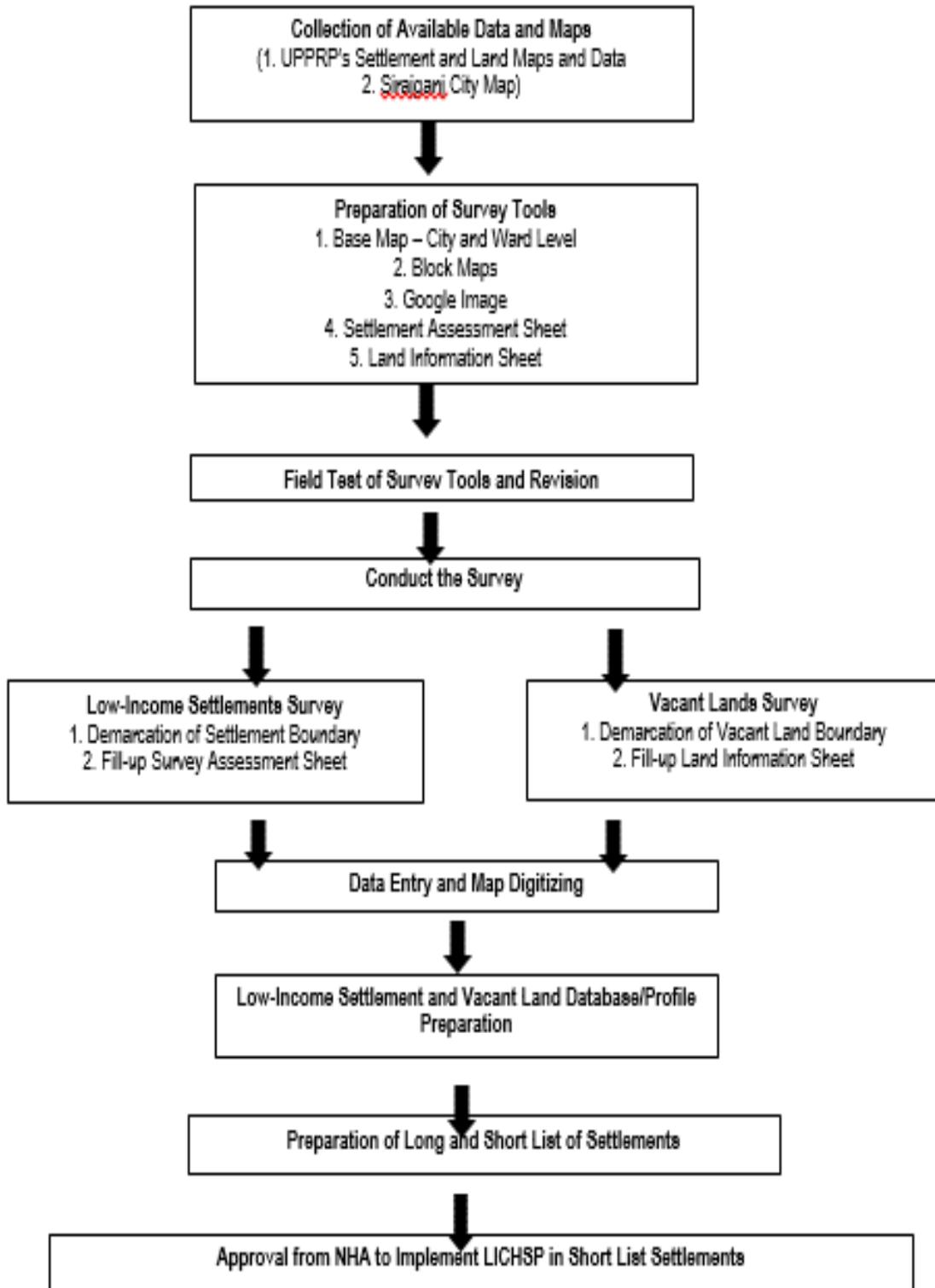


Figure 1-5: Selection Approach of Low income community Settlement

1.5 Current Situation, Proposed Intervention and Need for the Rahamatganj Millgate Settlement

1.5.1 Housing:

It was recorded that during the initial environmental reconnaissance survey, three major types of houses exist in Rahamatganj Millgate Low income community, comprising semi-pucca, tin shed and number of pucca houses. During this initial site visit, it was also discovered that the built-up area of the community consist of housing spaced haphazardly in an unplanned, where several shortcomings, regarding basic needs and living conditions were identified, refer to **Figure 1-6**.

1.5.2 Drainage System:

There is no drainage facilities within the settlement. Beside the settlement area there is existing Pourashava drain (RCC covered drain), but internal drainage system of the area is not sufficient to drain the storm/excess water of the area and existing internal drainage system is in damaged condition (beside internal roads). So NHA authority has identified, as a priority to develop some tertiary drains with positive drainage outfall to the Katakhal Khal.

1.5.3 Toilet/Community Toilet:

Sanitation is one of the most important services for housing development interventions. Many types of human threatening diseases prevail when the sanitation system is non-functional and inadequate. In Rahamatganj Millgate, the sanitation facilities are mostly inadequate and of an inappropriate design. The types of latrines observed, include i) sanitary latrine and ii) twin pit & single pit latrine. Maximum sanitary latrine are in damaged condition and unhygienic. There are some low land & ditches within the community. Wastewater from some pit latrine is directly discharged within the low land and ditches, causing widespread pollution of the existing watercourses and the potential spread of water borne diseases. Furthermore, most of the dwellers of Rahamatganj Millgate depend on such facilities with several shared latrine. Overflow of latrines during any flood or heavy rainfall is a common phenomenon in the area. Thus, to ensure a better environment and living conditions in the Rahamatganj Millgate community, NHA has proposed the provision of 85 Toilet & wash, 08 washroom, 1 Toilet, 62 Septic Tank & soak wells facilities, in promoting installation of hygienic latrine with water and wash facilities in replacement of the existing pit latrine.

1.5.4 Improvement of Tube Well Yard:

In the settlement area, most of the exiting tube well yards are earthen platform. These earthen platforms most of the cases remains moist and damped. In fact, during monsoon period it turns to worsen condition which makes the tube well yard slippery and muddy. Thus, especially women and children face difficulties to use the tube well. Considering the troubles and demands of low-income community, NHA has decided to replace 17 earthen platform by the CC platform. However, prior to construct the pucca platform all of these tube well water shall be analysed for evaluating the physical, chemical and biological characteristics (for instance Fe, As, Tc, Fc, Odor, TDS, Mn, Ca etc) whether it meet or not the potable water quality as per WHO and DoE guideline. If found any tube wells is affected by microbial contamination or carrying excessive pollutants (heavy metal or mineral), results in can causes of water borne disease. Contaminated tube well will be stopped for use and to be relocated for betterment.

1.5.5 Solid Waste Management

In the Rahamatganj Millgate area, there is no proper arrangement of waste disposal for the low-income community dwellers. It is found that, the highest number of household owners throw their household wastes in open dumping areas, which remain unhygienic and pollute the existing water bodies of the locality. People also use the vacant places (low land) of the community for dumping their solid wastes, which causes the spread of bad odors and environmental degradation in the settlement areas.

1.5.6 Connecting Road

In the settlement area, there are some key roads that connects the settlement with municipality road network at north. By using these road dwellers of settlement get access into the settlement area. Some roads are in good condition but unfortunately, some road condition is very poor. There are some earthen & brick flat soiling roads also.

At present, the existing RCC road is partially damaged in the different section of the road and in many locations are nearly impassable. Due to long time use road severely damaged containing cracks, pot holes, edge broken, and depressions are prevalent. Even, at some places missing of concrete exposed the reinforcement. During monsoon, these potholes accumulate storm water and remain in stagnant condition until drying up. Thus, traffic movement is interrupted as well as emergency service do not get smooth access. Moreover, within settlement poor road quality prevents people from moving during floods or forces them to walk in muddy surface or stagnant water, or on dangerous, dilapidated footbridges, resulting in many sicknesses, infections.

After implementation of the road problems will be alleviated and dwellers of settlement will be benefitted. Hence, under this project the road will be rehabilitated by replacing existing badly damaged road to new RCC & BC pavement for ensuring better road network to the community peoples.

1.5.7 Pathways/ Internal Road

There is no adequate connecting road to house access. Thus, people's uses the gap between two houses and yards of neighbor houses to entry their own houses which is very much embracing for the dwellers and their privacy also decline. In addition, existing CC road is also have been damaged with the contact of water since most of the time of settlement remains waterlogged especially at monsoon period. Besides, the earthen pathway turns muddy and slippery surface which become trap of accident for school going kids and old aged peoples. Thus, NHA is proposed a planned design where there will be adequate pathway/ internal road to house connection. Cover slab of RCC drain at internal roads will be used as paved width

1.5.8 Street Lighting Facilities

There are some lighting faculties in the settlement area, but those are not sufficient for the area. Hence, it interrupts pedestrians and traffic safety at night. Therefore, fixing of the street light is needed in the settlement area. Thus, NHA has decided to installation of 69 numbers of streetlight and 23 numbers of solar light set in the settlement area. The proposed section and plan of street

1.6 Proposed Intervention for the Rahamatganj Millgate Settlement

- 1348 m Three-Wheeler Accessed improved walkway (CC & BC surface)
- 1397 m New Walkway (RCC surface)
- 116 m Pipe Drain
- 3491 m U-RCC Drain.
- 69 New Street Light on existing Post.
- 23 New Street light with post.
- 01 Multi-purpose Center. To be built on existing low land belongs to Rahamatganj Youngs Club. It will be used as Training Center, CDC Center, Library and other sporting events. Formal permission is required from the landowner.
- Garbage Bin
- 85 Toilet & wash, 08 washroom, 1 Toilet, 62 Septic Tank
- 17 Tube-well Platform



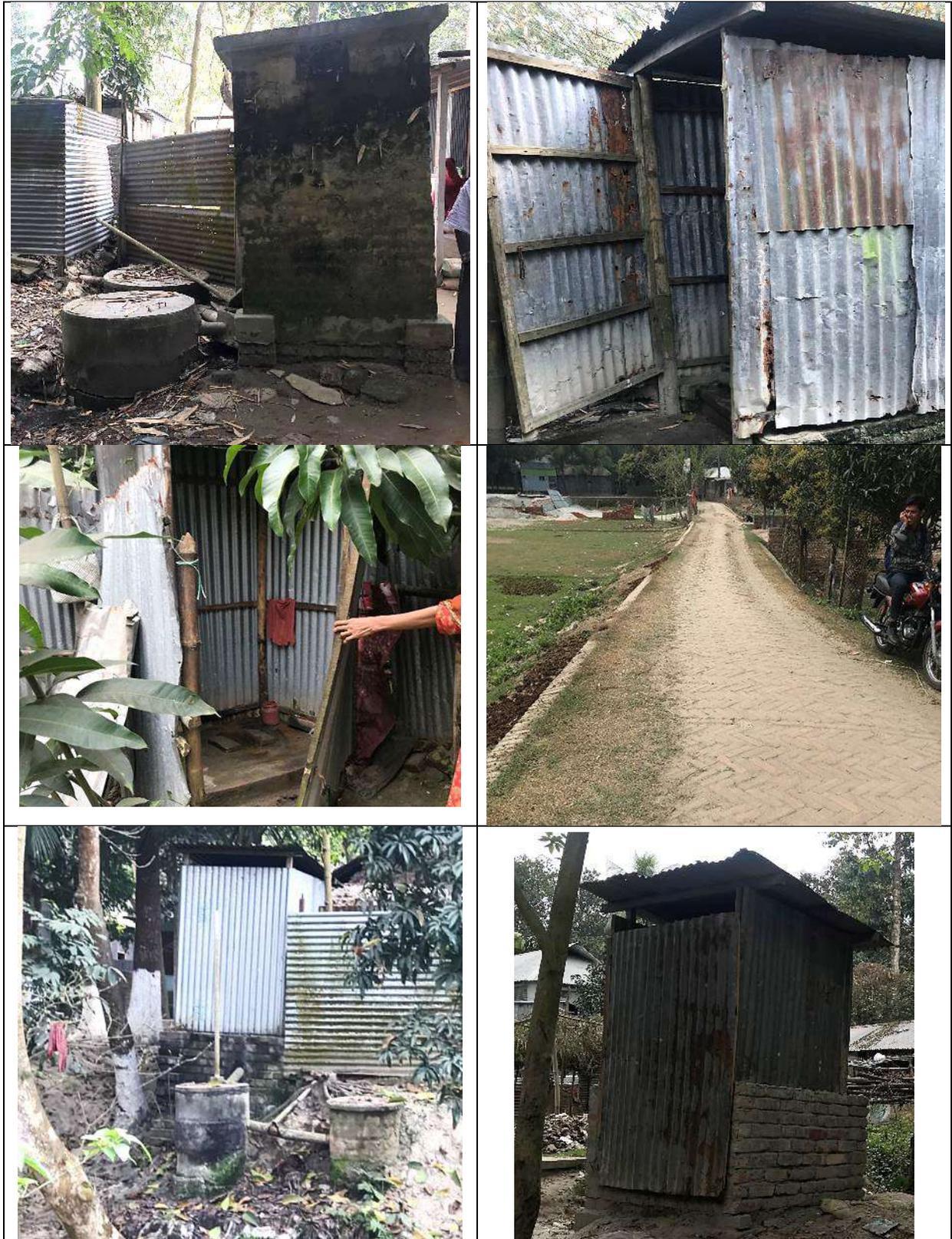


Figure 1-6: Current Situation of the Settlement: Poor Infrastructural Facilities

1.7 Major Subproject Activities:

The key physical activities to be performed for the implementation of the subproject include the following:

- Earth excavation for PVC pipe drain & RCC U drains;
- Pipe laying & backfilling;
- Construction of interceptor / inspection pits;
- Make connection with existing RCC covered drain;
- Demolition of existing damaged toilet;
- Construction of septic tank, toilet & bathroom;
- Improvement of internal road (RCC & BC) surface with RCC covered drain;
- Construction of street lighting lam post;
- Filling of low land & Construction of multi-purpose building (It will be used as Training Center, CDC Center, Library and other sporting events)

1.8 Schedule of implementation :

- a) Duration : 6 months
- b) Tentative start date : April 2020
- c) Tentative completion date : September 2019

Note: This EMP is a live document, so for any circumstances it can need to be updated

2. SURROUNDING FEATURES

The preparation of the subproject entails a detailed conditional survey to get a clear profile on the existing situation regarding surrounding and prevailing facilities and features. This EMP has been prepared by conducting comprehensive field reconnaissance and related surveys, whereby the data collected from such field visits is addressed in this EMP.

Moreover, this EMP is considered as a live document, which shall be subject to any revisions and updates, as required over the duration of implementing the associated subproject infrastructural development initiatives under LICHSP. The key findings of the related site inspection and investigative work are given in **Table 2.1**.

Table 2-1: Major Surrounding Features

Side/ Direction	Major Environmental and Infrastructural Features,
East	Kazipur road, trees, tin shade houses, Shops, Semi pucca houses, multi storied building, vacant land, pond, ditch, low land, electric pole
West	Cotton mill road, danghara Poschim para road, pond, low land, vacant land, tin shade houses, Shops, Semi pucca houses, multi storied building
North	Old bagura road, katakhali khal, tin shade houses, Shops, Semi pucca houses, two storied building, CC road, trees, electric pole, ditch, pond, low land, vacant land,
South	Cotton mill, BC road, earthen road, Mosque, tin shade houses, Shops, Semi pucca houses, multi storied building, CC road, trees, electric pole, ditch, pond, low land, vacant land

3. ENVIRONMENTAL SCREENING

Part A: General Description

Location of the low-income community:	Rahamatganj Millgate, Sirajganj Pourashava, Sirajganj.
Number of people/households to be benefited:	Generally, whole population of the Rahamatganj Millgate Low income Community will be benefited, where 348 households, with a present 1320 population, will be benefited.

Part B: Environmental Screening Checklist

	Environmental issues	Yes	No	Remarks
1	Encroach onto an important natural habitat or protected area?		√	The subproject is for the improvement of under-developed settlement areas to a developed area
2	Disturbance or harm of historical or culturally important site?		√	In the subproject influence area (1km), there is no historical or cultural site of importance. So, there is no question about disturbance of historical place.
3	Adverse effects or destruction of designated wetlands?		√	Except few ponds and low land within the study area no seasonal wetland exist. In fact, from improved sanitation facilities these ponds and low lands will free from discharge of households pollution load. So, there will have no effect on designated wetland.
4	Development interventions in high risk (climatic/disaster) area?	√		No risk
5	Drainage, water logging or congestion in the project area?		√	At present, settlement area is subjected to drainage congestion due discontinuous and inadequate drainage system. Hence, during monsoon period some locations within the low income community become flooded due to delayed discharge of rainwater. Moreover, during the construction work earthen drainages and submergible pump will be provide in the site to avoid drainage congestion from erratic rainfall.
6	Deforestation or cutting down of trees and vegetation?	√		For the implementation of the subproject, there will be needed cut down of trees during sites clearing work. However, the ecological imbalance to be caused by the feeling of trees will compensate by replantation of trees.
7	Over exploitation of ground water in the project area?		√	During the short-term construction work and construction of toilet, septic tanks, pits, installation of PVC pipe, RCC road with U drain, tube well platform, CDC center a minimal quantity ground water will be required. Moreover, effective use of the water will be ensured.
8	Adverse effects on groundwater quality?		√	There shall be no adverse effect on groundwater quality.

9	Adverse effects on surface water quality or flow?	√		In the proposed settlement area, adjacent to the households water bodies like ponds and lowlands has been degrading for long time due to lack of structured solid waste management or direct discharge of domestic waste water or toilet connection in to the water bodies. However, after completion of drainage and waste management system surface water quality will be improved.
10	Involve destruction of top soil?	√		This settlement upgrading subproject involves some excavation work for road and drain construction work. So, it may have possibilities to destruct of top soil. However, during excavation top soil will store in separate place from deep soils and during backfilling work it will aging take place on the top.
11	Conversion or degradation of agricultural land?		√	This settlement's development work will be followed in situ upgrading process. Even, in the Rahamatganj Millgate settlement there is no agricultural land. So, there is no matter of agricultural land conversion or degradation.
12	Increased noise due to every day construction activities?	√		Noise and vibration caused by the construction equipment (mainly concrete mixture machine & concrete vibrator) and construction materials carriage vehicles may temporarily disturb nearby residents. However, mitigation measures shall be taken as part of the Contractor's EMP, whereby use of low noise generating equipment shall be closely managed.
13	Functional operating system for waste management?		√	There is no functional solid waste management system. Thus, to provide hygienic environment and restrict the disposal of waste material here and there provision of primary bin and secondary transfer station should be incorporated in the proposed intervention list.
14	Increase of wind-blown dust i.e. fine aggregate, from storage?	√		From the stockpile of construction material, i.e. fine aggregate will have probability to dust blowing if not properly cover up. However, in full compliance of the provisions of the Contractor's EMP, all necessary mitigation measures shall be managed for the control of potential wind-blown dust from stockpiled construction material, including necessary water spraying and proper covering.
15	Use or transportation of any toxic or hazardous materials?	√		In full compliance of the provisions of the Contractor's EMP, all necessary mitigation measures shall be managed for the control of potential risk due to use of toxic and hazardous material like oil, grease for the operation of construction materials carriage vehicles and equipment. Thus, there shall be no, or minimal adverse impact on the species of aquatic environment due to disposal of waste construction materials and accidental leakage and spillage of the oil and grease from subproject vehicles and equipment into the existing water bodies.

Decision of EA Category and Further Assessment: In the EMF of LICHSP, all of the interventions implemented under LICHSP, fall in Category B as per WB guidelines. According to GOB guideline housing, road and drainage intervention are classified as category orange B. Category of remaining intervention to be implemented by the LICHSP are not addressed in GOB guideline. However, in the project EMF, it is also mentioned that, depending on assessment, subproject intervention can be classified as Orange A and or Orange B or green as per ECR-97.

Considering the environmental impacts which is low, very much site specific and significantly manageable through mitigation measures, primarily this subproject can be considered as Orange-A Category as per ECR-97.

Considering the anticipated impacts, the implementation of the subproject is classified as Category C, according to the WB classification. Therefore, environmental management plan is acceptable to meet the WB and GOB regulatory requirement.

Environmental Assessment Category

As per GOB Orange A Orange B C

As per WB Category B **Category C**

Therefore, there is no need for further evaluation:

Need IEE Yes **No**

Need EIA Yes **No**

4. IMPACT ASSESSMENT & MITIGATION MEASURES

4.1 General

From this subproject, the probable impact is expected from the activities to be performed for implementing the proposed interventions (internal road, drainage network, toilet, washroom, tube well platform, street lighting facilities). However, most of the impacts are considered minor and site specific, short term during the construction period, which are identified in this Section along with the related mitigation/enhancing measures.

4.2 Impact during Pre-construction for Site Preparation

4.2.1 Disposal of Demolished Toilet Waste

If during demolition of existing toilet is not properly planned and executed or protection gears are not adopted, it will affect health of residents, construction workers, and neighboring communities. Human excreta of those toilets (if untreated) might result into the health problem, water pollution and air pollution.

Mitigation Measure:

- Ensure use of vacuum pump to collect sewage sludge and it shall be carried with covered drum truck;
- In the Sirajganj municipality no fecal sludge treatment plant available. However, there is one designated solid waste dumping site at Banbaria (beside Sirajganj – Kodda highway) Sewage sludge shall be transported in the vacant place of. Banbaria dumping site and that shall be engraved in the earthen pit and soil cover shall be ensured at least one feet.
- Sewage sludge shall be disposed in the nearby fecal sludge treatment plant (if available), or that shall be engraved in the earthen pit and soil cover shall be ensured at least one feet.
- Ensure disposal tanks, drums or containers coming to site are in a satisfactory condition – check for damage or leaks;
- Ensure all deliveries are made as far away from watercourses and drains as possible;
- Ensure use of PPEs for the associate workers;

4.2.2 Clearing of Vegetation and Cutting of Trees

During site visit it was counted that, total 25 numbers of tree will be cut down for the upgrading of the low income community. There is also be needed few vegetation clearing works.

Mitigation Measure:

- 50 numbers of trees will be planted to compensate the felled down trees and enhance the ecological condition in the subproject area.

4.3 Impact during Construction Phase

4.3.1 Management of Site (Labor-shed, Material & Waste storage)

This subproject consists of different interventions at specific location. Hence, absent of proper site management such as storage of construction material and equipment here and there and lack of labor shed, and site office may arise different types of problem in the community and to the surrounding peoples. The problem associates with improper site management of waste disposal, dust generation, drainage congestion are considered for determining the required mitigation measures, as incorporated within this EMP and as follows:

Related Mitigation Measures:

- Prior to construction work one labor shed and site office with sanitation facilities and open space for stockyards will be arranged by the contractor;

- Selected stockyard place will be fenced to restrict the free movement of people and minimize windblown dust blowing in the stockpile of fine aggregate;
- In the camp site waste bin shall be provided;
- Transportation of construction material and equipment should be followed according to the management plan and scheduled time;
- Soil and sand carrying vehicles shall be covered to avoid risk of windblown dust;
- Road side storage of construction material and equipment shall be prohibited;
- Generated waste shall be correctly disposed in to the approved dumping site at Banbaria of municipality;
- Locations for the placement of containers, for temporary storage of waste, shall be provided and be emptied on a regular basis by the arrangements made by the contractor and the municipal services;
- Excavated soil mostly will be reused for the backfilling of drains and surplus portion, if any, shall be disposed in the designated dump site at Banbaria.

4.3.2 Construction of 01 Multi-purpose Center

Due to construction of building anticipated impact is mainly on physicochemical parameter. Construction of Multi-purpose Center building (one storied) involves use of equipment/machines which are produced noise, it may temporarily disturb nearby residents. However, if the settlement is located close to human settlements, noise pollution would be significant though the impacts are anticipated to be limited. Similarly, air pollutants will be emitted from the excavation work, equipment and construction vehicles are expected to remain low. Storing of cement bag without cover may also degrade the air quality. Local residents in the vicinity of the work sites will be temporarily disturbed by the limited dust pollution. If proper measure are not adopted temporary water-logging may be occurred. Moreover, the finishing work of construction stage is plastering, and painting. These work may degrade the soil and surface water quality if measure are not taken. Eventually, lime paint (locally known as white wash) need lime (Chun) to be mixed in water. Mixing lime will pollute air and possess potentials of serious pollutants and health hazards. However, scale of work is minimal & site specific. So, anticipated impact is also expected to remain low and site specific.

Mitigation Measure:

- Construction materials must be selected to ensure the least possible negative impact on the environment;
- Water should be sprayed at the work site for dust control;
- Ensure sprinkle and cover stockpiles of loose materials (e.g., fine aggregates);
- Maintain adequate moisture content of soil and sand for transportation, compaction and handling;
- Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local residents;
- Ensure all subproject vehicles are in good operating condition;
- For managing noise nuisance, construction works should be limited to daytime and all employees likely to be exposed to ear noise must use ear plug;
- If needed and applicable, all powered mechanical equipment and machineries will be fitted with noise abating gear such as mufflers for effective sound reduction;
- Place polythene at the ground to prevent discharge of paints, and plastering wastes in the soil;
- Carefully mixing of lime with water by ensuring safety gear and it should be in confined zone.
- For storing of construction materials like cement bag, shed must be covered as well as must have a concrete floor.
- In the construction process, use of chemical or binder in the concrete to strengthen and fasten the process should be avoided.

4.3.2.1 Toilet /Sanitation

Due to construction of toilet with septic tank and wash room there will have impact mainly on physicochemical parameter. Construction works involves use of equipment/machines which are produced noise, it may temporarily disturb nearby residents. Similarly, air pollutants will be emitted from the excavation work, equipment and construction vehicles are expected to remain low. Local residents in the vicinity of the work sites will be temporarily disturbed by the limited dust pollution. If proper measure are not adopted temporary water-logging may be occurred from excavated pit of septic tank. However, scale of work is minimal. So, anticipated impact is also expected to remain low and site specific.

Other hand installation of new sanitation system/ toilets is likely to bring significant adverse environmental impacts if not designed properly or constructed in an inappropriate location. The impact may be raised due to improper designing are: land loss, soil erosion, surface runoff, waterlogging, health and safety, air pollution, odor, water pollution, etc. However, by adopting proper design probable impact can be minimized.

Mitigation Measures

- Construction materials must be selected to ensure the least possible negative impact on the environment;
- Water should be sprayed at the work site for dust control;
- Ensure sprinkle and cover stockpiles of loose materials (e.g., fine aggregates);
- Maintain adequate moisture content of soil and sand for transportation, compaction and handling;
- Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local residents;
- Ensure all subproject vehicles are in good operating condition;
- For managing noise nuisance, construction works should be limited to daytime and all employees likely to be exposed to ear noise must use ear plug;
- Before designing sanitation system community should be involved;
- Selection of land for the sanitation or toilet should be followed engineering practice;
- Keep safe distance (minimum 10 m) between latrine and tube well or other water sources;
- Distance between ground water table and bottom of latrine pit should be at minimum 3 feet to protect ground water pollution;
- Sufficient ventilation should be ensured in latrine superstructure to reduce odor problem.
- Selection of land for the sanitation or toilet should be followed engineering practice;
- In the design of sanitation facilities, ensuring connection of toilets with septic tank in all establishment;
- Water supply shall be provided in each toilets to ensure hygienic environment;
- Before construction selected land for toilet should be ensured proper compaction to avoid soil erosion;
- Installation of hygienic latrine instead of pit latrine to stop the microbial contamination to the ground water;
- Noise and soil pollution should be kept within tolerable limit.

4.3.3 Air Quality and Dust

To implement the subproject interventions (internal road, drainage network, toilet, septic tank, tube well platform, pole for street light) appropriate and approved types of equipment and construction vehicles shall be used. The probability of emission of potential air pollutants shall be controlled in line with the mitigation measured detailed in the EMP. Although all of the intervention shall short term, the overall use of equipment and construction vehicles is expected to create a minimal impact.

Local residents in the vicinity of the work sites will be temporarily disturbed by the limited dust pollution. The overall impacts are expected to remain low.

Related Mitigation Measures

- Water shall be sprayed at the work site for dust control;
- Water sprinkling and use of cover to stockpiles of loose materials (e.g., fine aggregates) shall be assured;
- Adequate moisture content of soil and sand for transportation, compaction and handling shall be maintained;
- Use of dust generating equipment, which produce significant amount of particulate matter, shall be avoided and kept far away from the local residents;
- All subproject vehicles shall be kept in good operating condition.

4.3.4 Noise and Vibration

Noise and vibration caused by the equipment and movement of the construction vehicles may temporarily disturb nearby residents. In this subproject, sensitive areas, including roadside houses and shops, are likely to be affected, though the impacts are anticipated to be limited.

Related Mitigation Measures

- Transportation of the construction materials shall be carried during the scheduled times, and arranged mainly during the day;
- All powered mechanical equipment and machineries shall be fitted with noise abating gear, such as mufflers, for effective sound reduction.

4.3.5 Interruption of Pedestrians Movement

Having been congested nature of the existing road and walkway in the settlement area, during construction of road with drain and laying of PVC pipe drain will be restricted free movement of the pedestrian. Even, if proper measure is not taken it may occur accident to the pedestrians. However, all of the road and drain are short in length and very much site specific. Therefore, anticipated impact is less.

Related Mitigation Measures

- Pipe laying work and construction of inspection pit shall be conducted during the dry season;
- Slope protection shall be maintained for trenches/ excavations of more than 1.5 m depth;
- Backfilling and compaction work shall be done immediately after pipe laying;
- Proper protection and temporary fencing shall be provided to excavations including inspection chamber and pit construction work;
- Sufficient lighting system shall be provided beside open trench, as required;
- Construction work shall be performed in a systematic manner, section wise, as required;
- Appropriate cautionary warning and diversionary signs shall be provided for protection of pedestrians and for directing alternative road routes.
- Potential discharge of fuel, lubricants, chemicals, and wastes into adjacent water bodies, shall be avoided;
- During construction sufficient temporary waste bins shall be provided by the contractor and according to CDC direction.

4.3.6 Momentary interference to neighbouring settlements

The proposed interventions and demands of the infrastructural development work, within the area of the Rahamatganj Millgate community shall not give rise to momentary interference, or inconvenience, to neighboring settlements.

4.4 Impact during Operation Phase

4.4.1 Waste Management (Toilet & Septic Tank)

During operation phase, the fecal sludge generated from the toilets of the low income community area, will be managed through proper on-site sanitation i.e. through providing proper septic tank and soak pit (**Figure-4-3**).

As required, septic tanks are to be cleaned in regular intervals with effective sludge transport and disposal systems in place so that potential environmental pollution, including risk of overflow of septic tank and requisite health hazard to the community shall be safeguarded against.

Related Mitigation Measure:

- The community dwellers shall clean the septic tanks at regular interval with the help of conservancy unit of Pourashava or arranged privately, in a hygienic and approved manner;
- Community awareness programs about health impacts and proper sanitation practices shall be conducted;
- A functional monitoring system within the community shall be organized;
- During emptying pits proper handling of fecal sludge shall be arranged in a proper and acceptable manner using sealed carrying containers and adequate container size;
- Use of suitable sized vacuum truck shall be arranged to collect septage from the toilet, along with safe disposal;
- Fecal sludge and septage shall be correctly disposed in the nearby fecal sludge treatment plant or shall be disposed in approved earthen pit(s), using soil cover of at least one foot coverage thickness.
- Disposal tanks, containers used in septage collection shall be correctly sealed and free from damage or leaks;

4.4.2 Solid Waste Management:

Different numbers of garbage bins will be provided for solid waste management of the area. Operation of these garbage bins will generate different types of household's waste. If these, generated waste are not disposed properly, this waste will be disposed in to the nearby drain or ditch. Thus, low income community/subproject area will get unhygienic condition and odor.

Mitigation Measures:

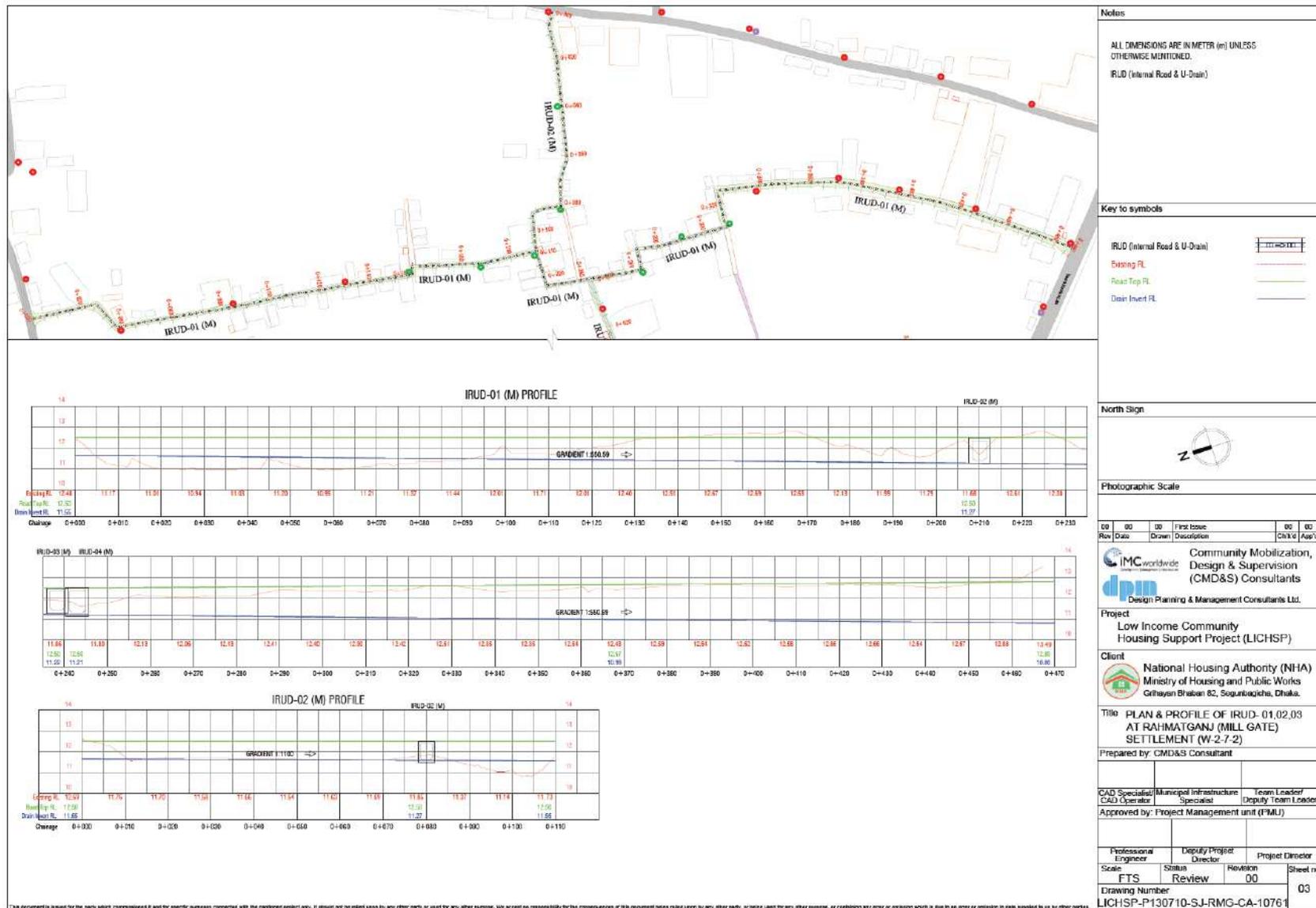
- Regularly clean of the primary waste storage bin is required;
- Within the design of bins, provision of cover should keep avoiding air and water pollution;
- The wastes will have to be collected from primary waste bin by the cleaners (to be engaged by the community or Pourashava) to the secondary transfer station;
- The Conservancy unit of Pourashava will carry the waste from the primary transfer station to the designated dump site by using the dump truck;
- Entrance of flood water should be blocked through raising the edge of this STS site in order to stop the spread of waste in the area.
- Conducting awareness program in the community about demerits of unplanned waste disposal and regarding their health effect and environmental pollution.

4.4.3 Waste Water Management:

Operation of the drainage system may create a risk of degraded quality of discharge at outfall, particularly if kitchen and bathroom waste water of the settlement are discharged directly into the drain. Even, backflow of drain water may take place in adjacent areas of the drain if proper design is not correctly adopted.

Mitigation Measures:

- Water retention tank (Figure 4-1) shall be constructed at regular intervals, for treatment of drain wastewater, before disposing in the water bodies;
- Correctly engineered drainage systems shall be designed considering the downstream discharge point; adequate slope and x-section (Figure 4-2);
- Direct connection to the drainage system of sewerage and wastewater shall not be permitted;
- Effective use of soak well for discharging of waste water (toilet, kitchen etc.) shall be ensured.



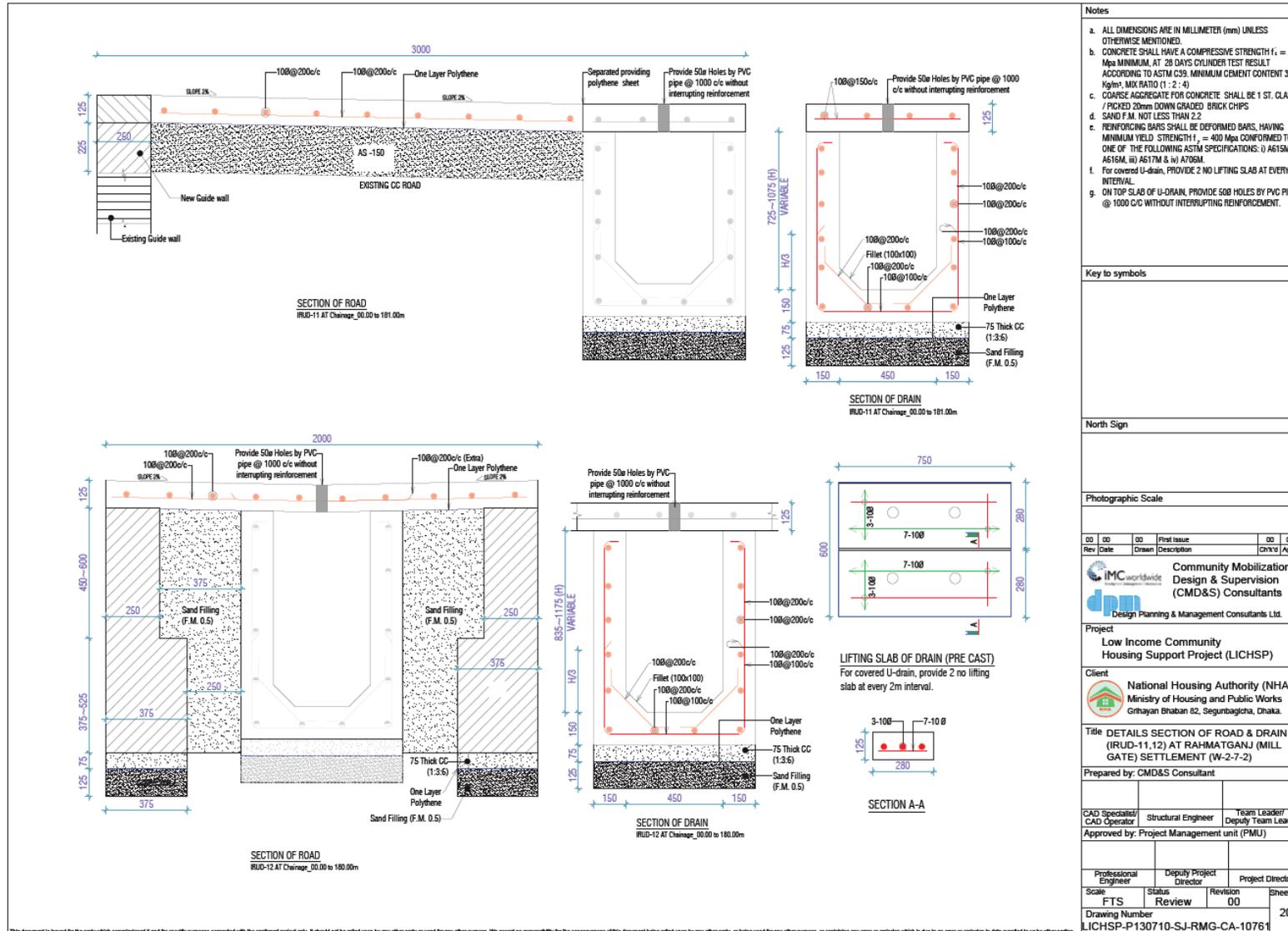


Figure 4-2 : Downstream discharge point; slope and x-section of drainage network

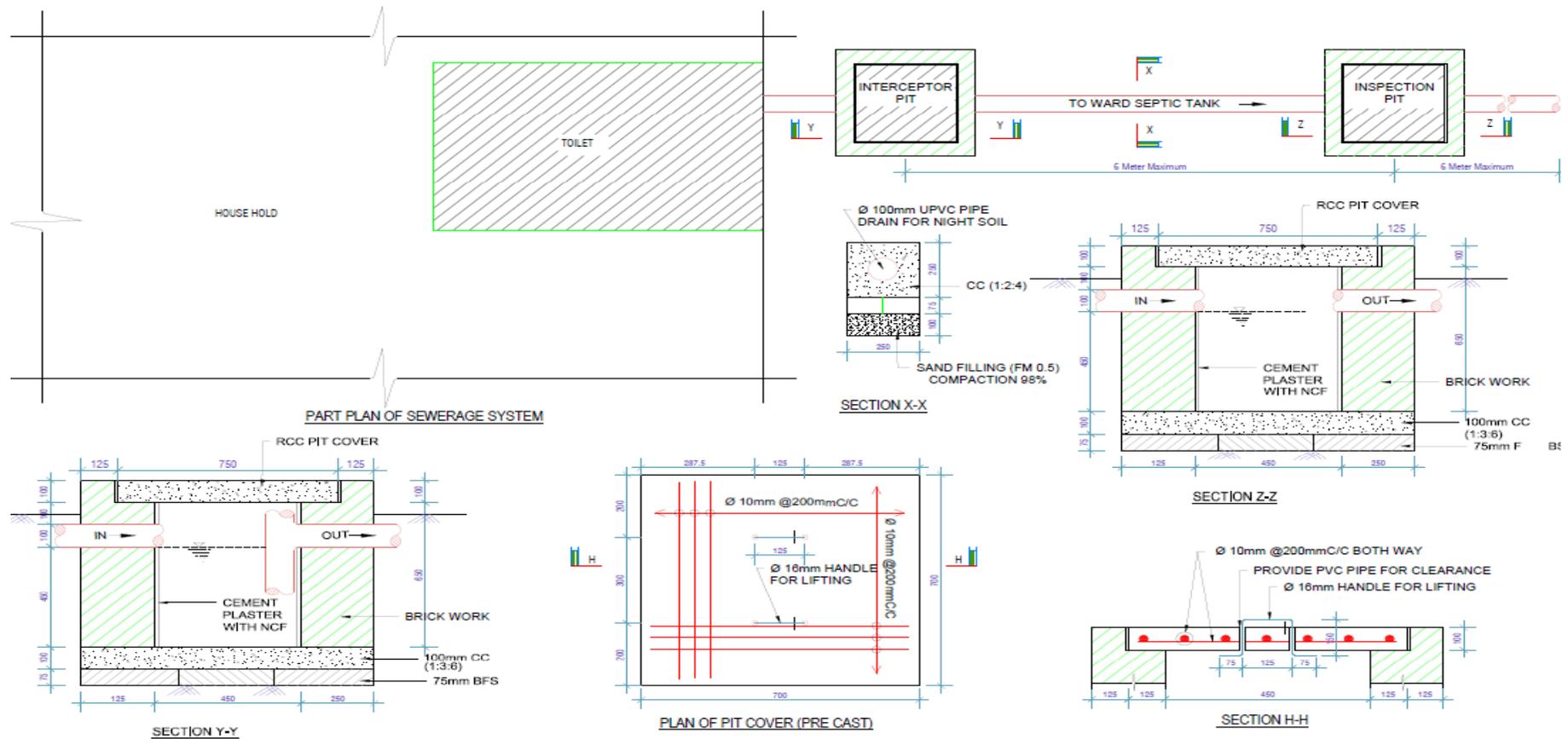


Figure 4-3: Layout plan of septic tank with soak pit and cross section

5. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

5.1 General

This EMP consists of a set of institutional arrangements, mitigation measures, monitoring plan, EMP implementation costs to be taken during the design, construction and operation (post-construction) stages of the project. The activities to be performed under this subproject are expected to have minimal impact and result in minor disturbance to the local environment and community. However, to ensure sustainable development and avoid temporary disturbance to the social and environmental aspect, required public consultation feedback is considered with regard to effective output in the final implementation of all EMP related interventions.

5.2 Institutional Arrangement for Safeguard Compliance

This project is implemented by National Housing Authority under the Ministry of Housing and Public Works. The PMU of the NHA under LICHSP will be responsible for overall environmental management, including implementation of mitigation measures, monitoring, and preparation of all statutory progress and monitoring reports.

The PMU has been formed with the Project Director, Deputy Project Director, Environment Specialists, Social Specialist, Procurement Specialist and Financial Management Specialist. In the institutional arrangement procedure, PMU of the NHA and the Consultant's Team Leader/ Deputy Team Leader are directly involved in the planning, design and implementation.

NHA/ Consultant's shall ensure the effective implementation of safeguard compliance, will ensure active engagement of Community Support Center (CSC), Community Development Committee (CDC). The CSC has been established in Rahamatganj Millgate, Sirajganj, under the project and shall be active during the construction period. The CSC is monitored by the PMU. The CSC officials, especially 'engineer' will be responsible for supporting the construction supervision. In addition, CSC focal person for Environment and local community head will be responsible to monitor and supervise the overall environmental concern. The construction work of Rahamatganj Millgate will be done through the CDC, as coordinated through the Consultant's, who will be responsible to implement the environmental mitigation measures, in accordance with the provisions of the EMP.

For effective implementation of the project, a very efficient institutional linkage has to be developed. Therefore, two major bodies are needed to be included, which are:

- (i) National Steering Committee (NSC) headed by the Secretary, MoHPW;
- (ii) Technical Review Committee (TRC) headed by the PD, which will also work as national level environmental committee.

The Environment Specialist will report the PD regarding any issues related to environmental supervision and management and will be responsible for overall environmental management of LICHSP interventions. PD will make final decision on any environmental actions, after due consultation with NSC and Technical Review Committee.

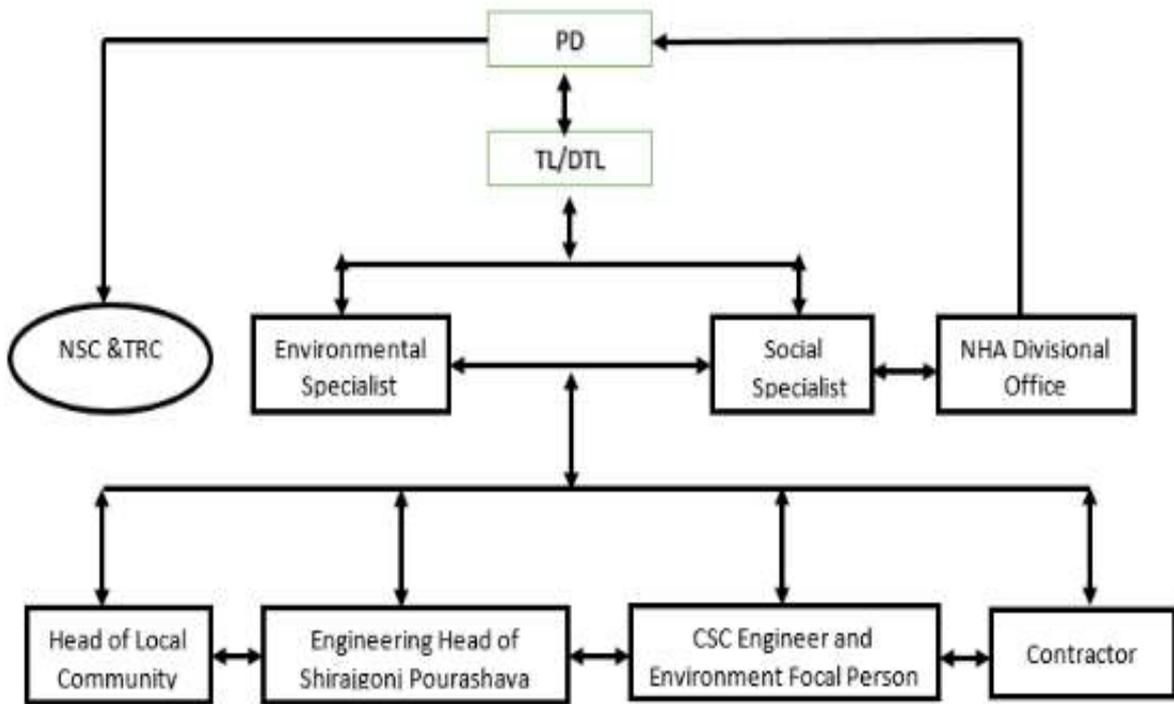


Figure 5-1: Institutional Arrangement for Environmental Safeguard

5.3 Public Consultation and Participants and Final Design Feedback

During the environmental survey stage, an attempt was taken to encourage stakeholder involvement including community people, local commissioner, NGOs representative, consultant teams and NHA representation. The proposed development interventions and the related activities to be performed, including feedback from the stakeholders, was also encouraged and incorporated in the final design of the proposed interventions. Photograph of public consultation & participant list with signature are included in the annex 1 & annex 2

The following feedbacks were addressed during the stakeholder engagement meeting by the participants.

- Participant stated that, before discharging of drain water into the water bodies, treatment facilities shall be provided to minimize the water pollution;
- Concern was stated regarding excessive noise and impaired air quality of the study area, during construction activates, which would need to be adequately controlled;
- It was stated that sufficient number of waste bins shall be needed, in the study area, for primary collection of the waste from houses. It was also stated that they expect regular disposal of generated waste by engaging the conservancy unit of Pourashava;
- They suggested for ensuring the quality construction work for sustainable development;
- They all expressed the need to avoid unnecessary roadside storage of construction materials and equipment, in keeping free movement of pedestrians during construction period.

Aforementioned feedback from the participants has been considered in the design of subproject intervention as much as possible adhered to in ensuring sustainable development in the study area. Some of the suggestions of participants which are reflecting in the design are mentioned below.

- The design of storm water drain system is provided with adequate attenuation retention tank capacity as a part of the water treatment facilities.

- Provision of adequate amount of waste bins has been provided and PMU shall ensure involvement of Pourashava for regular disposal of collected waste from the STS;
- The contractor will be responsible for ensuring suitable and adequate space for storage of all construction materials and equipment, which will be monitored closely by the CDC and the CSC;
- To avoid air and noise pollution, the probable impact, associated with construction activities, has been assessed and the corresponding mitigation measures have also been incorporated in the EMP.

5.4 Grievance Redress Mechanism (GRM)

In the social safeguard report, a common GRM is formed for social, environmental, or any other grievances related to the project; the resettlement plans (RPs) and EMP will follow that GRM, which is developed in consultation with key stakeholders. The GRM will provide a reachable and reliable platform for receiving and facilitating resolve of affected persons' grievances related to the project.

5.5 Environmental Management Plan (EMP)

Environmental Management Plan (EMP) is an integral part of all subproject interventions to be designed and implemented under the LICHSP. The LICHSP has prepared the EMP for every subproject intervention, where all the anticipated impacts resulting from the sub-project activities and mitigation measures have been recorded, for all the anticipated impacts have been suggested.

The major components of an EMP include: Mitigation Measures, Enhancement Measures/ ECoPs, Estimation of Cost of EMP, Environmental Monitoring, and Institutional Arrangement for Implementation of EMP. The following table shows potential mitigation measures as well as ECoPs, which are recommended in the LICHSP.

The activity-wise anticipated environmental impacts and corresponding mitigation measures have been outlined in **Table 5.1**.

Table 5-1: Environmental Management Plan (EMP)

Sub-Project Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible Parties
Pre-Construction of Sub-Project Interventions			
Site preparation	<ul style="list-style-type: none"> ▪ Demolition of existing toilet 	<ul style="list-style-type: none"> ▪ Ensure use of vacuum pump to collect sewage sludge and it shall be carried with covered drum truck; ▪ Sewage sludge shall be disposed in the nearby fecal sludge treatment plant if available, or that shall be engraved in the earthen pit and soil cover shall be ensured at least one feet. ▪ Ensure disposal tanks, drums or containers coming to site are in a satisfactory condition – check for damage or leaks; ▪ Ensure all deliveries are made as far away from watercourses and drains as possible; ▪ Ensure use of PPEs for the associate workers; ▪ In the Sirajganj municipality no fecal sludge treatment plant available. However, there is one designated solid waste dumping site at Banbaria. Sewage sludge shall be transported in the vacant place of Banbaria dumping site and that shall be engraved in the earthen pit and soil cover shall be ensured at least one feet. 	<p style="text-align: center;">CDC that is to be monitored by CSC, PMU, NHA</p>
Design and Construction of Sub-Project Interventions			
Site Management (Material and equipment Storage, Labor Influx etc.)	<ul style="list-style-type: none"> ▪ Waste disposal, dust generation, drainage congestion etc. 	<ul style="list-style-type: none"> ▪ Prior to the start of the construction activities, labor shed, site office with sanitation facilities, and open space for stockyards, will be arranged by the contractor.; ▪ Selected stockyard place will be fenced to restrict the free movement of people and minimize dust blown particles from the stockpile of fine aggregate; ▪ Transportation of construction material and equipment should be completed in accordance with prior approved activity and time schedule; 	<p style="text-align: center;">CDC that is to be monitored by CSC, PMU, NHA</p>

Sub-Project Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible Parties
		<ul style="list-style-type: none"> ▪ Soil and sand carrying vehicles should be fitted with covers to avoid dust blown material; ▪ Roadside storage of construction material and equipment shall be prohibited; ▪ Generated waste and construction debris shall be properly disposed in accordance with the approved designated disposal site(s) of the municipality; ▪ Acceptable quality of excavated soil shall be mostly reused for the backfilling of drain, with the surplus portion, if any, disposed in the approved designated disposal site(s). ▪ Separate waste collection bins, for organic and inorganic wastes, shall be provided throughout the construction and camp sites, whereby all waste collection bins shall be regularly emptied and cleaned; ▪ Waste shall be disposed at the approved designated dumping site at Banbaria of Sirajganj Pourashava, comprising all forms of generated waste (solid wastes and other forms of wastes); ▪ Dump trucks of the Pourashava shall be made available to facilitate transportation of all generated wastes, which will entail the proper disposal of the wastes and effluents. 	
Toilet (Single/ Community toilet with pour flush / piped sewer system/ septic tanks/Tube well platform)	<ul style="list-style-type: none"> ▪ Noise, water and soil pollution during the construction. 	<ul style="list-style-type: none"> ▪ All excavated top soil shall be properly segregated and stockpiled prior to final reinstatement for all excavated surfaces; ▪ Night time construction works activities, which may generate noise nuisance such as casting work, welding work, drilling work, rod cutting etc., shall always be avoided; ▪ Proper acoustically designed machinery should be used to avoid noise nuisance. ▪ Contractor will be responsible to control the workers from discharging of construction waste into adjacent water bodies. 	<p style="text-align: center;">CDC that is to be monitored by CSC, PMU, NHA</p>
Drains/ Drainage	<ul style="list-style-type: none"> ▪ Noise Pollution due to using of rod cutter 	<ul style="list-style-type: none"> ▪ Using of rod cutter and welding machine is to be avoided at night; ▪ Avoid use of wooden shuttering work and ensure steel shuttering 	<p style="text-align: center;">CDC</p>

Sub-Project Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible Parties
system	and concrete mixture machine	work; <ul style="list-style-type: none"> ▪ Proper acoustically designed machinery should be used. 	that is to be monitored by CSC, PMU, NHA
	<ul style="list-style-type: none"> ▪ Air pollution due to black smoke emission from diesel based concrete mixer machine and vibrator machine 	<ul style="list-style-type: none"> ▪ Regular maintenance of construction equipment and vehicles, including concrete mixer and vibrator machine should be ensured to avoid any black smoke emission. 	
	<ul style="list-style-type: none"> ▪ Impact on health and safety 	<ul style="list-style-type: none"> ▪ The workers shall be provided with suitable PPE (Personal Protective Equipment), safety goggles, and other necessities; ▪ Bamboo made barrier is to be provided for restricting access to the construction site. 	
	<ul style="list-style-type: none"> ▪ Generation of excavated loose soil and clay soil 	<ul style="list-style-type: none"> ▪ Contractor will be responsible for regular and quick disposal of excavated soil to the approved designate disposal site(s); 	
Internal road and Road with RCC U drain	<ul style="list-style-type: none"> ▪ Air and dust, noise and water pollution from construction work 	<ul style="list-style-type: none"> ▪ Watering and sprinkling shall be ensured to reduce dust pollution; ▪ Proper acoustically designed machinery should be used for minimizing the noise nuisance; ▪ All construction activities, including concreting work is to be performed at day time; ▪ To avoided accident proper protection and lighting (at night time) facilities will have to be arranged. ▪ Proper slope protection will be provided during excavation and drain construction work ▪ The contractor is to maintain adequate moisture content of soil and sand for transportation, compaction and handling; ▪ Avoid use of dust generating equipment, which may produce significant amount of particulate matter, within the construction site(s) and near vicinity of the local residents; ▪ Ensure all subproject vehicles are in good operating condition; ▪ The discharge of any kind of solid, or liquid wastes, from the construction activities, into adjacent water bodies shall be avoided. 	CDC that is to be monitored by CSC, PMU, NHA

Sub-Project Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible Parties
	<ul style="list-style-type: none"> ▪ Impact on health and safety due to operation of mechanical equipment 	<ul style="list-style-type: none"> ▪ Ensure use of personal protective equipment (PPEs) ▪ Carefully operation of mechanical equipment, with provision of suitable safety gear, shall always be used. 	
<p>Multi-purpose Center (one storied building)</p>	<ul style="list-style-type: none"> ▪ Noise Pollution due to using of rod cutter, vibrator, concrete mixture & mixture & another machine 	<ul style="list-style-type: none"> ▪ Using of rod cutter and welding machine shall be avoid at night. ▪ Avoid use of wooden shuttering work and ensure steel shuttering work. ▪ Proper Acoustically designed machinery should be used. 	<p>CDC that is to be monitored by CSC, PMU, NHA</p>
	<ul style="list-style-type: none"> ▪ Air pollution due to black smoke emission from diesel based concrete mixer machine and vibrator machine ▪ Dust pollution from construction materials (cement, sand etc.) 	<ul style="list-style-type: none"> ▪ Regular maintenance of the concrete mixer and vibrator machine shall be ensured to avoid any black smoke emission. ▪ Water should be sprayed at the work site for dust control; ▪ Ensure sprinkle and cover stockpiles of loose materials (e.g., fine aggregates); ▪ Maintain adequate moisture content of soil and sand for transportation, compaction and handling; ▪ Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local resident 	
	<ul style="list-style-type: none"> ▪ Impact on health and safety 	<ul style="list-style-type: none"> ▪ The workers should wear PPE (Personal Protective Equipment), safety goggles, and other necessaries. ▪ Restrict access to the construction site. 	
	<ul style="list-style-type: none"> ▪ The waste form the site during the construction of houses 	<ul style="list-style-type: none"> ▪ Awareness must be raised among workers on solid waste management. ▪ Specific dumping containers are to be kept in the site. ▪ Regular and quick disposal of generated construction debris shall be done. 	

Operation of Sub-Project Interventions

Sub-Projects/ Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible parties
Waste Management (Sewer system/ septic tanks)	<ul style="list-style-type: none"> ▪ Contamination to the ground water from fuel spillage and pit latrine discharge. ▪ Inappropriate operation may causes odor, health hazard problem by discharge of and overflowing of human excreta etc. 	<ul style="list-style-type: none"> ▪ Encourage all community members, for installation of sanitary hygienic toilets to stop contamination of the ground water; ▪ The community dwellers will clean the septic tanks in regular intervals with the help of CDC or conservancy unit of Municipality, or privately, whereby the desludged material shall be disposed to approved and designated disposal site(s) ▪ Ensure use of vacuum tanker/pump to collect desludged material ▪ Appropriate awareness programs shall be arranged for the community members on health and hygiene issues and the impacts of improper sanitation practices; ▪ Ensure disposal tanks, drums or containers coming to, and from, the site are in a satisfactory condition – check for damage or leaks; ▪ Ventilation systems and facilities shall be kept in good functional order to minimize untoward odor problems, ▪ In the Sirajganj Municipality no fecal sludge treatment plant available. However, there is one designated solid waste dumping site at Banbaria. Sewage sludge shall be transported in the vacant place of Banbaria dumping site and that shall be engraved in the earthen pit and soil cover shall be ensured at least one feet 	CDC& Municipality

Sub-Projects/ Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible parties
Waste Water	<ul style="list-style-type: none"> ▪ Improper disposal of drain water may degrade the outfall water quality and surrounding environment 	<ul style="list-style-type: none"> ▪ Water retention tank (Figure 4-1) shall be constructed at regular interval for treatment of drain waste water before disposing in the water bodies; ▪ Drainage system has to be designed considering the downstream discharge point; adequate slope and x-section (Figure 4-2); ▪ Direct connection of sewerage and sullage waste to the drainage system shall not be permitted; ▪ All toilet units shall be fitted with suitable collector systems and be equipped with proper soak well for discharging of waste water (toilet, kitchen etc.); ▪ Separate sewer lines for kitchen, bath room and toilet facilities should be provided. 	
Drains/Drainage system	<ul style="list-style-type: none"> ▪ Clogging/ stagnation of flow in the storm drain 	<ul style="list-style-type: none"> ▪ Proper maintenance and cleaning of the drainage system and outfall shall be conducted on a regular basis. 	CDC & Municipality
	<ul style="list-style-type: none"> ▪ Backflow of water through drain (e.g., due to high water level at downstream discharge point, such as khal) 	<ul style="list-style-type: none"> ▪ Designing drain considering the downstream discharge point; adequate slope and x-section; PVC drain pipe, where appropriate 	
	<ul style="list-style-type: none"> ▪ Discharge from drain pollute downstream water body 	<ul style="list-style-type: none"> ▪ Not allowing direct connection to drain from toilet; ▪ Awareness program for the community people should be taken to increase knowledge about improper waste disposal and its impact. 	
Management of disposal of Battery of Solar Street Light	<ul style="list-style-type: none"> ▪ In the country no e-waste dumping system exist. Hence, after lifetime disposal of battery of solar panel could be responsible ▪ if battery gets water contact over a period of several months by rain or any source can cause of spreading pollutants such as lead or carcinogenic cadmium in the water 	<ul style="list-style-type: none"> ▪ Rechargeable batteries shall be selected that life time is high; ▪ For reducing the waste battery, instead of replacement, battery maintenance work shall be given priority; ▪ Damaged battery throwing in to the water bodies or store under open sky shall be prohibited; ▪ Destroying of waste battery by open burning shall be restricted; ▪ Landfilling of damaged battery not to be allowed; ▪ If possible reuse of damaged batter to be done; 	CDC & Municipality

Sub-Projects/ Activities	Anticipated Environmental Impacts	Suggested Mitigation Measures/Enhancement Measures/ Environmental Design Considerations	Responsible parties
	<p>bodies</p> <ul style="list-style-type: none"> ▪ if landfill is done, it can break and toxic materials can leach into the soil, causing problems with drinking water ▪ Open burning will release smoke contains toxic fumes that are carcinogenic (birth-defect causing) when inhaled 		



5.6 Environmental Monitoring Plan

Environmental monitoring is an essential component of the EMP, as it provides the basic scenario of the impact of the project on the baseline conditions. Hence, a three-tier system of monitoring schedule is considered for (i) compliance monitoring, (ii) community monitoring and (iii) effect monitoring. This is based on the environmental components that may be affected during the pre-construction, construction and operation stages of the project.

Since the project is likely to have impact on various components of environment; a comprehensive monitoring plan, covering all identified parameters of related environment issues, including physicochemical, ecological and socio economic, has been considered. Monitoring points have been selected based on the sensitivity of the location, with respect to sensitive receptors. The main purpose of this Monitoring Plan is to ensure that the various tasks, as detailed in the EMP, particularly the mitigation measures, are implemented in an effective and efficient manner. The Plan also included the necessary evaluation program of impacts on the key environment and social parameters. Various types of EMP monitoring are discussed below.

5.6.1 Compliance Monitoring

The purpose of Compliance Monitoring, at the construction stage, is to check whether the Environmental Mitigation Measures, or Environmental Code of Practices (ECoPs) suggested in the design phase, are followed and implemented by the subproject contractor, in full compliance with the provisions of the EMP.

A simple checklist has been prepared for compliance monitoring by visual observation during construction and operation phase (shown in **Table 5-2**).

Table 5-2: Compliance Monitoring Checklist during Construction and Operation Phase

Monitored Parameter/ Issues	Monitoring Method/ Key Aspects	Location of Monitoring	Frequency of Monitoring	Responsibility
Safety orientation and training of workers	Frequency of training & orientation of workers for safety	Subproject site	Once a month	CDC,CSC PMU and Municipality
Personal Protective Equipment	Ensure every single person involved in the activities wear and use safety equipment	Subproject site	Regular	CDC,CSC PMU and Municipality
Worker's health	Monitoring health and safety of workers	Subproject site/Labour camp	Regular	CDC,CSC PMU and Municipality
Sanitation & drinking water facility to the workers	Availability of safe drinking water and sanitation to the workers	Subproject site and work campsite	Regular	CDC,CSC PMU and Municipality
Incident record and reporting	Documented record of all incident, accident, its remedial process	Subproject site	Regular	CDC,CSC PMU and Municipality
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	Regular	CDC,CSC PMU and Municipality
Notice/ announcement boards/ prevention signs	Visible in good condition or not	In front of the Subproject site	Regular	CDC,CSC PMU and Municipality
Stagnant water in the excavated pit	Pumping facilities available and functional	Subproject Site	Regular	CDC,CSC PMU and Municipality
Stockpile material	Storage material is cover-up or not	Subproject Site	Regular	CDC,CSC PMU and Municipality

Monitored Parameter/ Issues	Monitoring Method/ Key Aspects	Location of Monitoring	Frequency of Monitoring	Responsibility
Equipment /vehicles	-Switched-off diesel engines when not in use; -Search any possible leakage; -Fuelling.	Subproject site	Regular/ Specially when in operation	CDC,CSC PMU and Municipality
Dust	Dust is visible or not	Subproject site	Regular	CDC,CSC PMU and Municipality
Oily waste generation and disposal	Quantity of oil and fuel waste, storage and disposal	Subproject site	Regular	CDC,CSC PMU and Municipality
Solid waste generation	Quantity of solid waste generated and correct disposal	Subproject site	Regular	CDC,CSC PMU and Municipality
Discrimination on gender	Direct survey in the field by interviews with the women in order to ensure that there is not any gaps between man and women	Subproject site	Regular	CDC,CSC PMU and Municipality
Child labour	No child shall be engaged in the construction activities	Subproject site	Regular	CDC,CSC PMU and Municipality
Handling of hazardous materials	Fuelling, storage, operation	Subproject site	Regular	CDC,CSC PMU and Municipality

5.6.2 Monthly Environmental Monitoring Report

All the above mentioned environmental problems that may be generated at construction stage will be mitigated by the contractor and monitored by CDC during implementation of the subproject works. This will be supervised by the PUM, NHA, with the assistance of Sirajganj Pourashava and CSC officials. A monthly compliance monitoring report will be prepared by the field level focal environmental expert, which will be officially submitted to the NHA Environmental Specialist.

5.6.3 Community Level Monitoring

The community level monitoring of the EMP shall involve i) compliance of mitigation measures and ii) effectiveness of the proposed interventions. This monitoring will be conducted by the low income community residents, or community members who reside at the project site.

At the beginning of the project, PMU, NHA will arrange a short training program to provide an orientation on the process and effectiveness of community monitoring. In addition, a Bangla format community monitoring check list will be prepared prior to the commencement of the work that would concentrate on the compliance of mitigation measures during the construction phase, whereas functionality of newly implemented interventions will be monitored at the operation stage. A monitoring check list has been prepared for the visual observation during operation phase. While, at construction stage environmental compliance will also be monitored accordingly Table 5-3. With the involvement of community residents.

Table 5-3: Community Monitoring at Operation Phase

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Implemented by	Super- vision
During Operation and Maintenance						
Drainage congestion	At subproject site drain	Inspection to find any drain water is in stagnant condition	No waste materials to be disposed into the drain	Regular	Community Committee	Municipality
Waste bin	At subproject site	Visual inspection	Empty the bin	Regular or as required	Municipality Conservancy Unit	Municipality and Community
Street Light	At subproject site	inspection to find the functionality	Properly functional	Regular	Municipality Electrical Unit	Municipality and Community
Solid Waste Management	Secondary Transfer Station (STS)	Visual inspection	Deposition and vacating waste in the STS regularly	Regular	Municipality Conservancy Unit	Municipality and Community Committee
Ground water quality	Tube well or supply water	Visual observation and taste	inspection iron and taste	Regular interval	Municipality water supply section	Municipality and Community
Toilet connection	subproject site (near drain)	Visual inspection	No connection of toilet with drain	Regular	Whole community	Municipality and Community
Water harvesting pond	Near Water harvesting system	Visual inspection	Cleaning the source periodically	Two times in year	Community Committee	Municipality and Community
Good house-keeping	At subproject	Visual inspection	Ensure daily housekeeping	Regular	Whole community	Community people
Contaminate STS-nearby lands or dump site lands	Household, STS and dumping ground	Visual inspection	No waste to be stored at outside of house premises, STS and dumpsite	Regular	Whole community	Community people

5.6.4 Effects monitoring

Effects monitoring is a very important aspect of environmental management to safeguard the protection of environment. The effects monitoring plan proposed for the subproject is presented in Table 5.4. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction. The monitoring will also check whether the Pourashava and NHA is meeting requirement during operation and maintenance of the subproject. In addition, community will be careful in monitoring activities. Furthermore, under the effect monitoring two aspect will be served such as environmental management and analytical monitoring during construction and operation phase of the proposed subproject. Hence, environmental management related monitoring has been presented in Table: 5.5. Compliance indicators or threshold limits for the monitoring are also given in Table 5-4.

Table 5-4: Effect Monitoring for the environmental Management

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Implementati on	Super-vision
During Construction						
Drainage congestion	Near camp site and in the subproject site	Visual; to ensure temporary drain to drain out excess water during construction	There will be no stagnant water in the drain	Regular	CDC	CSC, PMU and Municipality
Infectious Disease HIV/AIDS	At camp site	Engaging Physician	No such affected person	Twice in a year	CDC	CSC, PMU and Municipality
Traffic Safety	Access roads around subproject	Proper traffic signs are in place	Smooth flowing of traffic around	Regular	CDC	CSC, PMU and Municipality
Dust	Sub-project site	Inspect to ensure dust suppression measures (water spray)	No dust from construction activities	Regular	CDC	CSC, PMU and Municipality
	Material storage sites and labour camp	Visual ; ensure dust suppression measures	No dust from the material storage sites and labour camp site	Regular	CDC	CSC, PMU and Municipality
Traffic movement	At subproject site	Inspection & record keeping	Note of accidents	Regular	CDC	CSC, PMU and Municipality
Accident	At subproject site	PPEs are available at working site	Ensure use of PPEs as per requirement	Regular	CDC	CSC, PMU and Municipality
Solid Waste Managemen t	Construction sites, and labour shed premises	Visual inspection for proper solid waste collection & disposal	Facilities and works are clean and in place	Regular	CDC	CSC, PMU and Municipality
Restoration of Work Sites	All Work Sites	Visual Inspection	The facilities are clean with no waste at the works sties	After completion of all works	CDC	CSC, PMU and Municipality
Grievances	In the subproject area	Number of grievances registered and addressed	Record of grievance redress meetings	Monthly	Environ- mental focal person	CSC, PMU and Municipality
Reporting on Environmen tal Monitoring	During Construction	All parameters	To meet the compliance requirement	Monthly	CSC and CDC Safeguard concern	PMU and Municipality

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Implementati on	Super-vision
During Operation Phase						
Drainage congestion	At subproject drain	Visual inspection	There will be no stagnant water in the drain	Regular	Community, Municipal Conservancy Unit	PMU and Municipality
Toilet connection	At subproject site (near drain)	Visual inspection	There will be no direct connection of toilet with drain	Regular	Whole community	Municipality and Community Committee

Table 5-5: Effect monitoring for Analytical analysis

Environm ental Indicator	Means of Monitoring	Frequency	Responsibility	
			Implemen tation	Supervision
Air Quality	Air quality monitoring (SPM, PM10) by Portable air quality measuring machine	<ul style="list-style-type: none"> • One time before the commencement of the project • Two times in construction period • One time after completion 	CDC	PMU, NHA
Noise Control	(Equivalent noise level (dBA), Leq, Max Noise level (dBA), Lmax) by Portable noise measuring machine	<ul style="list-style-type: none"> • One time before the commencement of the project • Two times in construction period • One time after completion 	CDC	PMU, NHA
Water quality	Inspection & Water analysis through laboratory (PH, turbidity, hardness, Cl, DS, Mn, As, Fe, TC, FC)	<ul style="list-style-type: none"> • One time before the commencement of work (sample for water source) • One time after completion (One sample for each water source) 	CDC	PMU, NHA

5.7 Environmental Safeguard Cost during Construction Phase

Considering the environmental impacts and their mitigation measures for these subprojects, several items are included in the BOQ to address these issues. The estimated cost to implement the EMP is elaborated in Table.5-6, Table 5-7 and Table 5-8

Table 5-6: Environmental Safeguard Cost

SI.	Description of the Items	Costs (Tk)
1	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. daily or as per requirements (lump sum)	50,000.00
2	Installation of cautionary sign in term of health and safety signs (8nos)	20,000.00
3	Providing PPEs like hand gloves, spectacles for eye protection, helmets, masks, visible jacket, ear plug, safety boots for at least 50 person (25 for workers and 5 for visitor) and one first aid box with necessary medicine	150,000.00
4	Wastes disposal facility during the construction period; collection, transportation, and providing 6 bin to be provided where 3 for organic and 3 for inorganic waste	36,000.00
5	Tree plantation for ecological enhancement work- preferably local fruits, flowers, medicinal and ornamental trees- 50 nos. trees (Lump sum)	25,000.00
	Sub-Total	281,000.00

Table 5-7: Environmental Enchantment Budget

SI.	Description of the Items	Costs (Tk)
1	Awareness documents (signs/ posters) for effective use of water source and proper waste management, Lump sum basis)	20,000.00
2	Environmental awareness training will be arranged by the PMU one at construction period and one at operation phase	30,000.00
3	Training on environmental health and safety will be arranged by PMU at implementation phase	20,000.00
	Sub-Total	70,000.00

Table 5-8: Environmental Monitoring Budget

SI.	Description of the Items	Costs (Tk)
1	Noise level measurement. It can be measured from the pre-approved public institute/ university 2 times during construction	20,000.00
2	Water quality one for ground water and one for surface water (PH, turbidity, hardness, Cl, TDS, Mn, As, Fe, TC, FC) - by any recognized laboratory. Total 3 times. One before construction, one during construction & one sample during operation stage. Total cost= 2(SW & GW) X 3 X5000(taka) = 30000 taka	30,000.00
	Sub-Total	50,000.00
	Total	401,000.00

5.8 Subproject Specific Environmental Compliance Clauses for Tender Document

Apart from the provisions under “General Specification” and “Particular Specification” for different sub-project components, the following special environmental clauses shall be included in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor, or CDC, carries out the responsibility of implementing the EMP and other environmental measures, including safety measures.

5.8.1 Environmental Management Plan (EMP)

All of the prescribed mitigation and enhancement measures in the Environmental Management Plan (EMP), which are related to mitigation of air/noise/water pollution / drainage/traffic congestion, have to be carried out by the contractor. Even, if additional environmental issues are identified then new mitigation measures, regarding the specific parameter(s) shall be added and shall be addressed under a revised EMP by the contractor. Moreover, after completion of work, the contractor will be responsible for the contracted one year, Defects Liability Period, to conduct any required rectification works and monitor the plantation of grass and trees.

5.8.2 Temporary Works

The Contractor shall make sure that all equipment and safeguards, required for the construction work, such as temporary stair, ladder, ramp, scaffold, hoist, barricade, chute, lift, etc. are substantially constructed and erected, so as not to create any unsafe situation for the workmen using them, or the workmen and general public passing under, on or near them.

5.8.3 Health and Safety

The Contractor shall observe and maintain standards of Health and Safety for all site personnel, in accordance with the guidelines laid down by the national standards or statutory regulations. Where applicable, to prevent workers falling from heights, the Contractor shall make sure that every temporary floor openings shall have safety railing of at least 900 mm height, or shall be constantly attended; and shall be provided with a hinged cover, Every open sided floor or platform of 1.2 m or more, above adjacent ground level, shall be guarded by a railing on all open sides.

The Contractor shall provide all appropriate protective clothing and equipment for the work to be done and ensure its proper use. Where required, safety nets, belts, harnesses and lines shall be provided by the contractor. The “safety directives for work equipment” and “safety directives for protective gears”, as specified in the Occupational Health and Safety Guidelines (attached) shall be followed. The contractor has to ensure that sufficient numbers and good quality Personnel Protective Equipment (PPE) will be provided to staff and labor at all times, as defined in the Occupational Health and Safety Guidelines, along with the Environmental Management Plan (EMP). The Contractor has to ensure a first aid kits with adequate medical supplies and other related facilities in the working site. The Contractor will also be responsible for ensuring trained personnel who are always available to render first aid. In addition, contractor will be kept provision of saline water in the working site especially at dry season while labor has probability to effect on de-hydration. The Contractor must provide or ensure that appropriate safety and/or health signs are in place at their work sites where hazards cannot be avoided or reduced such as place of construction chemical storage and construction vehicles re-fueling place etc. The Contractor has to record any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work, or not, and shall officially report to the Engineer promptly in written format.

5.8.4 Waste Disposal and Pollution

The Contractor shall not dispose any waste, construction debris, rubbish or offensive matter in any place not approved by the Engineer or Statutory Authority having jurisdiction. The Contractor shall not discharge into any watercourse oil, solids, toxic or floating materials. The Contractor shall take all reasonable precautions to keep public or private roads clean of any spillage or droppings from his vehicles or equipment. Any spillage or droppings which accrue shall be cleaned without delay to the satisfaction of the Engineer. The Contractor has to provide sanitary latrine (one for male and one for female) for disposal of human waste in the site office and temporary labor sheds for workers/ employees; the Contractor shall provide waste bins/ cans for collection of solid waste at appropriate locations (as

directed by the Engineer), and ensure proper transfer/ disposal of solid waste with support from the Pourashava.

5.8.5 Earthworks

Any kind of earthwork activities, such as excavation of trenches in natural soils or filling on the natural top soil, which are involved for the proposed intervention, the contractor has to make sure that the top 300 mm to 450 mm of topsoil be segregated during excavation and stored to one side of the trench. The remaining excavated soil is to be stored separately/ away from the stockpiled top soil. During backfilling of the trench, the topsoil shall be correctly reinstated as the top layer again.

5.8.6 Third Party Monitoring

For effective implementation and an independent environment evaluation, a third party consulting firm will be hired by the NHA. This consulting firm will be given the responsibility to independently monitor the overall performance of the contractor in complying with the provisions of the EMP for satisfactory environmental management of the proposed project, including compliance with the DoE conditions.

6. CONCLUSIONS AND RECOMMENDATIONS

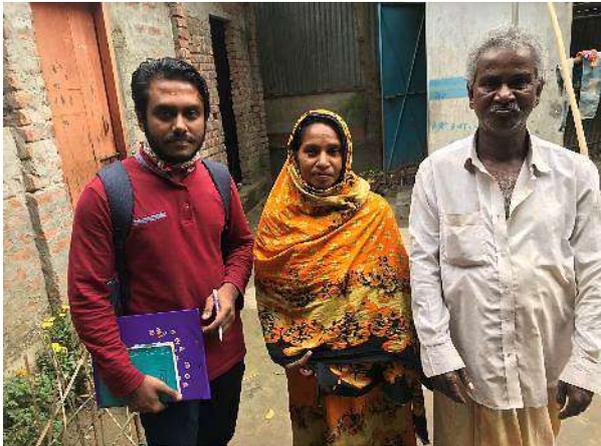
The subproject has negligible negative impacts on the ecology because no tree is to be cut due to the subproject implementation. During the construction phase, the physio-chemical components, such as air quality (because of dust) and noise level may be disturbed due to the subproject activities. The proper handling and disposal of the generated solid wastes is important issue that should be considered properly.

Based on the findings of the study, a few key recommendations are outlined below:

- NHA is responsible to ensure availability of the EMP in the Site Office;
- With the facilitation of the Consultant, NHA will supervise effective implementation of EMP;
- Formal and informal consultation should be carried-out by Consultant team, NHA Officials and Contractors regularly;
- Workforce environment and labor shed management should be monitored regularly.

ANNEX

Annex 1: Photograph of Public Consultation



Annex 2: List of the Participants

National Housing Authority
Low Income Community Housing Supporting Project (LICHSP)
Attendance of Local Participants in the Screening Exercise
Local Stockholders, Community Members

Subproject Name: Settlement Upgrading at Rahamatganj Millgate

District: Sirajganj
 Pourashava: Sirajganj

Upazilla: Sirajganj
 Date:

SL	Name	Gender	Social Status	Contact Number	Signature
১	মিঃ মোঃ হুমায়ুন কবীর	পুরুষ	শ্রমিক	০১৭১২৬৩৪৫২	
২	আব্দুল হামিদ	"	অসহায়	০১২৭৩৫৫৪ ০১৭২৭৫৬৭৫৪	
৩	মিঃ মোঃ হুমায়ুন	"	অসহায়	০১৮৭১৫৭১৫১	
৪	মুন্সুর রহমান	নারী	শ্রমিক	—	
৫	মুন্সুর হুমায়ুন	"	শ্রমিক	০১৭৬০৭৪৭৭১২	
৬	মুন্সুর আলী	"	শ্রমিক	"	
৭	মুন্সুর	"	শ্রমিক	০১৭৬২৭৬০৬২	
৮	মুন্সুর আলী	"	শ্রমিক	"	
৯	মুন্সুর	"	শ্রমিক	—	
১০	মুন্সুর	নারী	শ্রমিক	০১৭৭০৪৬৪৫৪৫	
১১	মুন্সুর হুমায়ুন	নারী	শ্রমিক	০ —	
১২	মুন্সুর	"	শ্রমিক	—	
১৬	মুন্সুর	"	শ্রমিক	০১৭৭৬৭৩৩০৬৪	
১৪	মুন্সুর হুমায়ুন	"	শ্রমিক	"	

National Housing Authority
Low Income Community Housing Supporting Project (LICHSP)
Attendance of Local Participants in the Screening Exercise
Local Stockholders, Community Members

Subproject Name: *Settlement Upgrading at Rahamatganj Millgate*

District: *Sirajganj*
 Pourashava: *Sirajganj*

Upazilla: *Sirajganj*
 Date: ~~*Sirajganj*~~

SL	Name	Gender	Social Status	Contact Number	Signature
১৪	তমি আক্তার	নারী	মুসলিম	01747850820	<i>[Signature]</i>
১৬	বিভা মাহুদ	নারী	মুসলিম	01703945106	<i>[Signature]</i>
১৭	আব্দুল জোব্বার	নারী	মুসলিম	-	<i>[Signature]</i>
১৮	লিমা মাহুদ	নারী	মুসলিম	01311035536	<i>[Signature]</i>
১৯	তমি	৷		01709937960	<i>[Signature]</i>
২০	মাহুদ	৷	মুসলিম	-	<i>[Signature]</i>
২১	আব্দুল হামিদ	পুরুষ	আবঙ্গালি মুসলিম	01735772312	<i>[Signature]</i>
২২	আব্বা	নারী	মুসলিম	-	<i>[Signature]</i>
২৩	বিভা	৷	মুসলিম	-	<i>[Signature]</i>
২৪	মুহ	৷	মুসলিম	01787372287	<i>[Signature]</i>
২৫	আঃ কাফিল (মাহুদ)	পুরুষ	আবঙ্গালি মুসলিম	01746893468	<i>[Signature]</i>
২৬	লিমা মাহুদ	নারী	মুসলিম	৷	<i>[Signature]</i>
২৭	আঃ বিলল	পুরুষ	আবঙ্গালি মুসলিম	0179433297	<i>[Signature]</i>
২৮	আব্বা	নারী	মুসলিম	-	<i>[Signature]</i>
-	-	-	-	-	-