Environmental Assessment Report

Construction of Ten-Storied Multistoried Municipal Building

Narsingdi Municipality
Municipal Governance Services Project (MGSP)
Bangladesh Municipal Development Fund (BMDF)

February 2018

Contents

1.0 Sub-project Description

1.1 Sub-project Background

The objective of this subproject is to establish a multistoried commercial building in Narsingdi Municipality, under the Municipal Governance and Services Project (MGSP). The subproject will be located in Brahmondi, Ward 2, Narsingdi Municipality. Through this subproject, the Municipality aims to provide commercial spaces for shops to provide daily necessities to the local population, without having to travel to the other end of the city. The six floors (including the ground floor) of the building would be commercial spaces (shops, food shops, office spaces). Through this project, the Municipality also hopes to create a stable, sustainable source of revenue for itself, to that it can function better.

Pertinent Information of the sub-project are:

Name of subproject	: Construction of 5 Storied + Ground Floor +1 Basement Multistoried Building (Foundation 10 Storied)
District Name	: Narshingdi
ULB Name	: Narshingdi
Market side Wards Number	: 02
Estimated visiting population daily	: 1,500
Ward's Population	: 20,000
Tribal People	: N/A
Land Acquisition	: No
Estimated Cost	: 50 Million BDT

Proposed Occupancy of Each Floor:

Basement = Car Parking, power generator, stairs
Ground floor = shop, male & female toilet, security guard room, stairs & elevator.
1st floor = shop, male & female toilet, stairs & elevator.
2nd floor = shop, male & female toilet, stairs & elevator.
3rd floor = office space, male & female toilet, stairs & elevator.
4th floor = office space, shop, prayer room, male & female toilet, stairs & elevator.
5th floor = Food Shops, Office, stairs & elevator.

1.2 Location of the sub-project

The proposed sub-project site is located in the Narsingdi Municipality under Ward no. 2. The location is about 50 km away from Dhaka, the capital. The sub-project site is located in the area Brahmondi, directly opposite to the Narsingdi Government College. The exact geographic coordinates of the subproject site are 23°56'02.7"N 90°43'20.5"E.

The surrounding areas of the sub-project site is mostly residential. Most commercial spaces are located in the other end of the city. The local and district government offices are about 3km away from the sub-project site.

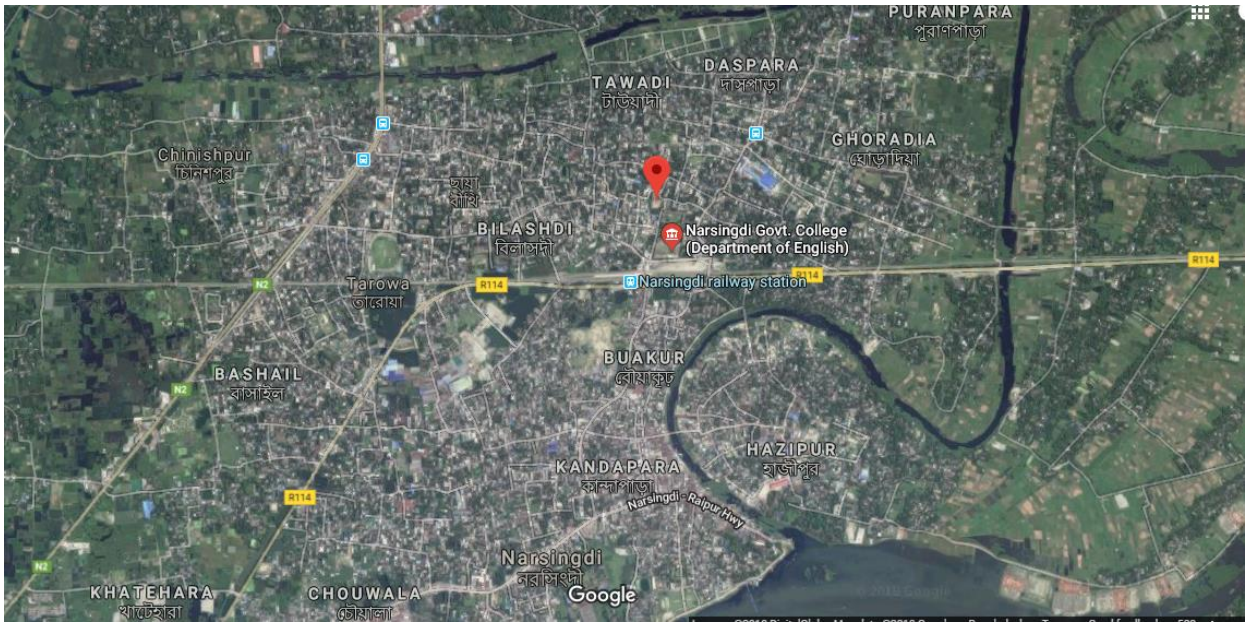

Figure: Location of Subproject Site (Site marked in RED)

1.3 Layout Plan of the sub-project

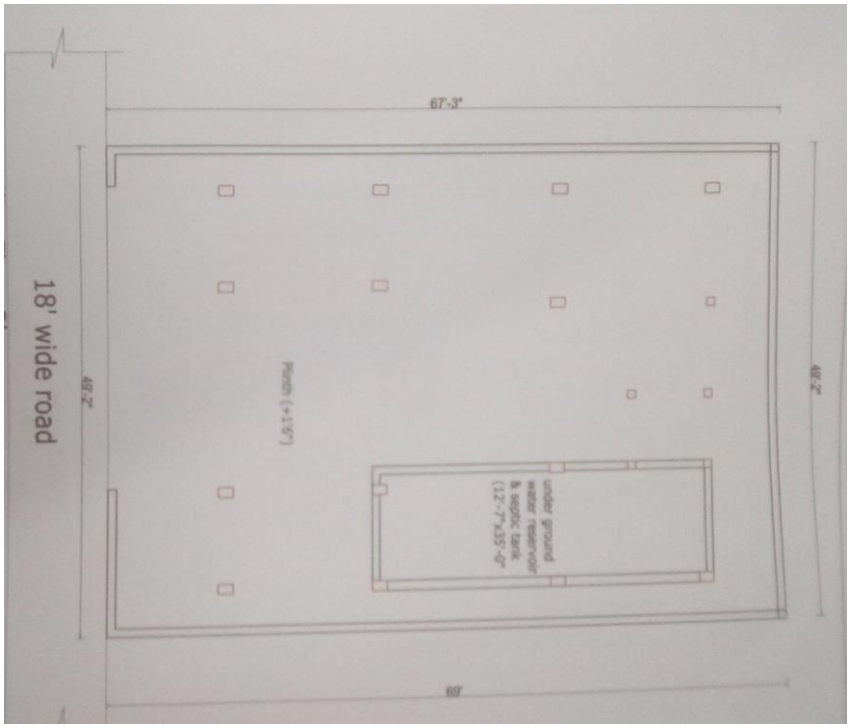

Figure: Layout Plan of the sub-project

1.4 Present status of the sub-project site

The subproject site is owned by Narsingdi Municipality. The site is currently empty, with a few trees temporarily planted by the Municipality.

The site is located in a relatively quiet part of the city. Most shopping centers and commercial spaces are located in the other end of the city. Constructing the market in this location will lead to convenience for the local population.

1.5 Objectives and justification of selecting of this sub-project

Municipalities of Bangladesh are quite weak and have no stable source of revenue. So, a project was designed which would allow the municipality to be sustainable, and provide better services to its population. This project will support the municipality and improve the overall infrastructure and service of the area.

Additionally, it will also provide the local population with necessities through the shops, offices present in the building. It is also expected to generate employment in the local community.

1.6 Key sub-project activities and implementation process

The subproject involves constructing a Ten-Storied building. The first four floors would be commercial and Office spaces:

Key subproject activities are:

- Construction of a basement car parking
- Construction of six floors for commercial use
- Construction of main staircase
- Construction of emergency staircase
- Installation of elevator

These activities will involve a wide range of work, such as earth work, brick work, CC and RCC works, reinforcement work; tiles work, plastering work, grill work, glass work, electrical work, plumbing works.

The materials to be used for the key activities are soil, bricks, brick chips, stone chips, cement and concrete, steel rods etc. Additionally, kerosene/diesel will be used for vibrator, pilling machine and power generator. Water will be used for drinking purposes and construction works such as for mixing concrete and curing. Electricity will be used for reinforcement fabrication and domestic purposes. The wood/gas will be used for cooking by the workers at the Labor sheds.

The major equipment to be used for the implementing the subproject are diesel machine, brick breaking or stone breaking machine, steel cutter, dump truck, water tanker, excavator and trucks for carrying construction materials.

The building will be connected to the Municipal water, electricity and sewage lines for regular use during the operation phase of the project.

1.7 Subproject Schedule

The tentative schedule of construction of the subproject is:

(a) Subproject duration (months): 15 months

(b) Tentative start date : December 2018

(c) Tentative completion date : March 2020

The daily construction hours will normally include regular working time. However, daily working hours may vary based on the site condition. The detailed work program will be prepared by the contractor with the assistance of the PIU, Narshindi Municipality. Then it will be shared with the PMU, BMDF. In addition, the detailed work program will also be shared with the Bank.

Category of sub-project

The project environmental classification has been selected as per the relevant legal framework. The classifications are:

According to **ECR 1997** of the Government of Bangladesh: **Orange B**
(Based on the requirements for commercial multi-storied buildings)

According to **World Bank Classification**: **Category B**
(Based on the environmental framework of the MGSP project)

1.8 Analysis of Alternatives

Analysis of alternative location:

The objective of this analysis of alternatives is to identify the suitable location for this proposed market. The objective was to reduce adverse impacts and smooth implementation of the project. This land is the most perfect for this purpose because it is the only Municipality owned land remaining. Any other site would have to be acquired. Additionally, the prominent location makes it very attractive for a commercial space.

Analysis of alternative design:

The alternative design may be proposed like steel truss market instead of RCC and brick. This is not feasible and economically viable in Bangladesh. The materials are not readily available in the market. On the other hand, skilled crew for fabricating and fixing steel members are not adequately available in Narshindi.

In the proposed design, all facilities for disabled and female visitors have been provided like ramp, toilets, elevators etc.

Detailed Environmental and Land use Features

This survey was done through physical observation of the nearby area. The area of the sub-project is entirely urban, with a few trees at the side of the road. The area is mostly residential with a few shops and schools present in the locality.

Table: Major Environmental Features around the proposed Market

Sides/Direction	Major Environmental Features
North	Residential Building, Shops
South	Train Station, Shops, Residential Building
East	Road , Narsingdi Govt. College,
West	Residential Building, Shops

2.0 Baseline Analysis of Environmental Condition

3.1 Physical environment

Geology, topography and soils

The sub-project area mainly comprises of plain land and almost flat with few undulations. The depressions and canals in the region are dominated by organic clay and peats. The average ground elevation of the project area is about 13m. The soil of the district is mainly formed with recent and sub recent alluvial sediments of low parts of the old Brahmaputra floodplain and the new Brahmaputra floodplain. Tract upland soil mixed with the old Brahmaputra floodplain is found in the north eastern part of the District. The central part is formed with the ridges and basins of the Brahmaputra floodplain having grey-clay loam. The soil of the southern part of the District is formed by grey silty complex clay for the young Brahmaputra floodplain. The soil condition of the district is very favorable for producing different types of vegetables and high yielding varieties of crops. Most of the areas under the Narsingdi District are occupied by compacted, pale brown, sandy soils on the ridges and shallow, dark grey, compact clays overlying sand in the shallow basins. Top soils are acidic when dry but near neutral when flooded. Sub-soils are often slightly acid at the top but all become moderately alkaline below.

Climate and meteorology

The climate of the district is relatively mild both in the summer and the winter. The maximum and minimum mean temperatures during the winter vary from 19°c to 23.7°c. During the summer maximum and minimum mean temperatures vary from 26°c to 29°c. The dry winter season starts from November and continues up to the end of February. Summer comes from mid of March and continues up to the mid of June. The rainfall is generally heavy during July and August. Heavy rainfall occurs during the monsoon. Annual average rainfall of this district is 2376 millimeters.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°C)	19.1	21.8	25.7	28.7	28.9	28.6	28.6	28.8	28.7	27.5	24	20.3
Min. Temperature (°C)	12.6	15.1	19.3	23.2	24.7	25.7	26.1	26.2	25.9	24	18.9	14.3
Max. Temperature (°C)	25.7	28.5	32.2	34.2	33.1	31.6	31.1	31.4	31.6	31.1	29.1	26.4
Rainfall (mm)	10	20	59	142	266	407	380	311	260	162	37	4

Source: en.climate-data.org

Hydrology (surface water, ground water, and rainwater)

There are a few ponds present in the city. All the ponds are man-made and used for fishing, water supply and domestic uses. River Old Brahmaputra flows nearby the sub-project area. Some small and medium industries observed near the subproject area which remarkable sources are of water pollution.

The depth of ground water level varies from 4m to 7m. Potable ground water is available at an average depth of 130m to 220m.

Flooding, water logging, and drainage pattern

There isn't any significant flooding in the region. Although, during the wet season, heavy rainfall can cause water logging due to lack of proper drainage systems in the city. The City has a few narrow drains that are not enough to carry storm and domestic waste water. The existing drainage system is not functional because people throw and dispose wastes in the drains. Also, because of paving, there isn't open surfaces for the water to be soaked by the ground.

Air quality and dust

Air quality data of the sub-project area is not readily available. From physical observation of the area, it can be said that the air quality is same as the average air quality of the City. There is no possibility of air pollution by industries because there are no major industries in this area. There is a lot of dust present, mainly due to sand in the roadside. The City is quite small and the most popular form of transportation are electric auto-rickshaws. There are only a few cars present. The highway is about 7km away, and buses and trucks move there.

As per the Environmental Conservation Rules (ECR 1997) of the Government of Bangladesh. air quality for commercial and mixed area should be SPM 400 µg/cm, SOx 100 µg/cm, CO 5000 µg/cm, NOx 100 µg/cm. As per the Environmental Management Plan, air quality will be measured during construction and operation to maintain standards.

Parameter	Environmental Conservation Rules,1997				WHO
	microgram/m^3				
	Industrial	Commercial and Mix use	Residential and Rural area	Sensitive area	
SPM	500	400	200	100	-
PM 2.5	65				10
PM10	150				20
SO_2	120	110	80	30	20
NO_2	100	100	80	30	40
Pb	.5				

Noise level

The major source of noise in the area is from transportation. Large vehicles such as Buses, and Trucks do not move in this area. Rickshaws, electric auto-rickshaws, motorcycles and a few cars are present in the sub-project area.

As per national standards, the sound level should be limited to 70 dB. Baseline data of noise level of the project area is not available. Noise level will be measured during construction time and operation time.

Noise level measurement locations	GPS Co-ordinate	Day-time	
		Equivalent Noise level (dBA),L_{eq}	Maximum Noise level (dBA),L_{max}
College Road (Near proposed Market)	23°56'0.39"N 90°42'57.46"E	61.37	62.33
Near Upazilla Gate	23°56'1.66"N 90°43'0.79"E	63.56	65.31
Bangladesh (DoE) Standard			
Zone	Max	Min	
Industrial	75	70	
Commercial	70	60	
Mixed Area	60	50	
Residential Area	55	45	
World Bank Standard			
Industrial	70	70	
Commercial, Residential, Educational	55	45	

Source: Field Survey April, 2018

3.2 Biological Environment

Flora and fauna

Flora and Fauna: The subproject is located completely in an urban environment, and therefore the flora and fauna in the area are normal urban flora and fauna. People generally plant fruit trees like mango (Mangifera indica), etc in their homes and there are a few medicinal and timber trees in the side of the road. Fauna present is generally observed urban fauna such as cats, dogs, crows, rats etc.

In the rest of the district, widely grown crops are: rice, wheat, banana and several vegetables. Common trees grown for timber are: koroy (Albizzia procera), tamarind (Tamariandus indica), chaplasta, etc.

Common mammals in the district are: Fox (Canis aureus), Mongoose (Herpestes edwardsi), Bat (Rousettus leschenaulizi). Common birds: Parakeet (Psillacula krameri), Ghugu (Streptopelia chinensis), Laxmi Owl (Tyto alba). Chicken, duck (Cairina sentulaca), and pigeon (Columba spp) are common the domestic birds.

Common fishes are: Ruhi (labeo rohita), Katla (Catla catla), Mrigel (Cirrhinus mrigala), kalboush (Labeo calbasu) etc.

Biodiversity Status: The sub-project site has very poor biodiversity. Because of rapid and unplanned urbanization, the City is suffering from lack of proper vegetation, and therefore fauna.

Although this is a very common occurrence all across Bangladesh, the district of Narsingdi has a good stock of biological resources. The diversity of species and population of flora and fauna in the district points to that. However, this could be threatened in the future because of the rapid industrialization it is undergoing.

3.3 Socio-economic environment

Land use

The subproject site is in the middle of the town and the land use in the area is almost completely commercial and residential. This includes residential buildings, personal homes, supermarkets, malls, government offices, educational institution etc.
The site is currently vacant, with only a few small trees present.

Beneficiary population

This proposed building is located in Ward no-2, which has a population of about 20,000. Directly and indirectly, the population of the entire municipality will be benefited through this Building.
The local population will be benefited by the shops in the building because they wouldn't have to travel to the other parts of the City and it would convenience them greatly. Also, the office spaces are expected to be leased by Banks, which will further ease the life of the local population.

The sub-project is located exactly opposite to the Narsingdi Government College, and if stationery and book shops are present in the building, it will greatly benefit the students.

Education

Narsingdi City has an average literacy rate of 50.9% with 52.5% for Male and 49.1% for Female (Bangladesh Bureau of Statistics, 2011).

There are a few government and private schools and colleges present in the city. Most students move to Dhaka for better education.

Tribal communities

This is no significant tribal population present in the Municipality. So, there is no expectation of affecting tribal communities through the sub-project.

Archeological/Historical places

There are no archeological or historical sites near the proposed sub-project site. So, no cultural impact is expected.

Land acquisition and resettlement

The entire sub-project area is owned by the Municipality and no additional land will be required.

3.0 Environmental Screening

Environmental Screening (ES) for the sub-project has been conducted with the purpose of fulfilling the requirements of DoE and WB. Environmental Screening ensures that environmental issues are properly identified in terms of extent of negative and positive impacts. A field visit for preparing the ES was carried out on November 2017 in the sub-project area. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework (EMF) of MGSP, was followed for identifying the impacts and their extents. The screening data and information for this sub-project have been analyzed and are shown in below.

Potential Environmental Impact during Construction Phase:

Ecological impacts:

• Felling of trees	Significant	Moderate	√**Minor**	Number of trees- 10
• Clearing of vegetation	Significant	Moderate	√**Minor**	
• Potential impact on species of aquatic (i.e., water) environment	Significant	Moderate	**Minor** √	

Physicochemical impacts:

•Noise pollution	Significant	**Moderate** √	Insignificant
•Air pollution	Significant	**Moderate** √	Insignificant
•Drainage congestion	Very likely	**Likely** √	Unlikely
•Water pollution	Significant	Moderate	**Insignificant** √
•Pollution from solid construction waste	Significant	**Moderate** √	Insignificant
•Water logging	Significant	Moderate	**Insignificant** √

Socio-economic impacts:

•Traffic congestion	Very likely	**Likely** √	Unlikely
Health and safety	Significant	Moderate	**Insignificant** √
•Impact on archaeological and historical	Significant	Moderate	**Insignificant** √
•Employment generation	Significant	**Moderate** √	Insignificant

Potential Environmental Impact during Operational Phase:

Ecological impacts: (important sub-projects include storm drain and boat landing jetty)

• Potential impact on species of aquatic environment	Significant	Moderate	**Minor** √

Physicochemical impacts:

Potential air quality and noise level	Improvement	**No-improvement** √	Deterioration
Drainage congestion	Improvement	Minor Improve	**No Impact** √
Risk of Water pollution	Significant	Moderate	**Minor** √
Pollution from solid waste	Improvement	**No-improvement** √	Deterioration

Socio-economic impacts:

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

Summary of Possible Environmental Impacts of the Subproject:

During Construction Phase

- Dust pollution
- Slight traffic congestion
- Noise pollution
- Drainage Congestion from construction waste

During Operation Phase

- Increased traffic in adjacent roads, leading to congestion
- Increased volume of municipal waste

From the above environmental screening it can be said that there are no severe ecological impacts of construction of this sub-project. No significant physicochemical impacts of the proposed project construction work is expected. Moderate noise and air pollution and solid waste may occur during construction. There are very minimal possibilities of adverse impacts on socio-economic environment of the sub-project area, although traffic congestion is expected.

There are some possibilities of producing moderate or minor adverse environmental impacts, which can be mitigated at the initial stage by taking mitigation measures. It is possible to limit noise levels and dust blowing during construction and operation of the project, proper disposal of solid and liquid waste through collection and drainage system development.

The air quality will need to be maintained by limiting dust and toxic gas emissions from equipment and vehicle exhaust. Health and safety will also be needed to be ensured for workers by following prescribed measures of World Bank's Health and Safety guidelines.

4.0 Specific Impact and Mitigation & Enhancement Measures To Safeguard Environment during Construction Period

4.1 Labor Shed Construction

The labor shed to be constructed needs to have separate resting bathroom facilities for male and female workers. There will be a clean water supply, proper light and ventilation and separate cooking spaces.

Mitigation Measures: The site of the labor shed will be about 300 meters away form the project side, near Narsingdi Train Station. There is an open space at the side of the road owned by the Municipality. There are no toilets and water supply present there, so the entire shed along with necessary services needs to be constructed.

Proper health and safety of workers will be ensured through providing health and hygiene training to the workers by the Municipality and the contractor. Waste bins will be present at the labor shed, and the workers will be encouraged to dispose off all their garbage at the waste bins. All the waste will be collected daily and taken to the Municipality waste treatment plant at Khatiyara.

4.2 Earthwork

The subproject requires no demolition of existing buildings. The subproject will begin with the construction of the building foundation. This will involve earth cutting, and removal of unsuitable materials. These works would most likely lead to dust blowing, noise and vibration which disturb the local adjacent people, pedestrians. Additionally, during excavation top soil could be compromised. The sub-project site is completely level, so earth filling is not expected to be needed.

Mitigation Measures: While carrying soil, the trucks will be covered. Water will be sprayed during day time to reduce dust. Adequate safety barriers with clearly visible signs will be erected at appropriate locations and the site will be off-limits for all non-essential personnel. Adequate lighting will be provided to the barriers and signs to make them clearly visible at night from a distance sufficient to respond.

4.3 Semi-Basement Work

Construction of the basements requires deep depth excavation work. Though, there are building at three sides which could be affected due to the basement work. If proper measures are not taken the adjacent building stability, soil stability could fail, which could cause property damage, injury or even death to the individuals and delaying the construction works.

Safeguard Measures:

- Fencing of the construction site and restrict unauthorized entrance;
- Providing effective short term measures for slope stabilization, sediment control and subsidence control until long term measures for the operational phase can be implemented.

- Providing adequate drainage systems to minimize and control infiltration
- Using of sheet pile to form cofferdam to support excavation;
- Availability of the adequate lighting facilities for basement work;
- Check availability of the adequate ventilation for basement work;
- Provide sump pit inside the lowest level of the basement to collect water and remove by pump. Ground water can be kept out either permanently such as for long term waterproofing for a basement, or temporarily such as to ease work during excavation;
- Generated waste should be properly handled, transport, re-sue if possible and disposed-off immediately;
- Use ladder and ramp for the workers safe movement from the ground to the basement and basement to the ground;
- Mechanical ventilation shall be provided where gases and fumes likely to be present in trenches. All personnel working there shall be provided with protective respiratory equipment. All trenches/tunnels shall be provided with emergency exits (BNBC Section 3.10.2.6 and Section 3.10.3)
- All shore piling and deep foundation operations shall be supervised by a competent foreman and shall be responsible to ensure all precautionary measures. For working at night, lighting of at least 100 lux intensity shall be provided at work site.
- Design and construction of the basement should follow BNBC, ACI and other standard code.

The foundation will be mat type. The anticipated impacts due to the foundation works are:

- Noise pollution due to use of the equipment; Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines.
- Potential occupational health and safety risks and accidents;
- Air and dust pollution due to black smoke emission from diesel based equipment.

The key activities associated to the cast-in-situ pile work-boring work, cutting and welding of the reinforcement, placing of the pile reinforcement ring into the bore hole and RCC work for Pile casting and demolition of the pile head etc. have environmental impacts on the physicochemical components. The anticipated impacts due to cast-in-situ Pile works are:

- Noise pollution due to use of rig machine, winch machine, concrete mixer machine, vibrator machine, steel cutter and welding machine;
- Muddy water and clay generation due to boring work;
- Potential occupational health and safety risks and accidents from steel cutter, welding machine, rig machine, and winch machine;
- Air pollution due to black smoke emission from diesel based rig machine, concrete mixer machine and vibrator machine.

Mitigation Measures

- Boring work and RCC should avoid at schooling time and at night time and should follow normal working hour;
- Establishment of pucca tank (two chambers) to collect muddy water and mud;
- Disposal of the mud at dumping site and re-use of the mud and clay for filling work if applicable;
- Avoid using of steel cutter, wielding machine, concrete mixer machine, vibrator machine, rig machine and winch machine at night;
- Avoid prolonged exposure to noise (produced by equipment) by workers;
- Ensure use of the personal protective equipment's (helmet, goggles, gloves, safety boot) (Follow Safety Standard (BDS 1265, 1266, 1360 as mentioned in the BNBC safety during Construction)
- Availability and access to first-aid equipment and medical supplies in case of any accidents;
- Carefully operation of the steel cutter, rig machine and winch machine;
- Ensure proper joint between two reinforcement rings to avoid any possible damage;
- Avoid operation of the concrete mixer and vibrator machine at night;
- Regular maintenance of the concrete mixer and vibrator machine to avoid any black smoke emission.

4.4 Construction material sourcing

The construction materials such as sand and bricks are generally obtained from the local vendors. Bricks are produced using clay and firing by coals and somewhere wood. Uncaring purchase of these materials from unlicensed operators indirectly supports, encourages and promotes environmental degradation at the illegal quarries, creates air pollution from using energy inefficient technologies and cause medium to long-term negative impacts.

Mitigation Measures: Construction materials will be obtained from government licensed and approved quarries and brick fields. The copies of the relevant licenses will be made available for inspection at the site by the contractor. All construction materials will be sourced from all close to the site as possible. All the materials will be carried, stored by cover and in safe places and safe transportation and handling will be monitored by the site engineer.

4.5 Air quality and dust

Air polluting substances like dust and smoke, are produced during construction works from land preparation, operation of diesel engines, welding, burning of fossil fuels etc. The construction site generates high levels of dust (typically from concrete, cement, wood, stone, and sand). Construction dust is classified as PM_{10} / $PM_{2.5}$ - particulate matter less than 10/2.5 microns in diameter, invisible to the naked eye. Oil spillage from engine causes soil pollution.

Mitigation Measures: Water will be sprayed regularly during construction works to control dust blowing. During carrying of construction materials like sand, soil, brick, cement, the trucks will covered to prevent dust blowing. Even at the construction site, cement, sand etc. will be kept covered. It will also be ensured that they are not washed into the drainage lines by rain or any other source of water. Non-toxic paints, solvents and other non-hazardous materials will be used wherever possible. Any machinery which uses oil must be operated on a plastic sheet to prevent spillage and soil pollution.

4.6 Noise and vibration

Construction sites will produce a lot of noise, mainly from generator, iron cutting, brick breaking machines, equipment, and machinery, but also from workers shouting. Excessive noise is not only a nuisance, but can lead to genuine health issues. Vibration also occurs during pilling works that is an issue for safety of nearby building and can causes landslides.

Mitigation Measures: Noise pollution will be reduced as much possible through careful handling of materials; modern, quiet power tools, equipment and generators; low impact technologies. To reduce the health effects of workers due to noise pollution hearing protection equipment like ear plug/muffler will be provided. Protective measures will be taken to control landslides during pilling works.

4.7 Solid Waste Disposal

There will be a significant amount of construction waste. If proper care is not given, these can cause drainage congestion, soil pollution, water pollution, etc.

Mitigation Measures:
All solid waste will be carefully removed and taken to the Municipal waste plant at Khatiyara.
The trucks carrying the waste will be covered to prevent additional pollution.

4.8 Workers safety

There is a general risk of accidental injury of workers, especially from working in open trenches of yard excavation, or working in high floors of multistoried buildings. Generally, accidents happen because of negligence and lack of proper protective equipment. There is also a potential health risk of contamination from toxic materials at work sites.

Mitigation Measures: Health safety training will be given to the workers. Personal protective equipment such as helmet, hand gloves, musk, goggles and gumboot will be provided to the workers and it will make sure that they will used it properly. A first aid box would be kept at work site and some of them will be trained on first aid. Health and safety of workers and work site would be monitored regularly to reduce health risks. To reduce the health effects of workers due to noise pollution hearing protection equipment like ear plug/muffler will be provided.

5.0 Specific Impact and Mitigation & Enhancement Measures to Safeguard Environment during Operation Period

Solid Waste Disposal:

The building is expected to generate solid waste from the shops, restaurant, and other commercial spaces. But if proper care is not given, these can pollute the neighborhood, clog drains, etc. It is assuming from the trend, it will generate solid waste in the market is about 40 kg/day (approx.).

Mitigation Measures: Bins would be installed in floor spaces of each floor, where visitors and shop keepers, Officials can throw their waste including food waste. The waste collector will collect the solid waste from the bin in twice a day. The waste collector will put the waste in a bigger waste bin which will be set out side of the building premises near road side. The Municipal dumping truck will collect at night from the waste bin and will dispose to Municipal designated landfill area.

Waste Water Disposal:

Waste water will be generated from toilets, restaurants, offices, etc. These can cause environmental pollution and public health concerns if not properly maintained. From the trend of waste generation in a Municipal Market, it is assuming that about 1400 liter/day waste water from the proposed market.

Mitigation Measures:

Sewer line for bath room, kitchen waste water and toilet facilities have provided separately. Waste water from bathroom, kitchen, floor wash will go to soak pit through separate pipeline (shown at BoQ in Sl# 27, item code 7.11.05.01).

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Fecal sludge management:

There are Faeces from toilets will be discharged to septic tanks through separate pipe line. Possibility of bad odor and environmental degradation due to improper collection of fecal sludge from septic tank & improper handling, transportation and disposal of the fecal sludge. Provision of septic tank system have been provided for the toilets (at BoQ Sl# 27, item code 7.11.05.01); avoid discharge of the waste water from the complex in to the existing drains.

Mitigation Measures:

Ensure use of closed container/vacuum tanker with sucker machine for the collection of fecal sludge from the septic tank at regular interval; Disposal of the sludge at the existing dump site at ward no 9 at khatahara STP which is under construction. There are possibility of recycling and treatment the sludge for reuse as manure.

Basement and Foundation Work

This will be a semi-basement which requires only 90 cm depth excavation and will be supported by RCC retaining wall. It will be constructed at the periphery of the proposed site. For land peripheral area, no further soil protection is needed as maximum earth cutting is 150-180cm distance from surrounding structures. Only 6 to 7 locations where needed temporary bamboo shoring or palisading will be needed to be installed and costing for this will be added in the bid document.

Safeguard Measures:

- Fencing of the construction site and restrict unauthorized entrance;
- Availability of the adequate lighting facilities for basement work;
- Check availability of the adequate ventilation for basement work;
- Provide sump pit inside the lowest level of the basement to collect water and remove by pump. Ground water can be kept out either permanently such as for long term waterproofing for a basement, or temporarily such as to ease work during excavation;
- Generated waste should be properly handled, transport, re-sue if possible and disposed-off immediately;
- Use ladder for the workers safe movement from the ground to the basement and basement to the ground;
- Design and construction of the basement should follow BNBC, ACI and other standard code.

Since this is high rise building, the possible foundation will be pile. The anticipated impacts due to the foundation works are:

- Noise pollution due to use of the equipment;
- Potential occupational health and safety risks and accidents;
- Air and dust pollution due to black smoke emission from diesel based equipment.

The key activities associated to the cast-in-situ pile work-boring work, cutting and welding of the reinforcement, placing of the pile reinforcement ring into the bore hole and RCC work for Pile casting and demolition of the pile head etc. have environmental impacts on the physicochemical components. The anticipated impacts due to cast-in-situ Pile works are:

- Noise pollution due to use of rig machine, winch machine, concrete mixer machine, vibrator machine, steel cutter and welding machine;
- Muddy water and clay generation due to boring work;
- Potential occupational health and safety risks and accidents from steel cutter, welding machine, rig machine, and winch machine;
- Air pollution due to black smoke emission from diesel based rig machine, concrete mixer machine and vibrator machine.

Mitigation Measures

- Boring work and RCC should avoid at schooling time and at night time and should follow normal working hour;
- Establishment of pucca tank (two chambers) to collect muddy water and mud;
- Disposal of the mud at dumping site and re-use of the mud and clay for filling work if applicable;
- Avoid using of steel cutter, wielding machine, concrete mixer machine, vibrator machine, rig machine and winch machine at night;
- Avoid prolonged exposure to noise (produced by equipment) by workers;
- Ensure use of the personal protective equipment's (helmet, goggles, gloves, safety boot);
- Availability and access to first-aid equipment and medical supplies in case of any accidents;

- Carefully operation of the steel cutter, rig machine and winch machine;
- Ensure proper joint between two reinforcement rings to avoid any possible damage;
- Avoid operation of the concrete mixer and vibrator machine at night;
- Regular maintenance of the concrete mixer and vibrator machine to avoid any black smoke emission.

Parking:

Though Narshindi is a small town and number of Cars will not too much which can create traffic congestion. However, there will be an effective traffic management system fixing entry, exist area and basement parking. The existing parking area has the capacity of 9 number of Cars which conforms the BNBC 1993. Community Police will be deployed by the market management committee in front of market who will manage all of traffic. Moreover, the market will be within walking distance of the local people, so it is assuming that 9 number of Car parking area is enough for Narshindi Municipality.

Fire Accident:

The proposed building will contain Food Shops, Electrical and Electronic shops which will use stoves and electric items. This may cause a fire hazard.

Mitigation Measures: The area of the market is only 207 m2 . There will be designed as fire stair which can be used as emergency escape during fire accident. Firefighting devices will be fixed at strategic points in all floors. Provide training on device use to the staffs who will be on duty at the building. Emergency numbers displayed at prominent locations. There could also be regular fire drills. Installation of smoke detectors at all strategic points. There will be water hydrants in the design which has mentioned in BoQ SL# 15, item no. 7.09.06.04 and water reservoir for water supply where a fixed level of water will be reserved for firefighting.

6.0 Environmental Management Plan (EMP)

6.1 Access to information

It is important for the public to be aware of the subproject and specific activities being held under it. Therefore, a public consultation meeting was conducted.

Before the beginning of construction, prominent signboards will be set up at the construction site to inform the local population of the subproject activities, along with contact information of Municipal Officials they can contact for any further information or lodge complaints.

During the operation phase of the subproject, when the commercial spaces in the building are sold or leased out, additional signboards will be placed in front of the building, the Municipality Offices, and local newspapers with relevant information. This is to ensure that the local population has necessary information, and that the bidding process for the spaces is transparent.

6.2 Grievance redress mechanism

Sub-project specific Grievance Redress Mechanism (GRM) will be set up by the Laxmipur Municipality. This is for timely receive, ground truthing and mitigate the solution of affected person/s as per EMF. This will be transparent, time-bound approach where the affected person

(AP) has scope to raise voice without any fear with facts and documents. If the below resolution process fails to satisfy the aggrieved person, then it will be suggested to drop the sub-project.

6.2.1 Grievance redresses committee (GRC)

A Grievance Redress Committee has been formed comprising of relevant stakeholders in the region for the resolution of any possible of grievances of the public. The members of the committee are:

1. Md. Kamruzzaman, Mayor, Narsingdi Municipality, Chairman of GRC
2. Member of Local Administration (TBD; awaiting appointment from District Commissioner)
3. Md. Nur Hossain Bhuiyan, Headmaster, Satirpara NK Institution, Member of GRC
4. Fahima Khanam, Local NGO Official, Member of GRC
5. AHM Jahangir, President, Narsingdi Inter-District Transport Owners Association, Member of GRC
6. Yesmin Sultana, Reserved Female Councilor, Member of GRC
7. Md. Tarequl Islam, Executive Engineer, Narsingdi Municipality, Member Secretary of GRC

6.3 Capacity building

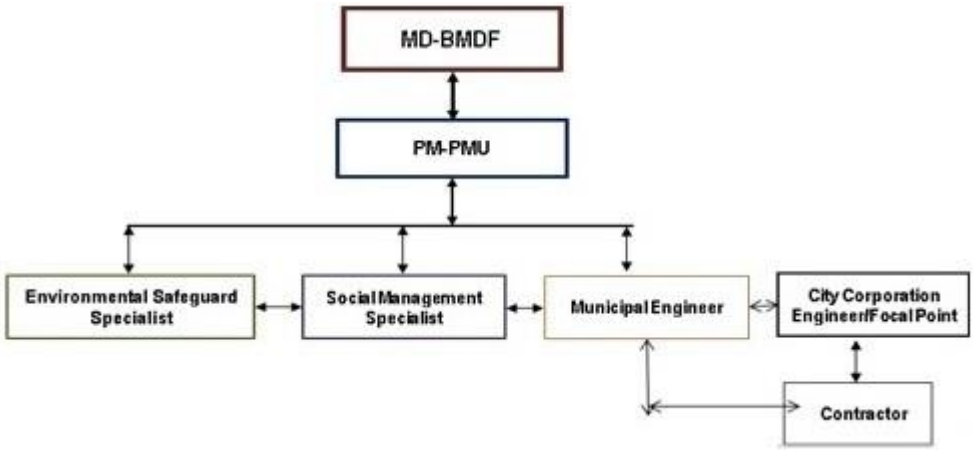
A Safeguard and capacity training program has already been conducted by PMU, BMDF for Narshingdi Municipality. Similar training program will be conducted in the same venue prior to the commencement of the work. The training program will include introductory course for the training of the PIU Officials and contractor's field staffs, preparing them on: (i) EMP implementation, including environmental monitoring requirements related to the mitigation measures; and (ii) Taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of the implementation. The contractor should be also included in the training program to enhance the Environmental awareness, Safety Security and orientation among the workers.

A detailed training manual will be developed by the Environmental Specialist and Social Management Specialist of PMU, BMDF prior to the demonstration training program in Narshindi.

6.4 Institutional Arrangement for the Safeguard Compliances:

In the institutional arrangement procedure, Managing Director and Project Manager will directly involve. The Managing Director and Project Manager will be supported by an environmental safeguard specialist and social management specialist. The Narshingdi Municipal Officials, especially members of PIU, would be responsible for supporting the construction supervision as well as environment and social management with the facilitation of the PMU, BMDF consultants. The civil works contractors will implement these environmental mitigation measures through taking assistance from PIU- Narshingdi Municipality and Environmental

Specialist-PMU, BMDF. The PMU (BMDF), with the facilitation of environment and social management specialist, will submit the monthly and quarterly progress reports on environmental and social compliances to the World Bank. A tentative Environmental and Social Management Team with specific roles (shown in the below Figures) has been formed for ensuring environmental safeguard in the overall subproject implementation.



Position	Responsibility
MD-BMDF/PM-PMU, BMDF	▪ Analyse and evaluate the report coming from environmental specialist, PMU and or PIU, Narshingdi.Provide suggestions and inputs as per requirement; ▪ Give feedback to WB.
Environmental Specialist-PMU, BMDF	▪ Supervise the overall environmental compliances in the subproject; Ensure that environment, health and safety regulatory requirements are met and EMP and monitoring plans are properly implemented;Give adequate training to PIU, Narshingdi Municipality on EMP and monitoring plan.
Municipal Engineer, PMU-BMDF	▪ Responsible for overall supervision of the construction works.
PIU- Narshindi Safeguard concern/focal point for environmental safeguard	▪ Responsible for supervision and monitoring of the EMP implementation and deliver monitoring report to ES-PMU, BMDF as per schedule.
Contractor	▪ Responsible for implementation of the EMP, visual and analytical monitoring.

6.5 Environmental Management Action Plan (EMP)

Sub-project Activity.	Activity/ Issues	Potential Impact	Proposed Mitigation & Enhancement Measures	Estimated Mitigation Cost	Frequency of monitoring	Responsible for monitoring	
						Implement	Supervision
Pre-Construction Phase							
Construction and operation of labor shed	Construction of labor shed in Close proximity; Establish of sanitary latrine and Tubewell	Solid waste and waste water generation; Environmental pollution; Workers health	Municipal space close to Train Station to be used as labor camp; Proper waste bins; Health and Safety training	Tentative cost BDT 200000	During Construction	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Construction Phase							
Earth Work and site preparation on, Solid waste generation	Earth cutting; Earth filling; Erosion of slope of the foundation trench	Solid waste; Slope erosion; Dust blowing	Construction Waste to be dumped in Municipal Waste at Khatiyara (landfill area)	Tentative cost BDT 7500	During Construction	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Air, Water Quality and Dust	Air. Water quality monitoring through lab test; Control air pollution and dust Blowing	Air pollution, Water Pollution	Water will be sprayed at regular interval to control the dust especially in day time; Air quality will be measured, tests and monitoring. Ground water quality test	Tentative cost BDT 10000 for controlling dust. BDT 50000 for air and water test (2 times).	During pre-construction, construction and operation period	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Noise and Vibration	Keep noise level at tolerable level; Measured and monitoring of noise level.	Noise pollution; Vibration at the construction site	Proper scheduling of transportation will be maintained	NA	During pre-construction, construction and operation period	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB

Sub-project Activity.	Activity/ Issues	Potential Impact	Proposed Mitigation & Enhancement Measures	Estimated Mitigation Cost	Frequency of monitoring	Responsible for monitoring	
						Implement	Supervision
Water Logging	Construction materials and construction waste causing drainage congestion and water logging.	Drainage congestion	Construction material will be kept in distance from drain and drain will be cleaned.	Tentative cost BDT 10000	During Construction	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Safety measures for semi basement	Fencing, palisading, pump machine	Land sliding, water logging	safety measures will be ensured through using fencing, palisading, water pumping	Cost in Civil work	During Construction	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Workers safety	Health risk and Safety issues of Workers	Physical illness; Accidental Injury	use of personal protective equipment (Helmet, Gloves, Eye protecting glass, ear plug/muffler, Boot, Jacket etc.) A first aid box will be placed at work place.	Tentative cost BDT 100000	During Construction	Contractor	Environmental Specialist-PMU, MGSP, PIU/ULB
Operation Phase							
Solid Waste Disposal	Generation of solid waste; Solid Waste management system.	Environmental degradation	Small bin will be established at the premises and ensure proper solid waste collection and management.	Tentative cost BDT 60000 yearly	During Operation phase	Contractor /Market Committee / Municipality	PIU/ULB
Waste Water Disposal	Generation of waste water.	Environmental degradation and Health risk	Separate pipeline and Soak pit	in Civil work	During Operation phase	Contractor /Market Committee / Municipality	PIU/ULB
Fecal sludge Management	Fecal sludge generation	Over flow	Septic tank, Cleaning as required using vacuum truck and safe removal	BDT: 30000 per cleaning	During Operation phase	Market Committee/ Municipality	PIU/ULB
Traffic Congestion and	Creation traffic congestion by Noise	Traffic congestion; Accident,	By separating area for motorized and non-motorized	Tentative cost yearly BDT 150000	During Operation phase	Market Committee/ Municipality	PIU/ULB

Sub-project Activity.	Activity/ Issues	Potential Impact	Proposed Mitigation & Enhancement Measures	Estimated Mitigation Cost	Frequency of monitoring	Responsible for monitoring	
						Implement	Supervision
noise pollution	from vehicles and traffic.	noise pollution	deploy community policing. Noise level monitoring.	for traffic control.			
Solar Energy and Glass wall	Saving electricity by using solar energy, energy saving lights and day Light	Energy consumption and load shading.	By Solar panel set up at roof top. Glass wall will be used where possible. LED and other energy saving appliances.	Cost should include in the electrical cost in BoQ	During Operation phase	Contractor	PIU/ULB
Air, Noise and Water	Monitoring air, noise and water quality	air, noise and water pollution	Lab test of air, noise and water and taking measures to improve if require	Cost should include in the electrical cost in BoQ	During Operation phase	Contractor	PIU/ULB

7.0 Public Consultation and Participation

7.1 Methodology

A Public Consultation Meeting was held on 25th January, 2018 Narsingdi Govt. College, Brahmondi, Narsingdi City to discuss the details of the project with the local population and receive their feedback.
The meeting was moderated by Mr. Tarequl Islam, Executive Engineer, Narsingdi Municipality and Mrs. Yesmin Sultana, Ward Councilor, Narsingdi Municipality.
The participants of the meeting were local students, teachers, businessmen, vendors, and other members of the local population.
The attendees of the meeting were first informed of all details of the subproject, and then asked for their concerns regarding the project, suggestions, and general opinion on the issue.

Stakeholders at the sub-project were identified under three main groups: (i) beneficiaries in the sub-project area; (ii) community leaders and Government officials and (iii) NGOs working at the local and regional levels. Stakeholder participation was completed in two steps: (i) firstly to collect and disseminate information through briefing and discussion meetings; and (ii) secondly to receive feedback for formulating appropriate mitigation measures against the adverse impacts.
In order to ensure appropriate feedback a range of information sharing techniques was used. Techniques used for different stakeholder groups included (i) Discussion with stakeholders (ii) Semi-structured interviews; (iii) Small group meetings with concerned officials in presence of stakeholder Site visits- stakeholder discussion in the field level.

7.2 Issues raised by the participants

The participants strongly agree to the construction of the Market, due to its prominent location and needs of the local population. since there is already traffic congestion in this road.

The major concerns of the participants during the construction phase of the project were:

- Noise pollution
- Traffic congestion
- Dust

The summary of the important suggestions during discussion are as follows:

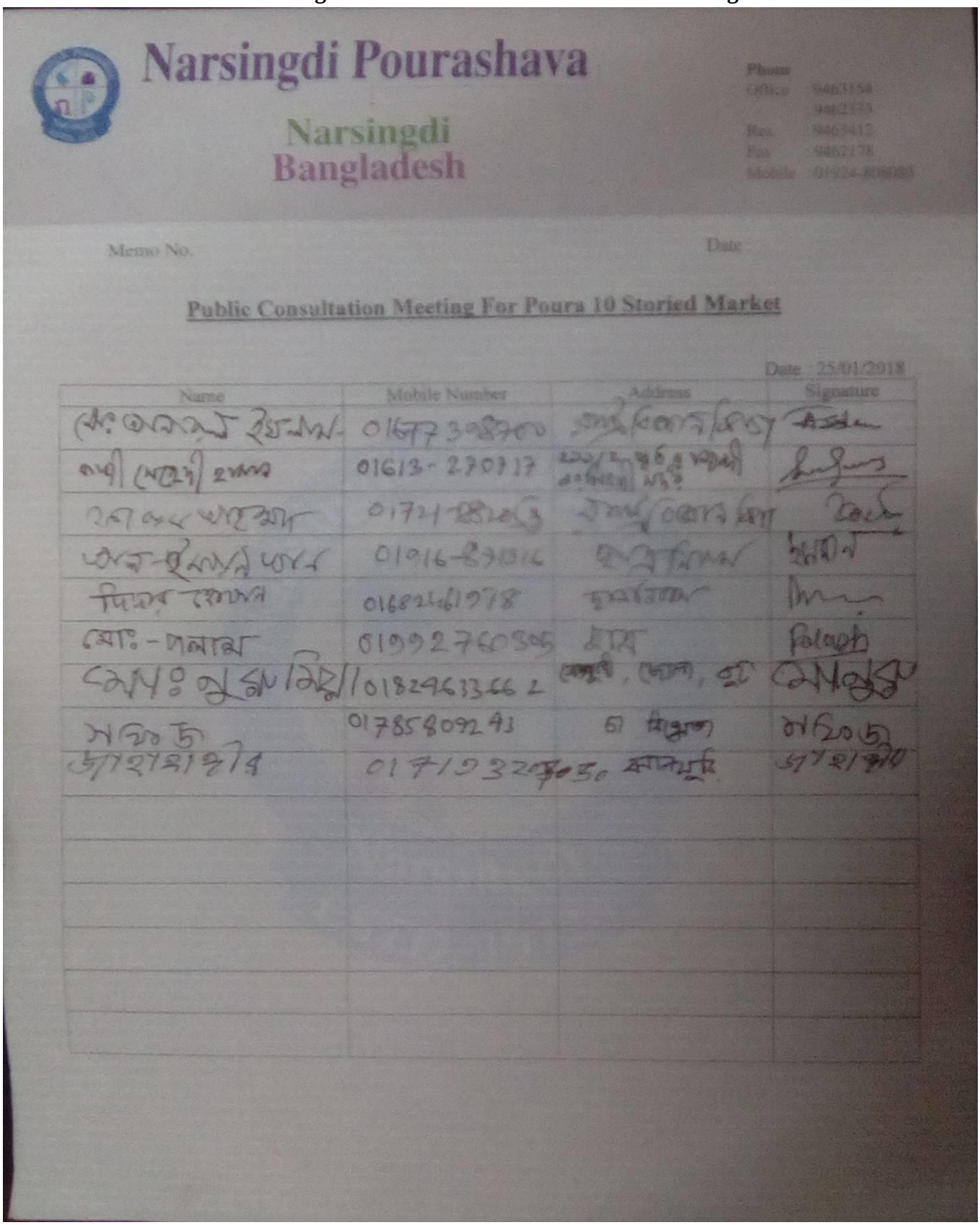
- Ensuring that the construction materials are not stored in the road to prevent congestion.
- Water should be sprayed in the construction space regularly to reduce dust.
- The building should be covered by shed on all sides to prevent any construction materials from falling and causing injure.
- Stationery and books shops should get priority when shops are leased to help the students of the college near the proposed market.
- Construction waste shouldn't be disposed off in the nearby drains.
- Work that produces noise pollution needs to be done as quickly as possible, to prevent nuisance over a long period of time.
- The project should follow the implementation timeline strictly to ensure that there are no delays.

8.0 Conclusions and Recommendations

It is understood from discussion with the stakeholders that this building will be very important and helpful for the local community because of its location and nature. And it can be implemented with a very low footprint on the environment if a few necessary measures are taken.

This project will increase the revenue of the municipality and also meet the requirements of the Municipal population. Like other construction projects, this project has some impacts on environment but these are not expected to be very significant. There will some generation of noise during construction work but the Contractor should take measures to reduce it. Emphasis should be given to make the building environment friendly during design and construction phase. Close monitoring of implementation of design, specification and suggested environmental parameters as mentioned in the EMP are very essential and responsibility of both Municipality and BMDF. Quality of construction and environment parameters should be monitored regularly by the Municipality for the sustainability of the building and its environment.

Annex A: Sign-in Sheet of Public Consultation Meeting



Narsingdi Pourashava

Narsingdi
Bangladesh

Memo No. Date :

Public Consultation Meeting For Poura 10 Storied Market

Date : 25/01/2018

Name	Mobile Number	Address	Signature