

**URBAN DEVELOPMENT DIRECTORATE (UDD)
Government of the People's Republic of
Bangladesh**

Interim Report

on

Package -01:

**PHYSICAL FEATURE SURVEY & SCANNING OF MOUZA MAP,
DIGITIZATION, EDITING, PRINTING ETC. UNDER PREPARATION OF
DEVELOPMENT PLAN FOR MIRSHARAI UPAZILA, CHITTAGONG
DISTRICT: RISK SENSITIVE LAND USE PLAN (MUDP)**

Submitted to

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Table of Contents

Chapter 1	8
1. Introduction.....	8
1.1 Background.....	8
1.2 Regional Setting.....	9
1.3 Objectives	10
1.4 Scope of Services and Activities.....	11
1.5 Categories of Activities.....	20
1.6 Other Activities	21
Chapter 2	22
2. Understanding the Project.....	22
2.1 Project Objectives	22
2.2 Project Component.....	23
2.3 Implementation Arrangement	26
Chapter 3	28
3. Location and History of the Project area	28
3.1 Introduction.....	28
3.2 Location and History of the Project area.....	28
3.3 List of Unions/Municipalities of the Study Area	31
Chapter 4	33
4.3 Poverty Reduction Strategy Paper (PRSP)	38
4.4 A Review of past Policies and Programs for Management of Urbanization	43
Chapter 5	47
Approach and Methodology	47
5.1 Introduction.....	47
5.1.1 Activity -1 Mobilization	47
5.1.2 Activity-2 Discussion and meeting.....	47
5.1.3 Activity -3 Collection of Document.....	47

5.1.4 Activity -4 Reconnaissance survey	48
5.1.5 Activity -5 Survey Plan	48
5.1.6 Activity - 6 Physical feature surveys	49
5.2 Methodology of Key Issues	50
5.2.1 Preparation Base Map	50
5.2.2 Geo-reference of Mauza Maps	50
5.2.3 Collection of RS and CS Mauza Maps	51
5.2.4 Scanning of Mauza Maps	51
5.2.5 Digitization of Mauza Maps	51
5.3 Identification of GCP (Tic) on digitized RS and CS Maps.....	53
5.4 Geo-referencing of RS and CS Mauza Maps (Joining of Mauza Maps).....	53
5.5 Methodology of Edge Matching of Mauza Maps	54
5.5.1 Preparation of Coverage (Topology) of the Project Area	55
5.5.2 GPS and GIS Technique	57
5.5.3 GPS Based Advanced Survey Technique	57
5.5.4 Differential Global Positioning System (DGPS)	58
5.6 Real Time Kinetics (RTK) GPS	58
5.6.1 Establishment of Reference Station for DGPS Survey	59
5.6.2 Approach and Methodology of Survey and GIS Mapping	59
5.6.3 Baseline Survey by RTK-GPS	59
5.6.4 DGPS Survey (Line, Point and Closed Boundary/Polygon Features)	61
5.7 RTK-GPS Fast Static Survey (Establishment of Secondary Control Points for TS Survey).....	61
5.7.1 Physical Infrastructure Survey	61
5.7.2 Total Station Survey (Line, Polygon and Point Features)	63
5.7.3 DGPS Survey (Point Features)	63
5.7.4 Map Updating	63
5.7.5 Field Check	64
5.7.6 Data Delivery	64
5.8 GIS Mapping (ArcInfo Coverage and Map Lay Out in ArcView)	67
5.9 Survey Data Processing (GPS and Total Station Data)	68
5.9.1 Development of GIS Database	68
5.9.2 Preparation of Coverage Description/Information Log-sheet	68

5.9.3 Preparation of Map Layout and Legend	68
5.10 Other relevant Study	69
5.10.1 Drainage & Environmental Study	69
5.10.2 Housing, Slums and Squatters Settlement Survey	70
Chapter 6	71
6. Analysis and Findings	71
6.1 Building related Information.....	71
6.1.1 Type of building Structures	73
6.1.2 Structure type wise floors distribution	73
6.1.3 Type of building Structures	75
6.1.4 Mobile Tower on the Structures.....	75
6.1.5 Heavy Over, Slope and Pounding	75
6.1.6 Structure Use.....	75
6.1.7 Trend of Construction Pattern.....	76
6.2 Access to Services.....	77
6.2.1 Access and Source of Fuel	77
Status of Electric Pole	75
6.3 Communication System in the Municipality Area	76
6.3.1 Types of Roads.....	76
6.3.2 Statistics of Road Length	78
6.3.3 Road Covered Areas	78
6.3.4 Bridge of Mirsharai Municipality	79
6.4 Status of Drainage System	80
6.4.1 Status of Covered and Uncovered Drain.....	81
6.4.2 Types of Drain	81
6.4.3 Length of Drain Line.....	82
6.6 Waterbodies of the Mirsharai Municipality	82
Types of Water body and these Areas	82
Chapter 7	84
Baorior Hat Pourashava	84
Analysis and Findings	84
7.1.Type of Building Structure	84

7.2. Building Structure Use.....	84
7.3. Structure Height Of this Area.	87
7.4 Structure Condition.....	88
7.5 Road Type and length.....	89
7.6 Drainage Type and length.....	90
7.7 Drainage Condition:.....	91
7.8. Tubewell and other points feature.....	91
7.9. Sludge Management.....	92
7.10 Water Bodies.....	93
7.11 Other Facilities.....	93
Chapter 8.....	95
Conclusion.....	95

List of Maps

Map 1:Project location in google image	29
Map 2: Project location in Bangladesh map	30
Map 3: Union Map of Mirsharai upazila.....	32
Map 4: BM pillar design	50
Map 5: Mouza map digitization	53
Map 6: Georeferencing mouza map with GCP	54
Map 7: Mouza map joining	55
Map 8: Mouza map of Misharai upazila	56
Map 9: Update map with attribute data.....	64
Map 10: Structures of the Mirsharai Municipality Area.....	72
Map 11: Position of tube wells in Mirsharai Municipality	73
Map 12: Chara Water line in the Mirsharai Municipality.....	74
Map 13 Electric poles in the municipality area.....	75
Map 14: Roads map of the Mirsharai Municipality.....	77
Map 15: Map of the location of bridges in Mirsharai Municipality.....	79
Map 16:Drainage line in the pourashava	80

List of Table

Table 1 Area, population and density of the project area.....	29
Table 2 List of union/municipalities	31
Table 3 Description of mouza map scanning	51
Table 4 Description of physical feature	62
Table 5 Physical infrastructure.....	63
Table 6 Attribute data format in shapefile	64
Table 7 Landuse categories	66
Table 8 Proposed shapefile description.....	68
Table 9 Number of floors and its' wise number of structures.....	74
Table 10 Statistics of the length of all roads in the municipality area	78
Table 11 Area of different types water body in the Mirsharai Municipality	83
Table 12 Structure Type.....	84
Table 13 Land use Table	85
Table 14 Structure Height	87
Table 15 Structure Condition	88
Table 16 Road type	89
Table 17 Drainage Type.....	90
Table 18 Drainage Condition	91
Table 19 Tube well other point feature in this Poushava area	91
Table 20 Sludge dumping facility	92
Table 21 type of water bodies	93
Table 22 List of other features	93

List of Figures

Figure 1 Different types of structure found in the Mirsharai Municipality Area.....	73
Figure 2 Number of floors in terms of existing different type of structures	74
Figure 3 Floor wise number of Structures.....	74
Figure 4 Structural shape and their status of condition within the Municipality	75
Figure 5 Different types of structure and their uses	76
Figure 6 Trendline of growth of the structures	77
Figure 7 Different types of electric pole and these percentages	76
Figure 8 Percentage of Different Types of Roads.....	76
Figure 9 Road covered areas of the Municipality area.....	78
Figure 10 Status of Covered and Uncovered Drains in Mirsharai Upazila.....	81
Figure 11 Type of Drain in Mirsharai Pourashava.....	81
Figure 12 Length of Drain Line in Mirsharai Municipality	82
Figure 13 Structure type of Baroiari Hat Pourashava	84
Figure 14 Structure use of Bariorar Hat Pourashava.....	86
Figure 15 Structure Height of Baroiarhat Pourashava	87
Figure 16 Structure Condition of Baroiar Hat Pourashava	88
Figure 17 Road Condition	89
Figure 18 Drainage Type of Baruihat Pourashava	90
Figure 19 Drainage Condition of Baruihat Pourashava	91
Figure 20 Sludge dumping facility of Baruihat Pourashava	93

Chapter 1

1. Introduction

1.1 Background

Physical planning comprises of spatial arrangement relating to physical resources to achieve functional efficiency, public safety and aesthetic quality. Physical/structure planning is primarily concerned with good management and development of land. Strategic Planning provides the mechanism for making comprehensive decision about the use of land and resources. It is an approach that intertwines all segments related to social, economic, physical and environmental dimensions. Many countries, like third world countries have rapidly urbanized and developed in an unplanned manner. Many continue to do so in an unprecedented rate. This has generated the conversion of forest lands, agricultural lands, wetlands, and aquifer recharge areas to industrial and urban uses. This trend has enormous impacts on productive agricultural lands and ecological resources and ecosystems. Industrial and urban development has likewise led to the segregation of land uses, e.g. separation of residential houses, shopping centers, and employment centers. Such land use development patterns have impacts on energy and resource consumption, which have turned out to be unsustainable for humanity, i.e. emergence of global warming and climate change.

Impacts due to unplanned and unsustainable land use development patterns have increased the risks to natural hazards. Vegetation and forest clearance, soil erosion, saline soils and decreasing water tables resulting from unsustainable land uses have brought more droughts, flooding, and landslides. Locations of houses and infrastructures in hazard prone areas have led to unthinkable deaths as well as resource degradation. It could be seen that land reservations such as river deltas, wetlands, coastal marshes, and coastal reservations had been developed for human settlements, making people extensively exposed to natural disasters. It is this link between development and disasters, i.e. development increasing vulnerability, which is consideration of disaster risks has to systematically become part of land use planning. UN Habitat suggests that land use planning is perhaps the most fundamental tool for reducing disaster risk especially when accompanied by political support and resource commitment. It is essential that national governments recognize the vulnerability of populations with respect to the physical environment, especially with regard to land, water, and natural resources. The integration of DRR in the land use planning process is vital in ensuring that development would reduce vulnerability to environmental and natural disasters.

Urban Development Directorate (UDD) is the only government Organization at the apex for preparing land use plan in Bangladesh. Since its creation, UDD has prepared 50 land use master plan for 50 district towns and 392 Upazila towns from 1984 to 1996. In the recent past UDD has prepared land use master plan for 26 Upazila town / Pourashava / district town by employing its own man power. Besides, UDD has implemented Structure plan, Master plan and Detailed Area plan for Sylhet and Barisal Divisional Towns and Preparation of Development Plan of Cox's Bazar town and Sea-Beach up to Teknaf, But till now no attempt has been made to integrate Disaster Risk Reduction (DRR) into land use planning directly. UDD has created a new dimension in planning by adding geotechnical consideration for planning in Bangladesh. M

For this reason the follow dimensions have been introduced into land use planning for the first time in Bangladesh

- Geo-morphological structure
- PRA (participatory rapid appraisal)
- 3-D (Three Dynamics) GIS Survey
- Social dynamics of social Space
- Historical pattern of spatial Transformation

1.2 Regional Setting

Mirsharai Upazila (Chittagong district) area 482.88 sqkm (BBS)/509.80sqkm(GIS data), located in between 22°39' and 22°59' north latitudes and in between 91°27' and 91°39' east longitudes. It is bounded by TRIPURA state of India, Chhagalnaiya and Feni sadar upazilas on the north, Sitakunda upazila and Bay of Bengal on the south, Fatikchhari upazila on the east, sonagazi and Companiganj (noakhali) upazilas on the west. Mirsharai Thana was formed in 1901 and it was turned into an upazila in 1983. Mirsharai Upazila consists of 2 Municipality, 16 Union, 113 Mouza, 41 mahallas, 208 villages. The average size of population of each ward and mahalla are 1546 and 679 respectively. On the other hand, the average size of population of each union, mauza and village are 23181, 3403 and 1783 respectively.

Mirsharai, the combination of lake and hilly area contains attractive scenic beauty on the southernmost part of Bangladesh. The most important attraction of the upazila is that one can travel Mohamaya Chara Lake by speed boat and explore hilly area and can enjoy Khoiyachora, Baghbiani, Napitachora, Sonaichora, Mithachora and Boyalia waterfalls. This

area is located 192.2 km far from DHAKA and 4.5 hour bus journey. Anyone can travel by rail and it is 197 km of rail journey and it takes 4.5 hour from Dhaka to Mirsharai Upazila. 56 km from the CHITTAGONG Divisional headquarters and takes 1.5 hour travel by bus. The Bangladesh Road Transport Corporation introduced a direct bus service from Dhaka to Mirsharai via comilla.(Source: Banglapedia,2012)

At Mirsharai Upazila main river is Feni; Sandwip Channel is notable; canal 30, most noted of which are Feni Nadi, Isakhali, Mahamaya, Domkhali, Hinguli, Moliash, Koila Govania and Mayani Khal. The hills range on the northern and eastern side of this upazila along the bank of the Feni River extended up to Chittagong and the Chittagong hill tracts.

1.3 Objectives

The objective of the project is to optimize resources and activities for sustenance of marginal people. The activities and resources are very important to the economy and life of the people of Bangladesh whose living conditions are inextricably linked to the productivity and sustainability of the region. There is no long term Holistic Development Plan for the Project area. Coastal zone needs to be integrated with the mainstream of development process of the country. So, an interdisciplinary development planning approach is urgent to optimize livelihood of the region. The Physical development planning problems, needing attention, are as follows:

- I. To integrate ecology, economy and social resources with the mainstream of development process of the country
- II. To frame policies for the best use of land and its control for the Mirsharai Upazila.
- III. To optimize environment for sustenance of people.
- IV. Formulation of Policies and plans for mitigation of different types of hazards, minimizing the adverse impacts of climate change and recommend possible adaptation strategies for the region.
- V. Formulation of Policies and plans for gradual nucleation of settlements with policies and plans for development of growth centers of the area.
- VI. Formulation of a guideline for development of tourism in Mirsharai Upazila, and also to accommodate future changes in existing land use pattern, socio-economic condition of the area and quality of life of the people.

1.4 Scope of Services and Activities

The scope of service and activities to prepare a land use development plan relating to the project –Package-1: Physical feature survey and scanning of mouza map, digitization, editing, printing etc. under Mirsharai Upazila Development Plan (MUDP) are prescribed in the following according to the ToR:

1.4.1 Scope of Services

Under the scope of service the detailed task have been categorized into three broad categories a) Mouza Map Processing, editing and Printing b) Preparation of base map through satellite image and mouza map and c) Attribute data collection, database development and report preparation. Under broad categories the detail tasks has to be accomplished of this project are described below-

a. Mouza Map Processing, Editing and Printing

i. Collection of Mouza Maps

Available mouza map shall be collected from concerned DC Office and Directorate of Land Records and Survey (DLRS) and scanning of mouza maps will be carried out using drum scanner. Flat bed scanner will not be allowed for scanning of mouza maps. Rotation and alignment must be maintained during scanning of mouza maps. After scanning of mouza maps all scanned files, in digital format, will be submitted to Project Director (PD) for preservation. The survey Firm will be liable to pay and communicate with the respective authority to collect the maps.

ii. Scanning of Mouza Map

Scanning of mouza maps will be carried out using drum scanner. Flat bed scanner will not be allowed for scanning of mouza maps. Rotation and alignment must be maintained during scanning of mouza maps. After scanning all scanned files in digital format will be submitted to Project Director (PD) for preservation.

iii. Accuracy and DPI Management during Scanning

During scanning of the Mouza maps at least 300 dpi resolutions and maximum error 2 mm. maintaining the appropriate resolution is mandatory. The scanner machine would be of latest technology with highest specifications.

iv. Digitizing the Mouza Maps

On screen digitization method will be used for digitization of mouza maps. Arc GIS software will be used for this purpose. Feature wise manuscripts will be developed for digitizing the

mouza maps and all features will be stored as layer coverage with a separate ID or code number of respective features in the GIS database. To keep uniqueness of all features the ID or code numbers of respective features will be finalised as per suggestion and discussion with Project Director (PD).

v. Manuscript 01: Point Features.

This manuscript will contain all point features like boundary and other pillars, traverse stations, GT stations, benchmarks etc. Every point will contain a numeric user ID representing feature type.

vi. Manuscript 02: Polygon Features

This manuscript will contain all polygon type features or closed boundary like water bodies, land uses, and topography. All features will be closed polygon and every polygon will contain a numeric user ID representing feature type.

vii. Manuscript 03: Line Features.

This manuscript will contain all line type features like administrative boundaries, roads, drainage, bridge/culvert, embankment/flood wall, sluice gate, water ways, rail ways etc.

viii. Quality Measures during Digitizing (Edit Plot Checking of Digitized Coverage)

After digitisation of mouza maps edit plots will be produced containing all the features in different colours to maintain the quality of the digitization of the mouza maps and ensure the proper projections while map projections will be carried out. The digitized mouza maps will be checked and verified by superimposing on the original mouza maps using the light table. This checking will be done with the joint team of UDD and the respective personnel appointed by the Survey Firm .By this edit plot check all possible errors (missing arcs, dislocated arcs, wrong or missing polygon labels, tic location and ID etc) will be solved and final digitized mouza maps will be prepared. After finalisation of digitization of mouza maps, all data both soft and hard copy will be submitted to Project Director (PD).

ix. Joining of Mouza Maps and Demarcation of Study Area

Joining of mouza maps will be done using ArcGIS software where surveyed GCPs will be used as TIC point. Afterward all Geo-referencing mouza sheets will be joined and Mouza map will be prepared using ArcGIS. The geo-referenced mouza maps will be prepared in original mouza scale. This map lay out will be submitted to Project Director (PD) in hard and soft format.

Study area will be demarcated by joint team, duly approved and signed by Project Director (PD) which will be considered as project area. While joining mouza maps, edge matching shall be performed in consultation with the PD.

x. Preparation of GIS Map Layout

A standard map layout will be developed with consultation of Project Director (PD). Scale, Paper size and Grid for preparation of map lay out will be prepared as specified by the PD. Legend for features in the map will be selected from the available symbol palettes in ArcGIS will be used to develop a standard layout. BBS geo-code may be used for administrative unit.

b) Preparation of Base Map through Satellite image and Mouza Map

i. Map Projection Systems

The Maps will be projected in BTM coordinates. Survey Firm will be needed to collect the appropriate parameters and implement it during the map projections.

ii. Quality Control of Geo-referencing

To ensure the quality and accuracy of the geo-referencing, the Survey Firm has to take all the measure including taking the GCP points and geo-reference the maps utilizing the GCP points.

iii. Selection of Ground Control Point (GCP)

At least 8 nos. of GCP (Tic) should be selected in ground for each of mouza sheet for conducting GCP survey. The joint team of UDD and the personnel appointed by the Survey Firm will select the GCP. Geo-referenced (x, y, z) permanent Bench Mark (BM) pillars uniformly distributed covering the project area have to be established to carry out the total topographic, physical feature and land use survey or as per direction of PD. Design drawing of BM pillars has to be approved by the Project Director (PD).

iv. GCP Survey for Ground Truthing

For each mouza sheets, at least 8 GCP points has to be selected and taken utilizing the RTK GPS. The configuration of the RTK GPS has to be of latest technology with highest level of accuracy.

v. Satellite Image Collection

Satellite image and data will be collected from UDD with necessary georeferencing and ground trothing.

vi. Base Map Preparation

Base will be prepared using the data extracted from satellite image and mouza data.

c. Attribute Data Collection, Database Development and Report Preparation

i. Map Printing at Proper Scale

After completing the survey and all the GIS processing, the Maps has to be printed by the survey firm. Maps would be printed at the scale 1:990 with proper annotations, titles and legend. The color grading and symbols for the map layout should be in accordance with the standards of the Client.

ii. Attribute Data Base of the Digitized Mouza Map

We will submit all attribute data of all the features in the mouza map including individual plot number that would be generated from the spatial database.

iii. Survey Report

After completing all the surveys, a survey report including both spatial and attribute database has to be submitted by the Survey Firm along with its progress report.

iv. Institutional Arrangement

The client will form a committee to communicate, monitor and check the tasks accomplished by the Survey Firm.

v. Team Composition

The Survey Firm will form a highly qualified team to accomplish the tasks as specified in the ToR. Adequate personnel and technical capabilities for providing training on the above-mentioned tasks.

vi. Construction and Establishment of Bench Mark (BM)/Ground Control Point (GCP)

Pillars covering the project area including approximately 5 km. grid in rural area (pillar 10||X10||, Base 3'X 3', height 5'). RCC pillars are to be constructed marking identification number Coordinate X, Y of these pillars along with Z value is to be marked on base map for future reference.

vii. Physical Feature Surveys

Physical feature survey will have to be conducted for the whole of project (rural or rural- urban fringe) area. Location and dimension (X, Y, Z value) of all existing structures including building type, height, floor type and use of each floor, year of construction/ age, collection of household population data, Ownership of the building and to transfer the data compatible to cohort population forecast, homestead boundary, homestead area, cropping pattern, cropping intensity, location of riser of gas of each household, location of well, tube well, pond, tap water etc, toilet with sewerage facility, safety tank and open drain etc. all

water control structures including khal (natural and man-made), cross section of water bodies specially khal , hill areas with one feet interval and existing routes/ roads, embankments, dykes, box culvert, sluice gate etc, vegetation cover, culmination between flood Plain and homestead, ground water harvesting devise, river ghat/ganj, railway station and railway line, all type of roads, location of all existing exposed light/electric, telephone posts and national electric grid/towers/transformer, gas, water, sewerage line etc.

Physical feature survey firm also will be conducted of 12.62 sq.km Urban survey with RTK GPS and total station survey for the urban area of project area, 10% hill area survey out of total hill area 130.00 sq.km/32124.40 acre (Calculated from GIS) with RTK GPS and total station survey of project area (tracking & channel), 50% Plain area survey out of total plain area 379.80 sq.km/93850.11 acre (Calculated from GIS) Rural survey with Satellite image and ground-checking of major settlements through RTK GPS and total station survey of the Project area. (All kind of Survey Uses by RTK GPS), 50% Plain area survey out of total plain area 379.80 sq.km/93850.11 acre (Calculated from GIS) Rural survey with Satellite image and ground-checking of except settlements through RTK GPS and total station survey of the Project area (RL Verification and other Information Collection), Urban survey with RTK GPS and total station survey for the urban area of project area, Two nos BM Pillar for Mirshari urban area , Two nos BM Pillar for Baraiarhat urban area. Rural survey with Satellite image and ground-checking of major settlements through RTK GPS and total station survey for the rural area. One nos BM Pillar for rural survey area each union. Different Types of Survey (as Directed by PD) and Studies (Different scale of survey maps and print outs will be finalized in consultation with the PD).

viii. Topographic Survey

The Topographic database shall be obtained from geo-referenced 3-D (four band) image and further cross-checked and ground truthing by using RTK-GPS and Total Station to obtain and verify 3-D data (X,Y,Z value) on location and alignment of all data obtained from physical feature survey including roads, flood embankments and other drainage divides. Location and alignment of all drainage and irrigation channels/canals showing depth and direction of flow. Closed boundary/outline of homestead, water bodies, swamps, forest etc. junctions, spot heights or land levels at roughly 10/5 m intervals for the Plain area, 1 m hill area, appropriate interval for sea area and close interval as and when required such as dyke, embankment, roads, rail-roads, river bank, rail line etc.

ix. Other Surveys and Studies

a. Survey of Development Activities: Site plan, land acquisition plans of new development projects shall have to be collected and presented in the map of RF 1: 990.

b. Population Studies: The population statistic shall have to be collected from all possible sources, such as:

(a) Census. (b) Municipal Record,

Analysis of existing population should bring out the following characteristics—

- (i) Male/Female ratio, (ii) Age-sex pyramid, (iii) Reasons for population growth/decline (Birth rates, Death rates, Immigration, emigration)/extension of Municipal boundary, etc and
(iv) General economic conditions of the people.

c. Road Surveys: In this survey detail of existing roads like type and condition of pavement, existing width and possibility for future extension should be studied and presented with appropriate explanatory notes. Road survey would include hierarchy, network and circulation pattern. Open space, relationships, etc.

d. Water Supply:

(a) Source and extend of existing supplies shall have to be recorded on maps and its future programme of expansion should be shown side by side in different colours.

(b) The capacity and system of water supply and future programme of expansion from municipality or public Health Engineering Department or any other appropriate agency.

e. Power Supply:

(a.) Capacity of the existing power supply sources and probable future expansion shall have to be presented in appropriate maps.

(b) Existing supply lines and the future probable lines should be presented on the same map side by side preferably in different colours.

f. Telephone Service:

(a) Types of Telephones Exchange and future programme.

(b) Existing Communication lines and future probable expansion shall be shown side by side.

g. Growth of the Town: Historical background with graphic materials on the existing Municipal area along with proposal for future expansion should be collected and presented with detail information.

h. Shopping: Shops and Commercial establishments differentiated into wholesale and retail shopping should be recorded. Growth or decline of shopping during the last 10 years should be collected and presented with explanatory notes on the causes for growth or decline.

i. Municipal Budget: Municipal Budget for last five years should be collected and presented with explanatory notes on the capacity of Municipality with respect to their development activities.

j. Municipal Achievements: Maps and publications on the town itself in the form of books and booklets, etc. should be collected and presented.

k. Disposal Services: The methods of collection and disposal of garbage should be surveyed and presented with comments. The graveyards, Cremation ground, etc. should, be surveyed and presented. The methods of sewage disposal should be surveyed and presented with comments with probable location of treatment plant.

l. Hydrology: Drainage network, drainage depth, width at 50 meter interval, flow diversion, water level, Drainage condition (Katha, Pacca, Semi-pacca) for both urban rural area, covered/uncovered, type of drainage, die of pipe drain, Outlet, cross-section etc. Identification of Catchment & Sub catchment and delineation of Primary, Secondary and Tertiary drain, flow direction, general slope of drain etc.

m. Agriculture Survey: Total agriculture land, Soil Type, Cropping Pattern, Intensity, Seasonal Variation, Agriculture Land Coverage by Irrigation, Rate of agriculture land reduction etc.

The survey firm shall prepare report on the basis of output of the obtained surveyed and studied data showing a possible quality of existing and possible future pollution in the project area with tentative remedial measures and adaptation for Project area. All the collected environmental pollution and disaster related attribute and spatial data shall be linked with other spatial database by the survey firm. All Information should be transport to mouza map and GIS Database.

1.4.2 Scope of Activities

a. Visit to the MUDP Area

The survey firms' team leader and/ or other team members of the project need to pay visit to MUDP area mainly for two purposes:

- Firstly, to acquire a firsthand knowledge about the area, its problems and prospects, and
- Secondly, to make the people and the local stakeholders aware of the need for a disaster resilient land use plan

b. Determination of Study Area

- The survey team determine the study area (or the area has been covered under the current MUDP package), based on existing condition, local demand including potential for future development/expansion, capacity, disaster resilient capacity, external and other ancillary local factors/conditions in and around the center.
- Structure plan area conduct shall be the Pourashava and its adjacent (urban and rural) fringe area and will be prepared in consultation with the Pourashava and local stakeholders keeping in views the need over a period of 20 years Structure Plan (Strategic Level). UDD already have organized 36 PRA sessions and two workshop which was Conducted at Pourashava, Surrounding ten Unions, Civil society , Journalist and general people of Mirsharai. Besides two workshops has been conduct to know the vision, attitude, views and development prospects of the project area. The implementation would act as the basis for the plan.

c. Surveys to Ascertain Existing Situation

- We will carry out detailed physical feature survey and studies of MUDP area according to approved format and shall also collect data from primary and secondary sources.
- The survey firms will responsible for all kind of survey report.
- Collect/obtain socio-economic and demographic information and data both from primary and secondary sources in the study area and also in the municipality and national urbanization as well.
- Analyze collected data and information, find out possible area of intervention for the forecasted future population of two municipality (15-20 years), vis-à-vis assess their requirements for different services, physical and social infrastructure facilities,

employment generation, housing, right of way and land requirements for various services and facilities like proposed roads, drains, playgrounds, recreation centers, other environmental and social infrastructure.

- In the Planning package, for development of the town, identify suitable location of respective zones/uses, circulation network, utility services, social services/facilities to be provided and their future requirements depending on the projected size of population and physical development patterns that will take place over time.

d. Assessment of Drainage System

- The Survey firms will identify the existing natural and man-made drainage system in the town and investigate the mechanisms of the drainage and local river system to assess the extent and flood damage amount and determine areas where flooding or poor drainage is most severe.
- The survey firms would be identified volume of water flow, water levels, duration of flood, sediment transport and river cross-section. The team also prepare erosion model for the area and identify flood flow area.
- The Consultant team will be study the contour and topographic maps produced by the relevant agencies and also review any previous drainage Master Plan available for the Pourashava.
- In such exercise the Consultants will consider all relevant issues including discharge calculation for the catchments areas; design of main and secondary drains along with their sizes, types and gradients and retention areas with preliminary cost estimates for the proposed drainage system.

e. Data Collection

- Assess and collect essential data relating to Pourashava map, master plan, and land use plan, regional and national high way development plans, accident statistics, fire hazard , number and type of vehicles registered in the Pourashava and road improvements on going and proposed.
- Assess additional data requirements, critical additional data not currently available will be collected through reconnaissance and traffic surveys. This will help estimate present traffic volume and forecast the future traffic growth and also identify travel pattern, areas of traffic conflicts and their underlying causes.

1.5 Categories of Activities

1.5.1 Signing of Contract

The contract between UDD and Geomark-Tiller joint venture has been signed on 14th November 2017 for Package-1: Physical Feature Survey and Scanning of Mouza Map, Digitization, Editing, Printing etc. Under –Preparation of Development Plan for Mirsharai Upazila, Chittagong District: Risk Sensitive land use Plan (MUDP)‖

1.5.2 Preparation of the Work Schedule

Preparation and adjustment of the work schedule for the project activities is finalized with Microsoft Project. Draft Plan was submitted and discussed with PMO and revised schedule has incorporated this report.

1.5.3 Mouza map Collection, Digitization and Georeferencing

The mouza has been collected and digitization has been started with following the guidelines of ToR.

1.5.4 Collection of Satellite Image Processing Data

The satellite image and data will be collected from UDD with necessary georeferencing.

1.5.5 Reconnaissance Survey: Reconnaissance survey has done and report has been submitted to UDD project Director.

1.5.5 Survey Tools Preparation Activities: Team formation is in progress. As soon as the inception report will be approved by the PMO, the team will be mobilized to the field.

1.5.6 Primary Data Collection: For primary data collection database has been developed and included in the annexure.

1.5.7 Secondary Data Collection: is ongoing from respective department as BWDB, BBS, DoE, SoB etc.

1.6 Other Activities

The following survey activities will be performed according to ToR

- I.** Physical Feature Survey Work with RTK GPS, Total Station & using 3D Image
- II.** Socio-economic Survey
- III.** Transport Survey
- IV.** Hydrological Study
- V.** Urban and Rural Economy Survey
- VI.** Other Study
 - a. Recreational open Space
 - b. Health Facilities
 - c. Educational Facilities
 - d. Pollution Study

- VII.** Preparation and Submission of Inception Report: Has scheduled to submit within one week of field visit

Chapter 2

2. Understanding the Project

2.1 Project Objectives

The objectives of preparation of Strategic planning at MUDP area, laid down in the TOR are as follows:

a. Prepare a Mainstreaming DRR into Development Planning Processes at the Upazila Town

- The structure plan will be drawn the importance of mainstreaming DRR in development plans local levels as well as in the physical framework.
- The land use plan will be the guiding document for implementation by all concern.
- Analyze the risk that the area faces from natural and manmade hazards

b. Facilitate Public and Private Sectors Development (at Upazila Towns)

The structure plan should be taken under with cooperation from other development agencies.

- Ensure an environment so that other development agencies cooperate in the plan preparation process:
 - i. Provide public services and facilities in a planned way.
 - ii. Ensure participatory process for a congenial environment for implementation.

c. Prepare Multi-sector Investment Plan

- Identify area based priority:
 - i. Disaster risk reduction plan
 - ii. Transportation and traffic management plan,
 - iii. Other need specific plan as per requirements.

d. Provide Controls for Private Sector Development

- Ensure clarity and security with regard to future development.

e. Provide Guide Lines for Development

- Consider the opportunity and constraints of future development (of district town).

f. Provide Planned Development

- Ensure sustainable environment.

2.2 Project Component

The terms of reference does not give a very clear view about the land use plan. As conceptualized from the TOR of the current master plan package, three components of hierarchical categories of plans will have to be prepared under the project, namely, Structure Plan, Urban Area Plan and Action Plan/Detail Area plans. Following are the details of each type.

2.2.1 Structure Plan

a. Concept and Aim of Structure Plan

The structure plan shall identify the order of magnitude and direction of anticipated urban growth in the regional context of MUDP area and define a broad set of policies deemed to be necessary to achieve the overall plan objectives. Structure Plan, in fact an indicative plan which is open-ended, providing a broad policy framework for area development and for action plans and development programs. It is a broad framework for major development and guideline subsequent lower level plans viz structure plan and Ward Action Plans and/or Detailed Area Plans. The plan will guide the growth and changes for distribution and redistribution of population, activities and their relationship and the pattern of land use that the activities will give rise all together with a network of communication, circulation and utility services.

b. Components of Structure Plan

The Structure Plan, in the current planning package, will cover policy issues on aspects like, transport and communication, housing, open space and recreation, municipal services-water supply, drainage, solid waste, sanitation, environment, urban heritage, legal aspects of plan and development, institutional aspects, urban finance and development planning administration and management. It will also describe the scale of map, duration of the plan, and the procedure of its revision and amendments.

c. Style and Format of Structure Plan

The Structure Plan will be presented in the form of text in report, spatial translation of sectoral priorities for development trend, growth direction, identification of problem and location them on map. Policy issues translated into maps for visual understanding. The map will only show the

broad future possible built up area, restricted areas for development, areas for development potentials, major existing and proposed communication network and other existing major features and land marks. Structure Plan will be prepared for 20 years period. The structure plan would come up with spatial guideline for balanced development.

2.2.2 Urban area plan

a. Concept and Aim

Urban area Plan, in this planning package, will comprise the spatial translation of the Structure Plan policies and strategies in the form of development proposal in broad level. The aim of the urban area Plan will be to enable the concerned authority to undertake specific development projects in order to promote organized urban development and revitalize the urban living environment. The major objective of preparing this plan is the consolidation of development activities by various agencies in areas that have strongest potential for growth in the medium term and can accommodate the anticipated volume of growth. Other purpose of preparing urban area plan is to facilitate the development control function.

- Urban area plan proposal will be based on land use categories and map designation following structure plan policies and will indicate purpose and intent, permitted and conditional uses in the planning zones and occupancy classes.
- Land development techniques for realizing plan objectives.
- General development provisions with the purpose of establishing reasonable standards relating to land development, which are generally applicable to any use or site irrespective of the zoning category in which it is located.
- Preparation of coordinated multi-investment programmes of drainage/flood protection, road transport and utility services in line with plan prioritized sequence of development.

b. Components of Urban area Plan

Urban area Plan, in current planning package, will cover almost all area level land use development and related aspects in broad level. These are

- Land-use Plan

- Transportation and Traffic Management Plan
- Drainage and Environmental Management Plan

c. Style and Format of Land Use Plan

The Land Use Plan will be the composite functional plan with spatial translation in but not limited to 1:1980 scale map in one sheet supported by necessary maps, charts etc. and report. It shows the broad land use zones on a more detailed scale of maps as derived from Structure Plan. As the desired scale of the plan is the same as that of cadastral map, and the plan provides detailed land use zoning and building controls, the development control function becomes easier to implement MUDP area Land Use Plan. Such Land Use Plan also shows land reservations required for essential uses and major infrastructure development.

Basically the Land Use Plan will be an interpretation of the Structure Plan over the 10 years. The coverage of the Land Use Plan will be for existing urban areas and their immediate surroundings with the purpose of providing development guidance in these areas where most of the urban development activities are expected to take place over the next 20 years. It will contain more details and specific plan as appropriate

C. Detail Area Plans

The Detail Area Plans will be prepared considering the following aspects:

- Existing Condition: Review of the existing situation of the with respect to land use, community facilities, public services, utilities, infrastructure etc.
- Problems and Opportunities: Discussion of problems which demands immediate intervention and scope of development
- Current Investment Programme: Discussion of current investment programmes of various urban and rural area.

Project selection will be need based and at this stage it can just be imagined that they may include water supply, road and drainage improvement, improved sanitation, provision of social facilities, upgrading of slum settlements etc. The projects may also be non-physical in nature. Depending on type, the projects may be formulated by the MUDP area at local level, using public-private partnership arrangements with the NGOs, CBOs, and national agencies. Despite

multiplicity of the development agencies involved, all their activities have to be incorporated in a single list so that an integrated approach to area level development can be pursued over a given period of time. For better performance, emphasis should be given for selection of the projects that could be implemented using available resources through Annual Development Programme (ADP) rather than those requiring new resources and/ or institutional capacity for their implementation. In carrying out the tasks for identification of priority projects, certain critical criteria to be addressed are as follows:

- whether self-financing or not (i.e. resource mobilization)
- equity consideration
- acceptability to all parties concerned
- compatibility with other projects
- sustainability
- environmental impacts

The project area, experiencing haphazard and unplanned growth, requires a comprehensive development plan for balanced development. The development planning package with its three major components, first is Structure Plan, second is Urban Area Plan and third one is Action plan or detail area plan which can help guide the development authorities on development issues for a livable pourashahar and rural area at MUDP boundary, which is not only healthy and safer but also efficient and better.

2.3 Implementation Arrangement

The UDD shall perform planning monitoring and coordinated functions (including resource mobilization and investment co-ordination) and in the process out sources survey firms for conducts different survey which is essential for preparation development plan. The municipality will exercise regulatory and supervisory authority and the delivery of municipality wide services within the municipality and it's adjacent fringe area without diminishing the autonomy of the (sectoral) development authorities, public and private including NGO's and civil societies concerning local matters.

Private sector may be upgrading of infrastructure supply systems with emphasize in improving accessibility at the level of secondary distributor roads. While public sectors will take care of early implementation of new roads and/or other modes of transportation as is required, and remove existing constrains of present poor accessibility.

Chapter 3

3. Location and History of the Project area

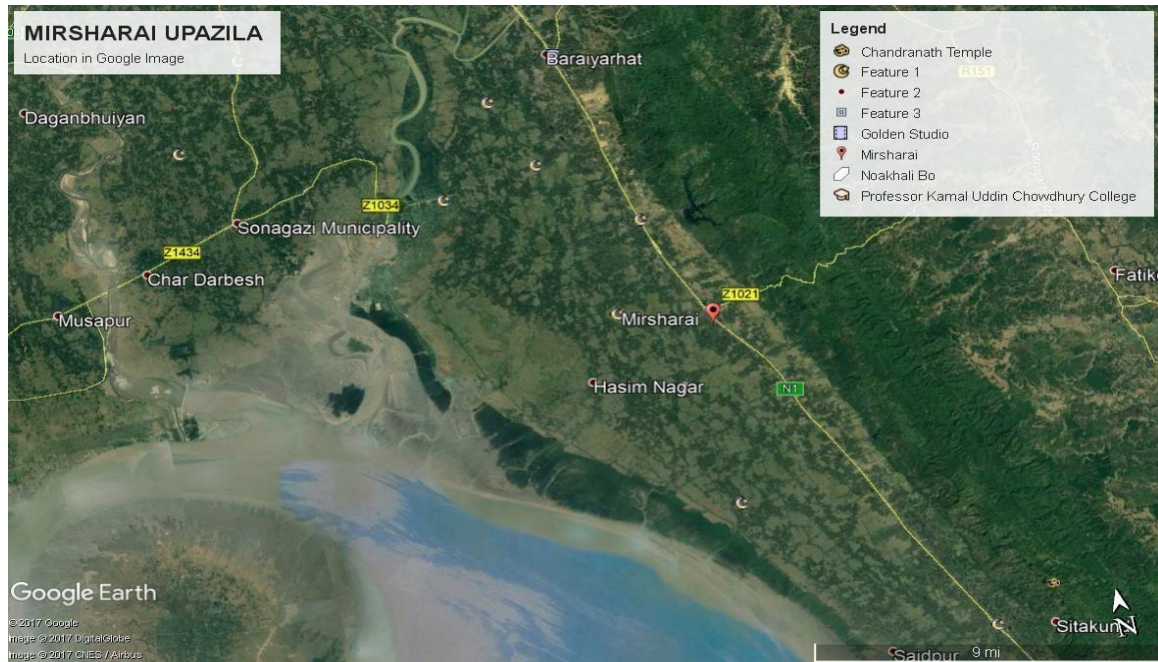
3.1 Introduction

This chapter describes the basic information about the Mirshrai district area and MUDP (Urban & Rural) area. The information presented in this chapter has been collected directly from the field as well as from many other secondary sources including National population Census Reports of BBS and other relevant document.

3.2 Location and History of the Project area

3.2.1 The project location

The proposed project would be prepared on a regional development perspective considering the region as a part of whole of Mirsharai Upazila and its 16 unions. In this development planning package since its location is strategically important from the regional context because this upazila is situated on the way to Dhaka Chittagong highway as the highway runs through this upazila.



Map 1: Project location in google image
(Source: Google earth)

3.2.2 Description of the Project Area

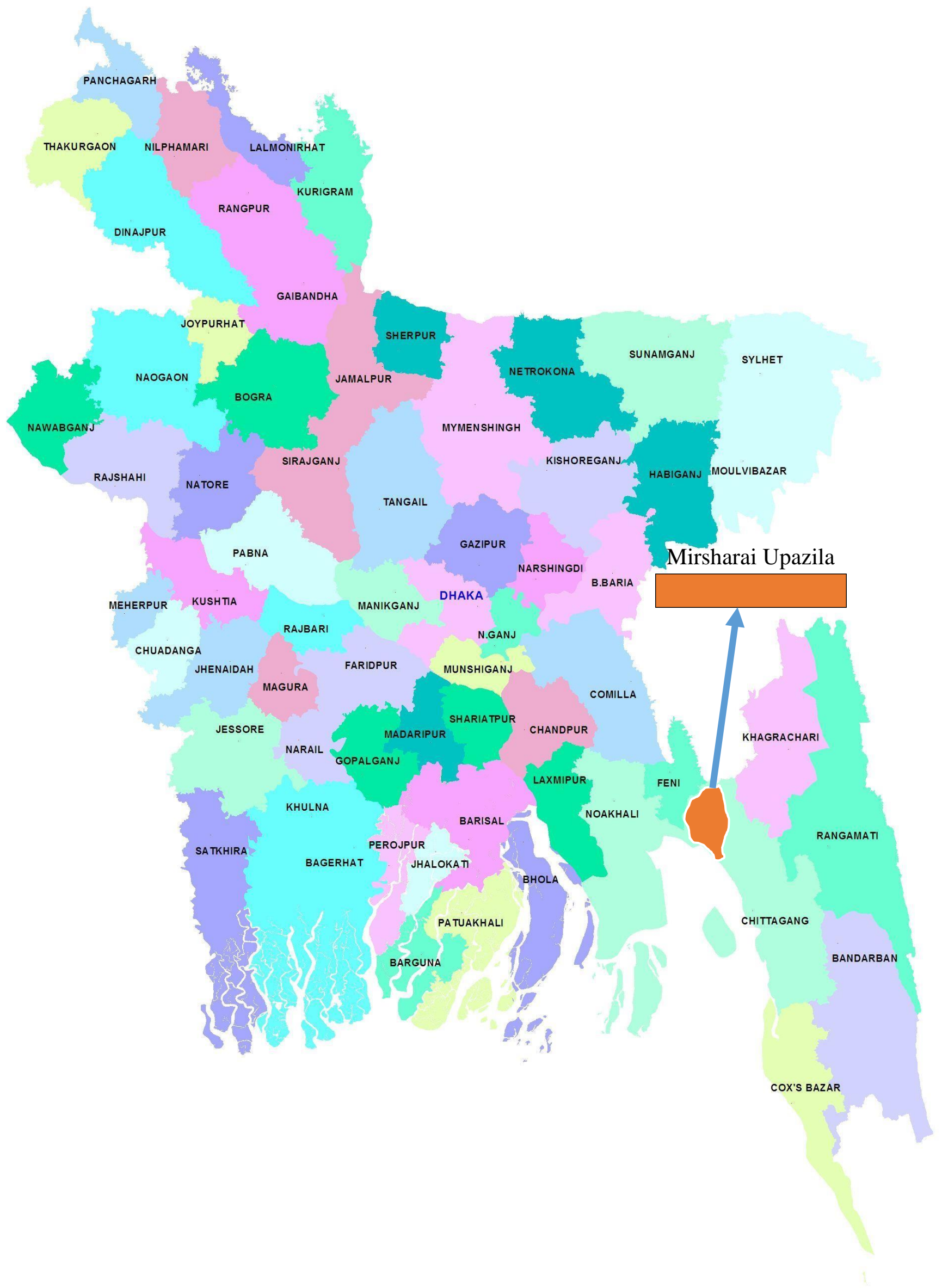
A detailed description of the Project Area is given below:

Table 1 Area, population and density of the project area

Municipality	Union	Mouza	Village	Population		Density (per sq km)	Literacy Rate (%)
				Urban and Other Urban	Rural		
2	16	103	208	31206	367510	826	55.1

Source: BBS, 2011

Mirsharai sea beach, hilly area, Mohamaya Chara Lake, Khaiya Chara region has the greater potential for tourism development as there are abundant resources to attract tourists. Mirsharai is developing in an unplanned and haphazard manner very rapidly due to the ample opportunity for tourism development, which is acting as pull factor for private sector developers. Hence, this project has been under taken to protect the region from depletion of its natural resources and character and tourism development as well. Moreover, honorable MoHPW Minister expressed his heartiest interest to develop char of this Upazila as an exclusive economic zone; as well as to establish a tourist zone and economic zone covering Mirsharai upazila.



Map 2: Project location in Bangladesh map
 (Source: LGED Digital Map)

3.3 List of Unions/Municipalities of the Study Area

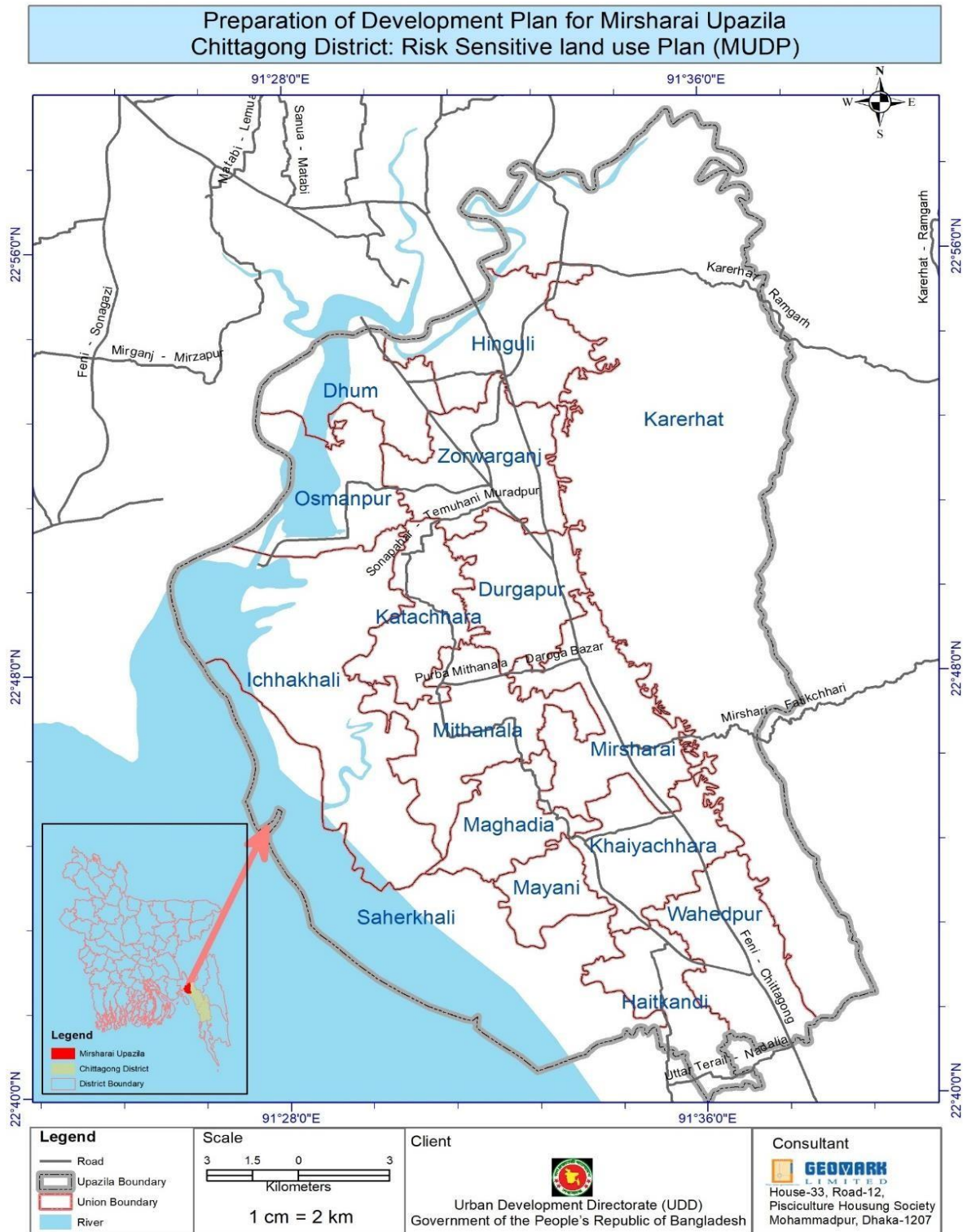
Mirsharai Upazila is comprised of two municipalities and sixteen unions which covers an area of about 482.88 sq. km.

Table 2 List of union/municipalities

SL	Municipality/Union	Name
1.	Municipality	Mirsharai Municipality
2.	Municipality	Baraiyarahata Municipality
3.	Union	Dhum
4.	Union	Durgapur
5.	Union	Haitkandi
6.	Union	Hinguli
7.	Union	Ichhakhali
8.	Union	Karerhat
9.	Union	Katachhara
10.	Union	Khaiyachhara
11.	Union	Mayani
12.	Union	Mirsharai
13.	Union	Mithanala
14.	Union	Maghadia
15.	Union	Osmanpur
16.	Union	Saherkhali
17.	Union	Wahedpur
18.	Union	Zorwarganj

Source: BBS 2011

Map 3: Union Map of Mirsharai upazila



Source: Geomark Ltd.

Chapter 4

4. MUDP and Linkage with National Development Plan

4.1 Introduction

This chapter explains the inter-relationship between the Mirsharai Upazila Development Plan and the national development plans of the country. The national development plans studied in this report include, The Sixth Five Year Plan and the Poverty Reduction Strategy Paper (PRSP). It is more rational to study on going and current plans instead of plans that were prepared long back.

4.2 Special Consideration

National development plans are prepared considering the overall needs and aspirations of the country with respect to different sectors of development. Policies, strategies and objectives are set and budget allocation is made to realize development targets. Sectoral budgets are again splitted down into programme and projects under each sector for implementation through various ministries. Any development initiative at the local level must relate to the national level plans in order to achieve cohesion and integrity with overall development of the country to attain the national development objectives. It is therefore necessary to study how the Development plans are related to the national development plans of the country.

4.2.1 Aspects of Development Planning Framework

Development frameworks and processes are complex and multi faceted encompassing a range of elements that make up development as a whole. Many countries like disaster vulnerable, within the region use a similar framework on which the details of each component can be built upon to form the development process as a whole. These frameworks can be loosely broken down into three key areas, Visioning, policy and planning, and implementation. Planning however is not a linear process and is achieved through a range of planning cycles.

Vision serves as the overall guide to the planning process. Based on the learning_s from the implementation of the previous plans, building on the strengths and also addressing the weaknesses, a long term vision is set where all citizens reap the benefits of socio-economic development and are empowered. Though the vision does not specifically mentions disaster

risk reduction or safety from natural hazards, however, reducing the risk from natural hazards in the country would only contribute to the achievement of the said vision.

Policy is necessary to meet the Vision; the identified challenges of the present and the perceived threats and opportunities of the future. These policies guide identification of goals, objectives, targets, strategies and projects and programs which is detailed out in the development plan. For example the national physical framework is a broad policy determining the spatial feature of proposed development in terms of settlement, production and protection land use, infrastructure etc. The physical framework in turn helps in identifying the socio-economic goals, objectives, targets and ultimately leading to programs and projects. As development factors such as society, economics and environment, are ever changing aspects of daily life and developmental growth, the formulation and implementation of policy must evolve to make sure that it does not become outdated. With this in mind, decision makers and policy developers, while creating policy, often use a cyclical process with clearly defined steps to ensure policy does not become outdated.

4.2.2 Integrating DRR into Physical Planning/Land Use Planning

DRR integration is best undertaken during the formulation stage of a physical framework/land use plan. It is at this planning stage that a risk assessment is invaluable in coming up with DRR-sensitive land use plan. The risk assessment forms the basis for understanding implications of current and future land use management and development. Given the levels of risk in identified geographical areas, the broad objectives/strategies for risk reduction in relation to land use management and development are to be determined. These include: avoidance; prevention; reduction; offsetting the impacts.

The analysis of risk impacts to land use guides planners and policy makers in determining where and what development could be further undertaken in their localities, as well as what could be done to improve current development conditions, thereby reducing risks to population and properties. The goals and objectives of land use and development plans should reflect this analysis and translate them into the planned specific programs and projects.

Population and urban development places a huge challenge in land use and development planning. Land use regulations or controls are important in this respect as they are the principal mechanisms for local governments to manage and regulate growth management and regulation of growth and development ensures the protection of fragile ecosystems and the

reduction of vulnerability to risks posed by natural hazards. Zoning has been the principal land use regulation used by municipalities and cities. Zoning identifies and distributes the location of different types of land uses (e.g. residential, commercial, industrial, agricultural, forests and protected areas) for purposes of regulating density of population and development.

Disaster risk reduction and land use planning are both multi-disciplinary arenas, they require a multi-stakeholder participation. Within government, both are collaborative endeavors that need to be undertaken together by various ministries/departments Land use planning goes beyond inter-ministry and agency collaboration, from the national to the local levels of government. As land use is an arena of competing interests, planning requires the participation of communities, e.g. farmers, urban settlers, environmental managers, indigenous peoples, as well as developers.

4.2.3 Mainstreaming DRR in National Development Plan

Mainstreaming DRR in the medium-term national planning process helps to ensure that longer-term concerns such as risk reduction are not overshadowed by more immediately pressing issues, and relative political stability, implying the potential ability to sustain long-term programs and initiatives. (Benson, 2009). Typically the national development plan provides the link between the social, economic and institutional agenda with the spatial development agenda and acts as the blueprint for development of the country over a specified period of time. It provides an opportunity to apply the lessons learned from the past and provide strategies for growth.

The national development plan also reflects a shared vision of the future of the country as a whole and hence attempts to be inclusive. Along with the sectoral priorities, the national development plan also provides an opportunity to outline the cross-cutting development themes which needs to be addressed as they have implications on the performance across all sectors. The themes typically include decentralized governance, women in development and environment.

Typically all development plans includes a specific section on the performance of the previous plan or challenges which have been hindering the process of development in the country. This analysis covers all the major sectors, individual sub-sector plans, the

parameters and/or indicators by which they were based on, as well as internal and external developments that may have affected the implementation of the plan.

4.2.4 HYGO Framework for DRR Management

In 2004, Bangladesh experienced one of the most devastating floods in nearly 50 years. About 38% of the country went under water. The damage caused by the flood was to the tune of US\$ 2 billion. Millions of people were affected. The most affected were the poor the most vulnerable in such disasters.

On January 18-22, 2005 the World Conference on Disaster Reduction was held in Kobe Japan. About 4,000 participants from 168 States, 78 observer organizations from the UN and other inter-governmental organizations, 161 NGOs and 154 media organizations attended the conference. The broad objective of the conference was building the resilience of nations and communities to substantially reduce the losses in lives and social, economic and environmental assets of communities. The conference produced a 10 year Framework document called **-Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities** Drawing on the conclusions of the review of the Yokohama Strategy, and on the basis of deliberations at the Conference and especially the agreed expected outcome and strategic goals, the World Conference on Disaster Reduction adopted the following five priorities for action:

- Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
- Identify, assess and monitor disaster risks and enhance early warning
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels
- Strengthen disaster preparedness for effective response at all levels
- Reduce the disaster related risk factors

4.2.5 Disaster Management Strategy in the SFYP

The SFYP will carry forward the implementation of the approved National Disaster Management Plan 2010-2015. It will continue the comprehensive all hazard, all risk and all sector approach and be built on the foundations laid in the last several years and learn from the positive experiences. The Bangladesh Disaster Management Model which made the basis for revising the disaster management policy and planning documents has mainly comprised

of two inter-related elements: Disaster Risk Reduction and Emergency Response. The plan will focus more on Disaster Risk Reduction (DRR) in order for reducing the relief and recovery needs and also be prepared to deal with any emergencies. The government accords the focus on community level preparedness, response, recovery and rehabilitation emphasizing the following three broad-based strategies:

1. Disaster management would involve the management of both risk and consequences of disasters that would include prevention, emergency response, and post disaster recovery.
2. Community involvement for preparedness programs to protect lives and properties would be a major focus. Involvement of local government bodies would be an essential part of the strategy. Self-reliance should be the key for preparedness, response, and recovery.
3. Non-structural mitigation measures such as community disaster preparedness training, advocacy, and public awareness must be given a high priority; this would require an integration of structural mitigation with non-structural measures.

The priorities on DRR during the SFYP will broadly include: These include:

- Professionalizing the Disaster Management systems and institutions through execution of the Disaster Management Regulatory Framework already established.
- Strengthening the Disaster Management Bureau's capacity to monitor and take part in cross government mainstreaming of disaster risk reduction through pre, during and post disaster assessment.
- Strengthening institutional capacity of government sectoral ministries, departments and other technical and academic actors in ensuring inclusion of DRR and Climate Change adaptation (CCA) issues and agendas within their respective sectoral policies, plans, programs and allocations of businesses.
- Empowering at risk communities to withstand and cope up with the disastrous situations through community and household level risk reduction interventions and livelihood support services.
- Reducing vulnerabilities of at risk communities through social safety nets – ensuring protection of women, children, the aged and differently able people giving due attention to their special needs.
- Preparedness for Earthquake
- Building Knowledge on DRR and CCA through piloting and adaption research

- Strengthening and improving an all Hazard Early Warning Systems through technical, technological and physical capacity strengthening of Bangladesh Meteorological Department and Flood Forecasting and Warning Center.
- Establishing and strengthening regional networks for real time data/information sharing
- Establishing an effective Community Alerting System through capacity strengthening of Cyclone Preparedness Program and Disaster Management Committees (DMC) at District, Upazila and Union levels.
- Introducing Contingency Planning and Disaster Preparedness across all sectors and at all levels.
- Establishing and improving Search and Rescue Mechanism
- Strengthening GO-NGO and private sector co-ordinations on relief and emergency management.
- Developing and establishing a well coordinated multi-sectoral post-disaster recovery and reconstruction mechanism.
- Establishing and operational a National Disaster Management Information Centre connected with all the 64 Districts and high-risk Upazila DMCs

4.3 Poverty Reduction Strategy Paper (PRSP)

In September 2000, at the Millennium Summit, the United Nations issued the Millennium Declaration, signed by 189 countries, committing themselves to a series of targets, most of which are to be achieved by 2015. This is known as Millennium Development Goals (MDGs); they represent a framework for achieving human development and broadening its benefits. The Millennium Development Goals provide a road map for the international community's efforts for development. They encompass a set of eight goals:

- (1) Eradicate extreme poverty and hunger.
- (2) Achieve universal primary education.
- (3) Promote gender equity and empower women.
- (4) Reduce mortality.
- (5) Improve maternal health.
- (6) Combat HIV/AIDS, malaria and other diseases.
- (7) Ensure environmental sustainability.
- (8) Develop a global partnership for development.

In persuasion of achieving the MDGs in 2003 Poverty Reduction Strategy Paper (PRSP) was

prepared. PRSP has taken over the place of Five-Year Plans. The Planning Commission under the Ministry of Finance initiated the Interim Poverty Reduction Strategy (IPRSP) in March 2003 and a full blown Poverty Reduction Strategy Paper (PRSP) was prepared in 2005. PRSP aims to targets of at least 20 sectors on special priority basis.

Physical planning, water supply and housing sector in the Planning Commission is now implementing development programme of nine Ministries through the Annual Development Programme (ADP) under Ministry of Planning. UNDP & UNICEF assisted "Reduce Urban Poverty through Local Partnership" project is under implementation, which is very relevant with the objectives of the Poverty Reduction Strategy Paper (PRSP). The completion of the Interim Poverty Reduction Strategy Paper (I-PRSP) titled *A National Strategy for Economic Growth, Poverty Reduction and Social Development*, in March 2003, marked an important milestone in the process of renewing the national goal of policy ownership over the formulation of Poverty Reduction Strategies (PRS). PRSP is prepared for unlocking the potentials using government's own resources and by local experts; thematic reports, prepared by the Ministries in their own areas, serve as background papers for the PRSP.

4.3.1 Strategy for Poverty Reduction in the SYFP

The review of past progress with poverty reduction has a number of important implications for poverty reduction strategy in the SFYP.

First, poverty still remains at a very high level and the number of people living below poverty line remains almost the same as it was in 1991–92 (about 56 million). The most startling consequence of widespread poverty is that a quarter of the country's population- 36 million people- cannot afford an adequate diet, according to the 2005 estimates of food poverty or extreme poverty²⁰. Chronically underfed and highly vulnerable, they remain largely without assets (other than their own labour power) to cushion lean-season hunger or the crushing blows of illness, flooding, and other calamities.

Second, faster poverty reduction during the 1990s was also accompanied by rising inequality measured by income as well as expenditure distribution, which is a major concern for policy makers. Rising inequality has the potential to dampen the pace of economic growth and poverty reduction outcomes while also contributing to social instability and must be addressed comprehensively.

Third, there are significant regional variations in poverty. Poverty is more pronounced in some areas and regions of the country which suffer from flooding, river erosion, mono cropping and similar disadvantages. Poverty is highest in the western region of the country

(Rajshahi Division) followed by Khulna and Chittagong. This lagging regions problem is a serious social challenge.

Finally, while these static point-in-time poverty estimates are useful for a snapshot of the poverty situation, they are not much useful to explain the gross movement of households in and out of poverty. Empirical evidence suggests that the gross movements in and out of poverty are much larger than the net aggregate poverty outcomes indicated by static estimates. In light of the above lessons of experience, the main elements of the poverty reduction strategy in the SFYP will consist of policies and programs to:

- promote growth by sustaining increases in labor productivity and job creation in manufacturing and services;
- increase farm income through better productivity;
- enhance the access of the poor to production inputs (fertilizer, seed, irrigation water, power, rural roads) and to institutional finance
- expand employment opportunities in lagging regions by improving connectivity with growth poles through better infrastructure and by investing in human capital;
- facilitate migration from poor areas given the poverty-reducing impact of remittances;
- Undertake entrepreneurship development scheme/strategy/mechanism for the Returnee Migrant;
- stimulate women's participation in the labor force;
- Promote overseas employment including women migration to the new destination and expand the existing overseas labour market;
- sustain Bangladesh's past successes in reducing fertility;
- improve poor households access to and quality of education, health and nutrition services;
- strengthen the coordination, targeting and coverage of social protection programs; enhance the access to micro finance;
- ensure stable food prices; and
- to mitigate the adverse consequences of climate change

Based on the projected acceleration of real economic activity, the shift in employment to more productive sectors of the economy, and implementation of related measures to enhance

the human and physical capital of the poor a significant reduction in poverty is expected throughout the Plan period. The reduction in the head count poverty rate is projected to range between 8-10 percentage points depending on the elasticity of poverty reduction with respect to GDP growth and assuming unchanged income distribution.

The reduction in poverty will essentially be driven by the growth in the per capita income which is projected to grow on average at more than 6% per year with the growth in per capita income steadily accelerating to 6.9% in the terminal year of the Plan. The poverty elasticity of growth method is used to project the head-count poverty rates for the plan years. However, there are different estimates of Bangladesh's poverty elasticity of growth. Using the long- term decline in poverty between 2000 and 2010, the value of the elasticity turns out to be 0.76. Based on this value, the head-count poverty rate in the terminal year of the Sixth Five Year Plan becomes 24.5 percent. However, using the more recent 2005-2010 poverty figures, the elasticity estimate becomes 0.89, which is significantly higher. Based on this higher elasticity value the head-count poverty rate in the terminal year becomes 22.5 percent. The Sixth Plan aims to achieve this lower poverty rate target.

4.3.2 Review of PRSP and Linkage between National Plans and Local Level Plans

The PRSP needs to gear up specially the improvement of slum living condition and accelerated poverty reduction programmes. But as the fund allocation by the donor agency remains insufficient by this fiscal year PRSP has been extended up to June, 2008 instead of June 2007. Besides this PRSP implementation committee noted that the indicators which have been used to measure the economic growth of our country has not been sufficient enough. Due to lack of data, it becomes difficult to calculate the employment generation rate through the government allocation in different development sectors for poverty reduction (The Prothom Alo, 2012). So it is necessary to fix relevant indicators and also prepare adequate data base for the measurement of allocation of resources for overall growth and development.

Moreover, the process of PRSP implemented so far, is not sufficiently responsive to the uniqueness of Bangladesh. In order to prepare a genuine strategy document for the core of government's mainstream five-year planning process, it needs to be locally conceived rather than formulated under the guidance of the Bank and the Fund. The voice of grassroots people is so crucial for devising responsive and pragmatic programmes is noticeably missing.

To achieve MDGs for cities, four distinct groups of policies can be identified:

- (a) Overall macro-economic policy for cities which affects economic growth.
- (b) City infrastructure and planning, including planned towns and improving local governance mechanisms through capacity building,
- (c) Employment generation.
- (d) Law and order measures.

The present system of national level planning hardly links the local level plans with that of the national level. The present system of national development budget allocation for urban local government is a top down approach, which is highly influenced by political objectives. Population is a loosely followed basis for budget allocation, instead of actual need. As a result local people's needs and aspirations are not always reflected in national development plans. Through political power, the local ruling party strongmen often manage development projects according to his own will, setting aside the desire of the local people. As a result many problems of the local level remain unresolved. Therefore, it is important to establish a linkage between the local plans and the national development plan so that aspirations of the people can be realized. This necessitates following a top down approach of development planning and the budget allocation should be made according to the choice of the local governments who are accountable to the people directly. Budget should be allocated according to the priority list of the projects prepared by the local authority that is supposed to reflect the needs of the Pourashava and rural people as the list will be prepared by the Councilors and the Mayor who are directly elected by the people.

The aim of the current project is to prepare a development plan for the Mymenshingh project area. In the process of planning large number of development projects will be identified in different sectors. Implementation of development projects will require improved infrastructure which intern will help improve infrastructure and services facilities much needed for a healthy environment and for harnessing local resources. This will attract more investment in the locality to generate new employment. New employment, again, will generate income for the poor people and shall improve the poverty situation, which is the main objective of PRSP. New jobs will also be created during implementation of various development projects. New and improved road infrastructure will also increase mobility vis - a -vis economic activities of the Pourashava and its adjacent rural area that will help address the problems of unemployment.

4.4 A Review of past Policies and Programs for Management of Urbanization

During the last two decades, Bangladesh has followed broad sector directions while policies on specific themes have been issued periodically. The national Housing Policy 1993 aimed for –housing for all and recognized the importance of planned development of human settlements. The Urban Management Policy statement 1994 envisioned sustainable and equitable urban development through decentralized development, public awareness and sector participation. Later on, the government updated the statement and issued Urban Management Policy Statement 1999 which provides a basic policy framework to guide and sustain the process of gradual decentralization. The purpose of this policy statement is to improve upon and augment the existing policy statement, with a view toward efficient urban management and increased decentralization in the longer term. The National Urban Sector Policy drafted in 2006 envisioned a decentralized and participatory process of urban development in which the national and local government, private sector and civil society play complementary roles. The policy prescribes far reaching actions on multiple dimensions of urban management and national level institutional changes and public participation structures at the city and sub-city levels. Other developments relevant to the urban sector includes the national Policy for Safe Water Supply and sanitation (1998), Water Supply and Sanitation Sector Development Plan, National Policy for Arsenic Mitigation, The National Sanitation Strategy and the pro-poor water and sanitation and cost sharing strategies. Many of these policies have attempted to give coherent directions to developments in the urban sector including adoption of principles like devolution of powers, resources and responsibilities to local governments and community groups, treating resources as economic goods, using awareness generation and mobilization and motivational tools for sanitation and solid waste management, tempering off subsidies on sanitation hardware and promoting private-public partnerships. The recommendations made by the Committee on Urban Local Governments for long-term municipal development and urban sector programming, property tax system, improved financial system management etc. are now under active consideration of the government. Past urban sector interventions mostly tried to address the long neglected infrastructure maintenance and rehabilitation needs and to develop the capacity of the Municipalities especially to raise income, improve financial management capacity and design municipal services in a planned way. But not much has been done to establish strong urban

institutions that are capable of meeting the future service demand of the projected urbanization pattern

4.4.1 Lessons Learned from Past Development Initiatives and Key Constraints

Municipalities in Bangladesh have witnessed nearly two decades of urban infrastructure initiatives with STIDP-I and II, MSP and the on-going UGIIP-1 since 2003. The MSP and its successor institution, Bangladesh Municipal Development Fund, presented a model of supporting decentralization especially by opening up access to infrastructure funding based on objective financial and institutional criteria outside the government's inter governmental fiscal transfer frame. UGIIP-1 made a radical departure from earlier initiatives in linking performance of Municipalities in achieving action based governance improvements to access infrastructure funding in phases. Focusing on governance improvements and a performance based approach urban infrastructure improvements have proved very successful;

- It addresses a wide range of areas simultaneously from improved participation of various stakeholder groups in service delivery to increased financial accountability and improved administrative procedures;
- Local governments feel full ownership in improving governance reforms, considering these reforms as an opportunity to improve their financial and administrative shortcomings.

They have been able to adapt to the new governance practices within a short period of time.

The following lessons learned:

- The performance of the Municipalities has been particularly good in areas where the identified governance indicators are concise and output oriented;
- municipalities took greater ownership and interests in areas where their legitimacy and performance in the local public eye improved immediately and turned out to be credible;
- Adopting governance improvements require substantive and timely capacity building inputs.

Based on an extensive review of previous projects focusing on governance improvement and a performance based approach, the following opportunities for improving this approach have been identified;

- Ensure that mechanisms are in place to deepen participatory planning ensuring prioritization of the needs of the poor;
- Refine the governance improvement action plan to include more qualitative achievements and ensure that the achievements will sustain beyond project implementation;
- Inculcating the practice of responsible financial decisions and discipline through financing and repayment mechanisms;
- Strengthening citizen's interface and accountability of the municipalities;
- Greater focus on capacity building of institutions at the municipality level
- Improvements in O&M management. One of the most significant lessons is the criticality of national level support to municipalities in terms of sector wide policy support, legislative and executive actions to enable more effective functioning of municipalities and supportive measures to improve their finance and financial management.

In this regard the parliament has recently passed the Pourashava Bill 2009 and City Corporations Bill 2009.

4.4.3 Urbanization Strategy under the Sixth Plan

A review of past policies, institutions and programs suggest that the urbanization strategy needs to change substantially to meet the challenges of future urbanization in Bangladesh. In the past much of the focus has been on implementing piecemeal programs. Multitudes of local government agencies, weak planning, poor governance, inadequate resources and weak project implementation capacity have limited the progress with meeting the urban challenge. The Sixth Plan will internalize these lessons of experience and shift the emphasis to the development of sound urban institutions, improve city governance and emphasize urban resource mobilization.

- Improving City Governance
- Promoting Balanced Development of Urban Centers
- Urban Resource Mobilization
- Developing a Sound Real Estate Market
- Facilitating NGO Involvement in Housing
- Taking Steps for Better Urban Land Management
- Better Environmental Management

- Developing Sustainable Urban Transportation
- Making Provision of Infrastructure and Services
- Reducing Urban Poverty

Approach and Methodology

5.1 Introduction

The approach & methodology, and work task to be performed to accomplish the stated objectives and activities stated in the TOR and as summarized in Section 4 are presented in this chapter. However, before presenting the methodologies, in the light of TOR our understanding regarding the scope of work and the major steps of activities are discussed.

5.1.1 Activity -1 Mobilization

The Survey firm recognize that one of the key requirements for the success of the work programme will be rapid and effective mobilization of the team members to start the required work without delay .this is generally true for all project but it's particularly true for the time constrained survey work of the project

5.1.2 Activity-2 Discussion and meeting

Discussion with project authority for successfully completion of the project according to the ToR. The Survey Firm after initiation of office would call on PD. They will held in depth discussion with

*Project Director PD

*project Manager PM

The survey firm also visit the related Pouroshava, EZ and its union office.

5.1.3 Activity -3 Collection of Documents

i. Collection and review of Database

For Map Preparation, basic data will be needed on Mauza maps, road network, river/khal network, population, holding numbers, social, economic and physical conditions in the project area etc. Most of this information will be collected from existing studies, plans and programmes, government publications, public authorities, statistical digests, documentation of external agencies, as well as the records of DLR, respective authorities and other development agencies working in the area. Reference will be made to relevant national reports, plans etc.

Major data gaps will be identified and will be collected through sector studies/surveys to be undertaken.

ii. Mouza Map Collection

Mauza sheets/maps of RS/CS or latest version will be collected covering the entire project area. The mauza sheets having distortion due to rapping or pasting cloths/tape in the mauza maps will be avoided during collection of mauza maps. Before scanning of mauza maps all collected mauza maps will be submitted to UDD for review and quality check/authentication.

5.1.4 Activity -4 Reconnaissance survey

In conjunction with the data gathering, the survey firm will conduct reconnaissance survey of the entire project area to devalued particularly the space zoning with the respect layout considering the overall service levels.

5.1.5 Activity -5 Survey Plan

This will be a highly qualified group of well-equipped and well-organized staff for its field survey and GIS mapping projects. The most modern survey equipment like Total Station, Digital level, and satellite based survey equipment like RTK-GPS, DGPS will be engaged for the field survey and data acquisition campaign. A quality Control team lead by a Quality Control Manager will be engaged. The quality control will be maintained in two stages, in the field and in the office.

i Quality Control in the Field

- Use of satellite based advanced survey technique,
- Maintain & monitor daily log sheets and level books in the field,
- Daily checking of the field equipment before starting the work,
- Routine check and calibration of the survey equipment,
- Frequent field visit by the joint team comprising the senior staff of Consultants and project officials of UDD, and
- Interaction with project officials in the field level

ii. Quality Control in the Office

- Daily review meeting with survey groups,
- Spatial and temporal Comparison of the survey data,
- Daily updating and processing data and Maps, and
- Frequent interaction and review meeting with project officials

In addition to those, progress as well as quality control of survey and data processing work will be reviewed in the progress meeting by the project authority.

5.1.6 Activity - 6 Physical feature surveys

The approach & methodology, and work task to be performed to accomplish the stated objectives and activities stated in the TOR and as summarized in Section 4 are presented in this chapter. However, before presenting the methodologies, in the light of TOR our understanding regarding the scope of work and the major steps of activities are discussed.

i. Collection and review of Database

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Major data gaps will be identified and will be collected through sector studies/surveys to be undertaken

5.2 Methodology of Key Issues

5.2.1 Preparation Base Map

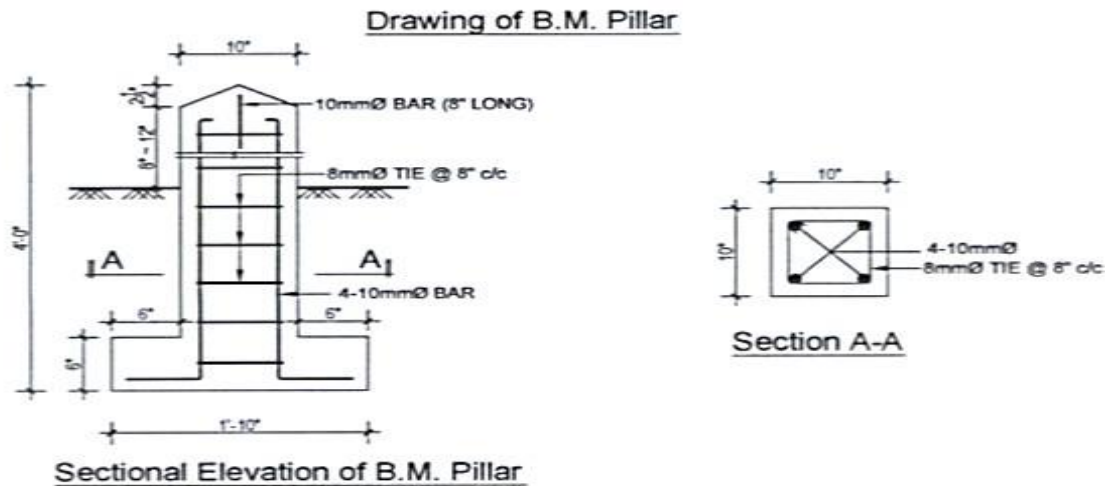
Preparation of base map for the project area needs following items of works:

Construction and Establishment of Bench Mark (BM) Ground Control Point (GCP):

Pillars covering the project area including approximately 5 km. grid in rural area (pillar 10|x10|, Base 3'x3', height 5'). RCC pillars are to be constructed marking unique identification number coordinate X, Y of these pillars along with Z value is to be marked on base map for future reference

- Geo-referencing of Mauza Maps, and
- Preparation of GIS Map Layout

Map 4: BM pillar design



Specification of Materials:

- I. $f'c = 3500\text{Psi}$ at 28 days on standard cylinder test.
Proportion of cement : sand: crushed stone chips = 1:1.5:3 of $\frac{3}{4}$ down grade size.
- II. $f'y = 40,000\text{Psi}$.
- III. Curing Period = 21 days.
- IV. Painted by bright yellow enamel paint.
- V. On the surface of Pillar KDA 07 will be inscribed.

5.2.2 Geo-reference of Mauza Maps

Georeferencing of GIS mauza map needs extensive digitization work, Ground Control Point (GCP) Survey, data processing, and field verification. The total work comprises the following items:

- Collection of RS/CS Maps,
- Scanning of Mauza Maps,
- Digitization of RS/CS Maps,
- Edit Plot Check of Digitized Coverage,
- Identification of GCP on digitized RS/CS Maps,
- GCP survey,

- Geo-referencing of RS/CS Maps, and
- Preparation of Arc/Info Coverage and Map Layout of RS/CS Maps

5.2.3 Collection of RS and CS Mauza Maps

Mauza sheets/maps of RS/CS or latest version will be collected covering the entire project area. The mauza sheets having distortion due to rapping or pasting cloths/tape in the mauza maps will be avoided during collection of mauza maps. Before scanning of mauza maps all collected mauza maps will be submitted to UDD for review and quality check/authentication.

5.2.4 Scanning of Mauza Maps

To minimize the distortion and deviations scanning of mauza maps will be carried out using drum scanner. Extra care will be taken for maintaining the proper rotation and alignment of mauza sheets during scanning. Later on all scanned mauza files will be submitted in soft format to UDD for preservation.

Table 3 Description of mouza map scanning

Image Type	Color
Image format	JPG
Image Resolution	100 dpi
Image Scale	100% (1:1)
Naming Convention	Geo-Code
Scanner	Océ CS4100

5.2.5 Digitization of Mauza Maps

On screen digitization method will be used for digitization of mauza maps. GIS based Arc/Info or Arc/View software will be used for this purpose. Feature wise manuscripts will be developed for digitizing the mauza maps and all features will be stored as layer coverage with a separate ID or code number of respective features in the GIS database. To keep uniqueness of all features the ID or code numbers of respective features will be finalized as per suggestion and discussion with UDD.



Manuscript-1: Point Features

This manuscript will contain all point features like boundary and other reference pillars, traverse stations, GT stations, bench marks etc. Every point will be stored with a numeric user ID representing feature type.

Manuscript-2: Polygon Features

This manuscript will contain all polygon type or closed boundary features like pond, water bodies, structures, plot and mauza boundaries etc. All features will be stored as polygon having a numeric user ID representing feature type.

Manuscript-3: Line Features

This manuscript will contain all line type features like roads, railways, drainage, sewerage line, embankment/flood wall etc. All features will be stored as line having a numeric user ID representing feature type.

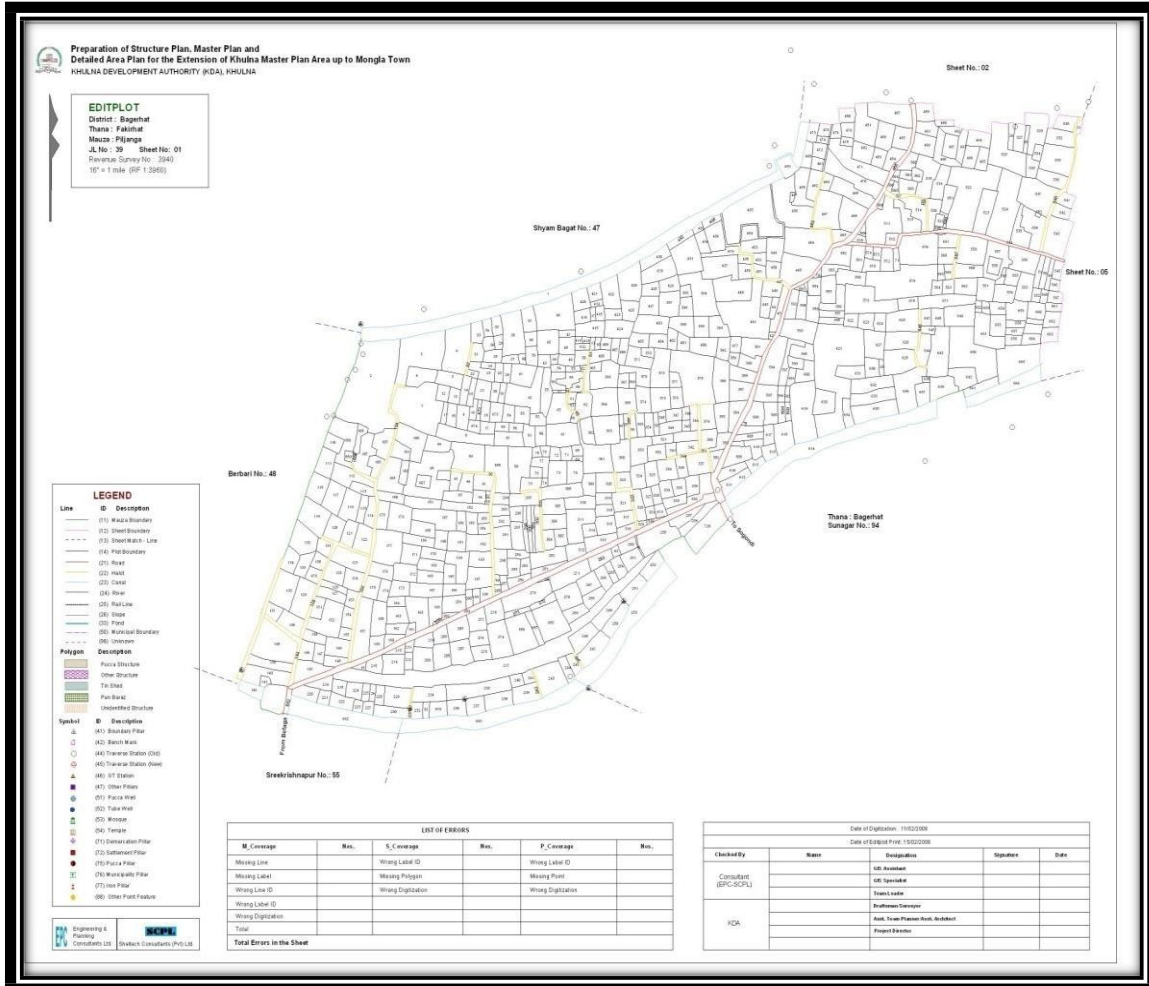
Edit Plot Check of Digitized Coverage

After digitization of mauza maps, edit plots will be produced containing all the features and boundaries in different colors. The digitized mauza maps will be checked and verified by superimposing on the original mauza maps using the light table. The checking of digital mauza maps will be done by the joint team of UDD and consultant. All possible errors (missing arcs, dislocation arcs, wrong or missing polygons, labels, tic locations, ID etc.) will be solved with this edit plot check and final digital mauza maps will be prepared. After digitization and necessary edit plot check, both soft and hard copy of all the digital mauza maps will be supplied to UDD for preservation.

5.3 Identification of GCP (Tic) on digitized RS and CS Maps

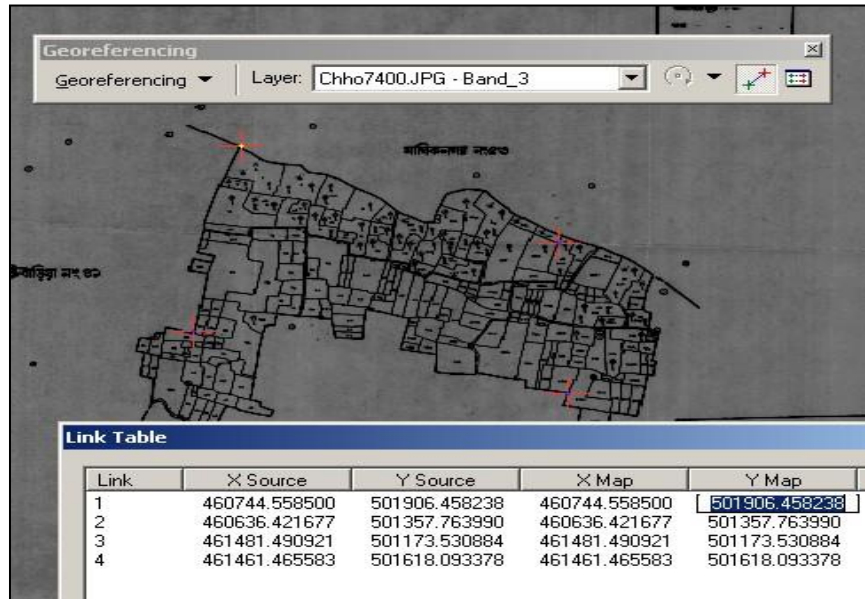
At least 4 nos. of Ground Control Points (GCP) will be selected on each mauza sheets identical with the real field condition. For accuracy and quality work maximum efforts will be given to identify as many as GCP for each mauza sheets. A joint team of UDD and consultant will select the GCP on mauza sheets.

Map 5: Map: Mouza map digitization



5.4 Geo-referencing of RS and CS Mauza Maps (Joining of Mauza Maps)

Georeferencing of mauza sheets will be done using GCP points (Northing, Easting) and GIS based software Arc/Info 3.5 or latest version with approval of PD, UDD. After georeferencing of all the mauza sheets of the project area, the mosaic mauza maps of the project area will be found having all the mauza features (point, line, and polygon) with GCP points in different layers.

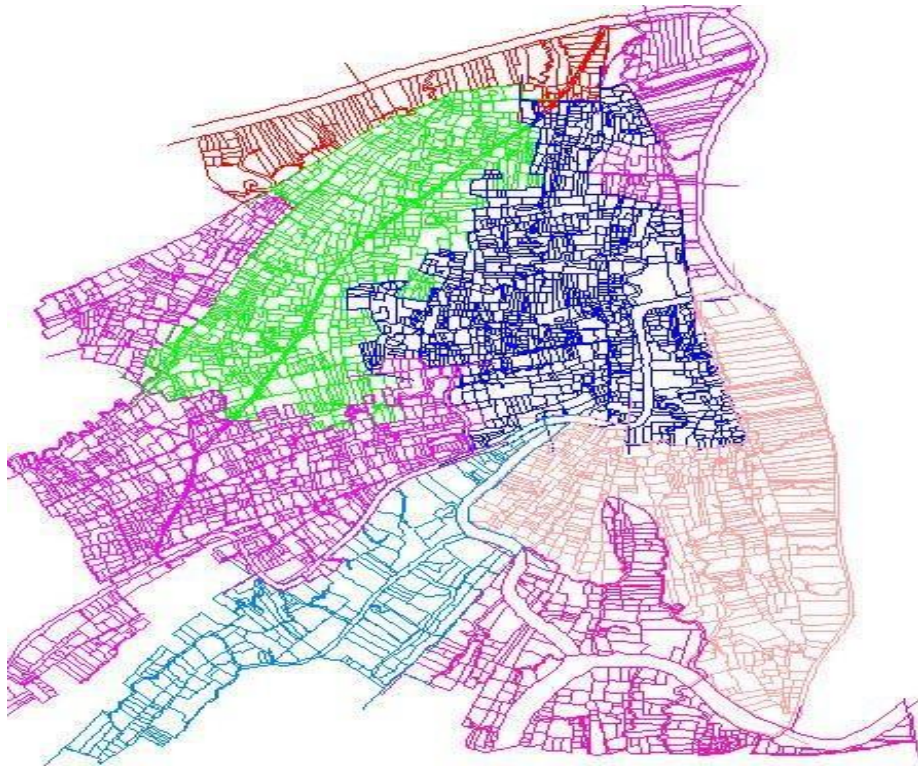


Map 6: Georeferencing mouza map with GCP

5.5 Methodology of Edge Matching of Mauza Maps

We have already explained our methodology of composite map preparation. Therein we have narrated the process through which all the sheets of the mauza maps will be mosaiced. In this section we again explain that. We know that a RS/CS mauza map consists of a single sheet or more than one sheet. That means that the mauza maps of the project area are divided in to many sheets. For preparing plans we need to mosaic them to have a composite map by edge matching. Edge matching will be done with the help of GPS readings. The four TIC points on each sheet having latitude and longitude readings will enable the work of edge matching with perfection.

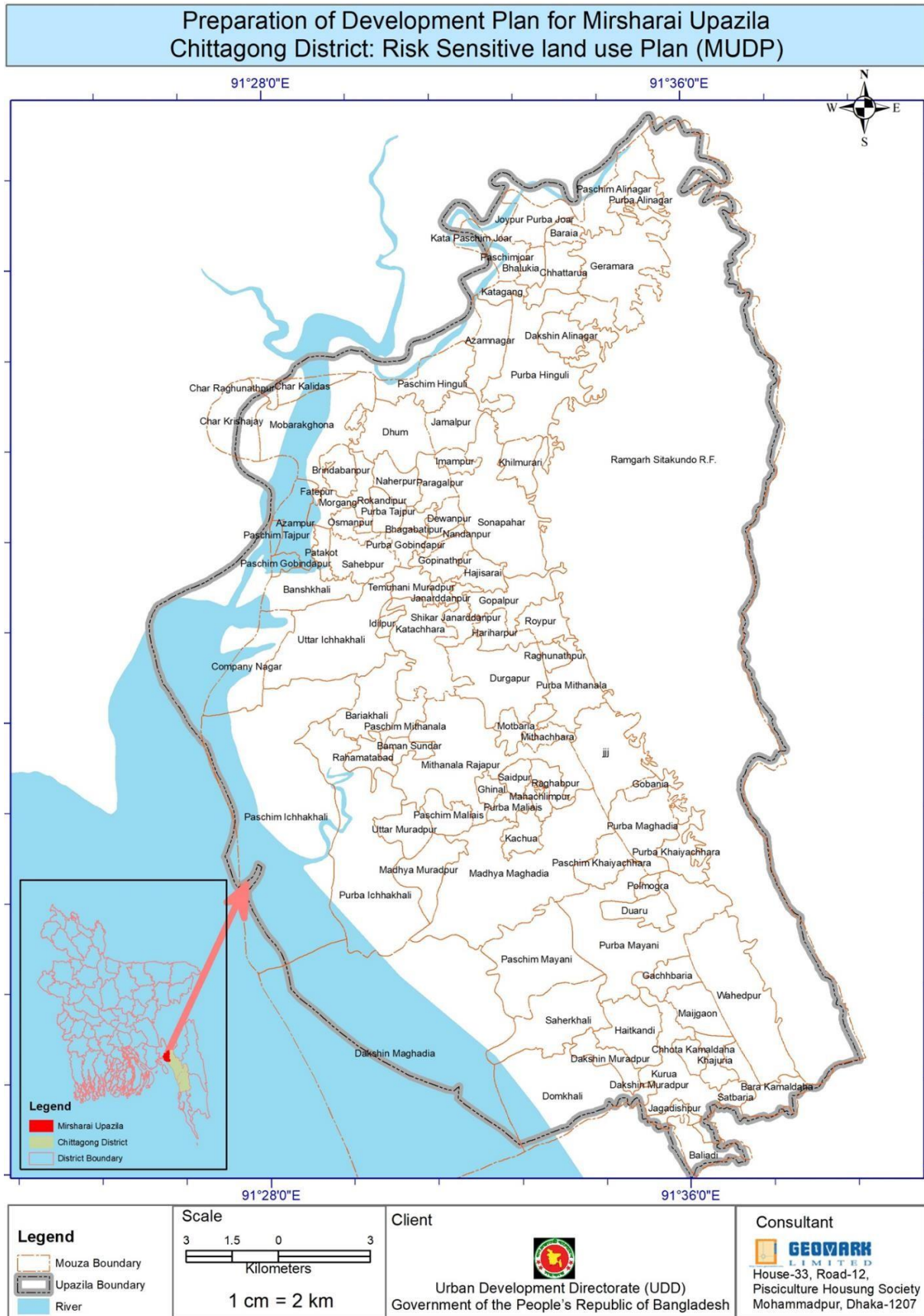
Map 7: Mouza map joining



5.5.1 Preparation of Coverage (Topology) of the Project Area

Final map coverage and layout of the project area (mosaic mauza of project area) will be done as per specification suggested by UDD using GIS based ArcInfo and ArcView software. All the features of mauza maps including plot, mauza and boundary of the project area will be identified and shown in the base/study area maps in separate layer. Later on this study area map will be incorporated in the physical and topographic survey maps. Both soft and hard copy of base/study area map will be supplied to UDD as per specification and scale mentioned in the TOR.

Map 8: Mouza map of Misharai upazila



5.5.2 GPS and GIS Technique

The automation, digitization and geo-reference of planning information deserves attention to the quality, vision of the extent of future applications, flexibility for the possible user groups and openness to easy access, all of which we are lacking in our country

Now a day all the planning activities need to deal with a large amount of digital and spatial data and maps, charts and reports. The Planners also need an automated information system like Geographical Information System (GIS) capable of dealing with spatial database to make their task efficient and effective. For which a digital and geo-reference data and information are very much needed. A comprehensive GIS includes software and hardware used to capture, store, organize, manipulate, analyze and display spatially referenced information. Easy manipulation and display of information helps to facilitate the decision making process by allowing planners to customize the maps and models produced.

5.5.3 GPS Based Advanced Survey Technique

Digitizing of existing mauza maps is time consuming with possibility of error, which can be easily converted to digital map by using scanner and processing through appropriate software with high accuracy. Spatial data collection and geo-reference digital mapping have now become very easy with satellite based advanced survey techniques using Global Positioning System (GPS) and Geographical Information System (GIS) with accuracy of millimetre level. Furthermore the development of high-resolution images helps to determine the spatial features as well as verify the survey data more accurately.

The Global Positioning System (GPS) is worldwide all-weather radio-navigation and positioning system formed from a constellation of 24 satellites and their 5 nos. ground control & monitor stations. GPS receivers use these US Navigation Satellites for Timing and Ranging (NAVSTAR) to calculate positions accurate to matter of meters. GPS receives radio waves, modulated for positioning, transmitted by a maximum number of 24 satellites, which enables to work out the distance between satellite and observation points. By receiving radio waves from four satellites simultaneously it is possible to find out the three-dimensional co-ordinates and time (UTC) of the observation point with an accuracy level which can not be conceived in traditional ground survey. The facility of GPS has been utilized in different kinds of ground surveys including geodetic, topographic and hydrographic survey in the recent times. Differential Global Positioning System (DGPS) is different versions of GPS technology, each with its own range of applicability and accuracy level. GPS based surveying has a number of advantages over conventional surveying methods. These are:

- Highly accurate
- Very fast
- Line of sight not required
- Digital/Computerized data storage, processing facility

- Unified 3-dimensional global co-ordinate system (x,y,z) output

GPS based survey with its computer based data storage and processing facility on and off the field offers immense flexibility in map production under a GIS environment. To ensure precision and accuracy in survey work and to facilitate georeference/digital map production by GIS software and finally to complete the whole work in a rather shortened time schedule, GPS technology was the best and logical approach to be followed.

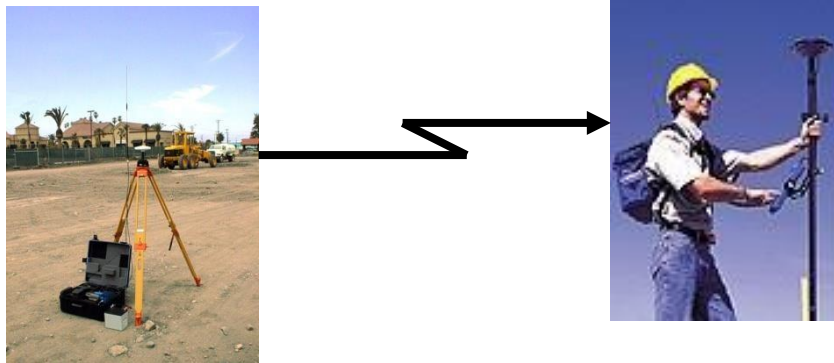
5.5.4 Differential Global Positioning System (DGPS)

To obtain precise position from a GPS receiver, we use techniques called –Differential GPS|. This involves at least two GPS receivers. One is stationary, at a known point or bench mark, we call this the –Base or Reference| receiver/unit and the other rover receiver/unit. The base unit ties all the satellite measurements into a solid local reference i.e. known point or bench mark. The Base receiver measures and records the timing errors and then transmit correction information to the other receivers those are roving around. The roving GPS receivers, possibly moving at an unknown point, calculates precise position by using the signals it receives from the satellites, and the correction information receives via radio from the Base. The correction information could be transmitted through online radio communication system or could be incorporated by off-line data processing software. Differential GPS usually gives about one meter accuracy.

5.6 Real Time Kinetics (RTK) GPS

RTK is a special form of Differential GPS that gives about one hundred times greater accuracy. The GPS system uses a coded signal from which a receiver derives distance and thus position. The GPS satellite provides the equivalent of tape measure from space. The tape labeled tick marks at ~300m intervals (the C/A code), as well as unlabelled tick marks at ~20m intervals (the carrier). A GPS receiver can measure the code to one-meter (1m) precisions, and the carrier to one-centimetre (1cm) precision. A receiver that can compute the –Labels| on the carrier can then deliver centimetre position accuracy. This is what RTK does.

10-20 km radius



5.6.1 Establishment of Reference Station for DGPS Survey

Reference stations for Differential Global Positioning System (DGPS) survey will be established in the project area. RTK-GPS static survey and baseline network adjustment technique will be used for this purpose. JICA BMs in or around the project area will be used as reference for establishment of DGPS reference stations. These reference stations will be used for recording and transmitting differential correction for DGPS rover units.

5.6.2 Approach and Methodology of Survey and GIS Mapping

GPS based advanced survey technique will be used for preparing the Georeference Topographic, Physical Feature and Land Use Map of the project area. ArcGIS based GIS software will be used for mapping purposes. The methodology of field survey, data processing and GIS mapping are described below:

5.6.3 Baseline Survey by RTK-GPS

The Baseline survey, simultaneous data collection in static mode at two or more fixed points using two or more dual frequency GPS receivers. The measurement network for RTK-GPS baseline survey will be planned by connecting the BM points to be established and the selected reference BM points (known Latitude, longitude and ellipsoidal height) available inside and around the project area. A line connecting two measurement points is known as baseline. It is important to emphasize that the configuration of network was based on practical considerations rather than requirements of an ideal network.

The GPS measurements consist a simultaneous static measurement with dual frequency GPS receivers at the ends of a baseline concerned. Measurement or logging time for a session is usually one hour. During the measurements the GPS receivers at the two points record the information or data (Latitude, Longitude, Ellipsoidal Height) on the configuration of available satellite at the time, which at the end of day's work will be processed using Trimble Geomatic Office software. If results from the field measurements found unacceptable, measurements will be repeated.

The verified results of each baseline will be stored for the subsequent network adjustment. After completing the baseline survey, network adjustment will be done with respect to the known values (Latitude, Longitude, and Ellipsoidal Height) of selected reference BMs available inside and around the project area. The adjustment module of Trimble Geomatic Office software will be used for network adjustment. After network adjustment the precise co- ordinates (Latitude, Longitude, and Ellipsoidal Height) of each BM will be obtained.

The survey team & their responsibilities have been listed below:

<i>Feature</i>	<i>Survey Activities</i>
<p>1. <i>Point, Line and Closed Boundary</i></p> <p><i>Features (where satellites signal available)</i></p> <p><i>DGPS closed boundary survey</i></p>	<p><i>DGPS position survey</i></p> <p><i>DGPS alignment survey</i></p>
<p>2. <i>Establishment of Secondary Control</i></p> <p><i>Points for Total Station Team (Team-C)</i></p> <p><i>Model</i></p>	<p><i>RTK fast Static Survey</i></p> <p><i>and use of project GEOID</i></p>
<p>3. <i>Point, Line and Closed Boundary</i></p>	<p><i>Position, alignment, boundary and spot/ land</i></p>
<p>4. <i>Water bodies</i></p> <p><i>bed level survey</i></p>	<p><i>Alignment, boundary and</i></p>

5.6.4 DGPS Survey (Line, Point and Closed Boundary/Polygon Features)

DGPS experts of the DGPS group will walk over the both sides of the road or embankment with the DGPS rover unit in a backpack to measure and store the alignment in x and y co - ordinates of roads, embankment and other line features roughly at 1 to 3m intervals. The point and closed boundary features also surveyed by the DGPS groups. The optical teams will pic- up the crest level of the road. DGPS group is also responsible for taking the position and the information of the structures (hydraulic structures, bridges and culverts etc.). At the end of day's survey, the DGPS data will be downloaded and post-processed in the office using Pathfinder Office software and stored into GIS database.

5.7 RTK-GPS Fast Static Survey (Establishment of Secondary Control Points for TS Survey)

The Secondary Control Point (SCP) will be established using RTK fast static survey technique and GEOID Model of the project. These SCPs will be used by the total station groups as reference points (Station and Back Points) for feature and land topography survey.

5.7.1 Physical Infrastructure Survey

Physical feature surveys provide the basis for understanding many planning problems. In a planning work such as Detailed Area Planning, precise locations and dimensions of physical features such as rivers, drainage channels, building, roads etc. are important. Thus to know existing information about physical features of an area, physical feature survey is carried out.

From the physical feature map information such as access to the area, available roads in different conditions (such as metalled, non metalled, kutchha), right of way, location of natural barriers, structures, utility services, etc. are collected. These information aid in planning. Decision can be taken whether a new access is required, or if there is any scope for expansion/improvement of roads. If a new link road is proposed, it is going to interact with the existing structures and natural barriers. for examples a bridge may be required over a road.

Physical Features:

Table 4 Description of physical feature

Physical features		Illustrated
a.	River	Indicate alignment, direction of flow & width
b.	Khal	Indicate alignment, direction & width
c.	Drainage Channels	Natural and improved (with flow direction & width)
d.	Ponds/Tanks/Ditches	Indicate them
e.	Marshlands/Flood Prone Area	Land liable to flooding during monsoon
f.	Building / Structures	Pucca / semi pucca structures & storey
g.	Roads	Pucca/HBB/Kutchra, earth etc.
h.	Bus/Trucks Terminals	Indicate right of way and any areas that are covered by the electricity system.
i.	Flood Works	Embankments, pumps stations, sluice gates length, width, condition of abutments and wing-walls.
j.	Bridge / Culverts	Indicate location, covered area, type of structure
k.	Utility Mains and Row	Electric, gas and telephone etc.
l.	Utility Substations	Electric, Water works, waste disposal and treatment, gas, telephone line etc.
m.	Deep Tube well Stations	R.C.C. DPHE and other deep tube well stations and output
n.	Mauza, Union/Ward, Thana and District Boundary	Administrative boundaries

The features identified above should be provided in the Base map. Names of settlements, village, rivers, khals, lakes, roads, markers, etc. must be indicated in the maps.

Physical Infrastructure

Table 5 Physical infrastructure

Survey Item		Illustrated
a.	Physical Infrastructure	<p>Type, width, length and name of road, road level above datum, slopes, borrow pit.</p> <ul style="list-style-type: none"> - Identification of any bridge or culvert with their length & width. - Identification of the water supply system, location of overhead water tank and its capacity, location of pumps for direct supply - Identification, location and capacity of electric substation, telephone exchange, gas sub station etc. Treatment plant, waste disposal sites. - Identification, location of electricity, telephone, gas and other utility lines of different capacity.
b.	Other Items	<ul style="list-style-type: none"> - If any new items identified during the survey.

5.7.2 Total Station Survey (Line, Polygon and Point Features)

Location and dimension of most of the physical infrastructures will be surveyed and stored using RTK-GPS supported Total Station (TS) survey technique. The cross-sections of road, drainage divide, drainage channel and borrow pits will also surveyed using Total Station where actual representative of the cross and longitudinal section of the feature can be drawn using GIS or other software. Data will be recorded in the TS memory card with separate ID or code number for each structure. Later on the TS data will be transferred directly to the GIS database where the feature will be kept in separate layer wise as per specified code or ID.

5.7.3 DGPS Survey (Point Features)

Location of point features such as telephone, electricity poles, small hydraulic structures etc. will be surveyed using Data Logger ProXR DGPS. Position data of such features will be stored in DGPS handheld computer with individual ID or code. Later on this data will be transferred to GIS database in layer wise after incorporating the differential correction and necessary processing.

Attribute Data Collection and Field Verification:

Attribute data of the features will be collected from the field after producing base map. It will be a step by step procedure. GPS and total station will be used for field object verification .

5.7.4 Map Updating

Attribute data and missing map object collected from the field, will be incorporated into the features in this stage.

Map 9: Update map with attribute data



5.7.5 Field Check

Field checking will be done check the following:

5.7.5.1 Dimension and shape of the features

5.7.5.2 Accuracy of feature's attributes

5.7.6 Data Delivery

Final map data will be produced and delivered to client for approval. For better understanding a table have been attached in the annexure a2.

Table 6 Attribute data format in shapefile

ID	NAME	Construction_Year	H_H	Floor_Hight	STRUC TYPE	Holding_No	Para_Moholla	Ward	G_Floor	1st_F_Use	2nd_F_Use	3rd_F_Use	4th_F_Use	5th_F_Use	6th_F_Use	7th_F_Use	8th_Fto Up_
	Hali m Loz		1	1	Semi Pucca	116/ka Bagmar a Road	Bagmara	17		Reside nce							
	Hali m Loz		1	1	Pucca	116/ka Bagmar a Road	Bagmara	17		Reside nce							
	Abdul Mazid			1	Semi Pucca	116/B, Bagmar a Road	Bagmara	17		Reside nce							
	Abdur Rajjak		2	1	Pucca	116/B, Bagmar a Road	Bagmara	17		Reside nce							

Topographic Survey

Topographic survey will be conducted by Optical Level in respect to established bench mark (BM) of Survey of Bangladesh (SoB) and 3d Stereo Satellite Image. Topographic data (DTM Points) having X, Y and Z values will be collected at 5 meter grid in urban area and 10 meter grid in rural area.

Land use survey

Land use planning is basically concerned with the location, intensity and amount of land development required for various space-using functions of city life. As planning is concerned with the use and development of land, studies of the existing pattern of land use are fundamental to the subject. This is done through land use surveys. Land use survey basically records the use of land by its functional activity such as residential, industrial or commercial. These are major land uses. As the scale of the map is enlarged, areas with these predominant uses may be further subdivided as required until the individual use of each building and plot of land can be shown.

Total Station and DGPS survey technique will be used for land use survey and land use data will be cross checked by Stereo Satellite Image. Each survey feature will be recorded with individual ID or code. Later on land use features will be identified and classified using the recorded code and separated in different layers during data processing stage, from where the category wise land use map can be drawn using the identification layers of each land uses features. The land use map will be prepared indicating the broad categories of land use indicated below:

Land Use Categories

Table 7 Landuse categories

	Physical features	Illustrated
a.	<i>Residential</i>	Planned, unplanned, average density (high, middle and low).
b.	Commercial (Markets and Shops/Workshops)	Established markets with ancillary shop groups of shops including small workshops.
c.	Industrial (as classified by Acts and Rules)	Main activity, type of waste effluent.
d.	Institutional Educational Facilities, Health Facilities	Primary/secondary and other schools, clinics, hospitals, etc.
e.	Mixed Use	Mixed areas without a dominant land use (Residential + Commercial, Office + Residential, Commercial + Office, Residential + School).
f.	Agricultural	All types of agricultural uses.
g.	Recreation/Sports	Parks, play/sports grounds, indoor facilities, zoological garden, stadium.
h.	Religious/Cemetery	Mosques, temple, church, mazar and others.
i.	Graveyard, crematory, cemetery	Sites.
j.	Historic	Historic structures or sites.
k.	Borrow pits	Areas cut for fill material.
l.	Vacant	Vacant land with no apparent use.
m.	Disaster prone areas	Flood (Indicating the flood affected area in 1998), Earthquake and fault-line.
n.	Waste disposal	Dustbins and Dumping grounds and other informal point.
o.	Public gathering	Places of Public meeting, open-air cultural performance and religious gathering.
p.	Garden	Indicating bettle leaf, etc.

5.8 GIS Mapping (ArcInfo Coverage and Map Lay Out in ArcView)

Topographic mapping will be done by using PC Arc/Info and Arc GIS based GIS software. All data will be provided both in soft (x, y, z) with and hard copy.

GIS data processing and mapping cover the following activities:

- Survey data processing,
- Development of GIS data base, and
- Development of Map layout and legend

As per ToR Geodetic reference, grid and vertical datum for GIS mapping is as below:

- Scale : As per TOR,
- Map size : As per TOR,
- No. of maps : As per TOR,
- Software : GIS (ArcView & ArcInfo),
- Plotting by : HP Plotter using GIS software,
- Geodetic reference : BTM (Bangladesh Transverse Mercator),
- Projection parameter : Scale factor : 0.9996,
Central meridian : 90° E,
False easting : 500,000m,
False northing : -2,000,000m, and
Latitude of origin : 0° (equator),
- Spheroid : Everest 1830,
Semi-major axis a : 6,377,276.345m,
Semi-minor axis b : 6,356,075.413m, and
Inverse flattening 1/f : 3008017,
- Datum shifts from WGS84: Rotation x : 0.00,
Rotation y : 0.00,
Rotation z : 0.00,
Translation x : -283.729m,
Translation y : -735.942m,
Translation z : -261.143m, and
Scale : 0 ppm
- Reference vertical datum : m PWD (Public Works Department), Bangladesh

5.9 Survey Data Processing (GPS and Total Station Data)

GPS and TS data can be stored in WGS84 format (latitude, longitude, ellipsoidal height in meter) or in any projection such as the BTM (Northing, Easting, ellipsoidal height in meter). In order to minimize the error the data will be stored in BTM projection system (as specified in the TOR) in an available file format such as .gen, .shp, .dxf, or .fat. However, conversion of data will be done in the *.gen format. i.e. in Arc/Info format.

5.9.1 Development of GIS Database

All spatial information or data from different survey such as line and point features, structures dimensions etc. will be processed and stored under a comprehensive GIS database component. Geographic information System (GIS) software such as ArcView and Arc/Info will be used for data processing and preparing maps. Later on digitized and geo-referenced mauza maps will be incorporated in the surveyed map.

5.9.2 Preparation of Coverage Description/Information Log-sheet

The log sheet will be maintained for all the developed coverage (created and updated in PC ArcGIS) where detailed description will be noted down with specific technical terminology of Arc/Info format. The log sheets will be supplied to the client during hand over data and maps. In the TOR, instruction and format of such log-sheet is mentioned as below:

5.9.3 Preparation of Map Layout and Legend

A standard map layout will be developed by consultation with concern project officials. Leading GIS software for map production ArcView 3.2 will be used to develop the standard layout for mapping. Legend for map features will be selected from the available symbol palettes in ArcView 3.2 and all the soft data will be supplied as PC Arc/Info 3.5 format. Proposed coverage description and legends (compatible to use in PC ArcInfo and ArcView) are enclosed in the below table. If required, later on this legend will be updated and finalized as per suggestion by UDD. Base maps will be prepared on the enlarged map for the project area indicates following features:

Table 8 Proposed shapefile description

Proposed Coverage Name	Feature Type	Coverage Type
• Mauza name and Boundary	Line	Shape/Coverage
• Ward no. and boundary	Line	Shape/Coverage
• Zone no. and boundary	Line and annotation	Shape/Coverage
• Pourashava boundary	Line	Shape/Coverage
• Thana name and boundary	Line	Shape/Coverage
• Mahalla name and bundary	Line and annotation	Shape/Coverage
• Plot boundary	Line/Polygon	Shape/Coverage
• Holding no. and boundary	Point and line	Shape/Coverage
• Park and playground with name	Point/Polygon	Shape/Coverage

• Vacant land with name	Line/Polygon	Shape/Coverage
• Location of primary school with name	Point/Polygon	Shape/Coverage
• Location of high school with name	Point/Polygon	Shape/Coverage
• Location of college with name	Point/Polygon	Shape/Coverage
• University with name	Point/Polygon	Shape/Coverage
• Road with name	Line/Polygon	Shape/Coverage
• Railway line	Line	Shape/Coverage
• River, khal, pond and other water bodies with name	Line/Polygon	Shape/Coverage
• Bridge, under pass and over pass	Point	Shape/Coverage
• Road divider and road island	Line/Polygon	Shape/Coverage
• Footpath	Line/Polygon	Shape/Coverage
• Dustbin and container	Point/Polygon	Shape/Coverage
• Mosque	Point/Polygon	Shape/Coverage
• Mazar	Point/Polygon	Shape/Coverage
• Madrasa	Point/Polygon	Shape/Coverage
• Mandir	Point/Polygon	Shape/Coverage
• Temple	Point/Polygon	Shape/Coverage
• Graveyard	Point/Polygon	Shape/Coverage
• Hospital	Point/Polygon	Shape/Coverage
• Clinic	Point/Polygon	Shape/Coverage
• Health facilities	Point/Polygon	Shape/Coverage
• Community center	Point/Polygon	Shape/Coverage
• Slum with name	Point/Polygon	Shape/Coverage
• Plot wise land use	Polygon	Shape/Coverage
• important establishment with name	Point/Polygon	Shape/Coverage

5.10 Other relevant Study

It will be made both at the aggregate level by time series analysis and at the disaggregate level by cohort survival method. However, monthly national level assumptions regarding survival and fertility rate will be used for disaggregate projections.

5.10.1 Drainage & Environmental Study

The protection of environmental with the provision of mitigation measures and monitoring plan in any physical and utilities development process is the prime consideration starting from its planning to implementation and operation& maintenance. The aim of the environmental study

is to improve the general environment in the project and surrounding area and keep the parameters up to the tolerable limit of the human health and ecosystem including water, air, sound. In the urban area special consideration is made in water supply, sanitation, solid waste management, drainage, flooding, air, sound, food and health hazards, etc. The consultants will carryout Initial Environmental Examination prior to formulation of plan along with the survey activities in an integrated manner so that some of the interrelated parameters can be collected with respective surveys. In addition, special PRA will carry out to get the basic information of urban environment. Environmental Impact Assessment (EIA) of the project due to planning of land-use/land management, infrastructure planning, physical facilities planning, transportation planning, etc. will be duly assessed and mitigation measures for the negative impacts be suggested to incorporate in the planning. In addition, an Environmental Monitoring Plan (EMP)

5.10.2 Housing, Slums and Squatters Settlement Survey

A separate housing sector, slums and squatter settlement survey will be carried out as required in the TOR. The main purpose of this study is to prepare an inventory of housing in the study area. For each major housing area, a summary of population, density, housing conditions, provision of services, sanitation, drainage, employment, tenure and income levels have to be determined.

6. Analysis and Findings

In field level Tiller and Geomark have surveyed 1350 questionnaire and found different information based on physical features which are important to prepare plan for the Mirsharai Municipality area. However, the following sections will describe the characteristics, existing conditions, access to different services, sources of necessary needs, and other physical features related information.

6.1 Building related Information

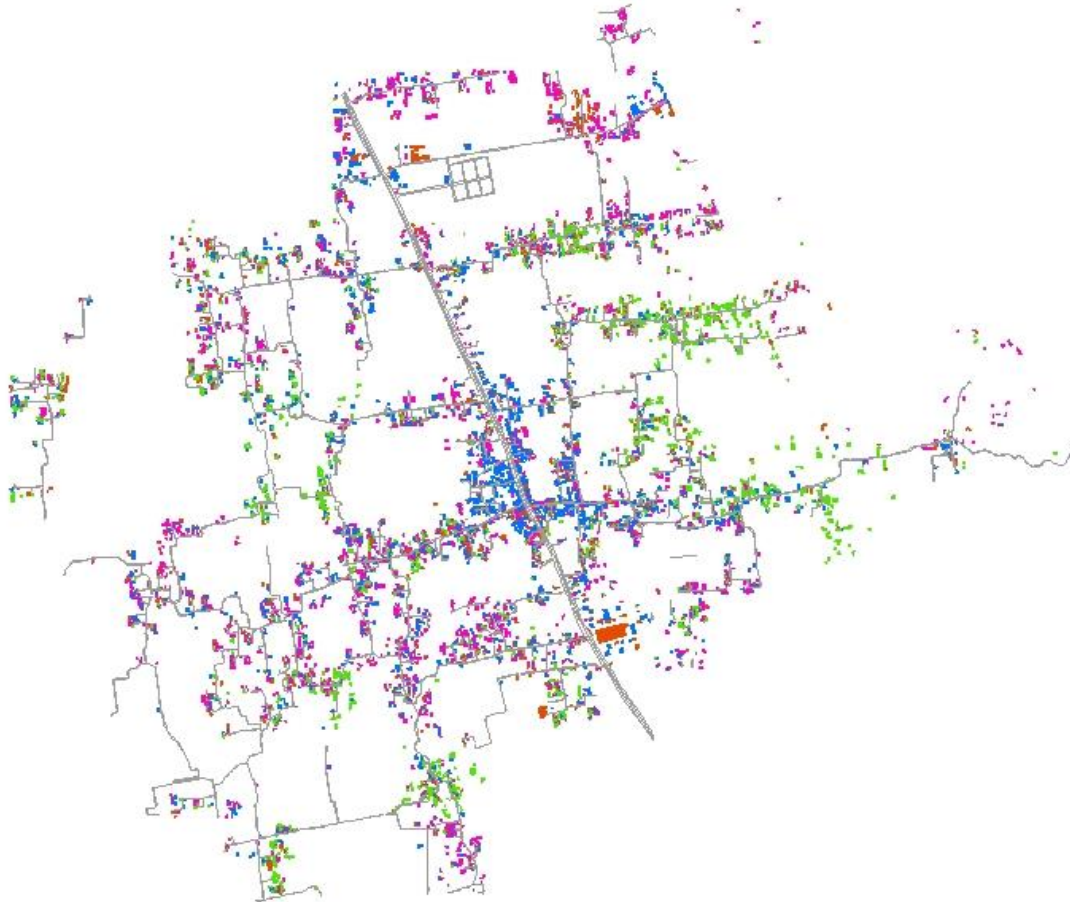
There is many information being tried to incorporate under this section. Type of building structures, number of floors in these types of buildings, building shape, their conditions, use and purposes served by these physical features, position of mobile tower on these structures, heavy over, pounding level, slope, access to gas and water, trend of the construction pattern in the municipality area are discusses in the following sub-sections. The map just includes here to understand the physical features' position in the area.

1:30,469.41

Structures of Mirsharai Municipality Area



Katcha: 2756
Pucca: 1728
Semi-Pucca: 1077
Tin-shed: 3669
Under Construction: 1
Total: 9231



Legend

— Road

St_type

-  Katcha
-  Pucca
-  Semi-Pucca
-  Tinshed
-  Under Construction

0 0.275 0.55 1.1 Kilometers

Client:



Urban Development Directorate
Government of the People Republic of Bangladesh

Consultant:



Map 10: Structures of the Mirsharai Municipality Area

6.1.1 Type of building Structures

Pucca, semi-pucca, tinshed, katcha, wooden and even under-construction are found in the municipality area. Tinshed building are found as 41% and Katcha as 30%. These types of structures have mainly witnessed in the area. As a municipality area, pucca buildings (19%) are not highly found. Wooden structures are only 1% in the Mirsharai Pourashava. Though under construction structures is 0% showed in the figure but actually this type is found. But due to very low number of this type of structure 0% we see.

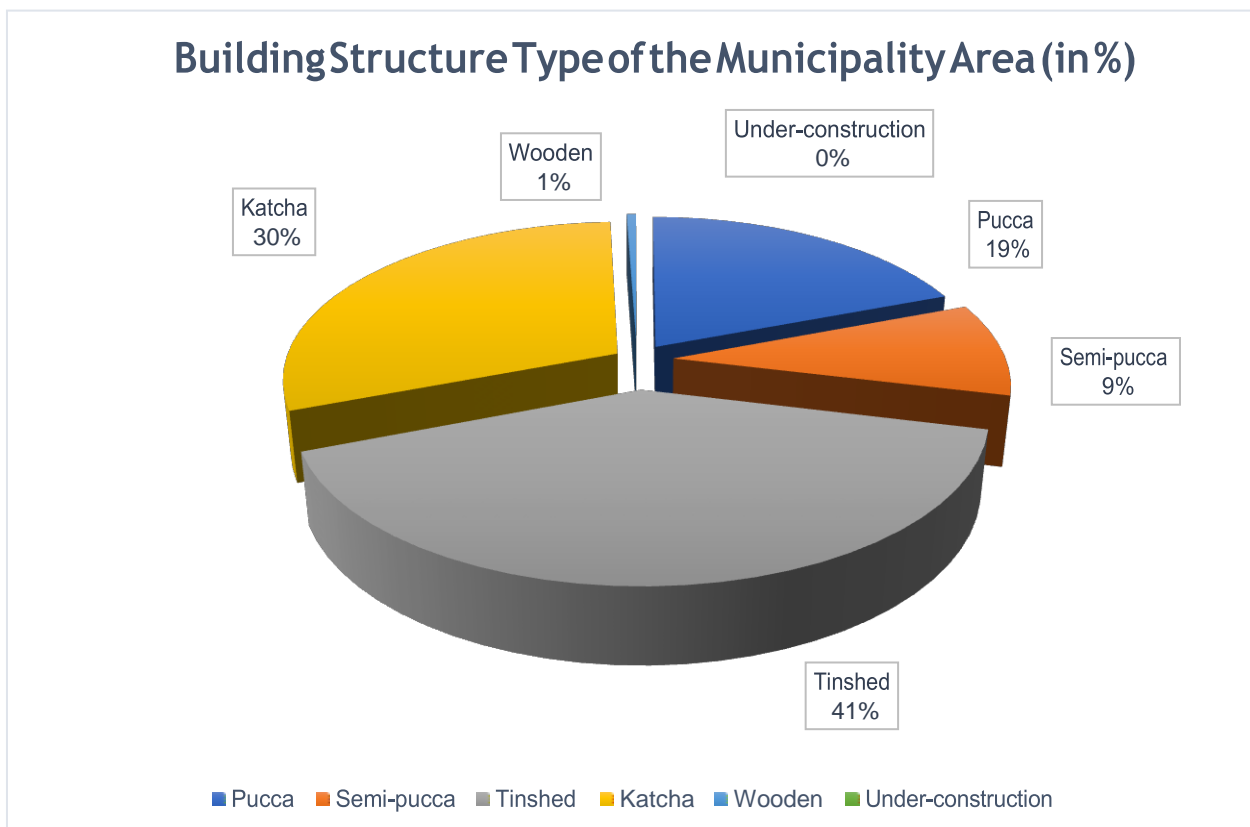


Figure 1 Different types of structure found in the Mirsharai Municipality Area

6.1.2 Structure type wise floors distribution

It is clearly understood that 2 storied building and more than that are only found for pucca. Because other categories can't be possible to cross 2 floors except under-construction. Some are found which number of floors are 0 means these are not buildings but they can be physical features e.g. graveyard, shashan etc. The figure (3) shows the number of structures under the floor number. Under 7 floors 'structures are mainly found in the municipality area.

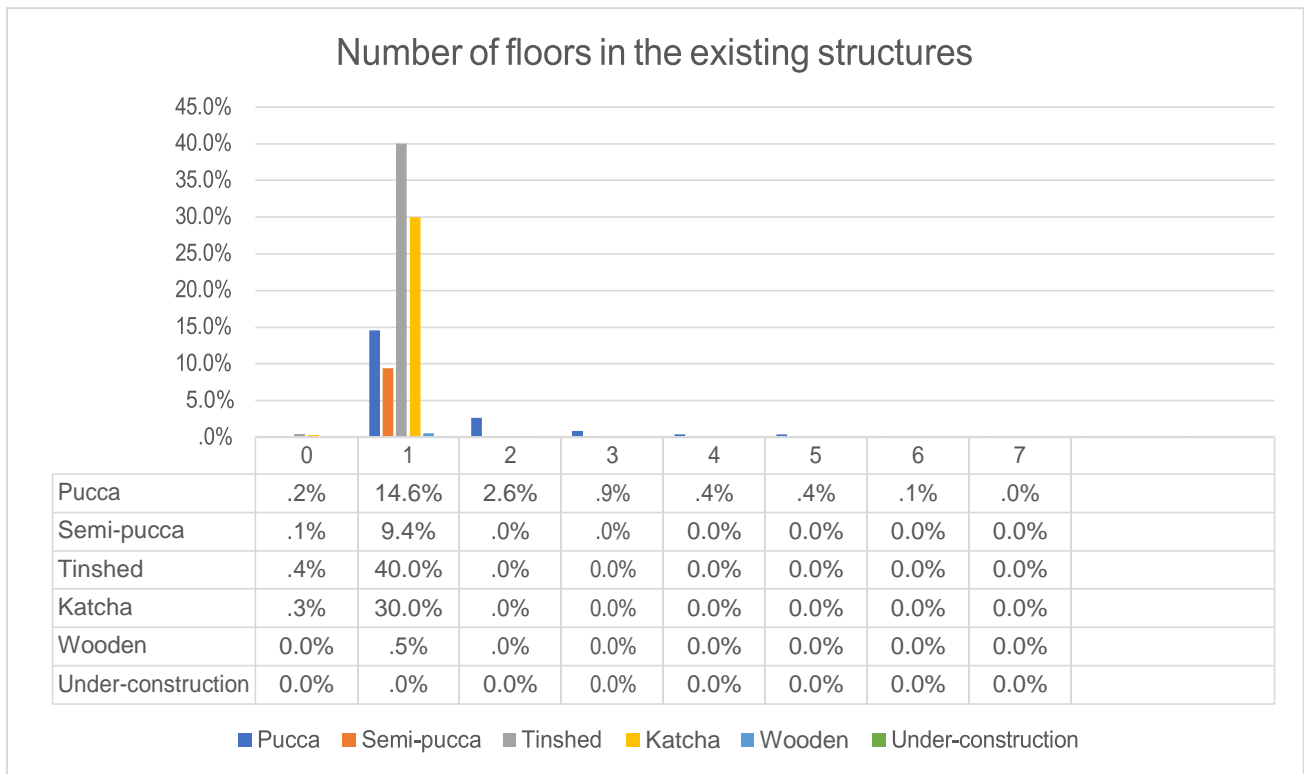


Figure 2 Number of floors in terms of existing different type of structures

Table 9 Number of floors and its' wise number of structures

0	1	2	3	4	5	6	7
419	8379	240	77	37	33	10	1

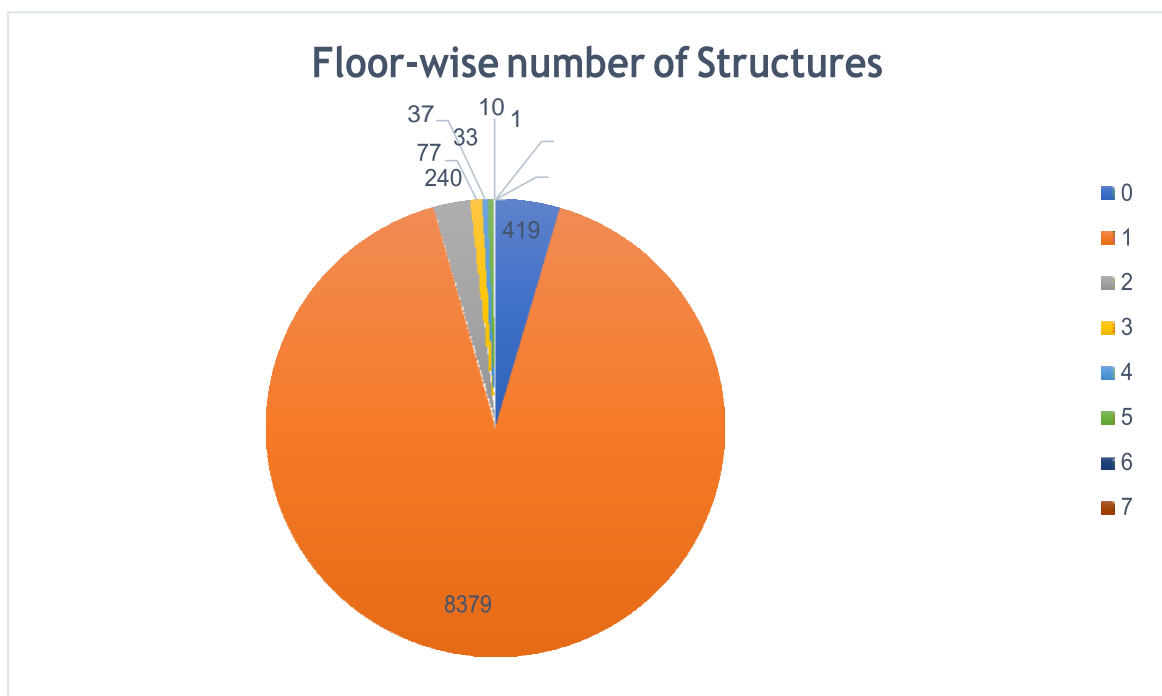


Figure 3 Floor wise number of Structures

6.1.3 Type of building Structures

Regular shape around 98% is found in the area. Only 2% structures are irregular. As a municipality area of a coastal region it is a regular picture. But these conditions are mainly poor around 43.82% which are below the satisfaction level. About 30.99% structures can be said as on an average.

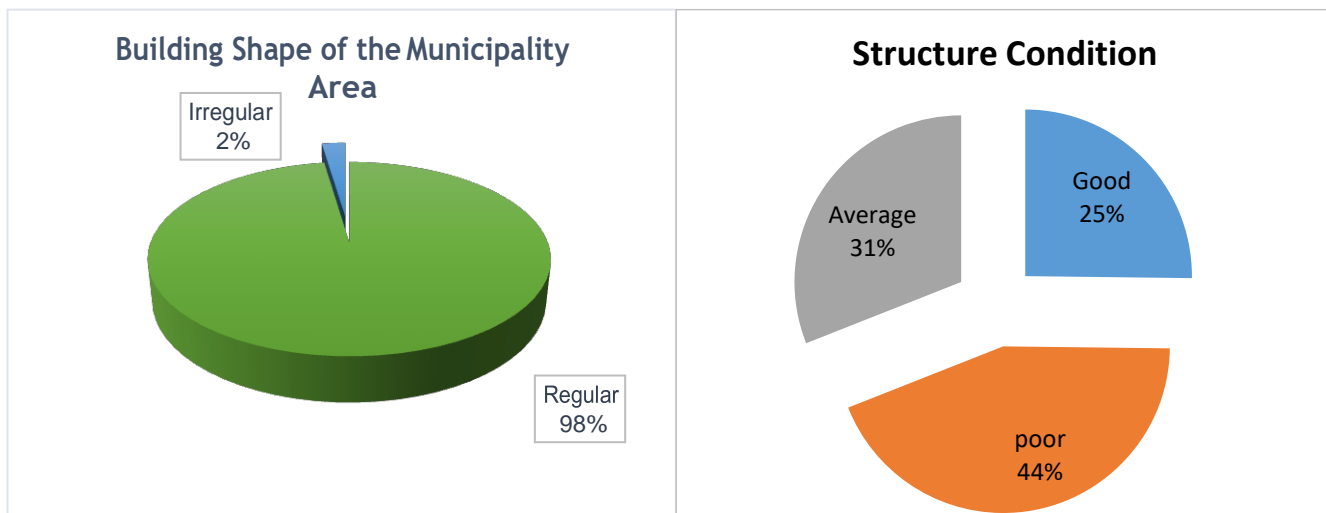


Figure 4 Structural shape and their status of condition within the Municipality

6.1.4 Mobile Tower on the Structures

Only .5% structures are found where the mobile towers are situated whereas the maximum structures about 99.5% have no mobile tower.

6.1.5 Heavy Over, Slope and Pounding

In this area, heavy over and pounding have not witnessed at high rate. Only 2.2% structures are found which have heavy over.

Only 1.6% structures have slope and most of the structures around 98.4% have no slope.

In case of pounding, 3.5% structures have chance during earthquake. And 96.5% structures have no chance of pounding as the density and height are low.

6.1.6 Structure Use

About 11 types of uses of the structures are found in the municipality area. It has already known that Mirsharai Pourashava is one of the coastal urban areas of Bangladesh. Because of the geographical location the all 11 types are not found at a high rate. Mainly the residential structures or buildings are mainly found not only applicable for this urban area but also witnessed all over the world's urban areas. However, in Mirsharai pourashava pucca, semi-

pucca, tinshed, katcha and wooden structures are found which have already explained. Among all structures under the residential structures 15% are pucca, 6.8% semi-pucca, 29.7% tinshed, 23.4% katcha and .5% wooden. Except residential uses others all types are not found significantly. But among these uses of community services, commercial and agriculture should be counted as important structural uses as different type of structures are there. Under mixed use, service activity, education, unused, manufacturing, administrative and prokolpo a few structures are found.

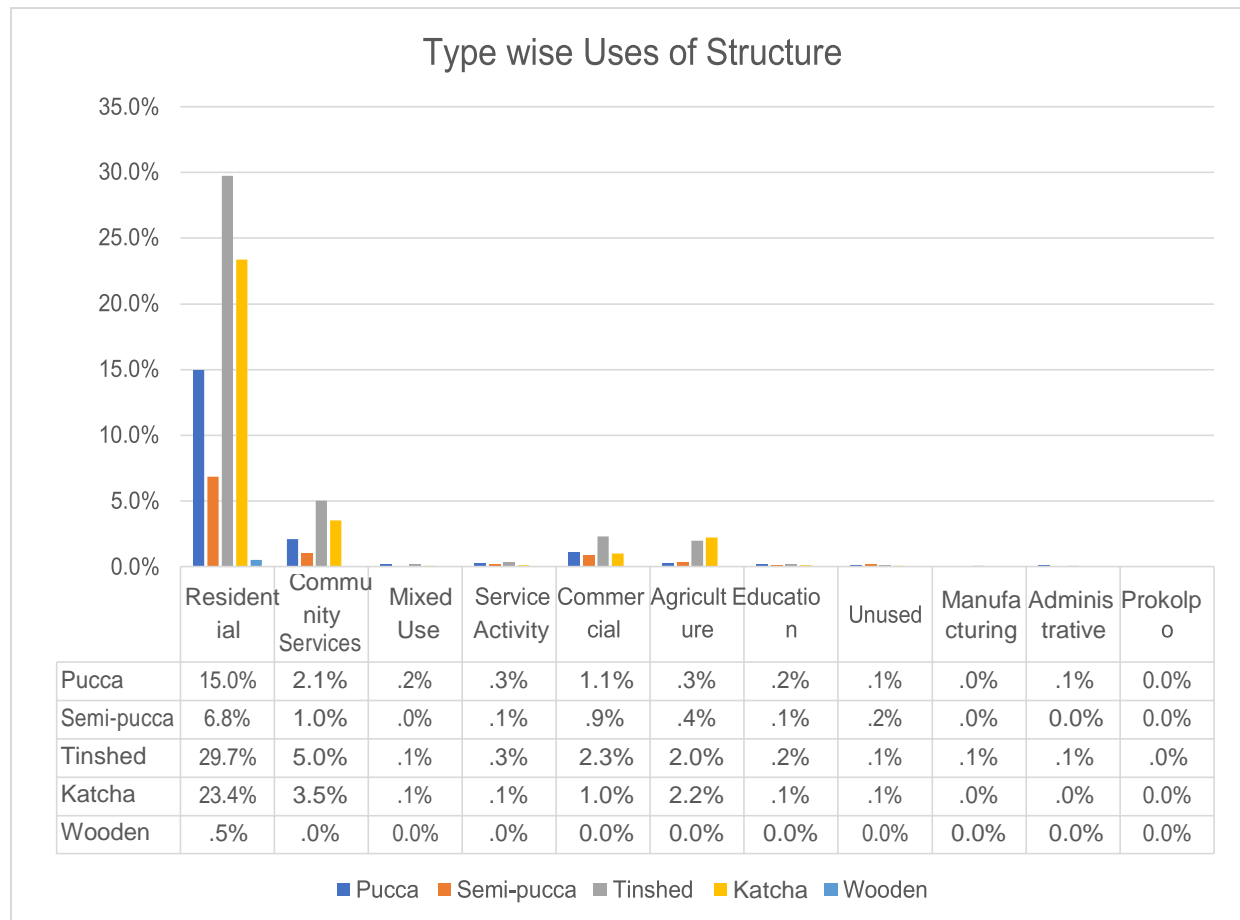


Figure 5 Different types of structure and their uses

6.1.7 Trend of Construction Pattern

The data that were collected from the municipality area we found that the construction approximately started around 100 years ago. The following figure () shows the trendline of the construction in this Pourashava. Since 1940 or before that only .1% structures are developed. After that from 1941 to 1963 .1% structures only had increased. But just after 10 years 1% structures were visible in the area indicates the starting era of development. Within 1987-1998 Mirsharai had to see the actual development scenario and after that the

development of structures stopped the gradual increasing patten and development flow become high. Now 60.8% structures are developed.

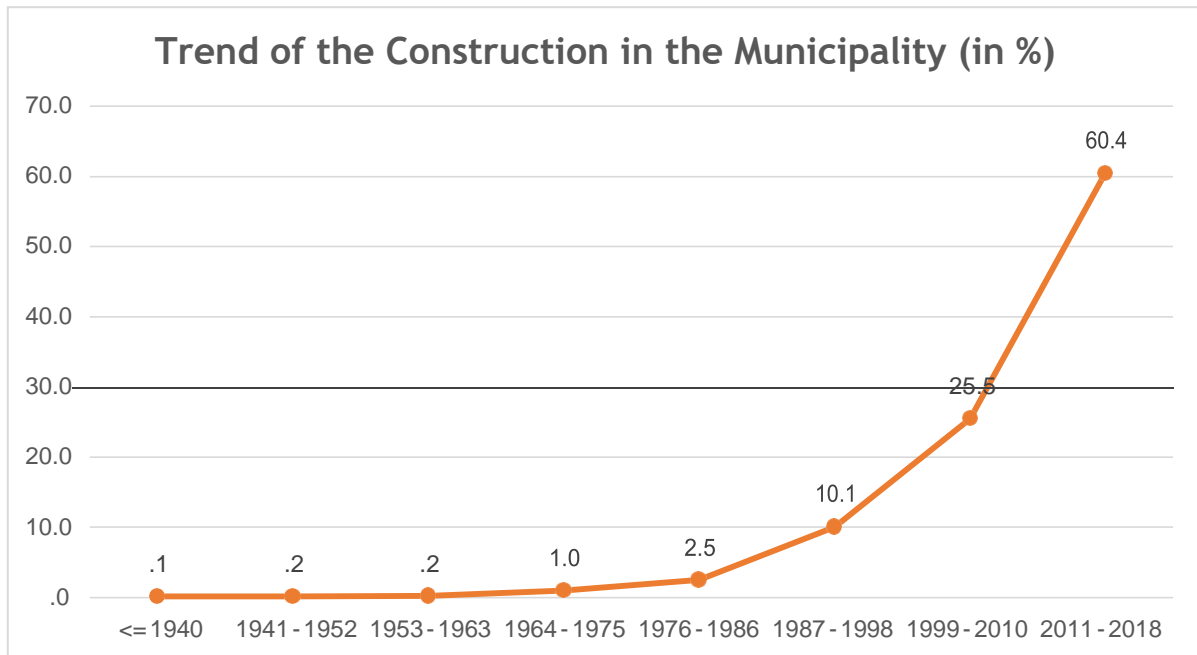
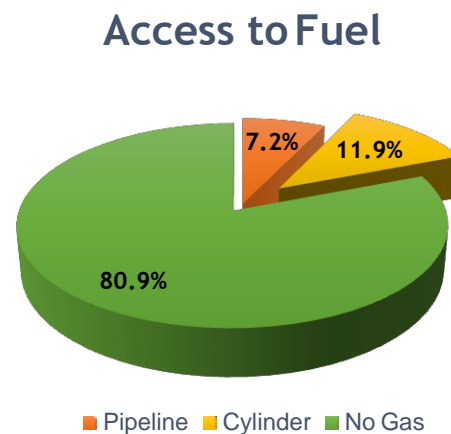


Figure 6 Trendline of growth of the structures

6.2 Access to Services

6.2.1 Access and Source of Fuel

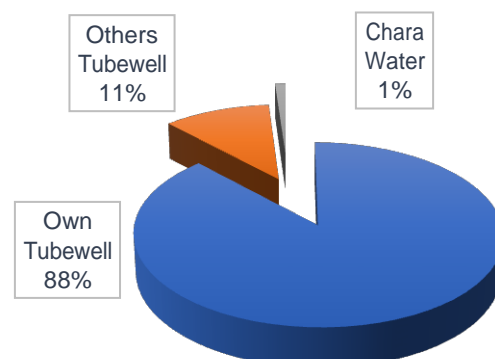
Maximum people around 80.9% of the municipality area have no access to gas either they can't get the access to pipeline or low capability to buy the cylinder gas. Only 7.2% people have the pipeline gas and 11.9% people buy cylinder for gas.



6.2.2 Access and Source of Water

Maximum people of the Mirsharai pourashava about 88% have own tube well that is why most of the people have no water related problem. From the figure () it can be easily understood that most of the places tube well can be marked. One of the fresh water sources is chara water. 1%

Sources of Water



people of the pourashava have meet their water demand from that. The figure () also shows the chara waterline from where these people meet their water demand. And others depend on others' tube wells which covers 11% people.

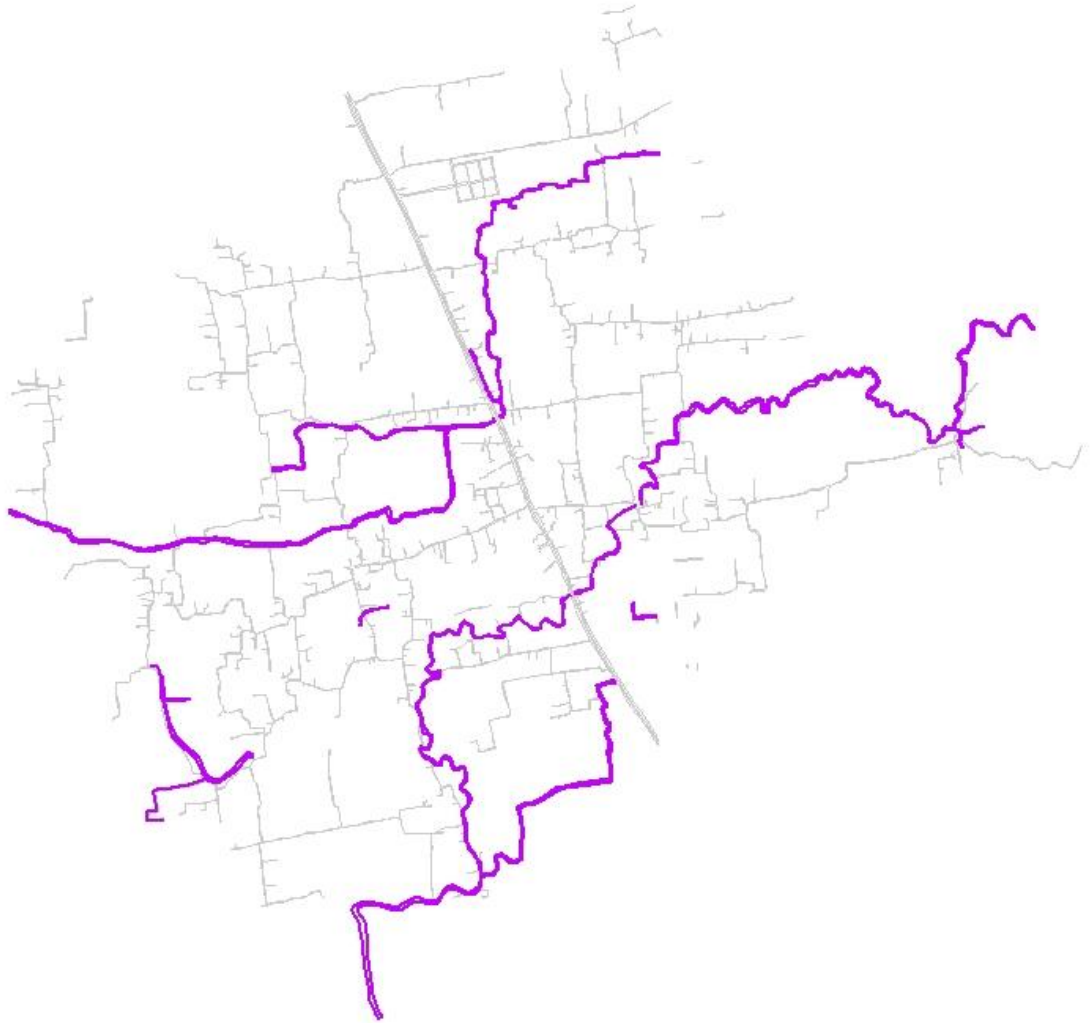
Total 508 tube wells are now existed in the Mirsharai Municipality area.



Map 11: Position of tube wells in Mirsharai Municipality

1:30,000

Chara Water line in Mirsharai Municipality



Legend

- Chara_Water Line
- Road

0 0.275 0.55 1.1 Kilometers



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Map 12 Chara Water line in the Mirsharai Municipality

Status of Electric Pole

Total 1053 electric poles are situated in the municipality area.



Map 13 Electric poles in the municipality area

Three types of electric poles in the municipality area are found which are light posts, high voltage and electric pole which covered levels are 4%, 2% and 94% respectively.

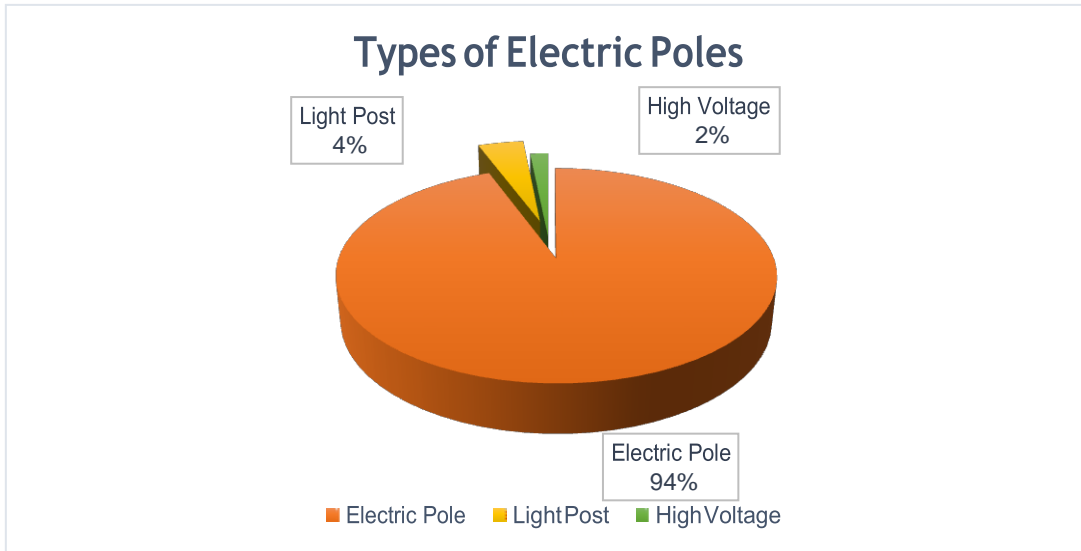


Figure 7 Different types of electric pole and these percentages

6.3 Communication System in the Municipality Area

6.3.1 Types of Roads

About 38% road in the municipality area is Pucca. Number of Semi-pucca road is almost same as Pucca road (36%). There is also 24% katcha road in the area. The rest is RCC (Reinforcement Cement Concrete) Road (2%) and foot over Bridge. But the number of Foot over Bridge is least in comparison with other types of roads.

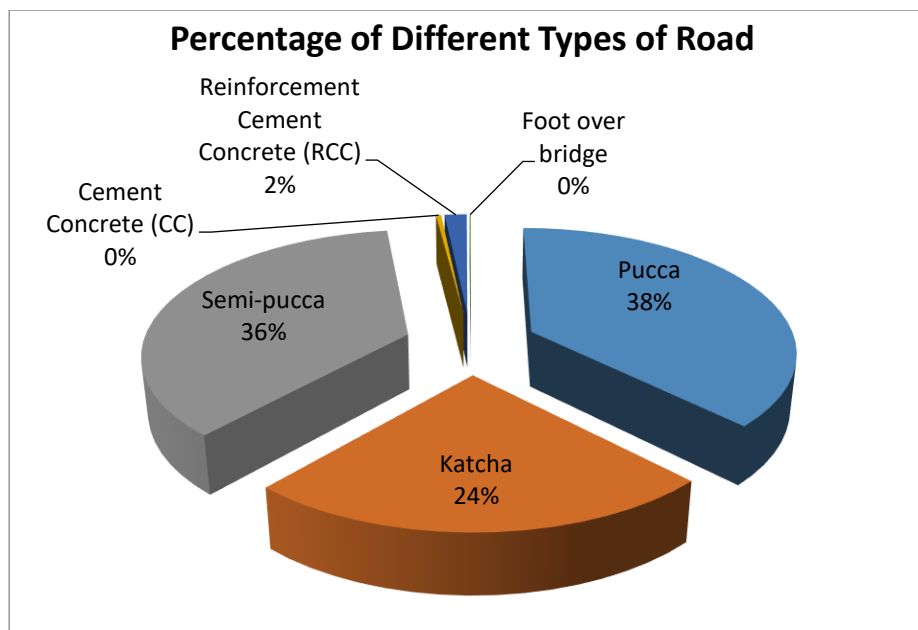
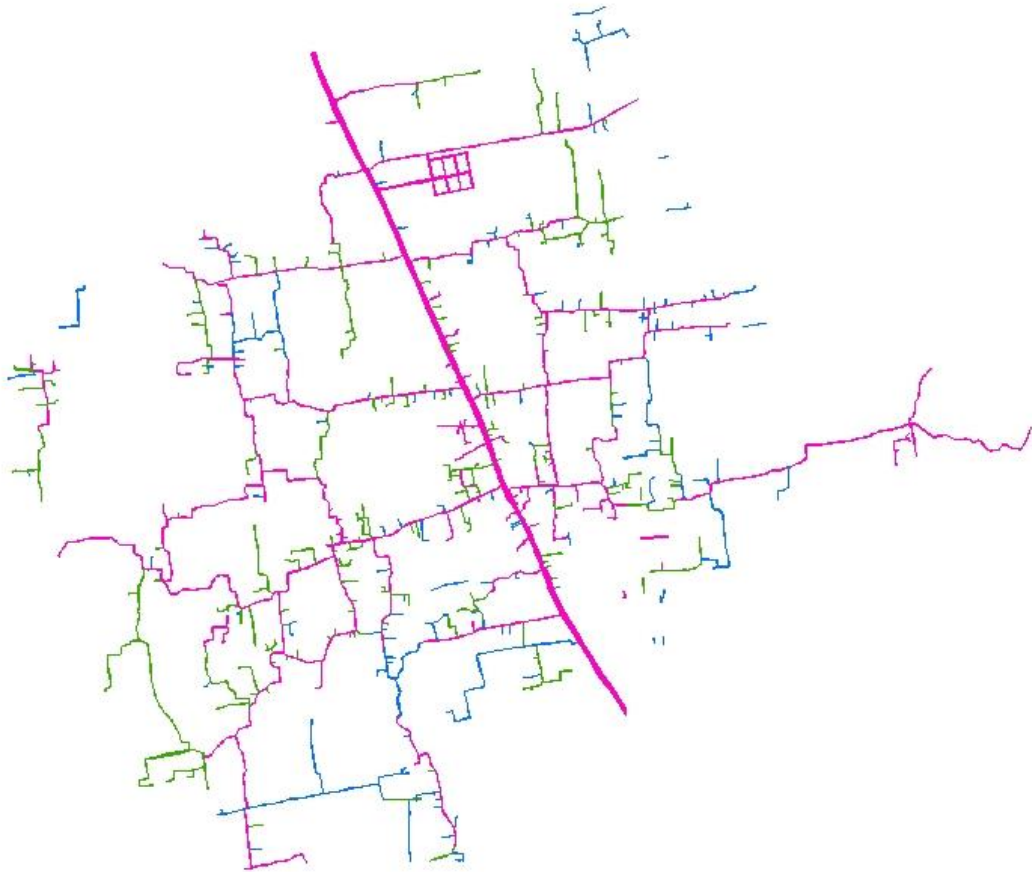


Figure 8 Percentage of Different Types of Roads

1:30,000

Road map of Mirsharai Municipality



Legend

Type

-  Foot Over Bridge
-  Katcha
-  Pucca
-  Semi-Pucca

0 0.275 0.55 1.1 Kilometers



Client:



Urban development Directorate
Government of the People Republic of Bangladesh

Consultant



Map 14: Roads map of the Mirsharai Municipality

6.3.2 Statistics of Road Length

Table 10 Statistics of the length of all roads in the municipality area

Total length of Roads	124
Mean	.710178946
Std. Deviation	3.54636591
Minimum	.0040787
Maximum	29.5484297
Sum	88.0621893

Total 124 roads exist in the municipality area. The average road length is .710 km where the standard deviation is not so high about 3.54637 km. The road of minimum length is 4.08 ft whereas the road of maximum length is 29.548.43 km. Moreover, the total length of all roads is 88.06219 km.

6.3.3 Road Covered Areas

Total .349138 sq. m areas are covered by the roads. Among these most of the roads around 97% are the categories of those roads which cover .020000 sq. km (per road). 2% roads cover more than .102529 sq. km and 1% is found within .020001 to .036506 sq. km.

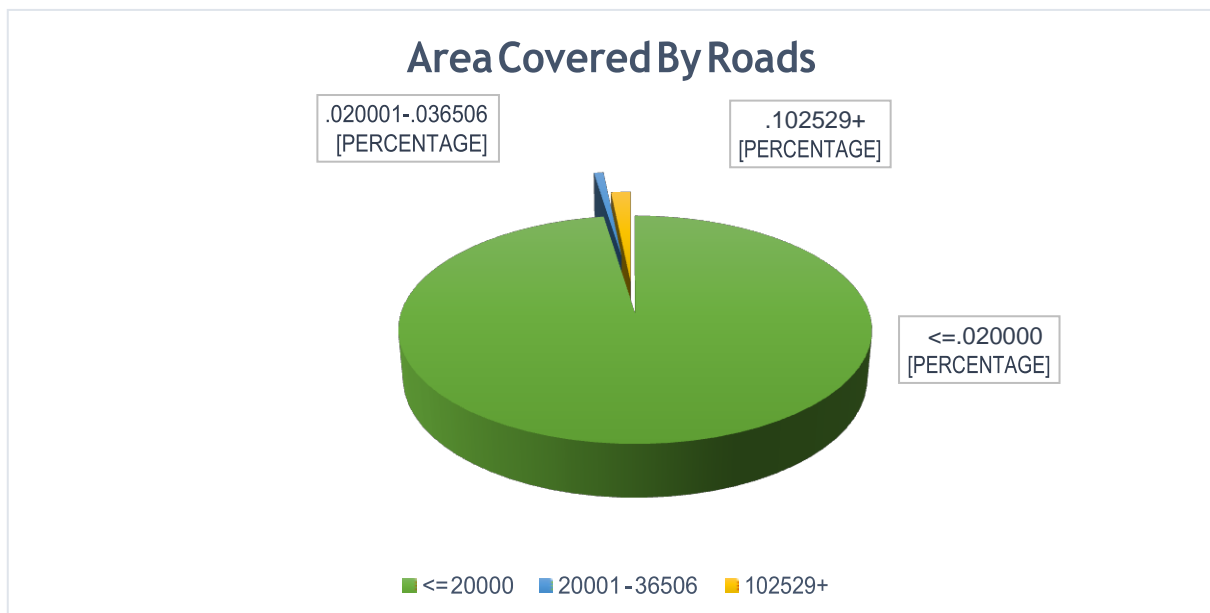
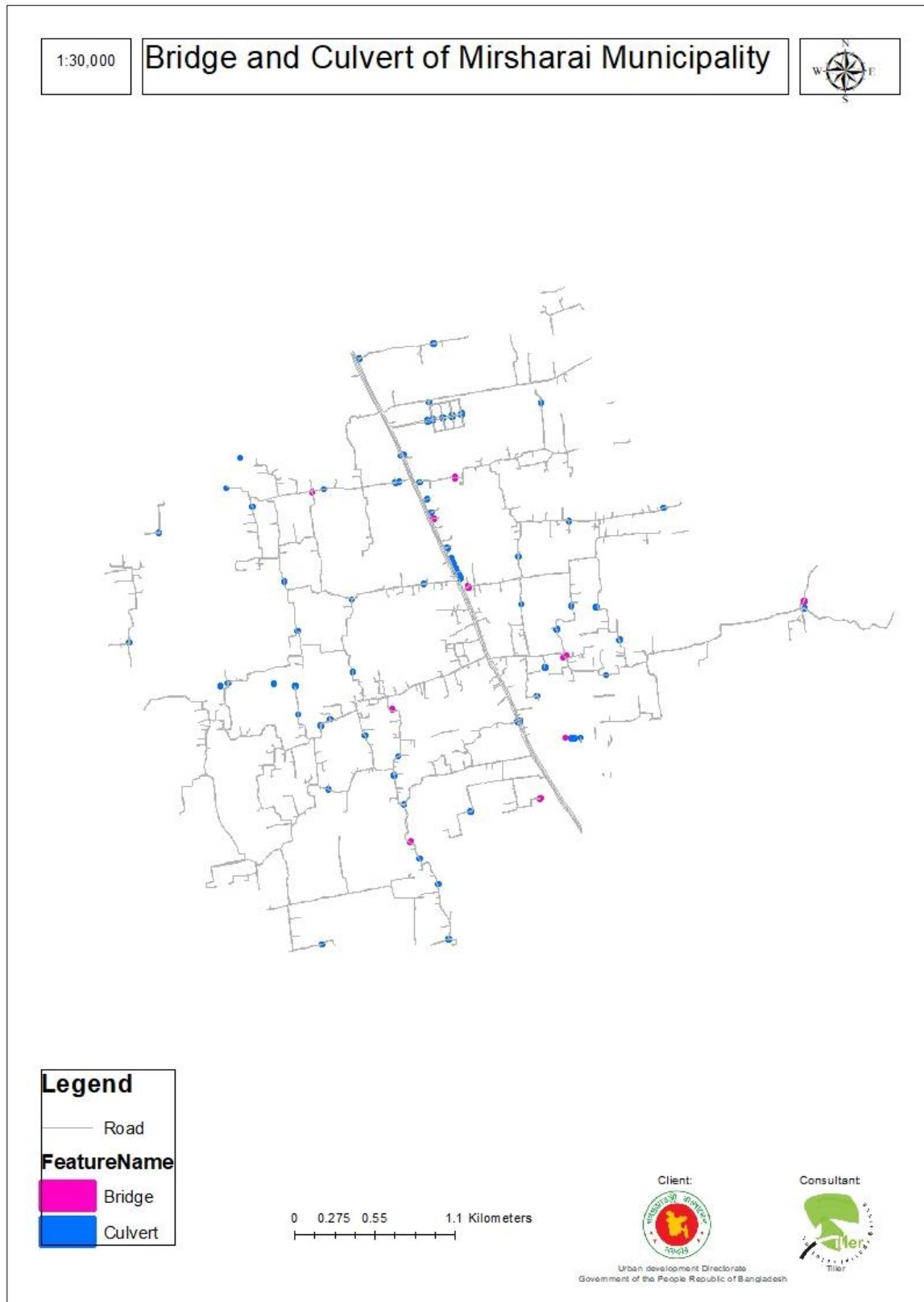


Figure 9 Road covered areas of the Municipality area

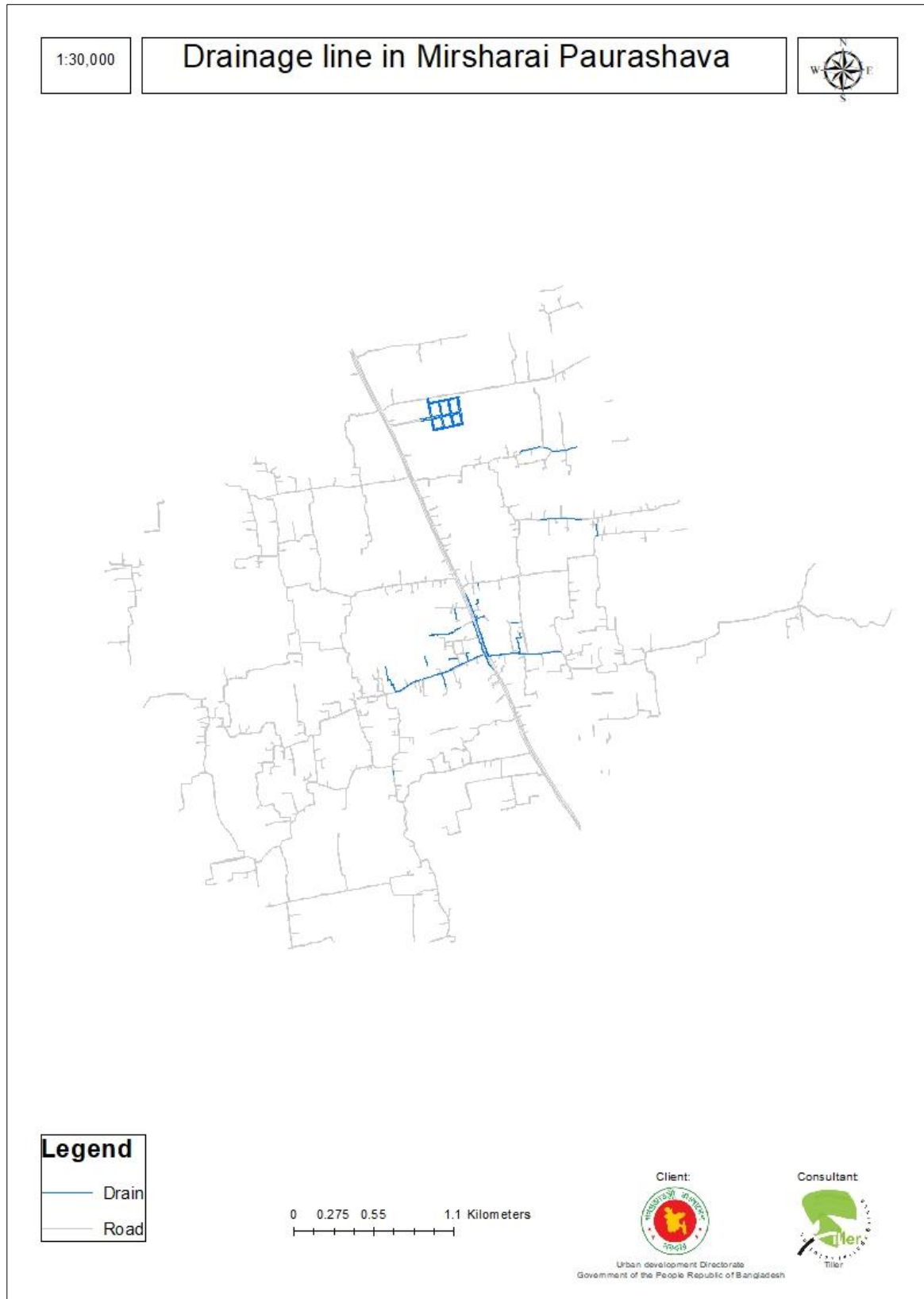
6.3.4 Bridge of Mirsharai Municipality

Total 28 bridges are found in the Mirsharai municipality area.



Map 15: Map of the location of bridges in Mirsharai Municipality

6.4 Status of Drainage System



Map 16: Drainage line in Mirsharai Pourashava

6.4.1 Status of Covered and Uncovered Drain

Most of the Drains in the municipality area are Covered (75%). The rest (25%) is open.

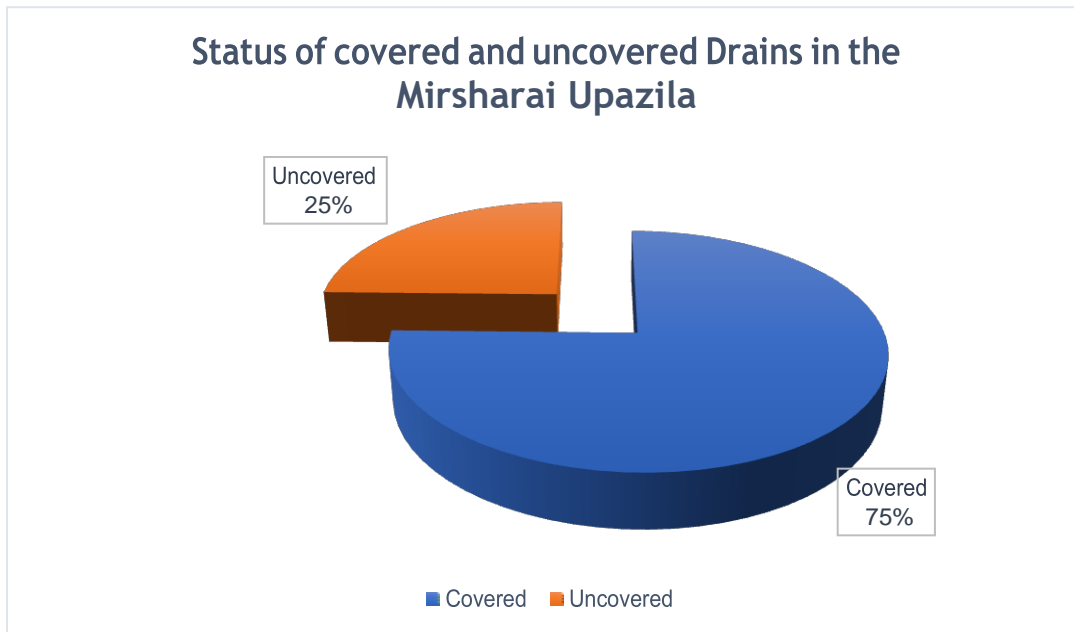


Figure 10 Status of Covered and Uncovered Drains in Mirsharai Upazila

6.4.2 Types of Drain

It is a good indication of the Pourashava is most of the drains are pucca around 82%. Because if the condition of drain is not in well condition then the access water during heavy rainfall can't pass out creating water logged areas. However, the katcha drains are around 18%.

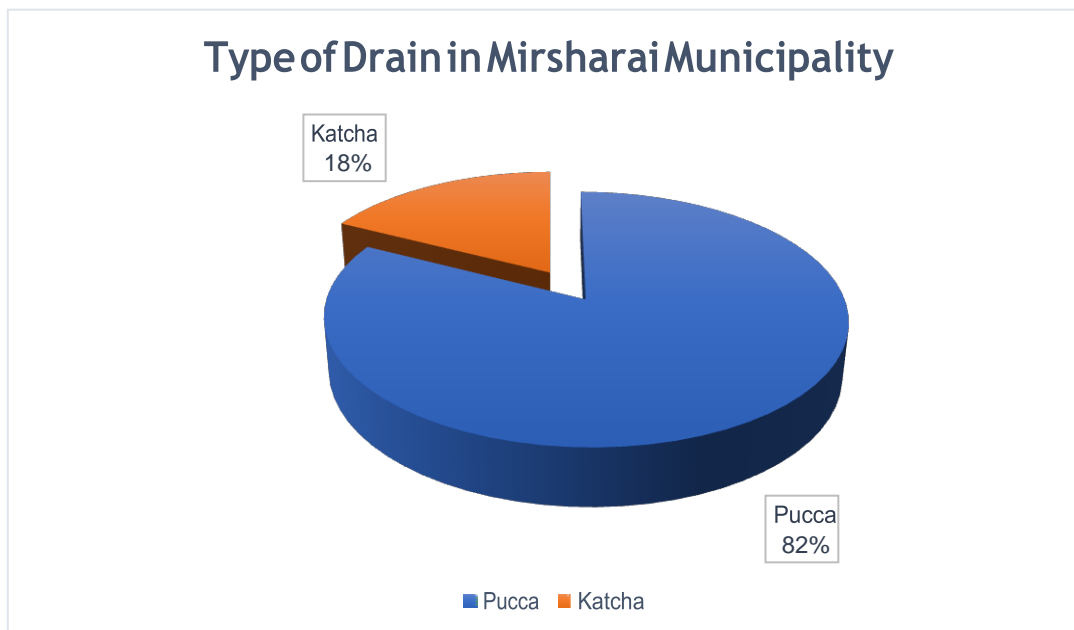


Figure 11 Type of Drain in Mirsharai Pourashava

6.4.3 Length of Drain Line

About 41% Drain is having a length between 0.119- 0.186 m. Almost 22% Drain is between 0.322-0.389 m long. The longest Drains (0.390m+) constitute 2% of the total drain covered area.

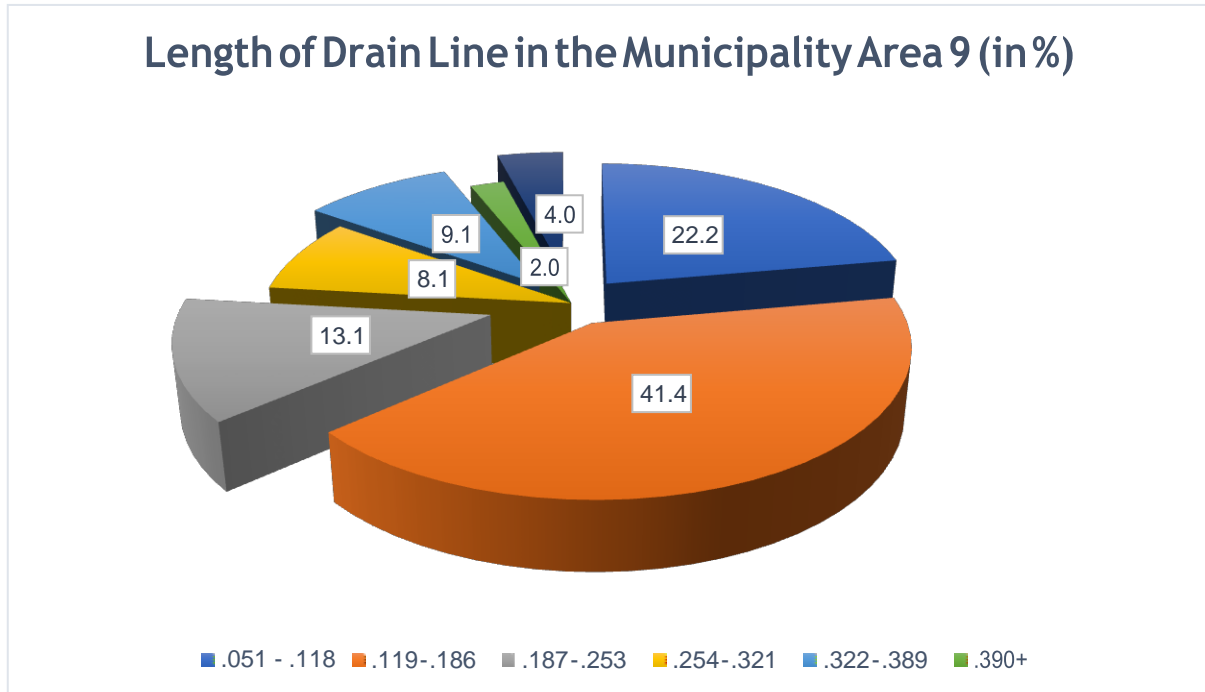


Figure 12 Length of Drain Line in Mirsharai Municipality

6.6 Waterbodies of the Mirsharai Municipality

Types of Water body and these Areas

Table () shows the number of water bodies and their percentage. Among 893 water bodies, there are ponds, fish ponds, ditch, khal and chara. Maximum amount of water bodies is pond (about 88%). Most of the ponds (84%) are having area of less than 0.005 sq. m. Amount of fish ponds is almost 10% of total number of water bodies. The rest are ditch (3.8%), khal (.1%) and chara (.6%).

Table 11 Area of different types water body in the Mirsharai Municipality

Type	Area (in sq. km) of Different Types of Water Bodies of the Municipality					Total
		< .005	.005- .008551	.008552 – .012103	.022757+	
Pond	Number	752	7	4	2	765
	% within Type	84.2%	.8%	.4%	.2%	85.7%
Fish Pond	Number	87	1	0	0	88
	% within Type	9.7%	.1%	0.0%	0.0%	9.9%
Ditch	Number	34	0	0	0	34
	% within Type	3.8%	0.0%	0.0%	0.0%	3.8%
Khal	Number	1	0	0	0	1
	% within Type	.1%	0.0%	0.0%	0.0%	.1%
Chara	Number	5	0	0	0	5
	% within Type	.6%	0.0%	0.0%	0.0%	.6%
Total	Number	879	8	4	2	893
	% within Type	98.4%	.9%	.4%	.2%	100.0%

Analysis and Findings

The JVC firm has surveyed the Baroiar Hat Area including Physical Feature, Land use and FEMA and other demographic pattern in each house hold and structures. Following section is describing the existing condition ,access to different services sources of necessary needs and other physical feature related information in this project area

7.1 Type of Building Structure

In the Mirsharai Project Area Baroiar Hat Pourashava is one of the rich areas. Building Structure is found Pucca, Semi Pucca, Tinshed and Katcha

Table 12 Structure Type

SL	Structure Type	Number	%	Remarks
1	Pucca	681	19.99	
2	Semi pucca	554	16.26	
3	Katcha	458	13.44	
4	Tin Shed	1707	50.10	Predominant Structure
5	Under Construction	5	0.15%	
6	Wooden	2	0.06%	
	Total Structure	3407	100%	

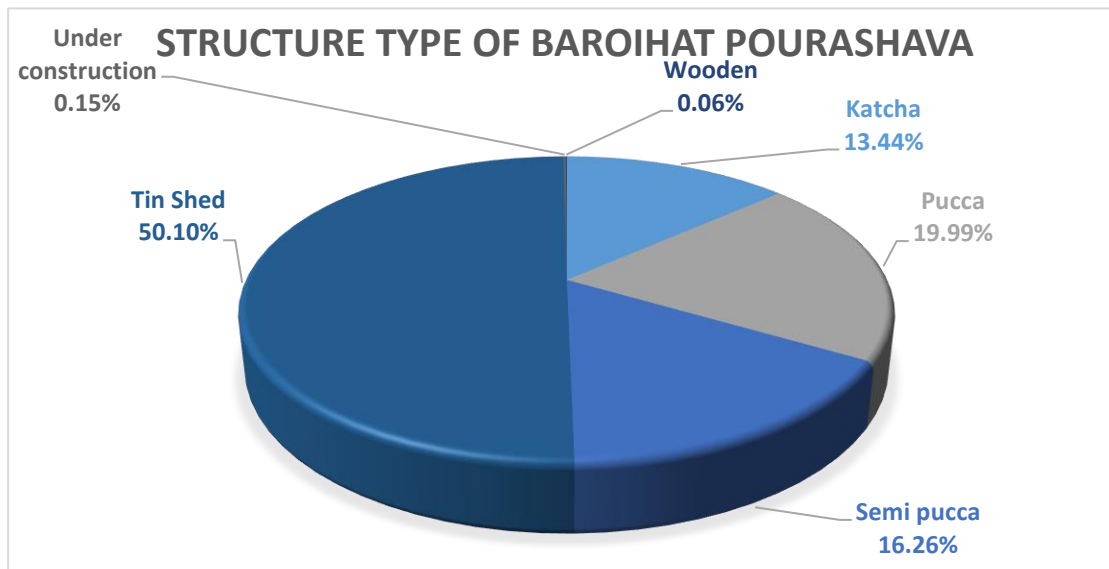
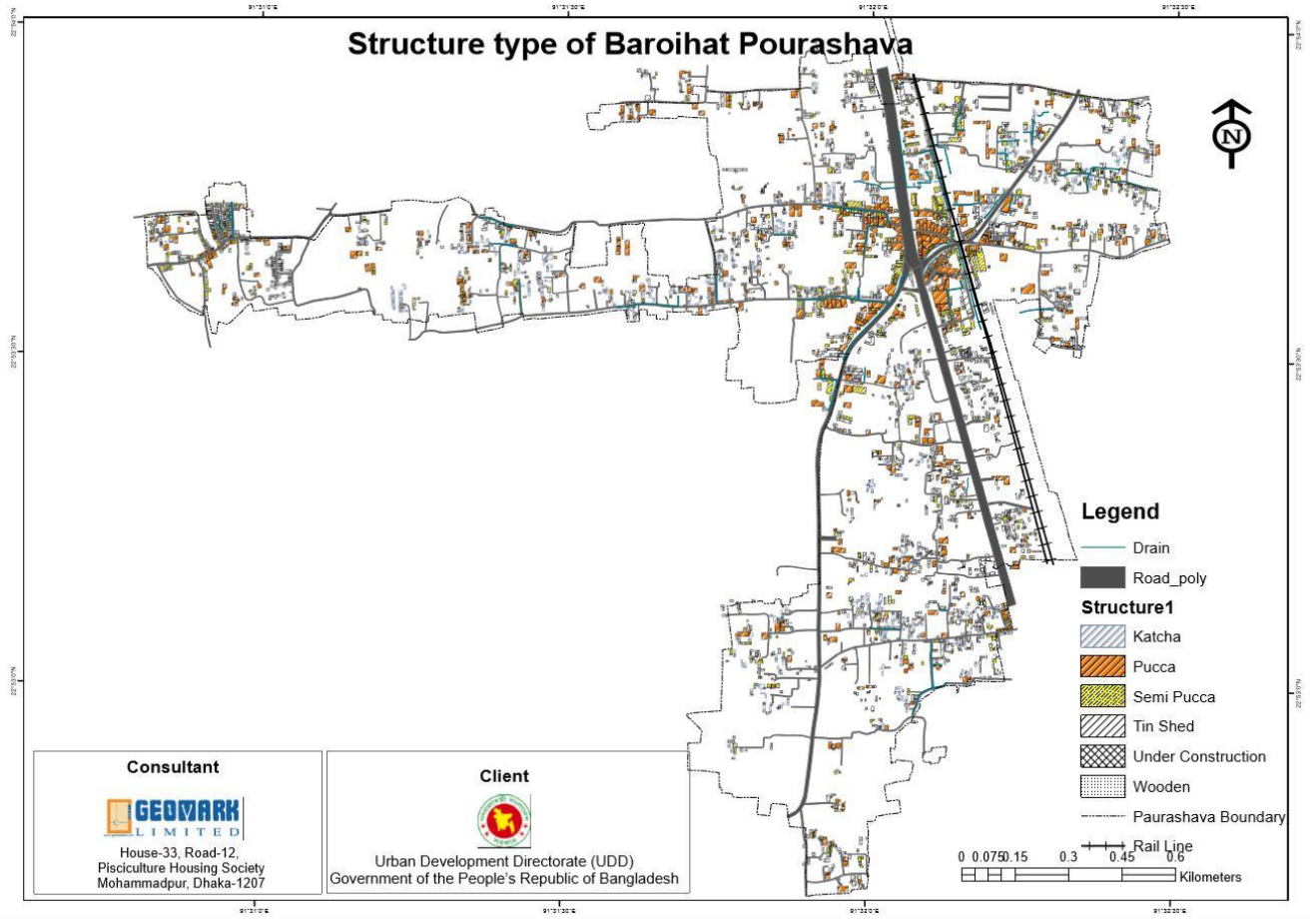


Figure 13 Structure type of Baroiari Hat Pourashava



7.2. Building Structure Use

Baorior Hat Pourashava's structure use mainly residential. Some Commercial use is adjacent part of the Residential house so it would be called mixed use.

Table 13 Land use Table

SL	Structure Type	Number	%	Remarks
1	Administrative	13	0.38	
2	Agriculture	45	1.30	
3	Commercial	667	19.33	
4	Community Service	37	1.07	
5	Education & Research	38	1.10	
6	Industry	8	0.23	
7	Mixed Use	84	2.43	
8	Residential	2466	71.48	Predominant use
9	Service Activity	54	1.57	
10	Transport & Communication	16	0.46	
11	Under Construction	22	0.34	

Amount	3407	100%	
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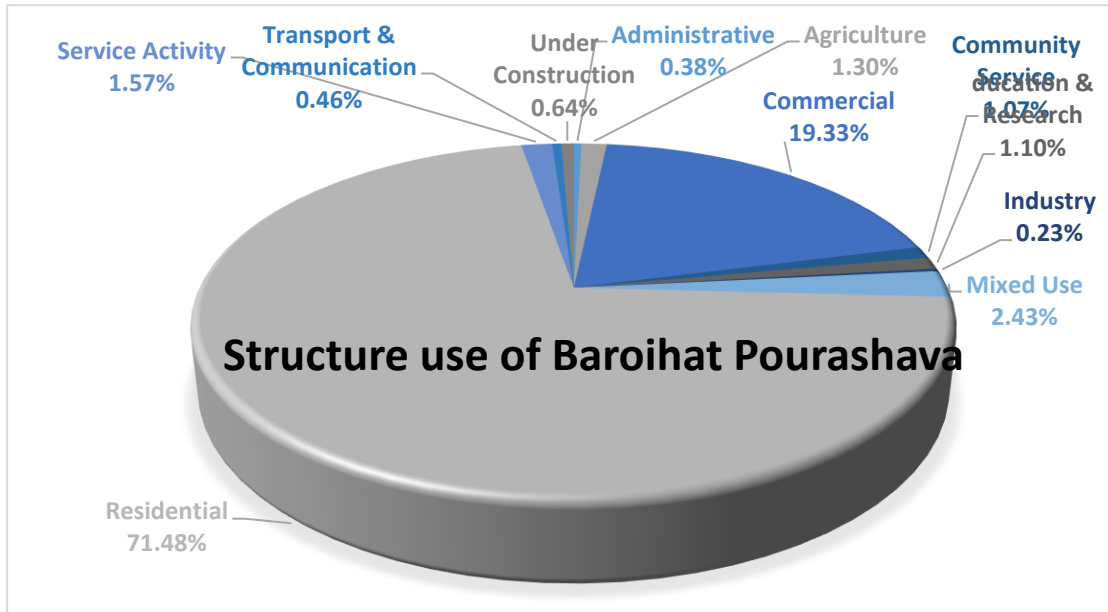
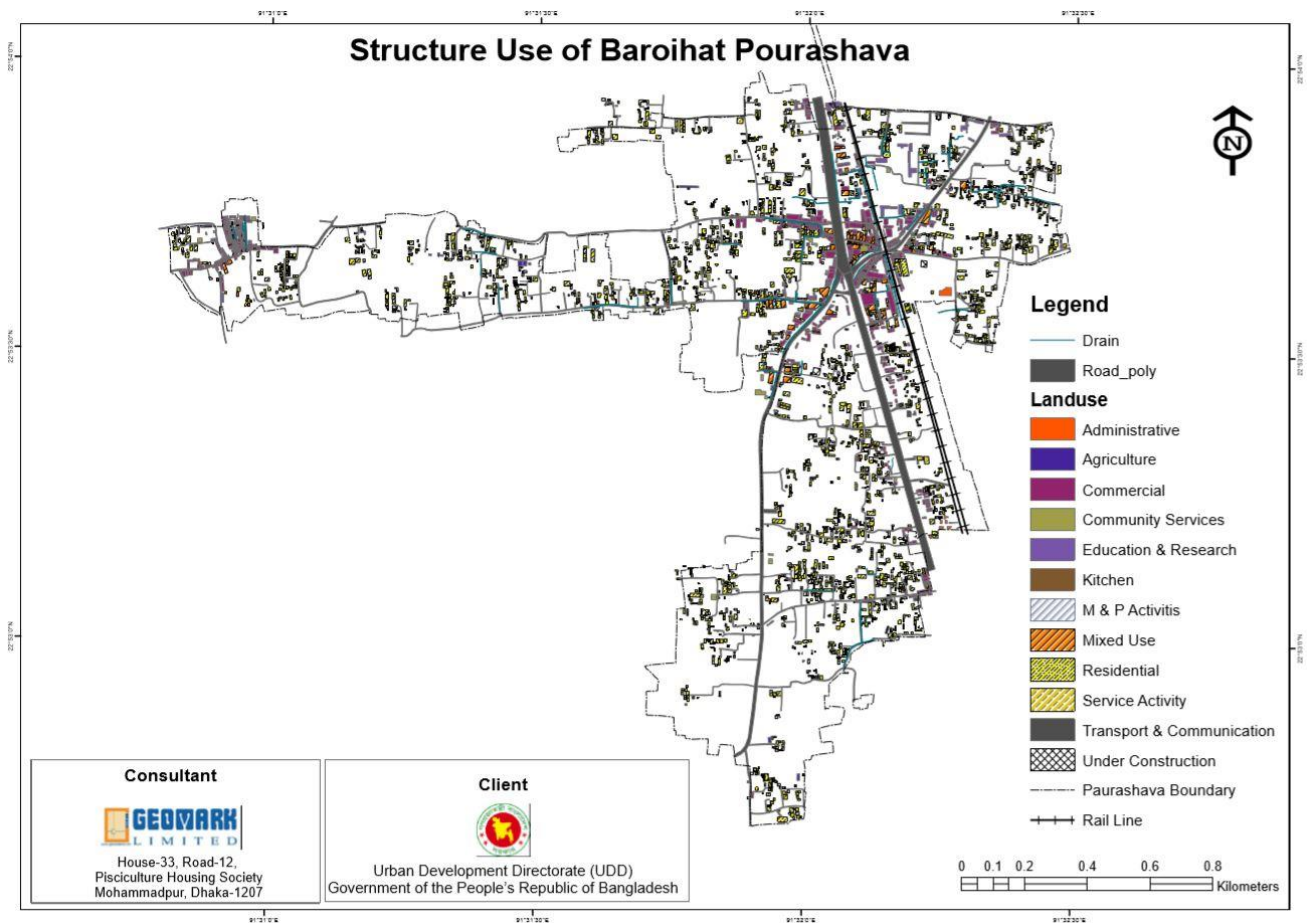


Figure 14 Structure use of Bariorar Hat Pourashava



7.3. Structure Height Of this Area.

In this pourashva area one storied building is 92.81% other is various categories and only six storied is 0.185 %.

Table 14 Structure Height

Sl No.	Storied	Structure	%	Remarks
1	1	3149	92.81	Predominant Height
2	2	120	3.54	
3	3	59	1.74	
4	4	43	1.27	
5	5	16	0.47	
6	6	6	0.185	
	Total Structure	3407	100%	

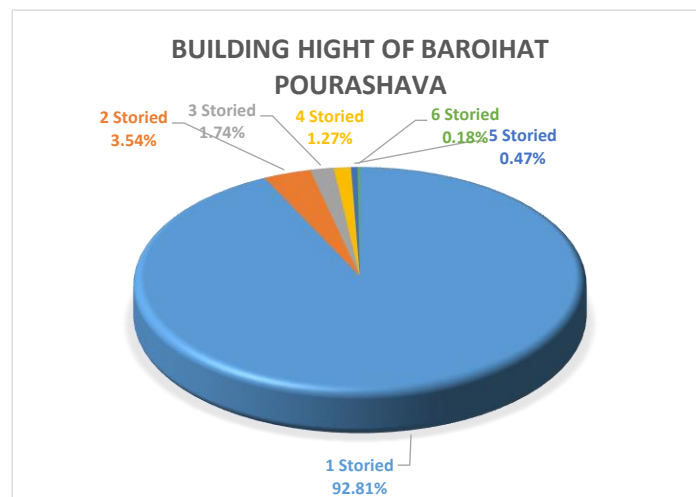
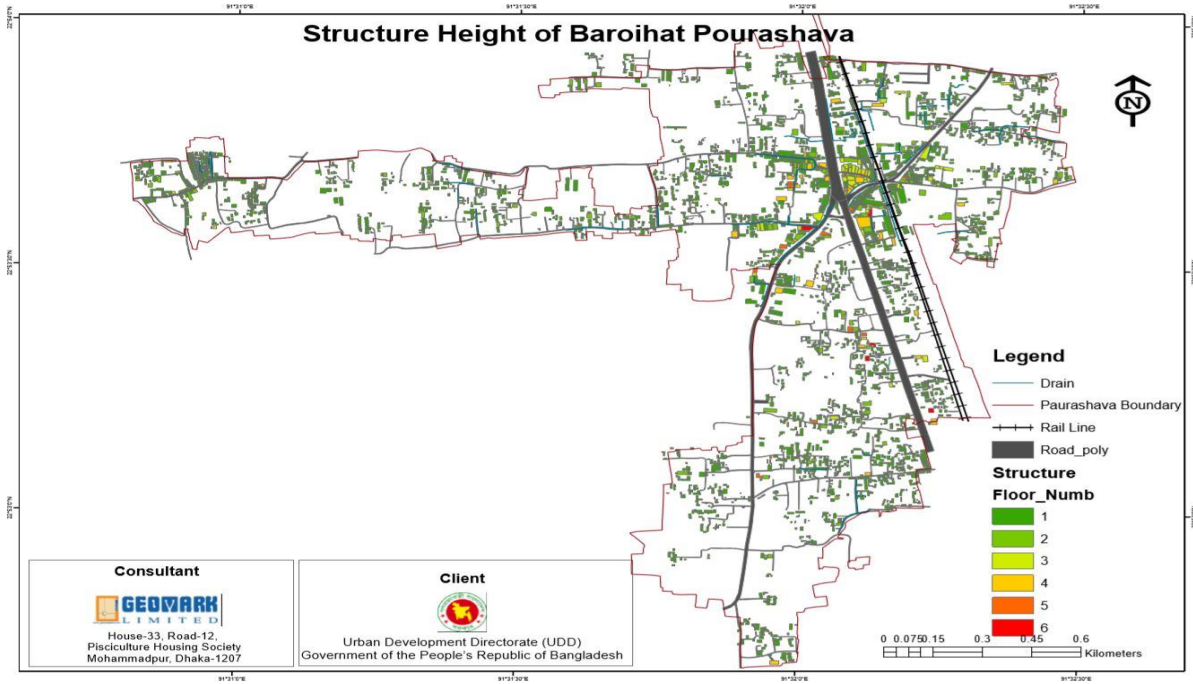


Figure 15 Structure Height of Baroiarhat Pourashava



7.4 Structure Condition

We found 92.81 % structures are in good condition during survey and it is the predominant one.

Table 15 Structure Condition

Sl No.	Structure Condition	Structure Number	%	Remarks
1	Good	1241	92.81	Predominant good
2	Average	724	3.54	
3	Poor	1487	1.74	
Total			100%	

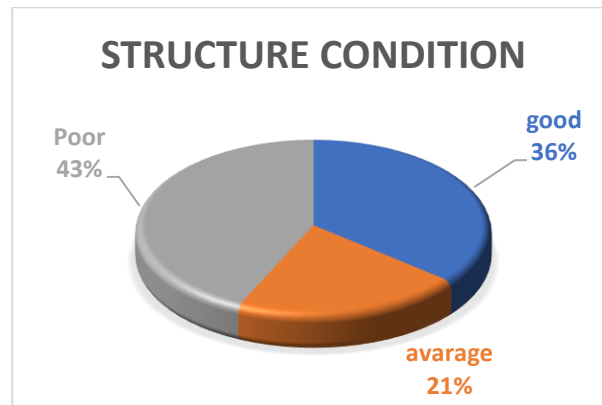


Figure 16 Structure Condition of Baroiar Hat Pourashava

7.5 Road Type and length

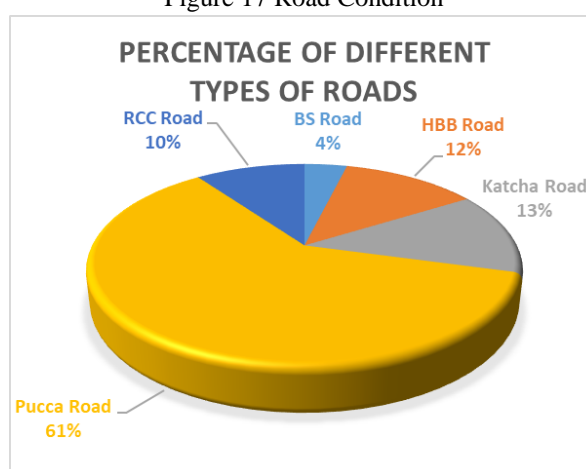
Table: Road Type

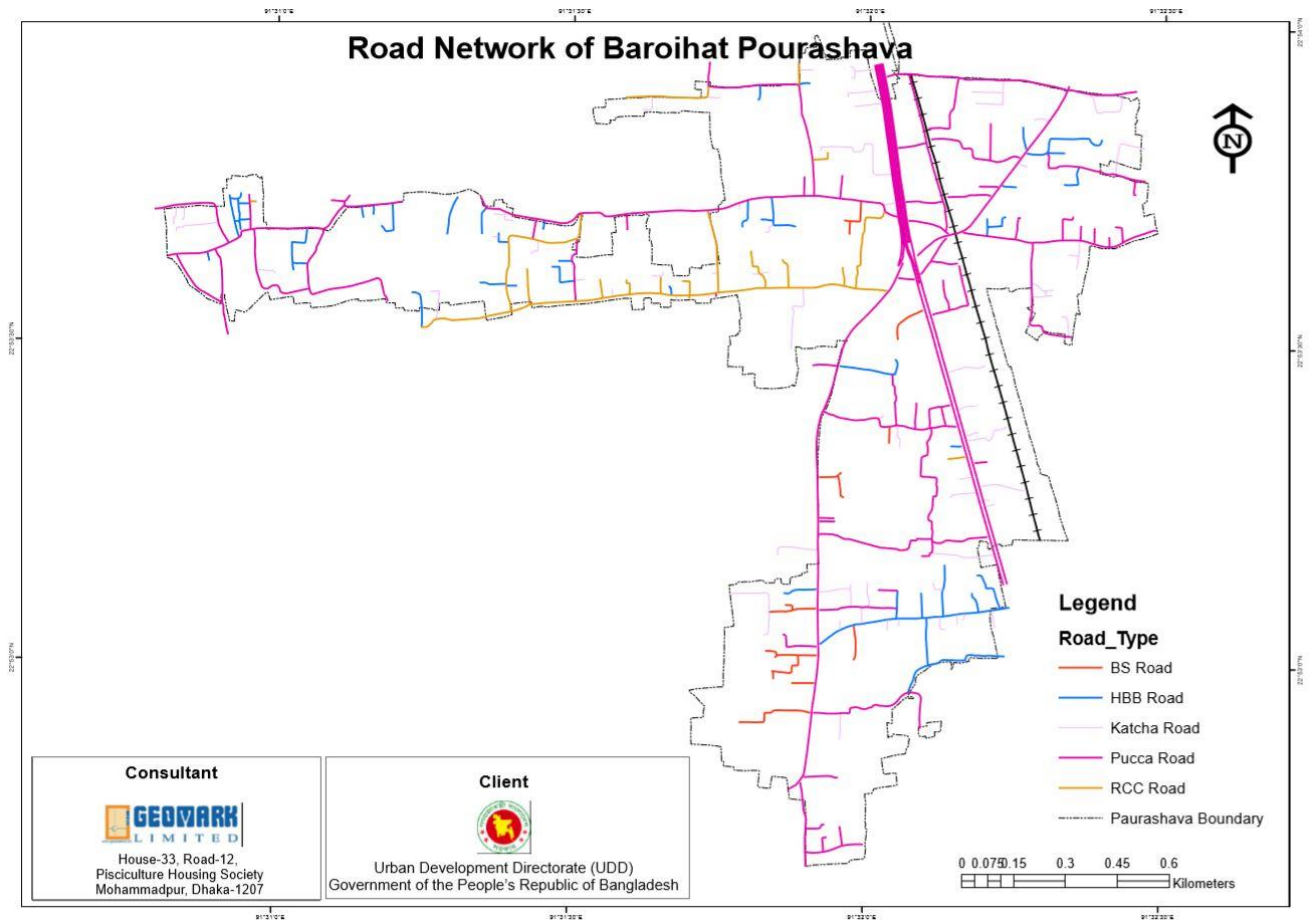
In urban area, pucca road is predominant because of the services of urban citizens.

Table 16 Road type

Sl No.	Road Type	Length (Km)	%	Remarks
1	BS Road	1.331177	4	
2	HBB Road	4.271817	12	
3	Katcha Road	4.559328	13	
4	Pucca Road	21.114129	61	Predominant
5	RCC Road	3.432527	10	
	Total length	34.708978	100%	

Figure 17 Road Condition





7.6 Drainage Type and length

Water logging along with drainage congestion problem is one of the major problems in the urban area of Baroiarhat. There is no sufficient drain and which is existing is not functionable due to proper maintenance. As our field survey we found Pucca Drain 125 nos. which is 98% of the total drainage and Katcha Drain 3 nos which covers 2% of the total drainage.

Table 17 Drainage Type

Sl No.	Type	Length (Km)	Length (m)	%	Remarks
1	Pucca	9.179631	9179.631497	98	
2	Katcha	0.201198	201.197838	2	

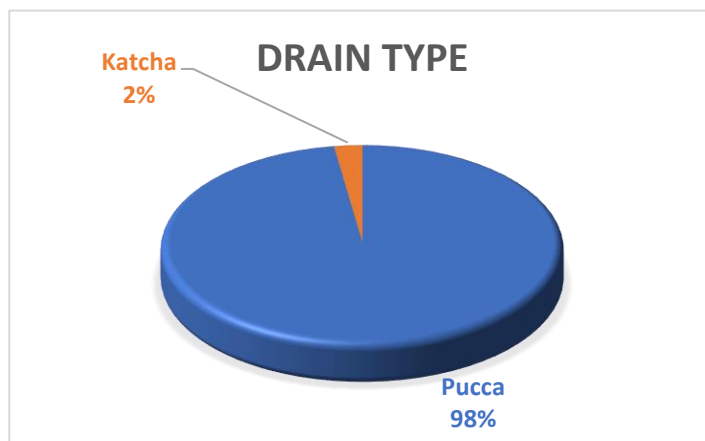


Figure 18 Drainage Type of Baruihat Pourashava

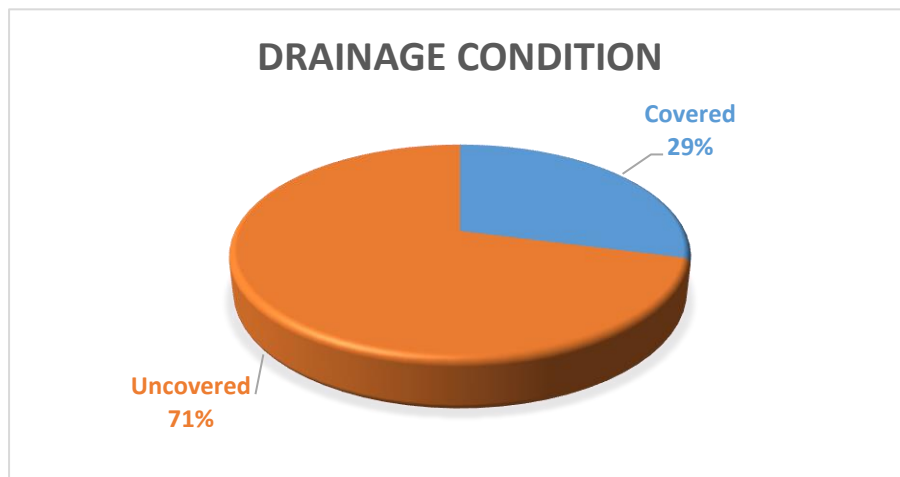
7.7 Drainage Condition:

From the survey, we revealed that, almost 71 % of the drains in Baroiarhat Pourashava are uncovered and only 29% of them are covered.

Table 18 Drainage Condition

SL	Drainage condition	Number of Drains	Length (km)	Length (m)	%	Remarks
1	Covered	26	2.725613	2725.612905	29	
2	Uncovered	102	6.655216	6655.21643	71	

Figure 19 Drainage Condition of Baruihat Pourashava

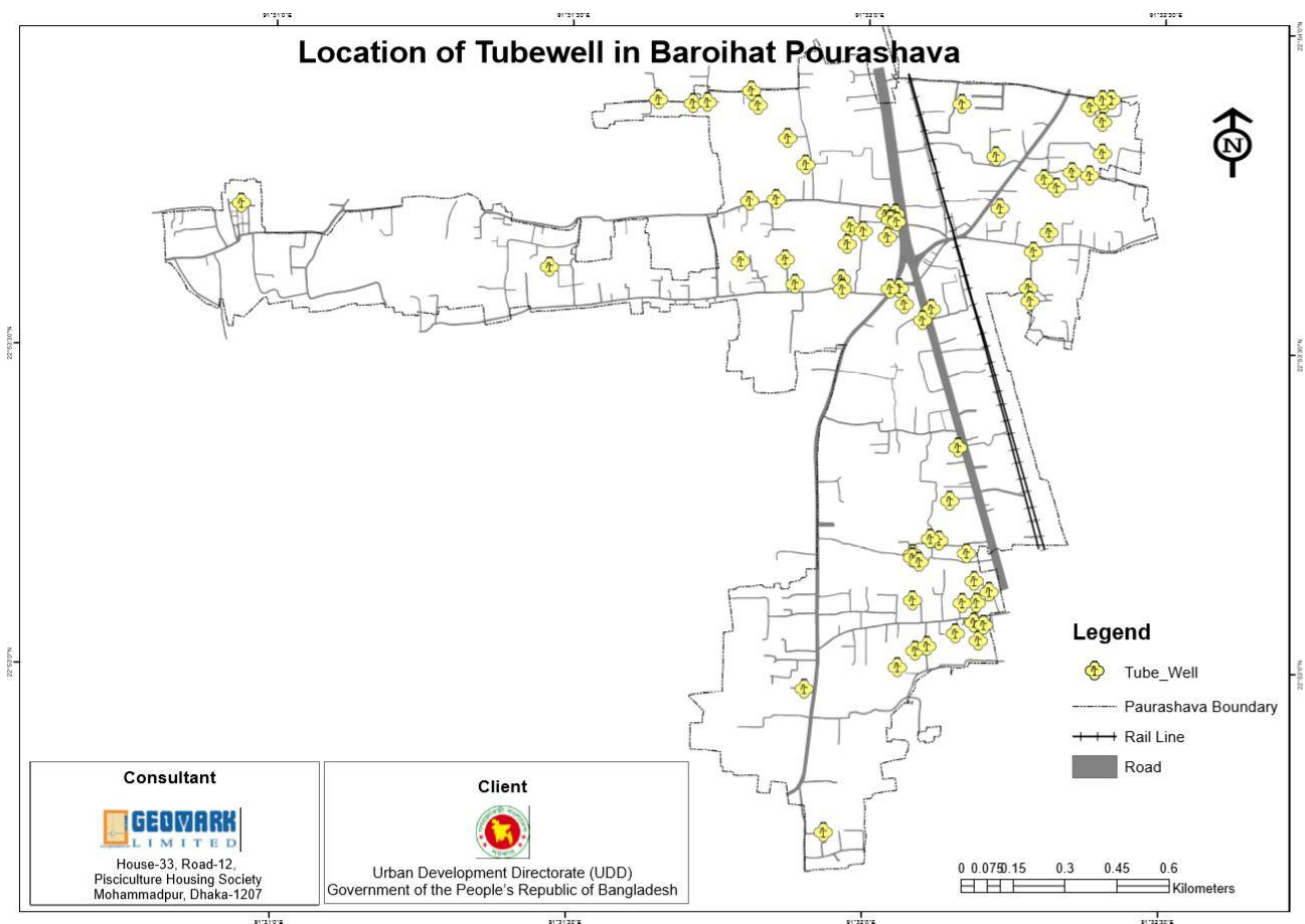


7.8. Tubewell and other points feature

From physical feature survey, we found 69 tubewell, 2 BM pillars, 35 bridge & Culvert and 364 Electric poles.

Table 19 Tube well other point feature in this Poushava area

Sl No.	Point Type	number	Remarks
1	Tube_well	69	
2	BM Pillar	2	
3	Bridge & Culvert	35	
4	Electric Pole	364	



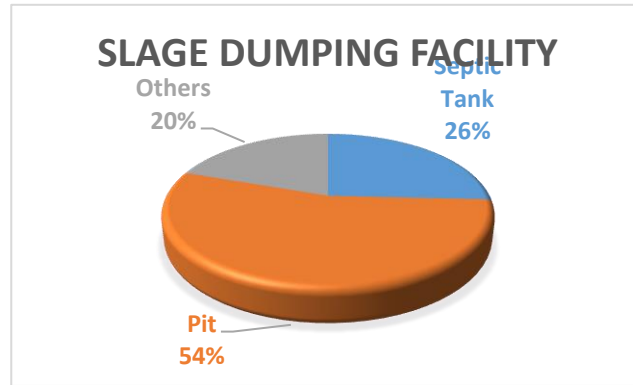
7.9. Sludge Management

For sludge dumping majority of the people living there prefer pit latrine and a few (26%) uses Septic tank to dump their sludge.

Table 20 Sludge dumping facility

Sl No.	Sludge Dump type	number	%	Remarks
1	Septic Tank	524	26	
2	Pit	1109	54	
3	Others	400	20	
			100%	

Figure 20 Sludge dumping facility of Baruihat Pourashava



7.10 Water Bodies

There are 272 number of ponds in Baroiar Hat Pourashava. There are some other water features like 51 Ditches, 4 Low land, and 2 canals.

Table 21 type of water bodies

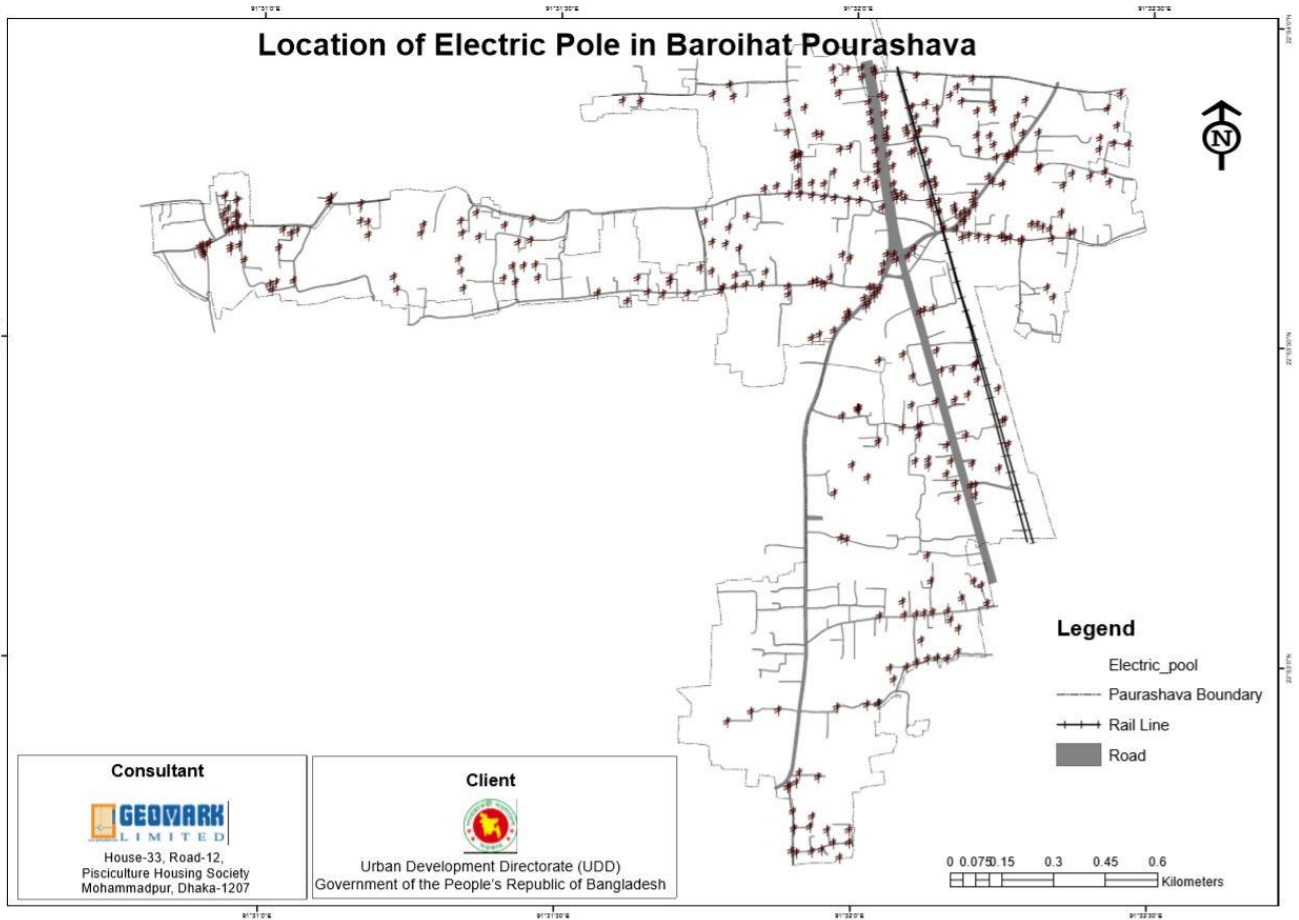
Sl No.	Water body Type	Number	Remarks
1	Pond	272	
2	Ditch	51	
3	Low land	4	
4	Canal	2	

7.11 Other Facilities

Baroiar Hat Pourashava has some other features in its boundary such as 10 Playgrounds, 10 Graveyards, 7 Barren land and 1 garden.

Table 22 List of other features

Sl No.	Type	Number	Remarks
1	Play ground	8	
2	Graveyard	10	
3	Garden	1	
4	Barren land	7	



Conclusion

This project works program and time schedule have been developed based on ToR. Modern tools and technologies had been tried to include for physical features surveys to deliver the data in a comfortable format for data analysis and visualization. Physical features survey data collection, approach and methodology had a great influence and inception report clarify the approach and methodology. As a coastal urban area many lacks and gaps are found which have to be addressed in the master plan. From the above discussion it has been clearly understood that positive and negative scenarios all are witnessed by us. Now it is necessary to solve the solutions maintaining sustainability.